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January 22, 2013

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Mike Monasmith
Senior Project Manager
Systems Assessment & Facility Siting Division
California Energy Commission
1516 Ninth Street, MS-15
Sacramento, CA 95814

Subject: Applicant's Opening Testimony
Hidden Hills Solar Electric Generating System (11-AFC-2)

Dear Mr. Monasmith:

On behalf of Hidden Hills Solar I, LLC; and Hidden Hills Solar II, LLC, please find attached a copy of Applicant's Opening Testimony [Exhibit 71].

This will be electronically filed via several emails due to the size and a CD will be overnighted to all on POS list. Please call me if you have questions about any of the files.

Sincerely,
CH2M HILL

John L. Carrier, J.D.
Program Manager

Encl/mf

cc: POS List
Project file

Exhibit 71, Applicant's Opening Testimony

Hidden Hills
Solar Electric Generating System
(11-AFC-2)

Application for Certification
Hidden Hills Solar I, LLC; and Hidden Hills Solar II, LLC

January 2013

With Technical Assistance from

CH2MHILL®

IS061411043744SAC

Air Quality

I. Introduction

A. Name: Gary Rubenstein

B. Qualifications: Mr. Rubenstein's qualifications are as noted in his resume contained in Appendix A.

C. Prior Filings: In addition to the statements herein, this testimony includes by reference the following documents submitted in this proceeding:

- Application for Certification, Volume 1 & Volume 2, dated August 5, 2011 [Exhibit 1]
- Applicant's Data Adequacy Supplement, dated September 7, 2011 [Exhibit 2]
- Applicant's Data Response, Set 1A, dated November 16, 2011. Responses to Data Requests 1 through 14 [Exhibit 4]
- Applicant's Data Response, Set 2A, dated February 9, 2012. Response to Data Request 136 [Exhibit 28]
- Applicant's Data Response, Set 2B, dated February 16, 2012. Responses to Data Requests 144 through 146 [Exhibit 32]
- Applicant's Data Response, Set 2B-2, dated February 20, 2012. Responses to Data Request 146 [Exhibit 33]
- Applicant's Data Response, Set 2C, dated March 5, 2012. Responses to Data Request 147 [Exhibit 34]
- Applicant's Supplemental Data Response, Set 1A, dated December 30, 2011. Response to Data Request AQ-1 through AQ-6 [Exhibit 45]
- Applicant's Supplemental Data Response, Set 2, Boiler Optimization Plan and Design Change, dated April 2, 2012 [Exhibit 46]
- Applicant's Supplemental Data Response, Set 5, dated July 13, 2012. Response to Data Request AQ-7 through AQ-11 [Exhibit 50]
- Transmittal Letter for Application for Determination of Compliance and Authority to Construct, submitted to Great Basin Unified APCD on August 3, 2011, filed on August 29, 2011 [Exhibit 52]
- Email correspondence between Richard Beckstead, Permitting Manager, Department of Air Quality and Environmental Management, Clark County, Nevada, and Nancy Matthews, Sierra Research, regarding air quality cumulative impact analysis, dated August 26, 2011, and filed on August 29, 2011 [Exhibit 53]
- Letter to Duane Ono, GBUAPCD, from Nancy Matthews of Sierra Research, dated October 4, 2011, Regarding: Correction to Air Quality Table 5.1-27, filed on October 5, 2011 [Exhibit 55]
- Letter to Jan Sudomier, Great Basin Unified Air Pollution Control District, from Nancy Matthews, Sierra Research, dated October 4, 2011, Regarding: Response to District Requests for Additional Information filed on October 5, 2011 [Exhibit 56]

- Applicant's Revised Authority to Construct Forms, dated December 19, 2011 and filed on January 3, 2012 [Exhibit 57]
- Email correspondence between Nancy L. Matthews of Sierra Research and Jon Becknell of Great Basin Unified Air Pollution Control District regarding Auxiliary Boilers, dated December 31, 2011 and filed on January 3, 2012 [Exhibit 58]
- Applicant's Updated Workforce Analysis, dated October 1, 2012 [Exhibit 63]
- Applicant's Preliminary Staff Assessment Comments, Set 2, dated July 23, 2012. [Exhibit 70]

D. Documents Prepared By Others

- Letter dated May 9, 2012, from Great Basin Unified Air Pollution Control District (Duane Ono) to Mike Monasmith (California Energy Commission) providing a Preliminary Determination of Compliance [Exhibit 59]
- Letter dated August 1, 2012, from Great Basin Unified Air Pollution Control District (Theodore D. Schade) to Mike Monasmith (California Energy Commission) providing a Final Determination of Compliance [Exhibit 60]

To the best of my knowledge, all of the facts contained in this testimony (including all referenced documents) are true and correct. To the extent this testimony contains opinions, such opinions are my own. I make these statements, and render these opinions freely and under oath for the purpose of constituting sworn testimony in this proceeding.

II. Summary of Testimony

Air pollutant emissions from the proposed Hidden Hills SEGS result from operation of the natural gas-fired boilers used to bring the system to operating temperature in the morning, to augment the solar operation when solar energy diminishes, and to maintain system temperatures overnight, and from additional supporting equipment. These emissions will be controlled through the use of effective pollution control technology. This project is an important component of the State's renewable energy program. The project will be located in southeastern Inyo County, where air quality levels are within all air quality standards, with the exception of the state PM_{10} and ozone standards. The air quality impacts of the project were evaluated and shown to satisfy all state and federal air quality requirements. This conclusion was confirmed, after extensive reviews by the Great Basin Unified Air Pollution Control District (GBUAPCD, or Air District), in the Final Determination of Compliance issued on August 1, 2012.

A. Existing Air Quality

The U.S. Environmental Protection Agency (USEPA) and California Air Resources Board have each established ambient air quality standards to protect public health and welfare. Both state and national ambient air quality standards consist of two parts: an allowable concentration of a pollutant, and an averaging time over which the concentration is to be measured. Allowable concentrations are based on the results of studies of the effects of pollutants on human health, crops, and vegetation. The averaging times are based on whether the damage caused by the pollutant is more likely to occur during exposures to a high concentration for a short time (one hour, for instance), or to a relatively lower average concentration over a longer period.

Air quality standards have been set for ozone, carbon monoxide, nitrogen dioxide, sulfur dioxide, particulate sulfates, respirable particulate matter (PM_{10}) and fine particulate matter ($PM_{2.5}$). Four ambient air monitoring stations were used to characterize air quality at the project site. These stations were used because of their proximity to the project site and because they record area-wide ambient

conditions rather than the localized impacts of any particular facility. Ambient concentrations of ozone, nitrogen dioxide, PM_{10} and $PM_{2.5}$ were taken from a monitoring station located in Jean, NV. Carbon monoxide measurements were collected in Barstow. Ambient concentrations of sulfur dioxide were measured at Trona, while ambient concentrations of lead were measured in San Bernardino. The monitoring stations for each pollutant are summarized in Table AQ-1.

TABLE AQ-1
Representative Background Ambient Air Quality Monitoring Stations

Pollutant	Monitoring Station	Distance to Project Site
Ozone, PM_{10}, $PM_{2.5}$	Jean, NV (Clark County)	34 miles
CO	Barstow, CA (San Bernardino County)	97 miles
SO_2, NO_2	Trona, CA (San Bernardino County)	82 miles
Lead	San Bernardino, CA (San Bernardino County)	150 miles

Each of these monitoring stations is the closest station to the project site for the pollutant monitored; in addition, most are generally located in or just downwind of more heavily developed areas. Therefore the concentrations recorded at these stations are believed to be representative of, or more conservative (higher) than, concentrations expected to be found at the project site.

Ozone. Ozone is an end-product of complex reactions between VOC and NOx in the presence of ultraviolet solar radiation. VOC and NOx emissions from vehicles and stationary sources—combined with daytime wind flow patterns, mountain barriers, temperature inversions, and intense sunlight—generally result in the highest ozone concentrations. For purposes of federal air quality planning, the entire GBUAPCD is unclassified or an attainment area with respect to national ambient standards for ozone. With respect to state standards, the entire GBUAPCD is classified as nonattainment for the 8-hour ozone standard, with the exception of Alpine County; and either unclassified (Alpine and Inyo counties) or nonattainment (Mono County) for the 1-hour state ozone standard.

Nitrogen Dioxide. NO_2 is formed primarily from reactions in the atmosphere between NO (nitric oxide) and oxygen (O_2) or ozone. NO is formed during high-temperature combustion processes, when the nitrogen and oxygen in the combustion air combine. Although NO is much less harmful than NO_2, it can be converted to NO_2 in the atmosphere within a matter of hours, or even minutes, under certain conditions. The control of NO and NO_2 emissions is also important because of the role of both compounds in the atmospheric formation of ozone. For purposes of both state and federal air quality planning, GBUAPCD is in attainment with regard to NO_2.

Carbon Monoxide. Carbon monoxide is a product of incomplete combustion and is emitted principally from automobiles and other mobile sources of pollution. It is also a product of combustion from stationary sources (both industrial and residential) burning fuels. Peak CO levels occur typically during winter months due to a combination of higher emission rates and stagnant weather conditions. For purposes of both state and federal air quality planning, the GBUAPCD is in attainment with regard to CO.

Sulfur Dioxide. SO_2 is produced by the combustion of any sulfur-containing fuel. It is also emitted by chemical plants that treat or refine sulfur or sulfur-containing chemicals. Natural gas contains nearly negligible sulfur, whereas fuel oils may contain much larger amounts. Because of the complexity of the chemical reactions that convert SO_2 to other compounds (such as sulfates), peak concentrations of SO_2 occur at different times of the year in different parts of California, depending on local fuel characteristics, weather, and topography. The GBUAPCD is considered to be in attainment for SO_2 for purposes of state and federal air quality planning.

Respirable Particulate Matter (PM_{10}). Particulates in the air are caused by a combination of wind-blown fugitive dust; particles emitted from combustion sources and manufacturing processes; and organic, sulfate, and nitrate aerosols formed in the air from emitted hydrocarbons, sulfur oxides, and nitrogen oxides. Particulates with a diameter less than or equal to 10 microns are referred to as PM_{10}, and are regulated because they can be inhaled, leading to health effects. Fine particulates, referred to as $PM_{2.5}$ and having a diameter equal to or less than 2.5 microns, are a subset of PM_{10} that is also regulated. $PM_{2.5}$ standards are described below.

PM_{10} is the most serious air quality issue in the GBUAPCD region, and the entire district is classified as nonattainment for the state PM_{10} standards.

Fine Particulates ($PM_{2.5}$). Fine particulates result from fuel combustion in motor vehicles and industrial processes, residential and agricultural burning, and atmospheric reactions involving NOx, SOx, and organics. Fine particulates are referred to as $PM_{2.5}$ and have a diameter equal to or less than 2.5 microns. The GBUAPCD is in attainment with the state $PM_{2.5}$ standard, and is classified as "unclassifiable/attainment" for the federal $PM_{2.5}$ standards.

B. Potential Construction Related Impacts; Avoidance and Minimization Measures

Air emissions will result from the operation of diesel-fueled construction equipment and from construction worker and delivery truck travel during the construction period. Fugitive dust emissions will also occur from ground disturbance and windblown dust. Air pollutant emissions during the construction period are shown in the Application for Certification, in the Applicant's Data Responses, and in the Final Staff Assessment (FSA). These emissions have been calculated in accordance with the best available estimates of construction activity and equipment to be used, with mitigation measures expected to be imposed as conditions of certification.

C. Potential Operational Related Impacts; Avoidance and Minimization Measures

Air emissions will result from the operation of the boilers, emergency standby engines, and diesel fire pumps. Fugitive dust and vehicle exhaust emissions will also result from maintenance activities (e.g., mirror washing). Air pollutant emissions from the Hidden Hills SEGS are shown in the Application for Certification, in the Applicant's Data Responses, and in the Final Staff Assessment (FSA). These emissions have been calculated based on the maximum capacity of the equipment, consistent with operating limits and mitigation measures expected to be imposed as permit conditions, and thus represent a worst case estimate. Actual emissions during plant operation are expected to be much lower than the levels shown in the FSA.

D. Project Benefits

Some of the project benefits from HHSEGS are described below:

- Assists in meeting California Renewable Portfolio Standard goals by increasing renewable generation and contributing to the state's efforts to move toward a high-renewable, low-GHG electricity system.
- Produces lower GHG emissions per megawatt-hour of generation than other types of power plants, as shown in Table AQ-2.
- Produces significantly lower criteria air pollutant emissions compared with an equally sized natural gas plant, as shown in Table AQ-3.

- Displaces a megawatt-hour of generation from a more traditional (i.e., fossil-fuel-fired) source of electricity for each megawatt-hour generated.

TABLE AQ-2
Comparison of GHG Emissions Performance

Type of Power Plant	GHG Emissions Performance, MT CO_2/MW[a]
HHSEGS	0.028 to 0.043[b]
Natural Gas Combined Cycle	0.370 to 0.430
California GHG Emissions Performance Standard (EPS)	0.500
Natural Gas-Fired Boiler	0.550 to 0.650
Natural Gas-Fired Peaking Turbine	0.550 to 0.900
Coal-Fired Boiler	~1.00

[a]All GHG emissions performance data except HHSEGS from Ivanpah FSA, Appendix Air-1, October 2009.

[b] Higher value includes indirect emission sources; from HHSEGS FSA, Greenhouse Gas Table 3.

TABLE AQ-3
Comparison of Emissions Between HHSEGS and a Well-Controlled Gas Turbine

	Pollutant				
Emissions/Equipment	NOx	SO_2	CO	VOC	$PM_{10}/PM_{2.5}$
Maximum Annual Emissions, total tons per year					
HHSEGS	8.3	0.8	12.9	3.1	2.1
Combined-Cycle Gas Turbine Project[a]	48	3.2	23.1	8.4	22

[a] Based on a new 500 MW natural gas-fired combined cycle turbine project operating 3,000 hours per year, utilizing BACT (assumptions: heat rate of 7,000 Btu/kWh, 2 ppmv NOx, 3 lb PM_{10} per 100 MW, 2 ppmv CO, 1.4 ppmv VOC, 0.006 lb/MMBtu SOx).

E. Summary of Compliance with Applicable LORS

The project's emissions and air quality impacts are required to comply with applicable local, state, and federal laws, regulations, and standards. In addition to the California Energy Commission's review, the air quality impacts of the Hidden Hills SEGS have been reviewed by the GBUAPCD.

The requirements applicable to the Hidden Hills SEGS include new source review (NSR) requirements and a number of prohibitory rules.[1] The NSR program applies to the facility as a whole, and is designed to ensure that new projects are developed in a manner that will not interfere with meeting health- and welfare-based ambient air quality standards. Prohibitory rules apply to specific pieces of equipment, rather than to the facility as a whole. They impose specific limits on emissions, including opacity and odors, and are enforced through permit conditions. Compliance with all of these rules is demonstrated in the Application for Certification, and has been confirmed in the Final Determination of Compliance issued by the Air District.

[1] The Hidden Hills SEGS is not subject to federal PSD review, since emissions from the project do not exceed federal PSD trigger levels.

F. Summary of the Potential Cumulative Impacts

A protocol for a cumulative air quality impact analysis of the Hidden Hills SEGS was prepared and included in the Application for Certification. Consultation with the GBUAPCD and Nevada air pollution control agencies with jurisdiction over the areas near the project site indicated that there were no sources of emissions that had the potential to contribute, with the project, to a significant air quality impact. The ambient air quality impact analysis discussed above included the combination of worst-case project impacts with maximum concentrations in the ambient air (reflecting the operation of existing sources); this analysis also demonstrates that the Hidden Hills SEGS will not create any new cumulative impacts.

III. Response to Certain Issues Raised in the FSA

At FSA page 4.1-32, ¶3, Staff suggests that adverse cumulative impacts are likely to occur in the "desert southwest of the United States" as a result of the project. Applicant believes that the "desert southwest of the United States" is not an appropriate geographic scope for the cumulative impacts analysis as it is overly broad. Cumulative impacts are the combined effects of the project with reasonably foreseeable future projects. To "combine" the effects, impacts would need to be in the same air basin. However, Applicant agrees with Staff that no significant cumulative air quality impacts are expected after implementation of the proposed mitigation measures.

At FSA page 4.1-33, ¶1, Staff indicates that the project would not require a PSD permit from U.S. EPA because criteria pollutant emissions from the project would be below the 250 ton per year threshold. This appears to be a typographical error and should be corrected to 100 tons per year. The correct value is shown in Staff's Air Quality Table 1. Staff's conclusions would remain unchanged.

IV. Proposed Licensing Conditions

The FSA for the project proposes 47 Conditions of Certification for this subject matter. In general, we agree with the Conditions of Certification set forth in the FSA pertaining to this subject; however, as discussed below, we believe that minor clarifications to some of the conditions are appropriate.

CONDITION AQ-SC3, CONSTRUCTION FUGITIVE DUST CONTROL

Condition AQ-SC3 requires all disturbed areas in the project and linear construction sites to be watered as frequently as necessary to minimize dust. Applicant requests clarification in this condition, similar to that made by Staff in Condition AQ-SC1, that the requirement applies only to construction sites in California.

Paragraph B of the Verification requirements for AQ-SC3 requires the Monthly Compliance Report to include copies of any complaints filed with the District related to project construction. Applicant requests clarification, similar to that made by Staff in Condition AQ-SC4, that only copies of complaints filed with the District and provided to the Applicant must be provided in the MCR.

Condition AQ-SC3, should be revised as follows:

AQ-SC3 Construction Fugitive Dust Control: The AQCMM shall submit documentation to the CPM in each Monthly Compliance Report (MCR) that demonstrates compliance with the following mitigation measures for the purposes of preventing all fugitive dust plumes from leaving the project boundary. Any deviation from the following mitigation measures shall require prior CPM notification and approval.

A. The main access roads through the facility to the power block areas will be paved prior to initiating construction in the main power block area, and

delivery areas for operations materials (chemicals, replacement parts, etc.) will be paved prior to taking initial deliveries.

B. All unpaved construction roads and unpaved operational site roads, as they are being constructed, shall be stabilized with a non-toxic soil stabilizer or soil weighting agent that can be determined to be both as efficient or more efficient for fugitive dust control as ARB-approved soil stabilizers, and shall not increase any other environmental impacts including loss of vegetation. All other disturbed areas in the project and linear construction sites located in California shall be watered as frequently as necessary during grading and stabilized with a non-toxic soil stabilizer or soil weighting agent to comply with the dust mitigation objectives of condition of certification **AQ-SC4**. The frequency of watering can be reduced or eliminated during periods of precipitation.

C. No vehicle shall exceed 10 miles per hour on unpaved areas within the construction site, with the exception that vehicles may travel up to 25 miles per hour on stabilized unpaved roads as long as such speeds do not create visible dust emissions.

D. Visible speed limit signs shall be posted at the construction site entrances and along traveled routes.

E. All construction equipment vehicle tires shall be inspected and washed as necessary to be cleaned free of dirt prior to entering paved roadways.

F. Gravel ramps of at least 20 feet in length must be provided at the tire washing/cleaning station.

G. All unpaved exits from the construction site shall be graveled or treated to prevent track-out to public roadways.

H. All construction vehicles shall enter the construction site through the treated entrance roadways, unless an alternative route has been submitted to and approved by the CPM.

I. Construction areas adjacent to any paved roadway shall be provided with sandbags or other equivalently effective measures to prevent run-off to roadways, or other similar run-off control measures as specified in the Storm Water Pollution Prevention Plan (SWPPP), only when such SWPPP measures are necessary so that this condition does not conflict with the requirements of the SWPPP.

J. All paved roads within the construction site shall be swept at least twice daily (or less during periods of precipitation) on days when construction activity occurs to prevent the accumulation of dirt and debris.

K. At least the first 500 feet of any paved public roadway exiting the construction site or exiting other unpaved roads en route from the construction site or

construction staging areas shall be swept at least twice daily (or less during periods of precipitation) on days when construction activity occurs or on any other day when dirt or runoff resulting from the construction site activities is visible on the public paved roadways.

L. All soil storage piles and disturbed areas that remain inactive for longer than 10 days shall be covered, or shall be treated with appropriate dust suppressant compounds.

M. All vehicles used to transport solid bulk material on public roadways and that have potential to cause visible emissions shall be provided with a cover, or the materials shall be sufficiently wetted and loaded onto the trucks in a manner to provide at least one foot of freeboard.

N. Wind erosion control techniques (such as windbreaks, water, chemical dust suppressants, and/or vegetation) shall be used on all construction areas that may be disturbed. Any windbreaks installed to comply with this condition shall remain in place until the soil is stabilized or permanently covered with vegetation.

Verification: The AQCMM shall provide the CPM a MCR (COMPLIANCE-6) to include:

A. a summary of all actions taken to maintain compliance with this condition;

B. copies of any complaints filed with the district and provided to the Applicant in relation to project construction; and

C. any other documentation deemed necessary by the CPM, and AQCMM to verify compliance with this condition. Such information may be provided via electronic format or disk at the project owner's discretion.

CONDITION AQ-SC4, DUST PLUME RESPONSE REQUIREMENT

Condition AQ-SC4 specifies augmented mitigation measures in the event visible dust plumes are observed to result from construction activities. As in Conditions AQ-SC3 and AQ-SC5, the verification requirement for this condition requires submittal of a Monthly Compliance Report that includes certain information. The CEC Staff appears to have inadvertently changed Verification Item C to remove language allowing the information to be submitted in electronic format. We believe that item should revert to the original PSA language so that is will remain consistent with the corresponding requirement in Condition AQ-SC3.

The verification requirement for Condition AQ-SC4 should be revised as follows:

AQ-SC4 Dust Plume Response Requirement: The AQCMM or an AQCMM Delegate shall monitor all construction activities for visible dust plumes. Observations of visible dust plumes that have the potential to be transported: (A) off the project site and within 400 feet upwind of any regularly occupied structures not owned by the project owner, or (B) 200 feet beyond the centerline of the construction of linear facilities indicate that existing mitigation measures are not resulting in effective mitigation. The AQCMP shall include a section detailing how the augmented mitigation measures will be accomplished within the time limits specified in steps 1 through 3, below. The AQCMM or Delegate shall implement the following

procedures for augmented mitigation measures in the event that such visible dust plumes are observed:

Step 1: The AQCMM or Delegate shall direct more intensive application of the existing mitigation methods within 15 minutes of making such a determination.

Step 2: The AQCMM or Delegate shall direct implementation of augmented methods of dust suppression if Step 1, specified above, fails to result in adequate mitigation within 30 minutes of the original determination.

Step 3: The AQCMM or Delegate shall direct a temporary shutdown of the activity causing the emissions if Step 2, specified above, fails to result in effective mitigation within one hour of the original determination. The activity shall not restart until the AQCMM or Delegate is satisfied that appropriate additional mitigation or other site conditions have changed so that visual dust plumes will not result upon restarting the shutdown source. The owner/operator may appeal to the CPM any directive from the AQCMM or Delegate to shut down an activity, if the shutdown shall go into effect within one hour of the original determination, unless overruled by the CPM before that time.

Verification: The AQCMM shall provide the CPM a MCR (COMPLIANCE-6) to include:

A. a summary of all actions taken to maintain compliance with this condition;

B. copies of any complaints filed with the District and provided to the project owner in relation to project construction; and

C. any other documentation deemed necessary by the CPM and AQCMM to verify compliance with this condition. Such information may be provided via electronic format or disk at the project owner's discretion.

CONDITION AQ-SC5, DIESEL-FUELED ENGINE CONTROL

Condition AQ-SC5 requires the Monthly Compliance Report to include a table demonstrating compliance with the AQCMP mitigation measures that seek to control emissions from diesel-fueled construction equipment. As drafted, Condition AQ-SC5 includes several overly detailed, burdensome and duplicative requirements for diesel construction equipment that the Applicant does not believe are reasonable or justified. While the CPM may grant relief from some of these requirements, the Applicant believes that some of these requirements remain overly burdensome and duplicative. Further, we believe it is more appropriate for most of these requirements to be part of the verification for the condition, rather than part of the condition itself.

Specific issues that dictate revisions to AQ-SC5 are as follows:

- The requirement for off-road diesel construction equipment to be "powered by the cleanest engines available" is vague, burdensome, duplicative, and unenforceable. It is unclear how such a demonstration would be made and by whom. The condition goes on to outline specific emission control requirements for the engines used in off-road diesel construction equipment, including a requirement that "the lowest-emitting engine [must be] chosen in each case, as available." Finally, we note that this language was not included in the conditions of certification for the Ivanpah SEGS. We request that this particular requirement be eliminated.

- The requirement for each engine "to be in its original configuration" is duplicative of state laws against tampering. The requirement to replace equipment or engines if the manufacturer's approved oil consumption rate is exceeded would appear to create a new and very burdensome requirement for the AQCMM to inspect manufacturers' specifications and individual equipment or engine maintenance records. The CEC Staff has not provided any evidence that excessive oil consumption is creating significant air quality problems at construction sites.

In addition, the standard restriction on idling of diesel heavy construction equipment was inadvertently omitted and should be included in this condition. While the CEC Staff refers to the idling restriction in the FSA (discussion of Construction Impacts Mitigation, p. 4.1-21; discussion of GHG mitigation measures, p. 4.1-79), the requirement itself has not been included in Condition AQ-SC5.

Finally, the CEC Staff appears to have inadvertently changed Verification Item C to remove language allowing the information to be submitted in electronic format. We believe that item should revert to the original PSA language so that is will remain consistent with the corresponding requirement in Condition AQ-SC3.

Condition AQ-SC5 should be revised as follows:

AQ-SC5 Diesel-Fueled Engine Control: The AQCMM shall submit to the CPM, in the MCR, a table that demonstrates compliance with the AQCMP mitigation measures for purposes of controlling diesel construction-related combustion emissions. Any deviation from the AQCMP mitigation measures requires prior CPM notification and approval.

All off-road diesel construction equipment with a rating of 50 hp or greater used in the construction of this facility shall ~~be powered by the cleanest engines available that also~~ comply with the California Air Resources Board's (ARB's) Regulation for In-Use Off-Road Diesel Fleets (California Code of Federal Regulations Title 13, Article 4.8, Chapter 9, Section 2449 et seq.) and shall be included in the Air Quality Construction Mitigation Plan (AQCMP) required by AQ-SC2. The AQCMP measures shall include the following, with the lowest-emitting engine chosen in each case, as available:

a. All off-road vehicles with compression ignition engines shall comply with the California Air Resources Board's (ARB's) Regulation for In-Use Off-Road Diesel Fleets.

b. To meet the highest level of emissions reduction available for the engine family of the equipment, each piece of diesel-powered equipment shall be powered by a Tier 4 engine (without add-on controls) or Tier 4i engine (without add-on controls), or a Tier 3 engine with a post-combustion retrofit device verified for use on the particular engine powering the device by the ARB or the US EPA. For PM, the retrofit device shall be a particulate filter if verified, or a flow-through filter, or at least an oxidation catalyst. For NOx, the device shall meet the latest Mark level verified to be available (as of January 2012, none meet this NOx requirement).

c. For diesel powered equipment where the requirements of Part "b" cannot be met, the equipment shall be equipped with a Tier 3 engine without retrofit control devices or with a Tier 2 or lower Tier engine using retrofit controls

verified by ARB or US EPA as the best available control device to reduce exhaust emissions of PM and nitrogen oxides (NOx) unless certified by engine manufacturers or the on-site AQCMM that the use of such devices is not practical for specific engine types. For purposes of this condition, the use of such devices can be considered "not practical" for the following, as well as other, reasons:

a. There is no available retrofit control device that has been verified by either the California Air Resources Board or U.S. Environmental Protection Agency to control the engine in question and the highest level of available control using retrofit or Tier 1 engines is being used for the engine in question; or

b. The use of the retrofit device would unduly restrict the vision of the operator such that the vehicle would be unsafe to operate because the device would impair the operator's vision to the front, sides, or rear of the vehicle, or

c. The construction equipment is intended to be on site for 10 work days or less.

d. The CPM may grant relief from a requirement in Part "b" or "c" if the AQCMM can demonstrate a good faith effort to comply with the requirement and that compliance is not practical.

e. The use of a retrofit control device may be terminated immediately provided that: (1) the CPM is informed within 10 working days following such termination; (2) a replacement for the construction equipment in question, which meets the level of control required, occurs within 10 work days following such termination of the use (if the equipment would be needed to continue working at this site for more than 15 work days after the use of the retrofit control device is terminated); and (3) one of the following conditions exists:

a. The use of the retrofit control device is excessively reducing the normal availability of the construction equipment due to increased down time for maintenance, and/or reduced power output due to an excessive increase in exhaust back pressure.

b. The retrofit control device is causing or is reasonably expected to cause engine damage.

c. The retrofit control device is causing or is reasonably expected to cause a substantial risk to workers or the public.

d. Any other seriously detrimental cause which has the approval of the CPM prior to implementation of the termination.

f. All equipment with engines meeting the requirements above shall be properly maintained and the engines tuned to the engine manufacturer's specifications. ~~Each engine shall be in its original configuration and the equipment or engine~~

~~must be replaced if it exceeds the manufacturer's approved oil consumption rate~~.

g. Construction equipment will employ electric motors when feasible.

h. If the requirements detailed above cannot be met, the AQCMM shall certify that a good faith effort was made to meet these requirements and this determination must be approved by the CPM.

i. All off-road diesel-fueled engines used in the construction of the facility shall have clearly visible tags issued by the on-site AQCMM showing that the engine meets the conditions set forth herein.

j. All diesel heavy construction equipment shall not idle for more than five minutes. Vehicles that need to idle as part of their normal operation (such as concrete trucks) are exempted from this requirement.

Verification: The AQCMM shall include in the MCR the following to demonstrate control of diesel construction-related emissions:

A. A summary of all actions taken to control diesel construction related emissions;

B. A table listing list of all heavy equipment used on site during that month, showing the tier level of each engine and the basis for alternative compliance with this condition for each engine not meeting Part "b" requirements. The MCR shall identify the owner of the equipment and contain a letter from each owner indicating that the equipment has been properly maintained; and

C. Any other documentation deemed necessary by the CPM and AQCMM to verify compliance with this condition. Such information may be provided via electronic format or disk at the project owner's discretion.

CONDITION AQ-SC7

Condition AQ-SC7 requires preparation of a site operations dust control plan and specifies certain requirements for the plan, including the use of durable non-toxic soil stabilizers in certain areas and the implementation of inspection and maintenance procedures. We are requesting minor changes to the condition that will allow the operations dust control plan to include alternative methods for stabilizing disturbed off-road area, consistent with the language that appears in the comparable Ivanpah SEGS condition.

Condition AQ-SC7 should be revised as follows:

AQ-SC7 The project owner shall provide a site operations dust control plan, including all applicable fugitive dust control measures identified in **AQ-SC3** that would be applicable to reducing fugitive dust from ongoing operations; that:

A. describes the active operations and wind erosion control techniques such as windbreaks and chemical dust suppressants, including their ongoing maintenance procedures, that shall be used on areas that could be disturbed by vehicles or wind anywhere within the project boundaries; and

B. identifies the location of signs throughout the facility that will limit traveling on unpaved surfaces to solar equipment maintenance vehicles only. In addition, vehicle speed shall be limited to no more than 10 miles per hour on these unpaved surfaces, with the exception that vehicles may travel up to 25 miles per hour on stabilized unpaved surfaces as long as such speeds do not create visible dust emissions.

The site operations ~~fugitive~~ dust control plan shall include the use of durable non-toxic soil stabilizers on all regularly used unpaved roads and disturbed off-road areas, or alternative methods for stabilizing disturbed off-road areas, within the project boundaries, and shall include the inspection and maintenance procedures that will be undertaken to ensure that the unpaved roads remain stabilized. The soil stabilizer used shall be a non-toxic soil stabilizer or soil weighting agent that can be determined to be both as efficient or more efficient for fugitive dust control as ARB approved soil stabilizers, and shall not increase any other environmental impacts including loss of vegetation.

The fugitive dust controls shall meet the performance requirements of condition **AQ-SC4**. The performance requirements of **AQ-SC4** shall also be included in the operations dust control plan.

At the time of decommissioning, the applicant is required to obtain Energy Commission approval to control wind-blown dust emissions until a natural crust is developed as part of the project owner's long-term dust control plan.

Verification: At least 60 days prior to start of commercial operation, the project owner shall submit to the CPM for review and approval a copy of the plan that identifies the dust and erosion control procedures, including effectiveness and environmental data for the proposed soil stabilizer, that will be used during operation of the project and that identifies all locations of the speed limit signs. At least 60 days after the beginning of commercial operation, the project owner shall provide to the CPM a report identifying the locations of all speed limit signs, and a copy of the project employee and contractor training material that clearly identifies that project employees and contractors are required to comply with the dust and erosion control procedures and on-site speed limits.

CONDITIONS AQ-20, -21 AND -22

Conditions AQ-20 and AQ-21 approve the use of specific emergency backup generators and fire pump engines, respectively, or equivalent engines that meet the current EPA Tier standards for the engine size. Condition AQ-22 requires the emergency engines to be operated in compliance with the diesel engine Airborne Toxics Control Measure (ATCM). The CEC Staff has proposed verification requirements for Conditions AQ-20 and AQ-21 that would require the project owner to submit the emergency generator and fire pump engine specifications to the CPM for approval at least 30 days prior to purchasing the engines. These verification requirements are partially duplicative of, and not fully consistent with, the verification requirement for Condition AQ-22 and with a comparable condition in the Ivanpah SEGS license, which only requires a demonstration that engines meet NSPS and ATCM emissions limits. The Applicant requests that the verification requirements for Conditions AQ-20 and AQ-21 be revised to be consistent with the verification language for Condition AQ-22, and that a time limit for review be added to all three verification requirements, after which the engine selection would be deemed approved.

The verification requirement for Condition AQ-20 should be revised as follows:

AQ-20 Emergency Backup Generator Engine
Each emergency backup generator shall be powered by a Tier 2, diesel-fueled, Caterpillar 3516C SCAC, 3,633 hp at 1,800 rpm, EPA Family ACPXL78.1T2E, ARB Executive Order U-R-001-0398-1, or an equivalent ARB-certified engine that meets the current EPA Tier standards for the given power range.

Verification: The project owner shall submit the emergency generator specifications to the CPM for review and approval at least 30 days prior to purchasing the engines. ~~for review and approval.~~ The emergency generator specifications shall demonstrate that the engines meet NSPS and ARB ATCM emission limit requirements at the time of engine purchase. The CPM shall notify the project owner within 15 days if the engines are not approved, along with the reason for disapproval. If the CPM does not provide notification of disapproval within 15 days of receipt of the emergency generator specifications, the engines shall be deemed approved.

The verification requirement for Condition AQ-21 should be revised as follows:

AQ-21 Emergency Fire Pump Engine
Each emergency fire pump shall be powered by a Tier 3, diesel-fueled, Cummins CFP7E-F30, 200 hp at 2,100 rpm, EPA Family ACEXL0409AAB, ARB Executive Order U-R-002-0516, or an equivalent ARB-certified engine that meets the current EPA Tier standards for the given power range.

Verification: The project owner shall submit the emergency engine specifications to the CPM for review and approval at least 30 days prior to purchasing the engines. ~~for review and approval.~~ The emergency engine specifications shall demonstrate that the engines meet NSPS and ARB ATCM emission limit requirements at the time of engine purchase. The CPM shall notify the project owner within 15 days if the engines are not approved, along with the reason for disapproval. If the CPM does not provide notification of disapproval within 15 days of receipt of the emergency engine specifications, the engines shall be deemed approved.

The verification requirement for Condition AQ-22 should be revised as follows:

AQ-22 Airborne Toxics Control Measure (also applies to Hidden Hills Common Area)
The permittee shall operate the diesel emergency backup generator and fire pump engines in compliance with the California Code of Regulations, Title 17 (17 CCR) § 93115.

Verification: The project owner shall submit the engine specifications to the CPM for review and approval at least 30 days prior to purchasing the engines. ~~for review and approval.~~ The engine specifications shall demonstrate~~ing~~ that the engines meet NSPS and ARB ATCM emission limit requirements at the time of engine purchase. The CPM shall notify the project owner within 15 days if the engines are not approved, along with the reason for disapproval. If the CPM does not provide notification of disapproval within 15 days of receipt of the emergency engine specifications, the engines shall be deemed approved.

V. Correlation to FSA and Hearing Topics:

- Air Quality, and Greenhouse Gas Emissions

Alternatives

I. Introduction

A. Names: Jennifer Scholl, Clay Jensen, Joseph Desmond, John Forrester, Chifong Thomas, and Dr. Arne Olson

B. Qualifications: The panel's qualifications are as noted in their resumes contained in Appendix A.

C. Prior Filings: In addition to the statements herein, this testimony includes by reference the following documents submitted in this proceeding:

- Application for Certification, Volume 1 & Volume 2, dated August 5, 2011 [Exhibit 1]
- Applicant's Data Response, Set 1A, dated November 16, 2011. Responses to Data Requests 15 and 16 [Exhibit 4]
- Applicant's Data Response, Set 1C, dated December 19, 2011. Response to Data Request 77 [Exhibit 17]
- Applicant's Data Response, Set 2A, dated February 9, 2012. Responses to Data Requests 137 through 140 [Exhibit 28]
- Applicant's Preliminary Staff Assessment Comments, Set 2, dated July 23, 2012. [Exhibit 70]

D. Documents Prepared By Others

- Nicholas T. Gabler's Comments Regarding Inyo County's September 19, 2012, Comments to Hidden Hills SEGS Applicant's Motion in Limine. Available online at: http://www.energy.ca.gov/sitingcases/hiddenhills/documents/index.html

E. Attachments

- Potential Effects of the No Project Alternative (Alt-1)
- Further Responses to the FSA (Alt-2)
- Rio Mesa Solar's Data Response, Set 1B, dated March 28, 2012. Responses to Data Requests 85-90
- Rio Mesa Solar's Data Response, Set 2A, dated June 19, 2012. Responses to Data Requests 170-171

II. Summary of Testimony

The purpose of the CEQA alternatives analysis is to identify ways in which the basic project objectives might be achieved while also avoiding or substantially lessening any of the significant effects of a project. (14 C.C.R. § 15126.6(a).) To achieve this purpose, CEQA mandates that the FSA analyze a "reasonable range" of project alternatives that will "feasibly attain" most of the basic project objectives (14 C.C.R. §§15124(b), 15126.6(a). In sum, qualified project alternatives must be: (i) feasible, (ii) able to satisfy most of the basic project objectives, and (iii) capable of substantially lessening at least one significant effect of the project. If an FSA alternative fails to satisfy any one of

these three criteria, it falls outside of the "reasonable range" of alternatives mandated by CEQA and should eliminated from consideration.

As explained below, the project offers substantial grid reliability benefits that none of the FSA's proposed alternatives can achieve. Moreover, the FSA's proposed Photovoltaic (PV), Parabolic Trough (PT) and Concentrating Solar Thermal Tower with Storage (Tower with Storage) alternatives all fail to satisfy at least one of the three criteria established by CEQA to qualify an alternative for analysis. The PV and PT alternatives are infeasible because they are incapable of being accomplished in a successful manner within a reasonable time. In addition, the PV and PT alternatives fail to achieve most of the FSA's proposed basic project objectives. Moreover, Tower with Storage does not avoid or substantially lessen any of the project's significant environmental effects. Since the PV, PT and Tower with Storage alternatives all fail to meet at least one of the three qualifying criterion, none should be considered by the FSA or the Commission. Finally, the FSA's No Project Alternative should be revised to consider what would be reasonably expected to occur in the foreseeable future if the project were not approved, based on current plans and consistent with available infrastructure and community services, as required by CEQA.

III. Responses to FSA

A. The FSA Does Not Adequately Consider the Technological and Environmental Advantages of Concentrating Solar Thermal Tower Technology.

The FSA should candidly acknowledge that the project—specifically, BrightSource's proprietary technology—will provide significant benefits to both California's grid and the Western Interconnect that are not offered by other renewable technologies, particularly PV. BrightSource's proprietary technology helps utilities and grid operators address integration challenges by delivering a firmer, more reliable and more controllable renewable power source. In doing so, the project has the added benefit of promoting broader integration of PV technology throughout California, as explained below.

Grid Reliability Services

The proposed project uses synchronous generators that provide the same types of support for the reliable operation of the transmission system as do conventional synchronous generators. As a result, the project can provide numerous important reliability services, such as reactive power and voltage support, primary and secondary frequency control and some degree of inertia response. These attributes significantly promote reliable operation of the transmission grid by controlling voltage and frequency within an acceptable band. As more renewable technologies connect to the grid that do not use synchronous generators (e.g., PV), overall grid reliability will be compromised if not balanced with the reliability services that synchronous generators offer. Since the technology used by the project allows for the replacement of conventional synchronous generators with renewable-energy-based synchronous generators, the project will help maintain the current level of grid stability while promoting the reliable integration of new non-synchronous renewable energy generators, such as PV. The primary grid reliability benefits of the project are described in more detail below.

Reactive Power and Voltage Support

The power system requires reactive power from generators, synchronous condensers, capacitors or other voltage support devices to support power transfer and maintain operating voltage levels under both normal and emergency conditions. On the one hand, inadequate reactive power can

result in power transfer reductions and voltage collapse and thus could lead to widespread blackouts. On the other hand, the over-supply of reactive power can increase voltage at points in the system to very high levels and create an unintentional electrical arc that can damage the grid and customer equipment and create unsafe operating conditions.

Power system voltages are affected by a variety of factors, including customer loads, the distance power is transmitted to the loads, and the amount of loading on the power lines. Because the power system conditions are variable and constantly changing, the amount of reactive power needed at various points in the transmission system to maintain adequate voltage is also variable and constantly changing. As such, the power system must include devices capable of constantly and automatically adjusting (injecting and withdrawing) the reactive power supply at specific points in the system. The project's synchronous generators are this type of device—they are capable of automatically adjusting the reactive power supply through the exciter/automatic voltage regulator control under normal (all facilities in-service) conditions and under contingency conditions.

During and after sudden changes in grid conditions (e.g., during a fault or following the outage of transmission facilities), fast and automatic injecting and withdrawing of reactive power is crucial to maintaining voltage stability and reliable system operations. In addition, if the system voltage begins to collapse, fast automatic increases in reactive power output is required to raise the voltage and prevent a collapse that could cause a blackout. The project's synchronous generators are capable of providing this grid reliability service and do so in a manner more effectively than other devices, such as Static VAR Compensators (SVC) or Static Synchronous Compensators (STATCOM). The reactive power provided by SVC and STATCOM decreases as the voltage drops, making them less effective as the voltage collapses, exactly when reactive power is needed. The project's synchronous generators will help prevent excessive voltage drop by providing automatic and continuously the same amount of reactive power independent of system voltage levels; thus, better supporting the transmission system as voltage decreases and thus helping to prevent voltage collapse.

Frequency Control

To maintain system frequency in an acceptable band, the system needs to hold resources in reserve to provide frequency control. This is accomplished in two ways - primary frequency control and secondary frequency control. Primary frequency control is the ability to automatically and autonomously adjust output rapidly (within seconds) after the sudden outage of other generators. Secondary frequency control refers to the ability to respond within minutes to changes in system frequency through Automatic Generation Control (AGC) under normal operating conditions. Both primary and secondary frequency control are critical to maintaining overall grid stability and can be provided by the project's synchronous generators. Moreover, since the output of PV is intermittent and PV does not intrinsically offer frequency control services, the project serves to promote PV integration by ensuring a clean reserve for frequency control needed to maintain grid reliability.

Inertia Response

Inertia on the grid is created by the energy stored in the rotating mass of conventional power plants. Inertia acts as a buffer that helps suppress frequency deviation due to various changes in the system. During and after the sudden loss of a transmission facility or a generator, inertia helps arrest the frequency decay (or overshoot) and allows time for generators in the system to stabilize the system. Since they provide rotating mass, inertia response is provided by the project's synchronous generators.

Controllability

Concentrating solar thermal tower technology has the particular ability to control the number of heliostats focusing on the receiver to account for variability of insolation in time of day and season, further stabilizing and shaping the project's generation profile to meet power system needs. The project can decrease or "turn down" excess mirrors when available solar energy is greater than can be absorbed by the receiver system and converted to electricity by the turbine. Similarly, toward the end of the day or during times of lesser insolation (e.g., winter), the project can increase the number of heliostats focused on the receiver to increase production and extend the generating day. These capabilities have the effect of reducing output variability. For example, each project unit will generate at its maximum rating for at least 40 percent of all sunlit hours despite the fact that insolation will be variable during those hours. A PV plant's output will be highly variable at all times.

Over the intermediate term, one of compelling attributes of solar thermal power tower technologies is its natural synergy with thermal energy storage, which will provide valuable, clean grid reliability services, such as load following and spinning reserves. Power tower configurations concentrate many multiples of suns, as compared to parabolic trough, enabling the achievement of higher temperature and pressure steam levels. At these higher levels, thermal storage in and discharge from a medium, such as molten salts, is more efficient and thus economically preferred.

The FSA should, but does not, adequately analyze the various grid reliability services offered by the proposed project, as described above. Such analysis should also examine how solar thermal tower technology actually promotes increased development of PV and other non-synchronous renewable technologies while replacing conventional synchronous machines, such as those used by gas-fired generators.

B. The FSA's PV, PT, and Tower with Storage Alternatives Are Not within the Reasonable Range of Feasible Alternatives

As explained above, all qualified project alternatives must be: (i) feasible, (ii) able to satisfy most of the basic project objectives, and (iii) capable of substantially lessening at least one significant effect of the project. If an alternative fails to satisfy any one of these three criteria, it falls outside of the "reasonable range" of project alternatives mandated by CEQA and should be disregarded by the Commission.

Feasibility: The PV and PT Alternatives Are Infeasible

In determining the CEQA mandated "reasonable range" of the project alternatives, the Supreme Court counsels that "agencies shall be guided by the doctrine of feasibility" and should not consider alternatives "whose implementation is remote and speculative," because unrealistic alternatives do not contribute to useful analysis. (*In re Bay Delta,* 43 Cal.4th at 1163.) CEQA defines the term "feasible" to mean "capable of being accomplished in a successful manner within a reasonable period of time, taking into account economic, environmental, legal, social and technological factors." (14 C.C.R. §15364.) As explained below, the FSA's PV and PT alternatives fail to satisfy CEQA's mandatory feasibility requirement and should be disregarded by the Commission.

The PV Alternative Is Not Feasible

The Applicant is not in the business of designing, constructing or operating PV projects. The substantial lead time in project development, the required renegotiation of existing power purchase agreements (PPAs) to accommodate a different technology, and additional permitting requirements render the PV alternative incapable of being accomplished in a reasonable period, as required by CEQA. Even the FSA acknowledges a lack of evidence that the PV alternative is, in fact, feasible when it states that "[t]he work required to redesign the project to use a PV technology would delay the

project schedule, and it is not known at what point a project schedule delay would affect project viability." (FSA, p. 6.1-78.) Indeed, the feasible implementation of the PV alternative is highly speculative given that Applicant's entire business structure, staffing, research and development and technological expertise centers on the solar thermal tower technology. It is unreasonable for the FSA to assume that Applicant could, within a reasonable period, abandon its business model and technological expertise in order to take on the design and development of an energy technology it does not have the ability to provide. Such rank speculation violates the "rule of reason" that must guide the FSA's alternatives analysis.

As discussed in the AFC, the Applicant evaluated substituting PV for concentrating solar thermal tower technology at the project site and determined it to be infeasible for the following reasons:

- The intermittency and variability associated with PV generators, especially those that use fixed-axis technologies that cannot track the sun over the course of the day, undermines their suitability for large-scale generation.
- Intermittency and variability reduce the quality of power generated by PV technology. To obtain similar power quality characteristics as provide by the project's synchronous turbine, a flywheel or other mechanical storage technology would be required to power a mechanical source, which would only be possible during those times when the PV field is generating electricity, resulting in substantial parasitic losses during the time generation is feasible.
- Battery storage technology, which could reduce PV variability and intermittency, is improving, but is currently economically infeasible at a utility scale.
- The CPUC has recognized that solar thermal has a higher on-peak availability factor than PV systems -- possibly 10 percent or more higher as shown in Table Alt-1 below. This essentially means that the buyer of a PV technology would need to purchase 10 to 50 percent more megawatts of PV to achieve the equivalent resource adequacy characteristics of a solar thermal project. For example, a 100MW solar thermal plant would yield 77MW, whereas a 100MW fixed-tilt PV plant would yield 51MW. The PV plant would need to be increased to 151MW to yield the equivalent 77MW of the solar thermal plant.

TABLE ALT-1
CPUC Generic Estimates of On-peak Availability Factors[1]

Resource Type	On-Peak Availability Factor
Biomass	66%
Geothermal	72%
Wind	16%
Solar PV	65% for Tracking Systems 51% for Fixed-Tilt Systems
Solar Thermal	77% (Range of 71% - 87%)

[1] See CPUC R.10-05-006, Planning Standards for Renewable Resources (last updated 2/2011), available at: http://docs.cpuc.ca.gov/efile/RULINGS/130670.pdf. Here on-peak availability is used as proxy for Net Qualifying Capacity for purposes of assessing a project's projected Resource Adequacy.

- PV converts light energy to direct-current electricity at low voltage, while concentrating solar power converts light energy to thermal energy as steam used to generate high-voltage AC electricity, as with other thermal generators on the grid. Consequently, the respective conversion efficiency of PV is far lower than concentrating solar tower technology.
- PV has a lower on-peak availability factor than the solar thermal tower technology. According to the CPUC's "RPS Calculator," PV systems have on-peak availability factors between 51 to 65 percent; whereas, solar thermal systems have on-peak availability factors of 71 to 87 percent. In other words, the proposed project would operate more efficiently during peak conditions than would PV.

Practical considerations aside, PV is, at minimum, legally infeasible because it is a non-thermal technology that is outside of the Commission's permit jurisdiction. Moreover, the Applicant's contractual counterparties are under no obligation to accept generation from an alternative technology and, in any case, the California Public Utilities Commission could require such a substantial contractual change to be rebid into a new RPS solicitation. The factors discussed above, both legal and factual, render the PV alternative infeasible under CEQA as a matter of law. As such, the PV alternative cannot be legally included in the reasonable range of alternatives that CEQA requires and should be stricken from the FSA.

The PT Alternative Is Not Feasible

As with PV, PT alternative is incapable of being accomplished in a successful manner within a reasonable period of time, taking into account economic, environmental, legal, social and technological factors. The FSA admits as much when it states:

> Changing the project technology at the HHSEGS site to a parabolic trough technology would likely require filing of an amended advice letter with CPUC requesting amendments to the PPAs, at least with regard to schedule. The work required to redesign the project and reconfigure the site to use a parabolic trough technology would delay the project schedule, and it is not known whether CPUC would approve amendments to the PPAs allowing the change, if such approvals would be necessary. It is not known at what point a project schedule delay would affect project viability. (FSA, p. 6.1-93)

BrightSource is not, and has never been, in the business of constructing and operating such systems on a commercial scale. Although a few BrightSource employees have past experience designing PT systems, this knowledge alone would not permit development of the PT alternative in a successful manner within a reasonable period of time. As the FSA suggests, the work required to redesign the project and reconfigure the project site would unreasonably delay project completion. Adding the time associated with renegotiating with contractual counterparties and reapproving the project PPA to accommodate a PT project (neither of which can be guaranteed successful) only highlights the degree to which timely implementation of the PT alternative is speculative and remote. Accordingly, the PT alternative should be disregarded as infeasible.

In the AFC, Applicant evaluated PT and determined that this alternative was infeasible for the following additional reasons:

- PT technology at the project site would result in less electricity production per acre of land because of the need to accommodate equipment layout and minimal site slope requirements (the project generation factor is 6.2 acres/MW generated [excluding

construction laydown area] as compared to an average of 7 acres/MW generated for PT, assuming a suitably sized and sloped site, which is not the case for the project site.)

- The triangular shape of the project site presents PT layout complications—approximately 25 percent of the site could not be developed because PT system layouts require rectangular-shaped sites. This would result in a significant decrease in energy generated (i.e., the project would generate approximately 67 percent more electricity).
- Energy conversion and heat energy loss rates are higher for PT than they are for the project.
- Project capital costs are higher to accommodate 500-MW PT project. The larger footprint and the need for flat terrain increases land costs, as does the increased civil infrastructure needed for drainage control systems and the increased overall operating costs associated with use of synthetic oil as heat transfer fluids (e.g., additional air emission and fluid control systems and increased fire prevention costs).

The PV and PT Alternatives Do Not Meet Most of the FSA's Project Objectives

As noted, to qualify under CEQA, a valid project alternative must be able to achieve most of the basic project objectives. The FSA's proposed project objectives are as follows:

- Safely and economically construct and operate a nominal 500-megawatt renewable energy electrical generation facility resulting in sales of a competitively priced renewable energy consistent with the needs of California utility companies;
- Develop a renewable energy facility that will supply electricity for use by retail sellers and publicly owned electric utilities to help satisfy their required California Renewables Portfolio Standard (RPS) program goals;
- Develop a renewable energy facility capable of providing grid support by offering power generation that is flexible;
- Ensure construction and operation of a renewable electrical generation facility that will meet permitting requirements and comply with applicable laws, ordinances, regulations and standards (LORS);
- Develop a renewable energy facility in a timely manner that will avoid or minimize significant environmental impacts to the greatest extent feasible;
- Obtain site control and use within a reasonable time frame; and
- Develop a renewable energy facility in an area with high solar value and minimal slope. (FSA, pp. 6.1-3 to 6.1-4).

The PV Alternative Cannot Meet the FSA's Proposed Project Objectives

There is no substantial evidence in the FSA demonstrating that the PV alternative can achieve most of the FSA's project objectives. The FSA admits that the PV alternative would not satisfy the FSA project objective addressing operational flexibility. (FSA, p. 6.1-78.) The FSA further admits that "it is not known whether the proposed 3,277-acre project site could be used for construction of a PV project that would achieve close to the 500-MW capacity" required by the FSA project objectives. (*Id*.) In using the 3,277-acre number, Staff is assuming PV energy generation on the 180-acre laydown area, in addition to the 3,097-acre site. HHSEGS will not use the 180-acre laydown area to generate energy. The FSA's analysis of the PV alternative's ability to satisfy the remaining objectives amounts to nothing more than a collection of bare assertions that the PV alternative could "potentially" meet such objectives. (*Id*.) Without such evidence, there is no basis for the FSA's

determination that the PT alternative is properly included within the CEQA mandated "reasonable range" and should therefore be disregarded.

In any case, six of the seven project objectives identified in the FSA require that a facility be "constructed" or "developed." However, as explained previously in section III.B., the Applicant does not presently have the expertise or ability to construct or develop the PV alternative and cannot obtain such expertise or ability in a reasonable period. Accordingly, there is no basis for finding that the PV alternative can meet six of seven of the project objectives proposed in the FSA. Moreover, constructing a PV project on the project site would yield significantly lower energy production. Using the correct values for the PV projects set forth in Table 5 of the FSA's Alternative Section, which are set forth in Table Alt-3, demonstrates that a PV project at the project site would result in expected energy production losses of between 24.3 percent and 35.1 percent. In fact, a PV project sized to produce the same energy as the project would require between 32 percent and 54 percent more acreage than the project.

The attached tables (Tables Alt-2 and -3) calculate the total energy production that would be expected from a PV-only project at the project site. The calculations are done first using data for the sites proposed in "Alternatives Table 5" of the FSA. Table ALT-2, below, includes estimates of both energy production and acres of impacted land for each of four utility-scale PV sites.

Using the uncorrected numbers for each PV site in FSA Table 5, energy production was divided by land area to obtain a measure of land use efficiency, expressed in annual GWh/acre. This value was then multiplied by the project site area (3,097 acres) to calculate the expected PV production (GWh) on the project site. The difference in total production between the project and the implied production of the PV facility at the project site was calculated and then divided by the project production to obtain an estimate of the reduction in the energy output from the site under a PV alternative. The values ranged from a 0.8 percent to a 34.5 percent reduction, with a mean value of 24.8 percent. Finally, the increased acreage required to produce equivalent energy to the proposed project was calculated as 1 divided by (1 – the reduction in energy production). The result (based on the uncorrected values) ranged from a 1 percent to a 54 percent increase in acreage, with a mean value of 37 percent. The results are shown in Table Alt-2, below.

TABLE ALT-2
Uncorrected Expected Reduction in Energy Production at the Project Site under a PV Alternative, Relative to the Project

Project	Annual Energy (GWh)	Land Area (Acres)	Annual Energy Production (GWh/Acre)	PV Energy Production at Project Site (GWh)	Project Energy (GWh)	Reduction Compared to Project (%)	Increase in acreage required to produce equivalent energy as Project (%)
AV Solar Ranch One	592	1,955	0.30	938	1,432	**34.5%**	**54%**
Desert Sunlight	1190	3,761	0.32	980	1,432	**31.6%**	**44%**
Topaz	1096	3,500	0.31	970	1,432	**32.3%**	**49%**

TABLE ALT-2
Uncorrected Expected Reduction in Energy Production at the Project Site under a PV Alternative, Relative to the Project

Project	Annual Energy (GWh)	Land Area (Acres)	Annual Energy Production (GWh/Acre)	PV Energy Production at Project Site (GWh)	Project Energy (GWh)	Reduction Compared to Project (%)	Increase in acreage required to produce equivalent energy as Project (%)
California Valley	688	1,500	0.46	1,420	1,432	**0.8%**	**1%**
Average						**24.8%**	**37%**

However, several errors in the values listed in FSA Table 5 were discovered that affect the comparison. These include the following:

- For AV Solar Ranch One, FSA Table 5 inaccurately reported the project acreage as 1,955 acres. The actual area is 2,093 acres.[2]
- For AV Solar Ranch One, FSA Table 5 inaccurately reported the annual production as 592 GWh. The actual value is 628 GWh.[3]
- For Desert Sunlight, FSA Table 5 inaccurately reported the annual production as 1,190 GWh. The actual value is 1,244 GWh.[4]
- For Topaz, FSA Table 5 inaccurately reported the annual production as 1,096 GWh. The actual value is 1,066 GWh.5
- For California Valley, FSA Table 5 reported the annual production as 688 GWh. The actual value is 652 GWh.[6]
- For California Valley, FSA Table 5 inaccurately reported the land area as 1,500 acres. The actual value is 1,861.7 acres.[7]

Updating the calculations in Table Alt-2 with corrected values yields expected energy production losses of between 24.3 percent and 35.1 percent, with a mean value of 30.5 percent, and increased acreage requirements of between 32 percent and 54 percent, with a mean value of 45 percent, as shown in Table Alt-3, below.

[2] http://planning.lacounty.gov/assets/upl/case/project_r2009-02239_approval-package.pdf

[3] http://planning.lacounty.gov/assets/upl/case/project_r2009-02239_deir.pdf

[4] http://www.sce.com/NR/sc3/tm2/pdf/2391-E.pdf

[5] http://www.pge.com/nots/rates/tariffs/tm2/pdf/ELEC_3514-E.pdf

[6] http://www.sloplanning.org/EIRs/CaliforniaValleySolarRanch/feir/fulltrack/b_proj_desc_FT.pdf

[7] http://www.sloplanning.org/EIRs/CaliforniaValleySolarRanch/feir/fulltrack/b_proj_desc_FT.pdf

TABLE ALT-3
Corrected Expected Reduction in Energy Production at the Project Site under a PV Alternative, Relative to the Project

Project	Annual Energy (GWh)	Land Area (Acres)	Annual Energy Production (GWh/Acre)	PV Energy Production at the Project Site (GWh)	Project Energy (GWh)	Reduction Compared to Project (%)	Increase in acreage required to produce equivalent energy as Project (%)
AV Solar Ranch One	628	2093	0.30	929	1432	**35.1%**	**54%**
Desert Sunlight	1,244	3761	0.33	1024	1432	**28.5%**	**40%**
Topaz	1,066	3500	0.30	943	1432	**34.1%**	**54%**
California Valley	652	1862	0.35	1084	1432	**24.3%**	**32%**
Average						**30.5%**	**45%**

As demonstrated by Table Alt-3, above, PV technology requires substantially more land (i.e., an increase of 37 to 45 percent) to generate the same amount of electricity and thus would require a much larger site to accommodate a 500MW facility.

The PT Alternative Cannot Meet the Project Objectives

There is no substantial evidence in the FSA demonstrating that the PT alternative can achieve most of the FSA's project objectives. The FSA admits that the PT alternative cannot satisfy the project objective addressing operational flexibility. (FSA, p. 6.1-93.) The FSA further admits that the "total potential generating capacity of this alternative is unknown and could be less than the proposed 500-MW capacity" required by FSA's project objectives. (*Id*.) The FSA's analysis of the remaining objectives amount to nothing more than bare assertions that the PT alternative could "potentially" meet such objectives. Without supporting evidence, there is no basis for the FSA's determination that the PT alternative is properly included within the CEQA mandated "reasonable range" and should therefore be disregarded.

Tower with Storage Does Not Avoid or Reduce the Project's Significant Effects

As noted, all alternatives qualified for the CEQA-mandated "reasonable range" must be capable of avoiding or substantially reducing at least one of the project's significant environmental effects. The Tower with Storage alternative fails this basic test, as admitted in the FSA. FSA Alternatives Table 4, which compares the effects of the project to the Storage alternative, confirms that none of the project's significant effects will be reduced by the Storage alternative, much less avoided. Indeed, the FSA concludes that the Tower with Storage alternative would, in fact, have *greater* environmental effects than the proposed project, not fewer effects, as CEQA requires. This FSA conclusion is unsurprising given that the Storage alternative is identical to the proposed project, but also adds storage facilities that enlarge the project footprint. Since the Storage alternative fails to avoid or reduce any of the project's environmental effects, it does not qualify for the "reasonable range" of alternatives and thus should be eliminated from consideration.

C. The FSA Inadequately Analyzes the Potential Environmental Effects of the PV Alternative

Unlike the project, which substantially maintains the project site's existing slope and terrain in existing condition, PV requires substantial grading and foundations for grounding the PV system. The FSA, however, incorrectly assumes that no substantial grading is required for PV technologies: "It is assumed that the PV Alternative would use a low-impact design that would minimize on-site grading and manage remaining native vegetation under the solar panels by mowing. It is possible that no grading would be necessary under most of the solar panels for the PV Alternative." (FSA, p. 6.1-83.) However, utility-scale PV systems do require substantial grading and are largely, if not completely, devoid of any vegetation growth. Indeed, the photographs of PV systems in Alternatives Figures 8a, 8b, and 8c show representative PV project sites that are graded completely flat and denuded of vegetation.

By assuming no grading, the FSA understates the PV alternatives impacts to biological and cultural resources. Moreover, the FSA fails to acknowledge that the PV alternative would require a substantially larger area to generate the same amount of electricity. Thus, the PV Alternative has the potential to cause even greater impacts to biological resources than would the project. The full extent of these impacts should be disclosed in the FSA.

D. The FSA Inadequately Analyzes the Potential Environmental Effects of the PT Alternative.

The PT alternative would have environmental impacts that were not, but should be, adequately analyzed in the FSA, as described below:

- A PT system using dry cooling would result in similar operational water use to the project. However, due to significant efficiency impacts, the larger number of troughs required to produce the same amount of power as the project must be washed. This would result in increased water demand and, in turn, increased groundwater extraction.
- A PT system has the potential for operational leaks of heat transfer fluids (e.g., piping, flanges, etc.) that could result in vaporization of fluids into small amounts of volatile organic compounds (VOCs) contributing to increased emissions of ozone (VOC) precursors.
- PT has increased fire risk from heat transfer fluid use and would result in increased fire prevention systems, demand for local fire protection and emergency response resources, traffic hazards from deliveries, and risk of accidental leaks or spills.
- PT requires increased ground disturbance to accommodate larger footprint and flat terrain requirement to generate the same amount of electricity as the project. This would result in greater impacts to cultural, paleontological, and sensitive biological habitat resources, increased soil disturbance, erosion, and need to install diversion channels to accommodate stormwater, increased discharge rates and runoff volumes, and stormwater runoff contamination from potential heat transfer fluid leaks.
- The PT circulatory system requires heavy equipment for construction and operation, which increases the operational workforce and potential operational impacts.

E. No-Project Alternative is Inadequately Analyzed in the FSA.

The "No Project Alternative" should reflect "what would be reasonably expected to occur in the foreseeable future if the project were not approved, based on current plans and consistent with available infrastructure and community services." 14 CCR 15126.6(e)(2). The project site is currently

subdivided into 170 individual parcels that range in size from 2.5, 20 and 40 acres. Under current zoning, if the project is not approved, it is reasonably expected that up to 170 individual landowners would build residences on the project site. These landowners are entitled to apply for a building permit, which is a ministerial, non-discretionary approval. In addition, those 170 owners could also apply for a well-permit, which is also a ministerial, non-discretionary approval. Rather than assume some level of development on the project site consistent with existing land use entitlements, as CEQA requires, the FSA's No Project Alternative assumes that the site will forever be preserved in its current state. Attached hereto, as Attachment Alt-1, is a table summarizing the potential effects of the No Project Alternative. These effects should have been, but were not, considered in the FSA.

Attachments

Attachment Alt-1

Potential Effects of the No Project Alternative

Assumes 170 Homesites, Wells, and Related Infrastructure Impacts

Environmental Effect	POTENTIAL EFFECTS OF THE "NO PROJECT ALTERNATIVE"
Air Quality	
Construction-related emissions	Air District dust control measures will apply; however, individual homebuilders will not have any Air District permits and no Air Quality Monitors.
Project operations emissions	Homes will have some common household emissions, but will not require Air District permits.
Biological Resources	
Impacts on special-status plant species and habitats	Homeowners will not be required to acquire offsite mitigation lands. Per existing law, homeowners must simply provide CDFG with 10-day notice before removing "special status" plants. If 10-day notice is given to CDFG, after that period ends, plants can be eradicated without any compensation.
Impacts on waters of the U.S. and waters of the state	Homeowners will not be required to acquire offsite mitigation lands.
Impacts on desert tortoise	Homeowners will not be required to acquire offsite mitigation lands. Homeowners will not be required to construct desert tortoise fencing. Homesites remove 3,276 acres of potential habitat.
Impacts on special-status terrestrial wildlife species (other than desert tortoise)	Homeowners will not be required to acquire offsite mitigation lands. Homeowners will be allowed to passively haze any onsite non-threatened, non-endangered species. Homesites remove 3,276 acres of potential habitat.
Impacts on avian species, including raptors	Homesites remove 3,276 acres of potential foraging habitat.
Cultural Resources	
Potential to disturb, destroy, or visually degrade significant prehistoric and historical archaeological sites *on* the site (see note)	Same as project with homesites located on the "site."
Potential to disturb, destroy, or visually degrade significant prehistoric and historical archaeological sites *beyond* the site	Same as project with homesites located on the "site."
Potential impacts on significant built-environment cultural resources *on* the site	Same as project with homesites located on the "site."
Potential impacts on significant built-environment cultural resources *beyond* the site	Same as project with homesites located on the "site."

Attachment Alt-1

Potential Effects of the No Project Alternative

Assumes 170 Homesites, Wells, and Related Infrastructure Impacts

Environmental Effect	POTENTIAL EFFECTS OF THE "NO PROJECT ALTERNATIVE"
Potential to disturb, destroy, or visually degrade significant ethnographic resources *on* the site	Same as project with homesites located on the "site."
Potential to disturb, destroy, or visually degrade significant ethnographic resources *beyond* the site	Same as project with homesites located on the "site."
Note: "Site" means the facility site proper and does not include linear or ancillary infrastructure away from the facility site.	
Fire Protection	
Potential impacts on local fire protection resources	Additional 170 homesites requiring fire protection.
Potential impacts on emergency response services	Additional 170 homesites requiring emergency services
Geology and Paleontology	
Potential impacts from strong seismic shaking	Similar to the HHSEGS, though different seismic codes apply to residential.
Potential impacts from soil failure caused by liquefaction, hydrocollapse, formation of soil fissures, and/or dynamic compaction	Similar to the HHSEGS, though different seismic codes apply to residential.
Potential impacts on paleontological resources	Similar to the HHSEGS with homesites.
Potential impacts on geological or mineralogical resources	Similar to the HHSEGS with homesites.
Hazardous Materials	
Potential for release of hazardous materials to occur onsite	Smaller quantities associated with homesites.
Potential for release of hazardous materials to occur offsite	Smaller quantities associated with homesites.
Land Use	
Conflicts or inconsistencies with general plan land use designations and zoning	Homesites consistent with general plan and zoning.
Conversion of agricultural land	Conversion of potential agricultural lands will occur, as evidenced by former orchard activities.

Attachment Alt-1

Potential Effects of the No Project Alternative

Assumes 170 Homesites, Wells, and Related Infrastructure Impacts

Environmental Effect	POTENTIAL EFFECTS OF THE "NO PROJECT ALTERNATIVE"
Noise and Vibration	
Potential for noise to impact noise-sensitive receptors	Temporary construction noise impacts less than significant; noisy construction limited to hours allowed by applicable LORS.
Public Health	
Potential for project operations to cause air toxics-related impacts that could affect public health	Home site construction and operations address potential for toxics-related impacts.
Socioeconomic Resources	
Construction employment and increased taxes and fees	Home site construction will have some beneficial socioeconomic impacts.
Displacement of existing rural residences	
Potential impacts to emergency medical and law enforcement services	Home site construction and operations will create demands for emergency, fire, and law enforcement services.
Traffic and Transportation	
Potential impacts on roadway infrastructure	Existing roadway system on project site can serve homesites.
Potential for glint and glare to cause safety hazards from an operator control perspective (i.e., vehicle drivers and aircraft pilots)	Homesites will not have reflective surfaces, other than windows. Residences will have night lighting, similar to night lights seen in Charleston View and Pahrump.
Transmission Line Safety and Nuisance	
Potential for impacts related to aviation safety, hazardous shocks, nuisance shocks, and electric and magnetic field exposure	Homesites will require residential (distribution-level) electric service, requiring new overhead or underground lines.
Visual Resources	
Construction-Related Impacts	
Potential to substantially degrade the existing visual character or quality of the site and its surroundings	Home site construction would likely be intermittent and staggered; that is, individual homesites would be built by landowners on their own schedules, as opposed to being constructed all at once in home-builder phases.
Potential to create a new source of substantial light or glare which would adversely affect day or nighttime views in the area	Home site construction not a substantial source of daytime light or glare or nighttime construction lighting.

Attachment Alt-1

Potential Effects of the No Project Alternative

Assumes 170 Homesites, Wells, and Related Infrastructure Impacts

Environmental Effect	POTENTIAL EFFECTS OF THE "NO PROJECT ALTERNATIVE"
Project Operations Impacts	
Potential to substantially degrade the existing visual character or quality of the site and its surroundings	Similar to project. Residences will have night lighting, similar to night lights seen in Charleston View and Pahrump.
Potential to create a new source of substantial light or glare, which would adversely affect day or nighttime views in the area	Residences will have night lighting, similar to night lights seen in Charleston View and Pahrump.
Waste Management	
Potential for disposal or diversion of project materials to cause impacts on existing waste disposal or diversion facilities	Homebuilders required to comply with applicable LORS re disposal or diversion.
Potential for impacts on human health and the environment related to past or present soil or water contamination	Homebuilders required to comply with applicable LORS re disposal or diversion.
Soil and Surface Water	
Soil erosion by wind and water during project construction	Home site development of the 3,276-acre site would result in similar soil erosion by wind and water during construction, given the Air Quality Monitors and related monitoring activity for the site versus the homebuilding not subject to similar stringent monitoring.
Soil erosion by wind and water during project operations	Home site development of the 3,276-acre site would result in similar soil erosion by wind and water during operations, given the Air Quality Monitors and related monitoring activity for the site versus the homebuilding not subject to similar stringent monitoring.
Water quality impacts from contaminated storm water runoff	Home site development of the 3,276-acre site would result in similar water quality impacts. In fact, home sites may result in more impervious surfaces and more non-point sources, such as residential motor vehicles, OHVs, and agricultural equipment (tractors and alike for the 20- to 40-acre home sites). Less than significant with implementation of BMPs.
Water quality impacts from storm damage	Home site development of the 3,276-acre site would result in stormwater control issues.
Water quality impacts from power plant operations	(*Note: This category seems redundant with others above and below.*)
Water quality impacts from sanitary waste	Greater than project operations. Home site development of the 3,276-acre site would result in greater needs for sanitary sewer services than project operation. Homeowners would be able to install septic systems, given the lack of available third-party sewer service in the Charleston View area.
Potential impacts from onsite and offsite flooding	Home site development of the 3,276-acre site would result in similar onsite and offsite potential flooding impacts, given the LORS requirements to match pre and post-project water flows.
Potential to impede or redirect 100-year flood flows, as shown on Federal Emergency	Home site development of the 3,276-acre site would result in similar potential impacts.

Attachment Alt-1 Potential Effects of the No Project Alternative Assumes 170 Homesites, Wells, and Related Infrastructure Impacts	
Environmental Effect	**POTENTIAL EFFECTS OF THE "NO PROJECT ALTERNATIVE"**
Management Agency maps	
Water Supply	
Potential impacts on local wells	The 170 homesites would each have the right to sink domestic wells as a matter of right (ministerial approval to ensure that public health is protected by property constructed wells). Assuming 1 AFY per home site (which is conservative, given the likely water uses on 20- to 40-acre desert home sites), the No project Alternative
	has as a reasonably foreseeable consequence an additional 170 AFY of domestic water use in the Charleston View area (WATER SUPPLY-1, -2, and -3). Individual homeowners would not be required to obtain offsets of water at 1:1, as proposed for the HHSEGS project. Consequently, the No Project Alternative would likely result in both (a) an additional 170 AFY of use and (b) no 140 AFY offset at 1:1 as proposed by the project, given that they would have unlimited pumping rights as overlying California landowners in an un-adjudicated basin (WATER SUPPLY-1, -2, and -3). Individual homeowners would not be required to do any monitoring of wells, given that they would have unlimited pumping rights as overlying California landowners in an un-adjudicated basin (WATER SUPPLY-6).
Potential impacts on local wells continued	Individual homeowners would not be required to reimburse additional energy costs, given that they would have unlimited pumping rights as overlying California landowners in an un-adjudicated basin (WATER SUPPLY-7). Individual homeowners would not be required to install water-metering devices; given that they would have unlimited pumping rights as overlying California landowners in an un-adjudicated basin (WATER SUPPLY-4). Individual homeowners would not be required to submit a Groundwater Level Monitoring, Mitigation, and Reporting Plan or monitor water levels in Nevada, given that they would have unlimited pumping rights as overlying California landowners in an un-adjudicated basin (WATER SUPPLY-6 and -8). Individual homeowners would not be required to develop a Groundwater Quality Monitoring and Reporting Plan, given that they would have unlimited pumping rights as overlying California landowners in an un-adjudicated basin (WATER SUPPLY-9).
Potential impacts on groundwater basin balance	The 170 homesites would each have the right to sink domestic wells as a matter of right (ministerial approval to ensure that public health is protected by property constructed wells). Assuming 1 AFY per home site (which is conservative, given the likely water uses on 20- to 40-acre desert home sites), the No Project Alternative has as a reasonably foreseeable consequence an additional 170 AFY of domestic water use in the Charleston View area (WATER SUPPLY-1, -2, and -3). Individual homeowners would not be required to obtain offsets of water at 1:1, as proposed for the HHSEGS project. Consequently, the No Project Alternative would likely result in both (a) an additional 170 AFY of use and (b) no 140 AFY offset at 1:1 as

Attachment Alt-1 Potential Effects of the No Project Alternative Assumes 170 Homesites, Wells, and Related Infrastructure Impacts	
Environmental Effect	**POTENTIAL EFFECTS OF THE "NO PROJECT ALTERNATIVE"**
	proposed by the project, given that they would have unlimited pumping rights as overlying California landowners in an un-adjudicated basin (WATER SUPPLY-1, -2, and -3). Individual homeowners would not be required to monitor wells, given that they would have unlimited pumping rights as overlying California landowners in an un-adjudicated basin (WATER SUPPLY-6).
Potential impacts on groundwater basin balance, continued	Individual homeowners would not be required to install water-metering devices, given that they would have unlimited pumping rights as overlying California landowners in an un-adjudicated basin (WATER SUPPLY-4). Individual homeowners would not be required to submit a Groundwater Level Monitoring, Mitigation, and Reporting Plan or monitor water levels in Nevada, given that they would have unlimited pumping rights as overlying California landowners in an un-adjudicated basin (WATER SUPPLY-6 and -8). Individual homeowners would not be required to develop a Groundwater Quality Monitoring and Reporting Plan, given that they would have unlimited pumping rights as overlying California landowners in an un-adjudicated basin (WATER SUPPLY-9).

Attachment Alt-2

I. Further Responses to the FSA

A. The PV Alternative Will Not Avoid Significant Effects

Will the PV alternative avoid potentially significant impacts of the HHSEGS project? No. The FSA asserts that HHSEGS will have potentially significant adverse impacts in several areas. The evidence shows that the PV alternative will not avoid these potential impacts

The FSA concludes that the HHSEGS project will have significant impacts after application of feasible mitigation in three subject matters: Biological Resources, Cultural Resources, and Visual Resources. As discussed below, the PV Alternative does not avoid significant effects in these same three resources:

Biological Resources

Collision: We agree with the FSA that the PV Alternative will not avoid the effects on avian species from collisions with project features. (FSA, Alternatives Table 6, p. 6.1-79.)

The FSA states that potential collision risks from both HHSEGS and the PV alternative would be significant and unavoidable. For example, "Similar to concentrating solar power technology, the PV Alternative would have the potential to cause a 'mirage' effect from the appearance of the sky reflected off the solar panels when viewed from a distance (see **Alternatives Figure 8**). Properties of the smooth, glass surfaces of the PV panels are known to cause polarized light pollution (Horváth et al., 2009 and 2010). The final EIS for the Topaz Solar Farm Project (San Luis Obispo County, 2011b) identified solar modules, or panels, as posing a possible risk of collision for birds, including golden eagle. The analysis discussed the possibility of birds colliding with the PV panels depending on the potential effects of 'glare or polarized light' from the panels. Both of these potential effects (i.e., the mirage effect or the effects of polarized light) could attract birds or bats to the facility, where they could be susceptible to mortality or injury by collision." (FSA, p. 6.1-83.)

The FSA's conclusion is that collision risks from PV remain a significant impact: "The extent and severity of potential collision impacts on avian species under the Solar PV Alternative is unquantifiable and cannot be reasonably compared to the proposed project. Impacts on avian species from collisions with solar panels and other structures are **unknown compared to HHSEGS**. Impacts on avian species stemming from habitat loss could be mitigated to below a level of significance. *However, no evidence exists demonstrating that impacts related to collisions with project structures could be reduced to below a level of significance, and these impacts could remain significant and unavoidable*." (FSA, p. 6.1-83, italics and underlining added; bold in original.)

We do not agree with Staff that the effects of collisions would be a significant impact at HHSEGS (see Biological Resources Testimony). However, even if the Commission finds this impact to be significant, we agree with the FSA that the PV alternative will not avoid a potentially significant effect of the project on avian collisions. Thus, the PV alternative does not avoid a significant effect of the HHSEGS project and thus is not a reasonable and feasible alternative that avoids or minimizes potential impacts to Biological Resources.

Flux: We disagree with the FSA's assertion that flux impacts are significant with HHSEGS and avoided by PV. It is true that PV has no "flux" associated with PV operations. However, as discussed in Applicant's Biological Resources testimony, the potential flux effects are not significant and thus cannot be avoided by PV.

Cultural Resources

The PV Alternative does not avoid or minimize potentially significant impacts associated with Cultural Resources. As is the trend throughout the FSA, "Cultural Resources" discussed are in reality largely Visual Resources issues counted twice: once as a visual effect and again as a cultural effect.

The CEQA question is whether the PV Alternative avoids or minimizes a potentially significant effect of the HHSEGS project. As the FSA admits, the PV alternative has its own significant impacts and thus cannot avoid potential effects of the project.

Alternatives Table 6 confirms two significant cultural impacts of the PV Alternative, both onsite and offsite. First, Table 6 confirms that as to onsite resources, the PV Alternative has the "Potential to disturb, destroy, or visually degrade significant ethnographic resources on the site," similar to HHSEGS and potentially significant and unmitigable. Second, Table 6 further confirms that the PV alternative has the "[p]otential to disturb, destroy, or visually degrade significant ethnographic resources beyond the site," which is also found to be potentially significant and unmitigable. (FSA, p. 6.1-79.)

Thus, as to Cultural Resources, the FSA concedes that the PV Alternative will not avoid or minimize potentially significant effects of the HHSEGS project.

Further, the FSA significantly understates the potential for significant effects on cultural resources onsite because it incorrectly assumes minimal or even no site grading for the PV Alternative. As discussed below, the representative PV projects described in the FSA have substantial grading. Grading results in GREATER site disturbance to cultural resources for the PV Alternative than the HHSEGS project. Greater onsite disturbance leads to the greater potential to impact surface and subsurface Cultural Resources.

The PV Alternative will not avoid potentially significant effects related to Cultural Resources, and in fact with grading may have greater potential for impacts to Cultural Resources than the HHSEGS project.

Visual Resources

As the FSA admits, the PV alternative does not avoid or minimize impacts to Biological Resources on the whole. The PV Alternative will not avoid potentially significant visual effects. First, as set forth in our Visual Resources testimony, the visual resource impacts of HHSEGS will be reduced to less than significant levels. Second, even if the impacts of HHSEGS are found to be significant, as the FSA recognizes, the PV alternative itself will have potentially significant visual effects.

While FSA Table 6 suggests no potentially significant visual effects from PV, this table is not supported by the text of the FSA, which does find potentially significant effects.

KOP 3 is the "View from Old Spanish Trail Highway and Property Boundary of Proposed St. Therese Mission, Charleston View, California." (FSA, p. 4.12-15.) With respect to KOP 3, the Visual Resources section of the FSA concludes: "Taking into account the moderate visual sensitivity and the high overall visual change, visual impacts at KOP 3 would remain significant even with mitigation." (FSA, p. 4.12-21.) Without agreeing to this conclusion, Applicant notes that the Staff unequivocally finds a significant visual effect at KOP 3.

In the Alternatives section, as to KOP 3, the Staff finds that the PV alternative and the HHSEGS project's potential visual effects are similar: "The Solar PV alternative would present similar challenges to screening the structures from view at key observation point (KOP) 3, but the potential

impacts on the more distant views toward the site from KOPs 4, 5, and 7 would be lower without the visually dominant SPTs [Solar Power Towers]." (FSA, p. 6.1-89.)

While the FSA seeks to divert attention away from KOP 3 by focusing on other KOPs, the staff's conclusions are undisputed: (1) the potential effects from KOP 3 are deemed "significant" in the Visual Resources section; (2) the potential effect of the PV alternative on the KOP are "similar" to those of HHSEGS; and thus, (3) if the effects of HHSEGS are significant, the potential effects of the PV alternative on KOP 3 must also be significant.

Thus, given the FSA's conclusion that the PV alternative has significant Visual Resource impacts at KOP 3, the PV alternative would not avoid the potentially significant Visual Resources impacts of HHSEGS.

B. The PV Alternative Results in Its Own Significant Impacts

Not only will the PV alternative not avoid potentially significant impacts of HHSEGS, the PV alternative will have its own, additional significant impacts.

Unlike the Applicant's technology that keeps the existing slope and terrain largely intact through the use of pylons without grading and foundations, PV requires substantial grading and foundations for grounding the PV system. Since electricity is produced at the panel in the field, electricity is produced throughout the PV field, unlike the HHSEGS thermal technology that only produces electricity at the power block. Grounding each "live" DC-current producing panel array requires greater grading and foundations. This massive grading at the proposed site would be a significant impact of the PV alternative, but not HHSEGS.

The FSA incorrectly assumes that no substantial grading is required for PV technologies: "It is assumed that the Solar PV Alternative would use a low-impact design that would minimize on-site grading and manage remaining native vegetation under the solar panels by mowing. It is possible that no grading would be necessary under most of the solar panels for the Solar PV Alternative." (FSA, p. 6.1-83.) However, utility-scale PV systems do have substantial grading and are largely, if not completely, devoid of any vegetation growth. The evidence of substantial grading is in the FSA. Specially, the photographs of PV system in Alternatives Figures 8a, 8b, and 8c show representative PV project sites that are graded completely flat and denuded of vegetation.

While the "assumption" of low impact design makes the PV alternative seem more appealing for the FSA's comparison, the reality is that PV sites are typically graded flat and devoid of vegetation. (The PV plants seen from the air flying into Las Vegas confirm this flat, graded construction for PV.)

By assuming no grading, the FSA incorrectly understates the impacts to Biological Resources of the PV alternative. Moreover, the FSA fails to account for the fact that the PV alternative would require 25 percent more area to generate the same amount of electricity. Thus, when properly analyzed, the PV alternative has the potential to cause even greater impacts to Biological Resources through extensive grading on a much larger footprint that HHSEGS.

Assessment of Parabolic Trough and Power Tower Solar Technology Cost and Performance Forecasts, prepared by Sargent & Lundy[8] also confirms that tower systems have higher energy

[8] Sargent & Lundy LLC Consulting Group. 2003. Assessment of Parabolic Trough and Power Tower Solar Technology Cost and Performance Forecasts (NREL/SR-550-34440), National Renewable Energy Laboratory, Contract No. DE-AC36-99- GO10337. October.

conversion factors than PT systems. Based upon this industry-recognized experience and forecast, the two largest advantages of tower systems are:

1. Lower parasitic energy for tower systems (PT systems typically use 10 to 12 percent of energy generated for plant use, including pumping heat transfer fluid throughout the solar field, while power tower use is no more than half of that), and
2. Lower energy generation because a PT system, with maximum steam cycle energy availability conditions of 750°F and about 1,500 psi generates steam with between 15 and 17 percent less energy than a tower, with steam conditions at 1085°F and about 2,500 psi. This is a major cycle efficiency penalty that translates directly into MW generated/acreage in the solar fields. In addition to the steam condition penalty for PT technology, a PT system does not convert the sun's energy directly to steam. It uses an intermediate heat transfer fluid, such as Therminoil, to absorb the sun's energy and then transfer it into water through a heat exchanger—this extra step contributes to additional inefficiencies. Adding the excess parasitic loads of PT technology to the cycle efficiency penalty yields a total penalty of more than 22 to 24 percent, assuming that the thermal fluid to steam heat exchanger operates at peak efficiency. This equates to a net generation capability of approximately 190 MW based on the project using wet cooling.

C. The Solar Trough Alternative Does Not Avoid Potentially Significant Impacts

The FSA concludes that the HHSEGS project will have significant impacts after application of feasible mitigation in three subject matters: Biological Resources, Cultural Resources, and Visual Resources. As discussed below, the Trough Alternative does not avoid significant effects in these same three resources.

Biological Resources

The FSA concludes that even with application of feasible mitigation, the Trough Alternative will continue to have significant effects on impacts to avian species from collisions with project features. (FSA, Alternatives Table 7, p. 6.1-94.)

Collision: The FSA recognizes potential collision risks as significant and unavoidable: "Parabolic trough technology has the potential to impact avian species from collisions with solar troughs and other project facilities or transmission lines, exposure to glint and glare and the effects of polarized light pollution, and loss of habitat. * * * It is unknown how glint and glare effects from the Parabolic Trough Alternative would affect the vision of avian species; therefore, the level of significance of this impact is unclear. Similarly, the extent and severity of injury and mortality from collision with project structures under the Parabolic Trough Alternative are unknown, although the Energy Commission decision for the Blythe Solar Power Project concluded that impacts on avian species could be mitigated below a level of significance with implementation of Condition of Certification **BIO-15**, which would have been achieved through preparation and implementation of an 'Avian Protection Plan' to monitor the death and injury of birds from collisions with facility features. **BIO-15** further requires that the monitoring data would be 'used to inform an adaptive management program that would avoid and minimize project-related impacts' (Energy Commission 2010c). The Parabolic Trough Alternative would not require central collector towers, which would eliminate the potential for avian species to collide with extremely tall structures. *However, without further data, staff concludes that impacts on avian species from collisions with project features under this alternative cannot be reasonably compared to the proposed project; and a conclusion for comparative avian impacts is **unknown**. No on-site avoidance measures for this impact are feasible;*

therefore, avian collision impacts would remain potentially significant and unavoidable." (FSA, p. 6.1-98, italics and underline added, bold in original.).

The FSA's conclusion is that there are collision risks from the Trough Alternative. Thus, the FSA concludes that the Trough Alternative will not avoid a potentially significant effect of the project on avian collisions. Thus, the Trough Alternative does not avoid a significant effect of the HHSEGS projects and thus is not a reasonable and feasible alternative that avoids or minimizes potential impacts to Biological Resources.

Flux: As to flux impacts, the FSA concludes that the impacts are significant with HHSEGS and avoided by Trough. It is true that Trough has no "flux" associated with operations. However, as discussed in Applicant's Biological Resources testimony, Applicant maintains that the potential flux effects are not significant and thus cannot be avoided by Trough technology.

Grading: With respect to other impacts on Biological Resources, the FSA fails to properly account for the fact that trough technology requires the site to be graded flat.

Unlike the Applicant's technology that keeps the existing slope and terrain largely in tact through the use of pylons without grading and foundations, the Solar Trough technology requires substantial grading and foundations. As the FSA describes, the earthwork is "extensive." "The Parabolic Trough Alternative could potentially satisfy the project objective to avoid or minimize significant impacts to the greatest extent feasible, *although site grading and earthwork for a parabolic trough project generally requires removal of all vegetation and mass grading to level the site*. Construction of engineered *drainage channels* is required to direct stormwater runoff around the solar field(s). The *extent and intensity of ground disturbance could be greater under this alternative compared to the proposed project*." (FSA, p. 6.1-93, italics and underline added.)

The Trough Alternative has the potential to cause even greater impacts to Biological Resources through extensive grading. Thus, as the FSA admits, the Trough Alternative does not avoid or minimize impacts to Biological Resources on the whole.

Cultural Resource

The Trough Alternative does not avoid or minimize potentially significant impacts associated with Cultural Resources. As is the trend throughout the FSA, "Cultural Resources" impacts discussed are in reality largely Visual Resources issues counted twice: once as a visual effect and again as a cultural effect.

Nevertheless, the CEQA question is whether the Trough Alternative avoids or minimizes a potentially significant effect of the HHSEGS project. As the FSA admits, the Trough Alternative has its own significant impacts and thus cannot avoid potential effects of the project.

Alternatives Table 7 confirms three significant cultural impacts of the Trough Alternative, both onsite and offsite – though the characterization of the impacts as significant but "somewhat less than HHSEGS" are questionable—given the greater grading and ground disturbance onsite with the Trough Alternative.

First, Alternatives Table 7 finds that the Trough Alternative has the "Potential to disturb, destroy, or visually degrade significant ethnographic resources on the site," similar to HHSEGS and potentially significant and unmitigable. Second, Table 6 further confirms that the Trough Alternative has the "Potential to disturb, destroy, or visually degrade significant ethnographic resources beyond the site," which is also found to be potentially significant and unmitigable. (FSA, p. 6.1-94.)

Thus, as to Cultural Resources, the FSA concedes that the Trough Alternative will not avoid or minimize potentially significant effects of the HHSEGS project.

Further, the FSA likely significantly understates the potential for significant effects on potential cultural onsite resources because it fails to account for the extensive grading onsite that the FSA acknowledges is required for Trough projects. Grading results in GREATER site disturbance for the Trough Alternative than the HHSEGS project. Greater onsite disturbance leads to the greater potential to impact surface and subsurface Cultural Resources, including any alleged remnants of the historic travel corridors.

The Trough Alternative will not avoid potentially significant effects related to Cultural Resources, and in fact with grading may have greater potential for impacts to Cultural resources than the HHSEGS project, given the grading at issue.

Visual Resources

The FSA finds that the Trough Alternative would have significant, unmitigated Visual Resources impacts, in this case, from two separate KOPS: "Visual impacts under this alternative at KOPs 5 and 7 would be *significant and unavoidable under the Parabolic Trough Alternative*. The overall alternative project operations impacts on visual resources would be **somewhat less than the proposed HHSEGS project**. *The net effect of this alternative on visual resources is considered significant and unavoidabl*e due to the high reflectivity of the parabolic mirrors; *no feasible mitigation measures could fully reduce the net effect to a less-than-significant level*." (FSA, p. 6.1-103; italics and underlining added; bold in original..)

Thus, given the undisputed significant Visual Resources impacts at KOP 5 and KOP 7, the Trough Alternative would not avoid a potentially significant Visual Resource impacts.

Applicant's Response to Data Requests, Set 2A (Nos. 155-172)

for the

Application for Certification

for the

Rio Mesa Solar Electric Generating Facility (Rio Mesa SEGF)

(11-AFC-04)

Submitted to the

California Energy Commission

Submitted by

Rio Mesa Solar I, LLC

Rio Mesa Solar II, LLC

June 19, 2012

Alternatives (Nos. 170-171)

Data Request:

170. Please provide a discussion of pertinent contractual agreements in the applicant's PPA with SCE that would prohibit the consideration or justify the dismissal of alternatives identified in the Application for Certification (AFC).

Response:

The Power Purchase Agreement ("PPA") between BSE and SCE is a legally binding contractual agreement that requires BSE to deliver to SCE a specified quantity of energy from a specified type of generating facility over a specified term. Any material deviation from the quantity of energy, the type of facility used to generate the energy or the period of delivery would constitute a default and potentially subject BSE to substantial financial penalties.

[redacted] The BrightSource LPT design – and solar thermal/concentrating solar power technologies in general – are widely recognized as having operational and reliability attributes that differentiate them from other technologies like PV. These attributes (described in more detail below) together with the express terms of the PPA that require the use of this technology, prohibit the consideration and justify the dismissal of alternatives identified in the Application for Certification (AFC).

The CPUC has recognized that solar thermal has a higher on-peak availability factor than PV systems -- possibly 10% or more higher as shown in Table 1 below. This essentially means that the buyer of the LPT design plant would need to purchase less back-up generation by at least 10% for Resource Adequacy than for a similarly sized and situated PV project.

Table 1 - CPUC generic estimates of on-peak availability factors[4]

Resource Type	On-Peak Availability Factor
Biomass	66%
Geothermal	72%
Wind	16%
Solar PV	65% for Tracking Systems 51% for Fixed-Tilt Systems
Solar Thermal	77% (Range of 71% - 87%)

Moreover, there are a range of other attributes provided by solar thermal that are known to be desirable from an operational perspective, and cannot be provided by PV. However, these attributes have values that are difficult to quantify monetarily at present (i.e., in terms of $/MWh), so are described here qualitatively. The LPT plants utilize synchronous generators, providing similar reliability and operational benefits to the system as conventional power plants

[4] See CPUC R.10-05-006, Planning Standards for Renewable Resources (last updated 2/2011), available at: http://docs.cpuc.ca.gov/efile/RULINGS/130670.pdf

at no additional costs. When the LPT plants are on-line, these benefits include reactive power support, dynamic voltage support, voltage control, some degree of inertia response, primary frequency control, frequency and voltage ride-through, small signal stability damping, and the ability to mitigate Sub-Synchronous Resonance ("SSR"). Hence, they provide attributes that bring system benefits, which other technology types (specifically PV) fail to offer.

A number of recent studies have begun to catalogue the regional power system requirements for integration of variable energy resources to maintain system frequency response (See references to GE Energy/NREL 2010; LBNL 2010; GE Energy/CAISO 2011 below). These include numerous measures, and clearly there are significant costs to be distributed over power market buyers and loads. While we cannot offer a specific cost that is additional to the costs we have already discussed, qualitatively any less variable and more controllable renewable resource, such as the LPT technology, will mitigate some of those costs, and can potentially significantly offset them.

References:

- GE Energy/National Renewable Energy Laboratory (NREL), May 2010, Western Wind and Solar Study, NREL, Golden, Colorado.
- GE Energy, California ISO Frequency Response Study, Final Draft, November 9, 2011, available at http://www.caiso.com/Documents/Frequency%20response%20study%20report.
- Lawrence Berkeley National Laboratory (LBNL), Use of Frequency Response Metrics to Assess the Planning and Operating Requirements for Reliable Integration of Variable Renewable Generation, December 2010, available at http://www.ferc.gov/industries/electric/indus-act/reliability/frequencyresponsemetrics-report.pdf.

Data Request:

171. Please provide a copy of the actual PPA, with confidential information redacted as necessary. Alternatively, staff would support a request that the filing be treated as confidential.

Response:

Applicant's confidential response to Data Requests Nos. 26 and 27 is an excerpt from the actual PPA Applicant executed with SCE. Applicant has an obligation to provide true and accurate information to the Commission and staff. Section 2505(g) of the Commission's regulations requires the Applicant to "certify under penalty of perjury that the information contained in [the] application for confidential designation is true, correct and complete to the best of my knowledge." The portions of Applicant's PPA submitted in response to Data Requests 26, 27 and 170 are accurate excerpts from Applicant's legally executed PPA with SCE.

BrightSource

Applicant's Response to Data Requests, Set 1B (Nos. 85-154)

for the APPLICATION FOR CERTIFICATION for the Rio Mesa Solar Electric Generating Facility (Rio Mesa SEGF)

(11-AFC-04)




DOCKET
11-AFC-04
DATE MAR 28 2012
RECD. MAR 28 2012

Submitted to:

CALIFORNIA ENERGY COMMISSION
1516 9th Street, MS15
Sacramento, CA 95814-5504

Submitted by:

RIO MESA SOLAR I, LLC
RIO MESA SOLAR II, LLC
RIO MESA SOLAR III, LLC
1999 Harrison Street, Suite 2150
Oakland, CA 94612

MARCH 28, 2012

URS

March 28, 2012

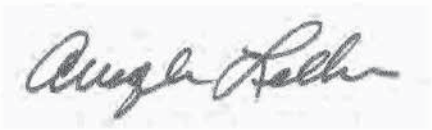
Pierre Martinez
Project Manager
Systems Assessment & Facility Siting Division
California Energy Commission
1516 Ninth Street, MS-15
Sacramento, CA 95814

Subject: Data Responses, Set 1B (Nos. 85-154)
Rio Mesa Solar Electric Generating Facility (11-AFC-04)

Dear Mr. Martinez:

On behalf of Rio Mesa Solar I, LLC, Rio Mesa Solar II, LLC, and Rio Mesa Solar III, LLC, please find enclosed an electronic copy of Data Responses, Set 1B (Nos. 85-154) in response to Staff's Data Requests filed on February 27, 2012. Five CD ROMS are being provided for Staff. Hard copies and/or CDs will be sent to the Proof of Service list.

Sincerely,



Angela Leiba, Vice President
Senior Project Manager/ Environmental Department Manager

Enclosure

cc: POS List
Project File

Applicant's Response to Data Requests, Set 1B (Nos. 85-154)

for the

Application for Certification

for the

Rio Mesa Solar Electric Generating Facility (Rio Mesa SEGF)

(11-AFC-04)

Submitted to the

California Energy Commission

Submitted by

Rio Mesa Solar I, LLC,
Rio Mesa Solar II, LLC,
Rio Mesa Solar III, LLC

March 28, 2012

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Introduction

Attached are responses from Rio Mesa Solar I, LLC, Rio Mesa Solar II, LLC, and Rio Mesa Solar III, LLC (collectively the "Applicant") to the California Energy Commission (CEC) Staff's Data Requests Set 1B (Nos. 85 – 154). Staff served these data requests on February 27, 2012. The responses are grouped into the following disciplines: Alternatives, Cultural Resources, Paleontological Resources, Soil and Water Resources, Traffic and Transportation, and Visual Resources. Responses are presented in the same order provided by CEC staff, and are keyed to the data request number (85 through 154). In addition, responses to eleven BLM data requests for soil and water resources are provided following responses to CEC data requests 131-142 in the Soil and Water Resources section. The response to one verbal data request for paleontological resources is provided following data requests 126-130 in the Paleontological Resources section. Tables, figures, and attachments are numbered in reference to the data request number.

On March 19, 2012, Applicant provided notice of its objections pursuant to Title 20, California Code of Regulations, Section 1716(f). Applicant objected to Data Requests 44, 121, 122, 123, 126, 127, 128, 129, and 130. In addition to Applicant's responses below, additional confidential information responding Data Requests 96, 103, 104, 105, 109, 112, 113, 116, 119, 123, 126, and 127 will be submitted directly to the CEC Executive Director with an application for confidentiality.

Alternatives (Nos. 85-90)

Data Request:

85. Please provide a more detailed discussion and updated analysis of the feasibility of adding energy storage capabilities to the proposed Rio Mesa Solar Electric Generating Facility (Rio Mesa SEGF) project. Please include the following:

a. Information on new and modified equipment and processes to add molten-salt or other energy storage to the project. Discuss known or potential alterations to the project configuration and changes to requisite number of heliostats.

Also include a detailed discussion of any increase in cost such alterations might add to the project and whether these costs would be offset by increased availability of electricity resulting from storage.

b. Information on the expected benefits of adding storage capabilities to the project. Include potential benefits pertaining to improved efficiency and capacity, reduced energy costs, smaller site footprint, increased flexibility, and other potential benefits. Include information comparing the benefits of the proposed Rio Mesa SEGF project to potential benefits of a project that is altered to include storage.

c. Information comparing the environmental effects of the proposed Rio Mesa SEGF project as opposed to a project that includes storage capabilities. Discuss in detail how altering the project configuration, reducing the project footprint, or changing project operations could affect the level of impacts on environmental resources, including potential impacts relating to water use, air quality, sensitive plant and animal species and habitats, cultural resources, and visual resources.

d. A detailed discussion of the extent to which a project with storage capabilities would or would not satisfy each of the stated project objectives compared to the proposed Rio Mesa SEGF project.

e. A detailed discussion of why adding salt storage to the Rio Mesa SEGF project was eliminated as a viable alternative when it is now being considered in two other BrightSource projects.

Response:

Applicant considers the addition of energy storage capabilities to the proposed Rio Mesa Solar Electric Generating Facility (RMSEGF) to be infeasible for three principal reasons:

1. Contractual

   The two specific signed and approved Power Purchase Agreements (PPAs) that relate to the RMSEGF do not include or anticipate energy storage capabilities in either the contracted capacity

factor or the contracted energy deliveries. The off-taker in these PPAs would not be obligated to purchase most or all of the additional electricity generated by implementation of an energy storage system. Moreover, it would not be feasible to complete the development and engineering of an energy storage system for RMSEGF on a timeline that would allow Applicant to meet its contractual obligations under these PPAs.

2. Site limitations

   The proposed project fully uses the developable area of the RMSEGF site for units without storage in meeting the delivery requirements of the PPAs covering electricity generated at the site. It should be noted that the heliostat layout has been designed for maximum efficiency by Applicant, using sophisticated and patented algorithms and methods, to ensure maximum electricity generation possible from the number of heliostats that was calculated to maximize the economic viability of the project. Therefore, adding sufficient heliostats to properly utilize even a short (e.g., 2-hour) storage system would not be possible without adding substantial potential shadowing and blocking penalty that would limit the extent of any increment in additional electricity generation.

3. Economics

   The incorporation of energy storage to the RMSEGF would be extremely costly, and would require, among other things, a substantial redesign of the heliostat field, power block engineering, and project layout, and would significantly extend the project's schedule violating PPA commercial on-line date (COD) requirements, and making the financing of the project infeasible.

a. The entry of BrightSource Energy (BSE) into the solar thermal storage market was at a point after substantial planning and design had already been completed on the RMSEGF project, and the AFC and POD were created specifically around non-storage CSP technology. A substantial delay in the project would result in order to complete a redesign of the power blocks and solar fields, which would result in a reevaluation of the hydrology and storm water runoff models as a minimum, affect visual resources, require additional biological and cultural ground surveys to account for additional land requirements, and violate PPA COD deadlines. Therefore, BSE has no plans contemplated for potential alterations to the project configuration to add molten-salt or energy storage capability.

b. BSE is currently validating the supercritical and storage configuration to be implemented and tested on future projects at our Solar Energy Development Center (SEDC) facility in Israel. A switch to supercritical technology would mean a delay of at least two years for these projects. RMSEGF has developed preliminary engineering solutions for storage in subcritical plants (current RMSEGF technology) but commercialization of the subcritical storage technology will not be available in California before the implementation of the current PPAs related to this project. A CSP project with storage of equivalent megawatt capacity would require a larger, not smaller footprint. Because of the limitations described above, at this time analysis has shown that any potential benefits would be heavily outweighed by the redesign costs, permitting delays, and loss of at least two signed and approved PPAs. Changing the design at this point would result in a higher cost to the project in engineering, procurement, and construction. Theoretically, the average efficiency utilizing the

supercritical technology would improve a few points, and there would be the benefit of providing clean energy after the sun has set in the afternoon, but this technology alternative has not been validated by our engineers and is currently not available. Additionally, since the project would lose its related PPAs, it would likely become unfinanceable.

c. Without design information for the RMSEGF that specifically integrates storage capabilities, any information regarding potential environmental effects would be extremely speculative. However, as stated above, the addition of storage capabilities to RMSEGF would require the installation of additional heliostats. Hypothetically speaking, the additional heliostats could result in (1) a proportionally higher water usage for mirror washing, (2) more ground disturbance, which would affect biological and cultural resources, and (3) require a remodeling of site hydrology and impacts to Waters of the US and Waters of the State. A redesign including storage may also include relocation of the power blocks, which would require new visual representations of the project for review by the resource agencies.

d. BSE is currently validating the supercritical and storage configuration to be implemented and tested on future projects at our SEDC facility in Israel. A switch to supercritical technology would mean a delay of at least two years for these projects. RMSEGF has developed preliminary engineering solutions for storage in subcritical plants (current RMSEGF technology) but commercialization of the subcritical storage technology will not be available in California before the implementation of the current PPAs related to this project. This facts alone make the project non-compliant with Project Objective No. 7, which states:

7. Design and develop the Project to conform to the requirements of the site-assigned 20-year Power Purchase Agreements (PPA) for Rio Mesa Solar Holdings, LLC, including a commercial on-line date (COD) of 2015.

Additionally, the supercritical with storage configuration does not comply with the timely requirements of Project Objectives Nos. 8 and 12, which state:

8. Site the Project in a timely and environmentally responsible manner by selecting a location with minimal potentially significant impacts, where compliance with applicable laws, ordinances, regulations, and standards (LORS) is feasible.

12. Develop a solar generating facility that assists BLM with its mission to approve 10,000 MW of renewable energy projects on public lands by 2015 in a manner that reduces impacts (i.e., edge effects) and leverages resources being developed on private lands (i.e., shared facilities).

Because the addition of energy storage would require substantial time and resources to modify the design of the RMSEGF and re-evaluate biological, cultural, hydrological, soil and water, and visual impacts, a project with storage technologies would not meet the stated project objectives of achieving the targeted COD of third/fourth quarter 2015. A project with storage capabilities would not satisfy the stated Project Objective No. 7, as well as the proposed RMSEGF, because even if the timeframe were not violated (which it is by a substantial period), the PPAs meant to be serviced by the

RMSEGF do not allow for the increased capacity factor or increased annual energy deliveries that would be realized with a storage equipped project, those benefits would be contractually at risk.

e. A thorough analysis was made concerning our ability to convert these SCE PPAs at Rio Mesa to subcritical[1] with storage in order enjoy the same benefits of the more advanced technology and configuration: lower costs, added value and higher electricity sales (due to storage).

However, because of siting and scheduling constraints, we were unable to consider conversion of the Rio Mesa projects to storage applications at either subcritical or supercritical steam conditions.

- **Siting:** at 1,850 acres per unit, the land area available in the Rio Mesa Solar sites does not support storage, which requires the addition of at least 18 percent more heliostats to the solar field.

- **Scheduling:** the RMSEGF project was well into the development and design phases prior to BSE's ability to engineer a storage solution within our technology. The projects currently being considered for storage inclusion, are still in early stages of development where conceptual designs for power blocks and solar fields are being initiated. As mentioned above, the PPAs that relate to RMS are "non-storage". Furthermore, in order to meet COD targets for the two RMS projects, we must reach financial closing by fourth quarter 2013. BSE is currently validating the supercritical and storage configuration to be implemented and tested on future projects at our SEDC facility in Israel. A switch to supercritical technology would mean a delay of at least two years for these projects. RMSEGF has developed preliminary engineering solutions for storage in subcritical plants (current RMSEGF technology) but commercialization of the subcritical storage technology will not be available in California before the implementation of the current PPAs related to this project.

Data Request:

86. Please provide additional information on the technological feasibility of a parabolic trough alternative, including the following:

a. Information and details documenting the conclusion that a parabolic trough system is less efficient than the proposed Rio Mesa SEGF project. Please expand the discussion of efficiency to address energy conversion, land use, water use, and operating and maintenance costs. Compare the expected efficiencies of the proposed Rio Mesa SEGF project to an alternative using a parabolic trough technology. Include specific data on the net generating capacity, in megawatts, for a parabolic trough alternative at the proposed Rio Mesa SEGF project site (i.e., assuming the same project acreage).

b. Information on the feasibility of adding energy storage capabilities to an alternative using a parabolic trough technology.

[1] Up to an operating pressure of around 2,755 psig in the evaporator part of the boiler, the cycle is sub-critical. This means, that there is a non-homogeneous mixture of water and steam in the evaporator part of the boiler. In this case a drum-type boiler is used because the steam needs to be separated from water in the drum of the boiler before it is superheated and led into the turbine. Above an operating pressure of 3,205 psig in the evaporator part of the boiler, the cycle is supercritical. The cycle medium is a single phase fluid with homogeneous properties and there is no need to separate steam from water in a drum.

c. Details on the potential impacts of a parabolic trough project relating to worker safety, fire protection, and environmental hazards.

d. In addition to the information requested under 86.c, above, provide information comparing the environmental effects of the proposed Rio Mesa SEGF project to an alternative using a parabolic trough technology. Discuss in detail how operation of a parabolic trough project could change the level of impacts on environmental resources, including potential impacts on birds, bats, and eagles. Address the magnitude of impacts on visual resources, including a discussion of the difference between a parabolic trough project and a solar power tower project. Compare impacts relating to glint and glare. Include discussions of how changing the project configuration and operations could affect the level of impacts on other environmental resources, including potential impacts on other sensitive biological species and habitats, water supply and use, air quality, cultural resources, and soils.

e. Information on the extent to which a project using a parabolic trough technology, with and without storage, would satisfy the stated project objectives compared to the proposed Rio Mesa SEGF project.

Response:

Applicant notes that the characteristics of parabolic trough systems are well known to many members of its senior engineering team, which includes numerous senior engineers and managers of Luz International, which commercialized parabolic trough systems in California and built and operated the 354 MW SEGS plants. The decision to move from trough systems to tower systems was fully informed of that prior knowledge and decades-long experience with the older trough technology.

a. Any discussion of a parabolic trough alternative must begin with the fact that substantially less electricity could be produced at the RMSEGF site using the older technology even before considering the effects of the requisite dry cooling, which would only reduce output of the trough system further.

   With respect to energy conversion, Sargent & Lundy[2] have shown that tower systems have higher energy conversion than trough systems. From Applicant's experience, the advantages of the tower system are even larger than those shown by Sargent & Lundy. The two largest advantages are:

   1. Lower parasitic energy for tower systems (trough systems typically use 10 to 12 percent of energy generated for plant use, including pumping heat transfer fluid throughout the solar field, while power tower use is no more than half of that), and

   2. Steam cycle energy availability.

   Trough, with maximum steam conditions of 750°F and about 1,500 psi generates steam with between 15 and 17 percent less energy than a tower, with steam conditions at 1085°F and about 2,500 psi. This is a major cycle efficiency penalty that translates directly into acreage in the solar fields. In

[2] Sargent & Lundy LLC Consulting Group. 2003. Assessment of Parabolic Trough and Power Tower Solar Technology Cost and Performance Forecasts (NREL/SR-550-34440), National Renewable Energy Laboratory, Contract No. DE-AC36-99-GO10337. October.

addition to the steam condition penalty for trough, keep in mind that a trough system does not convert the sun's energy directly to steam. It uses an intermediate heat transfer fluid, such as Therminoil, to absorb the sun's energy and then transfer it into water through a heat exchanger, which is contributes to additional inefficiencies. Adding the excess parasitic loads of trough to the cycle efficiency penalty yields a total penalty of more than 22-24 percent, and that is assuming that the thermal fluid to steam heat exchanger operates at peak efficiency. This equates to a net megawatt capability of approximately 190 MW and is based on the project using wet cooling.

Assuming that the parabolic trough alternative used dry cooling, water use would likely be similar. Operations and maintenance costs can be projected to be lower with a power tower because the capital costs (pumps, piping, coatings etc.) are lower than comparable trough technologies. The Applicant knows of no parabolic trough project that is progressing into construction utilizing dry cooling for its main process steam.

It is useful to compare the Abengoa Mojave Solar Park trough project (a 250MW project to be constructed on 1,765 acres and generate 617,000 MWh per year based on the CPUC advice letter in the case), to the proposed 250 MW power tower project that will produce around 700,000 MWh per year (13 percent more). Moreover, the Abengoa project uses conventional wet cooling towers and requires 2,163 acre-feet/year for 250 MW of total generation. Conversely, RMSEGF utilizes dry cooling for the main process and uses no more than 85 acre-feet/year for each 250 MW plant. This represents a reduction in water requirements of 96 percent for each 250 MW. If the trough plant were to utilize dry cooling like RMSEGF, the reduction in generation and overall efficiency penalty would be significant, and that is over and above the substantial additional parasitic load requirements of trough versus tower projects.

Also, parabolic trough technology requires that the solar field area be completely graded and additional earth moving to accommodate drainage and stormwater flow mitigation, The complete grading of the parabolic trough project site results in a total loss of foraging habitat and many orders of magnitude more land disturbance, versus the tower technology. Impacts to site post construction hydrology including large detention ponds would increase impacts to Waters of the US and Waters of the State. See Figure DR 86-1 to illustrate the minimal ground disturbance by power tower technology solar field relative to parabolic trough solar field.

b. Please refer to the discussion in DR 85 with respect to site limitations and scheduling, both of which apply to the trough alternative. Once again, a trough plant with storage requires a larger footprint, not smaller, than a trough plant without storage. Addition of a storage option for trough technology, if feasible with dry cooling, would further reduce the amount of available energy available for daytime generation. A recent report from NREL-Sandia Labs described a parabolic trough plant with 6 hours of storage where each 50 MW of capacity required approximately 830 acres. Assuming that all 5,750 proposed developed acres for RMSEGF were utilized at this ratio, a total of 346 gross MW would be generated, less than half of the current RMSEGF generation of 750 MW.

c. Fires relating to the synthetic oil used as heat transfer fluid (HTF) have been documented in both California and Spain. The potential environmental hazards associated with HTF typically require additional investment in preventive equipment, berming, etc., and the potential impact of such

hazards has been documented in various CEC siting cases. Applicant is not aware of any potential impacts on worker safety.

d. **Soils**

Based on steam cycle energy conditions and projected cycle efficiencies, implementation of parabolic trough ("PT") technology would require as much as 30-40 percent more land than solar power tower ("SPT") technology to generate the same amount of power if dry cooling were used, and would therefore require a much larger project footprint than the RMSEGF project. Also, since Applicant knows of no trough project currently being proposed with dry cooling, it is debatable as to whether a dry-cooled trough project is feasible.

Assuming that the project boundaries remained the same, the RMSEGF site would have to be graded and leveled, and a flood control and stormwater diversion system installed for a parabolic trough system. PT technologies require a site with less than 1 percent slope, due to the systems pump collector fluid throughout the field. Grading and leveling the site to the proper slope and the installation of the pipe system needed to circulate the collector fluid would involve orders of magnitude greater ground disturbance than that required for RMSEGF. These impacts are only increased when the boundaries for the PT alternative are expanded to accommodate the amount of land that a PT alternative would require to generate the same amount of power as RMSEGF. (see Figure DR 86-1 to illustrate the minimal ground disturbance by power tower technology solar field relative to parabolic trough solar field). The RMSEGF, in comparison, will be constructed in a manner that leaves as much as 66 percent of the site undisturbed, minimizing impacts on biological species, soil, and water resources, among others

Cultural Resources

Given the increased ground disturbance needed for PT technologies (in terms of both on site ground disturbance and the necessary increased project footprint), potential impacts to cultural, archeological, and paleontological resources would be greater for a PT system.

Air Quality

Grading and leveling the site to the proper slope and the installation of the pipe system needed to circulate the collector fluid would involve orders of magnitude greater ground disturbance than that required for RMSEGF. These impacts are only increased when the boundaries for the PT alternative are expanded to accommodate the amount of land that a PT alternative would require to generate the same amount of power as RMSEGF. (see Figure DR 86-1 to illustrate the minimal ground disturbance by power tower technology solar field relative to parabolic trough solar field), Grading and leveling the site for a PT alternative would result in a larger amount of fugitive dust emissions.

The large circulatory system of the PT technology requires heavy equipment for construction including the complete grading of the site that would require orders of magnitude more water or soil stabilizers to control dust. During operations, the additional maintenance requirements in the solar field of a PT project could potentially result in higher emissions from mobile servicing equipment. The proposed RMSEGF, in comparison, requires only mirror washing activities in the heliostat field.

The electronics for each of the heliostats would require substantially less maintenance support than the mechanical equipment supporting many miles of piping and the associated pumps for the heat transfer fluid.

Figure DR 86-1. Minimal ground disturbance of power tower technology solar field relative to parabolic trough solar field

Water Supply and Use

Water use would be greater for PT technology, as there would be a larger amount of reflective surface (mirrors) to clean in order to produce the same amount of power as RMSEGF. If the project boundaries remained unchanged, water use for washing troughs would likely be similar to that expected for RMSEGF on a gal/m^2 basis; however, less power would be generated relative to the

amount of water used if dry cooling were used. A parabolic trough project that uses water for cooling would require much more groundwater than the air-cooled RMSEGF. As noted above, the recently permitted Abengoa project in San Bernardino County states that it requires 2,163 acre-feet/year for 250 MW, whereas RMSEGF will require no more than 85 acre-feet/year.

Biological Species and Habitats

Trough technologies would result in greater impacts to biological resources than SPT given that greater areas of habitats are disturbed in order to produce the same amount of power. Potential impacts to birds, bats, and eagles would be similar regardless of whether trough technologies or the power tower technology is used. Bat impacts are not expected since solar facilities do not operate when bats forage, and bats can easily echolocate to avoid stationary structures on site.

Applicant has shown at the Ivanpah site that as much as 66 percent of a tower project site can be left undisturbed, minimizing impacts on biological species, water resources and soil, among others. A trough technology alternative would require a complete grading of the entire site and removal of all vegetation. It would not be possible to retain the general topography of the site including slope, washes, stormwater runoff, etc.

Visual Resources

The SPT facility heliostat field will have a similar appearance as the PT collector array. The SPT tower will be a more visible feature of the SPT project.

Glint and Glare

Glint and glare impacts would be small for both PT and SPT technologies. The only significant difference between a PT alternative and RMSEGF is the apparent glare of the SRSG at the top of the tower, which does not exist in parabolic trough plants.

e. The following explains why a parabolic trough alternative would not be compliant with stated Project Objectives Nos. 3, 4, 6, 7, 8, and 10.

3. **Consistent with national policy, which encourages the development of new or significantly improved technologies to "avoid, reduce, or sequester air pollutants or anthropogenic emissions of greenhouse gases" (see, e.g., 42 U.S.C. §16513[a]), use BrightSource Energy Inc.'s (BSE's) proprietary solar power tower technology in another utility-scale project, further proving economic viability of the technology.**

   Installing a PT project would not utilize BSE's proprietary solar power tower technology which prevents deployment and proving of incremental improvements on a new technology to make best use of land resources.

4. **Develop a project that minimizes land consumption on a MWh per acre basis.**

Parabolic Trough (PT) systems as discussed earlier are less efficient than power tower systems due to PT not being able to achieve the same high temperature and pressure steam conditions. Therefore, if a PT plant were to use dry cooling similar to a power tower plant, then an additional 21-23 percent land at a minimum would be required. Further, since Applicant knows of no PT projects that are currently being advanced that have dry cooling, which leads us to question its feasibility.

6. **Select a site with minimal slope, predominantly five (5) percent or less.**

   PT projects require a site slope of less than one percent. Much of the RMSEGF project site exceeds this criteria.

7. **Design and develop the Project to conform to the requirements of the site-assigned 20-year Power Purchase Agreements (PPA) for Rio Mesa Solar Holdings, LLC, including a commercial on-line date (COD) of 2015.**

   The 250 MW much more water intensive, wet-cooled Abengoa project generates only 617,000 MWh/year. The SCE PPA's related to the RMSEGF project permit generation up to 700,000 MWh/year.

8. **Site the Project in a timely and environmentally responsible manner by selecting a location with minimal potentially significant impacts, where compliance with applicable laws, ordinances, regulations, and standards (LORS) is feasible.**

   A PT project results in massive grading and leveling of the site, use of large detention ponds to manage stormwater flows, and completely removes all flora and fauna from the site further impacting downstream runoff from the site.

10. **Respond to Metropolitan Water District of Southern California's (MWD's) requests for proposal (RFPs) to develop a solar electric generation facility on MWD-owned land.**

    MWD issued an RFP for a solar project that included contractual rights of up to 600 acre-feet/year. PT projects that are moving forward use much more water intensive wet cooling. The Abengoa project utilizes wet cooling and requires 2,163 acre-feet/year of water for 250 MW. In contrast, the RMSEGF project uses no more than 260 acre-feet/year for 750 MW. Using Abengoa as the benchmark, a PT project is not compliant with the contractual water rights limitation from MWD.

Data Request:

87. Please provide additional information on the technological feasibility of a PV alternative, including the following:

a. Information on how the location of a PV project relative to load centers alters the effect of intermittency on the system.

b. *Data on the net generating capacity, in megawatts, for a PV alternative at the proposed Rio Mesa SEGF project site (i.e., assuming the same project acreage) and provide information as to the types of PV solar cells used in the calculation (e.g. Monocrystalline or Polycrystalline Silicon, thin film, etc.).*

c. *Information on the costs and benefits of incorporating energy storage into a PV project to improve the project's dispatchability and address intermittency.*

d. *Information comparing the environmental effects of the proposed Rio Mesa SEGF project to a PV alternative. Provide details on differences in required water usage for the two technologies. Discuss in detail how operation of a PV project could change the level of impacts on other resources, including potential impacts on birds, bats, and eagles. Address the magnitude of impacts on visual resources, including differences between a PV project and a solar power tower project. Compare impacts relating to glint and glare, including the impacts of heliostats compared to PV panels. Include discussions of how changing the project configuration and operations could affect the level of impacts on other environmental resources, including potential impacts on other sensitive biological species and habitats, air quality, cultural resources, and soils. In addition, please provide the type of PV cells that were used in this comparison (e.g. Monocrystalline or Polycrystalline Silicon, thin film, etc.).*

e. *Information on the extent to which a PV project would satisfy the stated project objectives compared to the proposed Rio Mesa SEGF project.*

Response:

a. Intermittency and variability of PV plants, especially those that use fixed-axis technologies that cannot track the sun over a course of the day, brings into question their suitability for large-scale generation. From the utilities' standpoint, solar thermal power plants in general enjoy substantial operational benefits. RMSEGF's SPT design uses solar energy to heat water into superheated steam that drives a turbine connected to a synchronous rotating generator connected to the transmission system. Thermal and rotating equipment contain inertia that serves to "smooth" generation as well as provide other grid-stabilizing benefits such as VARs, active power control and governor control. RMSEGF also has the particular ability to increase or decrease the number of heliostats focusing on the receiver to account for variability in time of day and season further stabilizing the generation profile, or shaping to profile to meet system needs. RMSEGF can decrease or "turn down" excess mirrors when available solar energy is greater than can be absorbed by the receiver system and converted to electricity by the turbine. Similarly, toward the end of the day or, during times of lesser insolation in winter months, RMSEGF can increase the number of heliostats focused on the receiver to increase production and extend the generating day. These capabilities have the effect of reducing the variability of output of the RMSEGF tower technology. For example, each unit in the proposed RMSEGF project will generate at its maximum rating for at least 40 percent of all sunlit hours despite the fact that insolation will be quite variable during those hours – while a corresponding PV plant will be highly variable at all times.

b. The largest PV plant in the United States is the Sempra Copper Mountain project in Boulder City, Nevada, which is delivering electricity under a PPA to PG&E. This project is listed by CPUC at 48 MW capacity. The largest in California (and the third largest in the country) is NRG's 21 MW Blythe PV project delivering electricity to SCE. Both Copper Mountain and Blythe Solar use Thin Film CdTe type panels.[3] In contrast, solar thermal units of at least 80 MW each have been operating since the 1980s.

   Using the two examples above of "large" PV systems (and publicly available data), the Blythe system has a 21 MW capacity on 200 acres, while Copper Mountain is 48 MW on 450 acres. Translated to the 5,750 acres of the RMSEGF site, this yields a range of 604 MW to 613 MW, the latter figure being based on Copper Mountain. Even at the upper end of the range, this is over 18 percent less capacity than the proposed RMSEGF, prior to factoring in that PV cells provide incrementally less power on very hot days, when tower systems operate can still operate at peak capacity. Comparing electricity generation, CPUC figures show 100,000 MWh annually (23.8 percent capacity factor) for Copper Mountain and 50,000 MWh (27.2 percent capacity factor) for Blythe. Applying the more encouraging Blythe figures to RMSEGF would yield about 1,439,000 MWh at the RMSEGF site, approximately 31.5 percent less than the 2,100,000 MWh for the proposed project. Applicant is not aware of any operating utility-scale Monocrystalline or Polycrystalline Silicon PV projects in California.

c. Flywheel and other mechanical storage technologies would require the powering of a mechanical source, which would only be possible during those times when the PV field is generating electricity, resulting in substantial parasitic losses during the time generation is feasible. Battery storage is undergoing serious study, but to-date has proven to be too expensive and unable to "scale up" to utility-scale projects to consider feasible. Thermal storage is unavailable to PV technologies since by design they create no useful thermal energy. Given these constraints, intermittency and lack of dispatchability issues remain for PV technology.

d. As noted above, most of Staff's areas of inquiry are directly related to the RMSEGF footprint, not the technology. Substituting a PV technology for the SPT technology, would likely require a larger footprint to be able to generate the same amount of GWh of electricity as RMSEGF. Thus, for those disciplines where impacts are substantially related to the project footprint (such as terrestrial biology, botany, and cultural resources), a PV project would not avoid or minimize potentially significant effects. Similarly, for most subject matters related to project construction and operations (such as worker safety, transmission system line safety and nuisance) the potential effects of a PV project are substantially similar to those of a SPT project, and thus a PV facility would not avoid or minimize potential impacts in those disciplines.

[3] CPUC Energy resolution E-4157 (Blythe Solar) and E-4302 (Copper Mountain Solar-1).
NRG Solar (Blythe Solar) and Sempra Energy (Copper Mountain).
It is important to note that both of these plants use CdTe thin-film PV modules, a relatively new technology compared to the older, more established crystalline silicon technology, and recent reports of failures of CdTe thin-film panels raise questions as to long term viability of the current technology capabilities. While there is as yet insufficient data on long-term performance degradation of CdTe cells in desert conditions, all PV cells are known to generate less electricity in elevated temperatures such as summer afternoons, and all PV cells are known to experience a gradual yet steady degradation of performance over their lifespans.

Water Use

Water use would be less for a PV system since steam cycle make up is not required. PV panels and heliostats both require washing in a desert environment, but PV panels may not need to be washed as often.

Bird, Bat and Eagles

All documentation submitted by Applicant to-date demonstrates that the risk from the RMSEGF technology is minimal and the associated impacts to birds, bats, or eagles will be less than significant.

Visual Resources, Glint and Glare

Glint and glare impacts would be small for both PV and SPT technologies.

Sensitive Biological Species and Habitats, Air Quality, Cultural Resources, and Soils

Implementation of PV technology would require more land area than SPT technology for the same MWh output. Projects using either technology would have a perimeter desert tortoise/security fence that would keep tortoise and other wildlife out. PV panels can be developed on top of a framework set 4 to 5 feet above ground surface. However, impacts to the land (soil and stormwater) would be greater for PV as the panels are mounted on concrete foundations where the pylons for Applicant's project are installed by a vibratory hammer with no concrete foundation.

Additionally, because of the larger land area disturbed with PV, biological, cultural, archaeological, and paleontological impacts would have the potential to be greater at a PV facility. Operations of a PV facility would have no air quality emissions. PV panels use smaller and less-complicated mechanical equipment for operation; consequently, PV facilities would use less heavy equipment for construction. Therefore, air emissions from construction equipment is likely to be lower for PV facilities. Fugitive dust emissions would be greater for a PV facility in the solar field for the reasons described above. During operations, since panel washing occurs less frequently, air emissions related to this activity would likely be less. Also, since construction of a PV facility is less complex, it would have less workforce (i.e., provide less jobs) and less traffic impacts. It would also have significantly less operational workforce (almost none) and less economic benefit to the county and state.

e. The Applicant's project objectives are described in more detail in the body of the AFC (see Section 1.3 of the AFC). Those basic project objectives that are not satisfied by a generic PV alterative are not compliant with stated Project Objectives Nos.4, 6, 7, and 8.

4. Consistent with national policy, which encourages the development of new or significantly improved technologies to "avoid, reduce, or sequester air pollutants or anthropogenic emissions of greenhouse gases" (see, e.g., 42 U.S.C. §16513[a]), use BrightSource Energy Inc.'s (BSE's) proprietary solar power tower technology in another utility-scale project, further proving economic viability of the technology.

Installing a PV project would not utilize BSE's proprietary solar power tower technology which prevents deployment and proving of incremental improvements on a new technology to make best use of land resources.

5. **Develop a project that minimizes land consumption on a MWh per acre basis.**

   A generic PV system as discussed earlier are less efficient than power tower systems on a MWh per acre basis and an additional 25-30 percent land as a minimum would be required to equal the generation of a SPT project.

6. **Select a site with minimal slope, predominantly five (5) percent or less.**

   PV projects require a site slope of less than two percent. Much of the RMSEGF project site exceeds this criteria.

7. **Design and develop the Project to conform to the requirements of the site-assigned 20-year Power Purchase Agreements (PPA) for Rio Mesa Solar Holdings, LLC, including a commercial on-line date (COD) of 2015.**

   The generic PV plant would be incapable of generating the maximum permitted MWh allowed under the PPA's that relate to the RMSEGF site. Refer also to the response under Objective 4 above.

8. **Site the Project in a timely and environmentally responsible manner by selecting a location with minimal potentially significant impacts, where compliance with applicable laws, ordinances, regulations, and standards (LORS) is feasible.**

   A generic PV project results in massive grading and leveling of the site, use of large detention ponds to manage stormwater flows, and completely removes all flora and fauna from the site further impacting downstream runoff from the site.

A significant and basic project objective is to use BSE's proprietary technology in another utility-scale project, further proving the technical and economic viability of the technology. A PV project fails to attain this basic objective. It may also be infeasible, since it could not be accomplished in a reasonable time frame, given the lead time to negotiate for the use of another proprietary technology and the follow-on development process.

Data Request:

88. Please provide the additional acreage of washes, wetlands, and jurisdictional waters (Waters of the U.S. and State of California) that would be directly impacted by the on-site alternative 2 in comparison to the preferred alternative direct impacts.

Response:

See response to Data Request 90.

Data Request:

89. Please provide the acreage of wetlands and jurisdictional waters (Waters of the U.S. and State of California) that would be impacted by the on-site alternative 3 given the reduced footprint.

Response:

See response to Data Request 90.

Data Request:

90. For comparison purposes, please provide a table showing the acreages of wetlands and jurisdictional waters that would be directly impacted by each on-site alternative, including the preferred.

Response:

Table DR 90-1 below provides a comparison of impacts to jurisdictional waters (Waters of the U.S. and Waters of the State) among the three on-site alternatives.

For Waters of the U.S., acres of direct impacts have been calculated for On-Site Alternative 1 based on the detailed solar field, power block and common area layout. However, because detailed layouts are not available for On-Site Alternatives 2 and 3, acres of direct impacts cannot be calculated to the same level of detail as for On-Site Alternative 1. Therefore, direct impacts to Waters of the U.S. are estimated for On-Site Alternatives 2 and 3 using the approach described in Table DR 90-1 (see footnote 2).

For Waters of the State of California, acres of direct impacts are not available at this time for On-Site Alternative 1 (CDFG is currently reviewing preliminary delineations and can formally approve direct impact areas once approval of the delineations occurs. Preliminary delineations were based on the guidance and direction of Magdalena Rodriguez at CDFG). Moreover, detailed layouts are not available for On-Site Alternatives 2 and 3. For purposes of comparison, acreage calculations of Waters of the State of California within each on-site alternative are provided. Direct impacts to Waters of the State of California are assumed to be proportional to the size (acres) of the alternative. In addition, percentages were calculated based on the size of the alternative compared to the size of the Preferred Alternative (see Table DR 90-1, footnote 3).

Table DR 90-2 below provides a comparison of impacts to wetlands among the three on-site alternatives.

Table DR 90-1
Direct Impacts to Jurisdictional Waters for On-Site Alternatives

On-Site Alternative	Land area within:		Waters of the U.S. within:[1]		Waters of the State of California within:[1]		Direct Impacts to WUS within:[2]		Direct Impacts to WSC Relative to On-Site Alternative 1:[3]	
	Fenceline[4]	Project Boundary	Fenceline	Project Boundary	Fenceline	Project Boundary	Fenceline	Project Boundary	Fenceline	Project Boundary
#1 Preferred Alternative	5,526 acres	8,979 acres	619 acres	1,171 acres	1,261.4 acres	2,081 acres	40.8 acres (21.7 acres permanent; 19.1 acres temporary)	Not applicable	100%	100%
#2 750 MW MWD-only	Fenceline not available	8,449 acres	Fenceline not available	1,002 acres	Fenceline not available	1,786 acres	Fenceline not available	62.4 acres (33.2 acres permanent; 29.2 acres temporary)	Fenceline not available	94%
# 3 500 MW MWD-only	Fenceline not available	5,580 acres	Fenceline not available	433 acres	Fenceline not available	880 acres	Fenceline not available	28.2 acres (15.0 acres permanent; 13.2 acres temporary)	Fenceline not available	69%

Notes:
1. Results for WUS and WSC do not include acres within the transmission line corridor or access roads (Bradshaw Trail and 34th Avenue) because acres of WUS and WSC are the same for each on-site alternative.
2. For On-Site Alternatives 2 and 3, calculations of direct impacts to WUS are based on the ratio of direct impacts to fenceline acreage for On-Site Alternative 1 (i.e., 5,526 acres within the fenceline divided by 40.8 acres of direct impacts to WUS equals one acre of direct impact to WUS for every approximately 135.4 acres within the fenceline). The ratio of one acre of direct impact to WUS for every 135.4 acres is applied to the project boundary acreage for On-Site Alternatives 2 and 3. For purposes of this table, On-Site Alternatives 2 and 3 are assumed to have the same proportion of permanent and temporary impacts as the Preferred Alternative.
3. Direct impacts to Waters of the State are not available at this time. CDFG is currently reviewing the delineations provided to them on October 7, 2011. A copy of this filing was included in the AFC (Appendix K, Jurisdiction Delineation Information, of Appendix 5.2A, Biological Technical Report, docketed with the CEC on October 14, 2011). Once approval of the delineations occurs, CDFG can formally approve direct impact areas. Since direct impacts are not available at this time, impacts for the sake of comparison of alternatives are assumed to be proportional to the size (acres) of the alternative, and are expressed as a percentage based on their size relative to the size of the Preferred Alternative. For example, On-Site Alternative 2 is 94 percent the size of the Preferred Alternative. Therefore, under this proportional approach, the direct impact area of On-Site Alternative 2 would be equal to 94 percent of the direct impact area of the Preferred Alternative.
4. Fenceline includes solar field layout and common area.

Acronyms:
MW = megawatt
MWD = Metropolitan Water District of Southern California
WSC = Waters of the State of California
WUS = Waters of the United States

Biological Resources

I. Introduction

A. Names: Dave Phillips (Avian, Bat, Wildlife), Amy Hiss (Plants), Kathy Rose and/or Mike Klinefelter (State Waters), Gary Santolo (Avian Flux Issues), Sönke Johnsen (Solar Flux Modeling); Dr. Ivan Schwab (Avian Ocular Impacts), Alice Karl (Desert Tortoise), Dr. W. Geoffrey Spaulding (Groundwater Dependant Vegetation)

B. Qualifications: The panel's qualifications are as noted in their resume(s) contained in Appendix A.

C. Prior Filings: In addition to the statements herein, this testimony includes by reference the following documents submitted in this proceeding:

- Application for Certification, Volume 1 & Volume 2, dated August 5, 2011 [Exhibit 1]
- Applicant's Data Adequacy Supplement, dated September 7, 2011 [Exhibit 2]
- Applicant's Data Adequacy Supplement B, dated September 23, 2011 [Exhibit 3]
- Applicant's Data Response, Set 1B, dated December 5, 2011. Responses to Data Requests 51 through 73 [Exhibit 7]
- Applicant's Data Response, Set 1B-2, dated December 30, 2011. Response to Data Request 63 [Exhibit 8]
- Applicant's Data Response, Set 1B-3, dated January 31, 2012. Response to Data Request 63 [Exhibit 9]
- Applicant's Data Response, Set 1B-4, dated March 5, 2012. Responses to Data Requests 52, 55, and 59 [Exhibit 10]
- Applicant's Data Response, Set 1B-5, dated March 15, 2012. Response to Data Request 54 [Exhibit 11]
- Applicant's Data Response, Set 1B-6 Anabat Quarter 1, dated April 20, 2012. Response to Data Request 63[Exhibit 12]
- Applicant's Data Response, Set 1B-6 Anabat Quarter 2, dated August 3, 2012. Response to Data Request 63 [Exhibit 13]
- Applicant's Data Response, Set 1B-6 Anabat Quarter 3, dated October 25, 2012. Response to Data Request 63 [Exhibit 14]
- Applicant's Data Response, Set 1B-7, dated May 25, 2012. Response to Data Request 52 [Exhibit 15]
- Applicant's Data Response, Set 1B-8, dated November 21, 2012. Response to Data Request 66 [Exhibit 16]

- Applicant's Data Response, Set 1C, dated December 19, 2011. Responses to Data Requests 78 through 92 [Exhibit 17]
- Applicant's Data Response, Set 1C-2, dated March 23, 2012. Response to Data Request 88 [Exhibit 18]
- Applicant's Data Response, Set 1C-4, dated October 22, 2012. Response to Data Request 87 [Exhibit 20]
- Applicant's Data Response, Set 2D, dated April 9, 2012. Responses to Data Requests 156, 157, 166, and 173 [Exhibit 35]
- Applicant's Data Response, Set 2D-2, dated April 16, 2012. Responses to Data Requests 158 through 165 and 167 through 171 [Exhibit 36]
- Applicant's Data Response, Set 2D-3, dated April 23, 2012. Response to Data Request 172 [Exhibit 37]
- Applicant's Data Response, Set 2D-4, dated July 2, 2012. Response to Data Request 174 [Exhibit 38]
- Applicant's Data Response, Set 2D-4B, dated October 25, 2012. Response to Data Request 174 [Exhibit 39]
- Applicant's Data Response, Set 2D-5, dated October 1, 2012. Response to Data Request 175 [Exhibit 40]
- Applicant's Data Response, Set 2D-6, dated October 2, 2012. Response to Data Request 176 [Exhibit 41]
- Applicant's Data Response, Set 2E, dated May 4, 2012. Response to Data Request 177 [Exhibit 42]
- Applicant's Data Response, Set 3, dated November 21, 2012. Response to Data Request 199 through 208 [Exhibit 44]
- Applicant's Supplemental Data Response, Set 1A, dated December 30, 2011. Response to Data Request BR-1 [Exhibit 45]
- Applicant's Supplemental Data Response, Set 3, dated April 18, 2012. Responses to Data Requests BR-2 and BR-3 [Exhibit 47]
- Applicant's Supplemental Data Response, Set 6, dated August 3, 2012. Response to Data Request 159 [Exhibit 51]
- Applicant's Presentation at the Informational Hearing, dated November 31, 2011 [Exhibit 54]
- Applicant's Supplemental Avian Study Information, dated November 19, 2012 [Exhibit 66]
- Applicant's Center for Biological Diversity, Data Response Set 1, dated March 30, 2012 [Exhibit 67]
- Applicant's Center for Biological Diversity, Data Response Set 1B, dated April 16, 2012 [Exhibit 68]

- Applicant's Preliminary Staff Assessment Comments, Set 1, dated July 13, 2012. [Exhibit 69]
- Applicant's Preliminary Staff Assessment Comments, Set 2, dated July 23, 2012. [Exhibit 70]

D. Attachments

- Fall Avian Surveys for the Proposed Hidden Hills Solar Electric Generating System, Fall Report September 25 – November 29, 2012 (Attachment BIO-1)
- Avian Ocular Protective Mechanisms In Response to Noxious Stimuli (Attachment BIO-2)
- Assessment of Potential Impacts to Birds from a Solar Thermal Power Plant , Dimona Israel, Draft Interim Report, Summer Survey 2012 (Attachment BIO-3)
- Assessment of Potential Impacts to Birds from a Solar Thermal Power Plant , Dimona Israel, Draft Interim Report, Autumn Survey 2012 (Attachment BIO-4)

To the best of our knowledge, all of the facts contained in this testimony (including all referenced documents) are true and correct. To the extent this testimony contains opinions, such opinions are our own. We make these statements, and render these opinions freely and under oath for the purpose of constituting sworn testimony in this proceeding.

II. Executive Summary

The HHSEGS project has been sited to avoid significant impacts to biological resources. Much of the proposed site has been previously disturbed by human activity. Only one federal and state threatened or endangered species, the desert tortoise, occurs within the site, and habitat values for the tortoise are generally low. No state or federally listed plant species occur within the project site, and approximately 23 acres of lower-quality desert washes are present. Use of the site by avian, mammal and other documented species is also very low. As a result, development of the project site is consistent with state and federal policies that seek to locate renewable energy projects in areas with relatively limited biological resources.

The Applicant is in general agreement with the biological resource analysis and recommended Conditions of Certification in the FSA. Certain conclusions and recommended conditions, however, must be corrected to accurately reflect the scientific evidence and comply with applicable law, including the following:

A. Desert Tortoise Mitigation

Survey data shows that desert tortoise density increases from the west to the east of the project site. No desert tortoise was found in shadscale scrub areas, which comprises approximately half of the site, has a generally low value for the species, and is associated with less suitable soil types. Based on the site's ecology, mitigation should be provided at a ratio of 1.5:1 acres for the portions of the site that include soil type Qa1, at a ratio of 1:1 with other Qa and Qb soil types and lower halogeton (*Halogeton*

glomeratus)concentrations, and at a ratio of 0.5:1 ratio where halogeton is abundant and little or no tortoise habitat is present.

B. Desert Wash Mitigation

Onsite desert washes support only limited or, in many cases, no vegetation. Consistent with prior CEC project approvals, mitigation for impacts to onsite desert washes should be provided at a ratio of 1:1 acres.

C. Special Status Plant Mitigation

The FSA concludes that project impacts to four plants, none of which are listed as threatened or endangered, could be significant without mitigation. Due to low rainfall conditions, it is likely that these species occur to a much greater extent in the project vicinity. The Applicant is proposing additional mitigation flexibility for potential plant impacts, including in-lieu fee payments, and conducting additional regional surveys that may demonstrate that project impacts are less than significant.

D. Non-listed Wildlife Mitigation

The Applicant has requested that mitigation requirements for burrowing owl, the American badger, desert kit fox, and certain other wildlife that are not listed as threatened or endangered be revised from the levels proposed in the FSA to reflect applicable precedents and legal requirements.

E. Groundwater Dependent Ecosystem Mitigation

The Applicant will implement a groundwater monitoring program and a vegetation monitoring program for groundwater dependent ecosystems, which are generally mesquite-dominated plant communities located in Nevada. Certain action-level triggers included in these measures must be modified to reflect applicable hydrological data and groundwater monitoring that will be conducted under the proposed Water Supply Conditions of Certification.

F. Avian Impacts

The FSA analysis of potential avian and golden eagle impacts, including cumulative impacts, is scientifically insupportable and inaccurate.

- Expert testimony by Dr. Sönke Johnsen, Professor of Biology at Duke University, and experimental and survey data, , show that, due to significant analytical errors made in the FSA, the level of concentrated solar flux (mirror reflections directed towards the central tower) that could potentially affect avian flight feathers is approximately a factor of ten (10) times less than that indicated in the FSA. Flux levels that might impact feathers would only occur in a very small volume of airspace (substantially less than 0.1% of the total airspace) located over the facility around the upper portion of the central towers.
- Expert testimony by Dr. Ivan Schwab, Professor of Ophthalmology at the University of California Davis School of Medicine, demonstrates that the chance of significant visual injury to avian species is insignificant. Birds have well-developed protective visual systems that will prevent ocular harm from reflected sunlight or heat. Birds will also tend to react to reflections in the heliostat field in a manner that avoids ocular or other potential harm.

- The HHSEGS heliostats are significantly smaller than those used in older solar facilities and will reduce potential avian collision risks. Survey data from two operational facilities using similar technology (the Solar Energy Development Center in Israel, and the Gemasolar facility in Spain) indicate that avian collisions with heliostats, as well as other project structures, would be very rare.
- Avian use surveys conducted at HHSEGS have documented that golden eagle use of the site and the surrounding region is very low, even with the presence of artificial perching sites on existing power poles. The nearest potentially occupied golden eagle nest is approximately seven miles west of the proposed facility. Golden eagles are known to respond to human activities at greater distances than many other raptors, and can be expected to avoid the facility during construction and operations for foraging use. All project power lines and power poles will be constructed and maintained in a "raptor-safe" manner in accordance with the APLIC (1994, 2006) guidelines.

The Applicant recognizes that potential avian impacts are an important issue, and will implement a robust avian monitoring and adaptive management program to identify and respond to detected avian impacts, if any. Based on the best available scientific evidence, and with the implementation of the proposed monitoring and adaptive management measures, project impacts to avian species, including cumulative impacts, will not be significant.

III. Summary of Testimony

A. Affected Environment

The Hidden Hills Solar Electric Generating System (HHSEGS) project is a solar facility composed of two adjacent solar energy plants in the Mojave Desert region of Inyo County, California. The HHSEGS project site is located on privately owned land adjacent to the Nevada border. The project site is approximately 18 miles south of Pahrump, Nevada, and approximately 45 miles west of Las Vegas, Nevada and adjacent to (north of) the community of Calvada Springs (also known as Charleston View), California.

Each of the two adjacent solar energy plants will use heliostats—elevated mirrors guided by a tracking system mounted on a pylon—to focus the sun's rays on a solar receiver steam generator (SRSG) atop a solar power tower near the center of each solar field. Each solar plant will generate 270 megawatts (MW) gross (250 MW net), for a total net output of 500 MW. A 103-acre common area will be established on the southeastern corner of the site to accommodate an administration, warehouse, and maintenance complex, and an onsite switchyard. A temporary construction laydown and parking area on the west side of the site will occupy approximately 180 acres. The total project acreage including the temporary construction laydown area is 3,277 acres (5.12 square miles). The 180-acre construction laydown area will be restored after construction.

The project area lies in the axial basin of the Pahrump Valley. This linear basin, oriented northwest-southeast, is typical of elongate valleys, or bolsons, that lack a hydrologic outlet and therefore fill with fine-grained sediment over tens to hundreds of thousands of years and are charged with evaporites and carbonates. The eastern margin of this basin lies just to the east of the HHSEGS project area, and is formed by the fault scarps

of the Stateline Fault System (SFS; Scheirer et al., 2010). The scarps comprise successively higher-elevation, subparallel lineaments, between about 0.25 mile and 2 miles northeast of the border. To the east of the SFS scarps lies the west bajada, or alluvial fan complex, of the Spring Mountains, and to the west is the HHSEGS project area in the Pahrump Valley bolson. This basin marks the position of the graben, or down-warped segment of crust, that lies to the west of the SFS (Lundstrom et al., 2002; Scheirer et al., 2010).

The project lies within the Pahrump Hydrologic Unit, a 140,196-acre watershed in the Pahrump Valley (URS, 2011). The watershed is a closed basin, with surface runoff at the HHSEGS flowing to Pahrump Playa. The site contains substantial disturbed areas; dirt roads have been constructed on the perimeter of subdivided parcels within the project area and have altered the natural hydrology (URS, 2011).

Ephemeral drainages and playas are dry most of the year, with surface water present only in response to storm events. There are no wetlands mapped by the National Wetland Inventory (NWI) within the project boundaries (U.S. Fish and Wildlife Service [USFWS], 2011).

An ecotone between saltbush scrub to the west and creosote-burrobush scrub to the east is evident on the site. The western approximately two-thirds of the HHSEGS project area support vegetation dominated by shadscale (*Atriplex confertifolia,* a type of saltbush). On the eastern sandy alluvium of the site creosote bush (*Larrea tridentata*) and burrobrush (*Ambrosia dumosa*) are the dominant species. The vegetation onsite is described in more detail in the Spring 2011 botanical resources survey report (CH2M HILL, 2011).

The project does not conflict with any habitat conservation plans or natural community conservation plans. It is not located within or immediately adjacent to a Bureau of Land Management (BLM)-designated Desert Wildlife Management Area (DWMA), Areas of Critical Environmental Concern (ACEC) or Wildlife Habitat Management Areas.

Surveys conducted for biological resources in the project area focused on threatened, endangered, and other special-status wildlife and plant species that could potentially occur onsite, as well as general avian and bat surveys to document the baseline community. Field surveys included general reconnaissance, sensitive plant surveys, wetland delineations, USFWS protocol-level desert tortoise (*Gopherus agassizii*) surveys, western burrowing owl (*Athene cunicularia*) surveys, winter, spring and fall songbird and raptor surveys, raptor and golden eagle (*Aquila chrysateos*) nest surveys, and acoustic bat detection surveys. Other species were also searched for during the general reconnaissance and USFWS protocol-level surveys, including: American badger (*Taxidea taxus*), desert kit fox (*Vulpes macrotis*) , roosting bats, and nesting and migratory birds.

Results of the special status wildlife surveys and conservation measures that will be implemented to minimize and avoid impacts to these species are described in a subsequent section.

Federal and State-listed Species

Desert Tortoise

There is only one federal and state threatened or endangered species on the Hidden Hills SEGS site, the desert tortoise. The desert tortoise is listed as Federally Threatened

and California Threatened. No other federal or state threatened or endangered animal or plant species are onsite.

The HHSEGS site is not located in an area that has been determined by the BLM and USFWS to be critical to the survival of this species, specifically, designated critical habitat or a DWMA. On February 8, 1994, the USFWS designated 6.4 million acres as critical habitat within 12 critical habitat units[1] for the desert tortoise in portions of California, Nevada, Arizona, and Utah. The revised Recovery Plan identified DWMAs that act as reserves in which recovery actions are implemented[2]. BLM established DWMAs in their area plans and consider DWMAs to be ACECs.

For areas like the HHSEGS site that are located outside of ACECs and not on designated critical habitat, the BLM's Final EIS for the Northern and Eastern Mojave (NEMO) calls for a 1:1 mitigation ratio, indicating the lowest quality of occupied habitat:

> *Compensation shall be required by BLM for disturbances of desert tortoise habitat at the rate of 1 acre for each acre disturbed*; this is the same as the current requirement in BLM's Desert Tortoise Statewide Management Policy. Funds collected from project proponents shall be directed to habitat enhancement, rehabilitation or acquisition in the Eastern Mojave Recovery Unit. Proponents may also implement enhancement or rehabilitation projects or donate lands directly, at BLM discretion. (BLM Final EIS for NEMO, p. A-18, emphasis added; BLM, 2002)

Sundance Biology, Inc. (Sundance) completed protocol surveys on the project site and surrounding area in April 2011 (Sundance, 2011). Both in the project and within a 150-m buffer area, 100 percent coverage surveys were completed. Beyond the 150-meter buffer, transects were used to assess the project vicinity at 200, 400, 600, 1,200, and 1,600 meters from the project boundary. Using the survey data from onsite only, 3.8 adult desert tortoises (95% Confidence Interval: 0.94 - 15.14) are estimated to occur within the project area; 14.5 (95% CI: 1.94-18.49) are estimated to occur in the 150-m buffer east of the site[3]. The density of tortoises observed increased from west to east through the project site and east, consistent with the increasing habitat quality. Only two adult desert tortoises were detected within the project boundary, in the eastern portion of the project site. By contrast, six adults were observed east of the site, three of which were in the 150-m buffer. Although the absolute number of tortoises (two versus three) does not seem very different at first glance, it must be remembered that density - the number of tortoises per unit area – is, in fact, much higher east of the project. The estimate of 3.8 tortoises on the 3,277-acre (5.12 square mile) project site (including the construction laydown area) translates into a project site density of 0.7 adult tortoises per square mile. In the 265 acre (=0.4 square mile) buffer to the east, the

[1] Federal Register, Vol. 59, No. 26, Feb. 8, 1994: 5820-5866; http://ecos.fws.gov/docs/federal_register/fr2519.pdf

[2] USFWS. 2011. Revised recovery plan for the Mojave population of the desert tortoise (*Gopherus agassizii*). Pacific Southwest Region, Sacramento, CA. 222 pp.

[3] Note: These calculations have been revised from CH2M HILL 2012g. The corrected abundance of tortoises is 6.0 (1.94, 18.49) in the 150-m buffer area. The revised density estimate east of the site would be 14.5 tortoises per square mile.

14.5 estimated tortoises translates into 26.3 tortoises per square mile. The density in the ZOIs is even higher.

Special-status Species[4]

An evaluation of impacts to other special-status species (i.e., plant and animal species other than federal- and state-listed species under the federal and California Endangered Species Acts) was conducted, including an evaluation of the following: species proposed for those listings; federal Candidate species, USFWS Birds of Conservation Concern for Bird Conservation Region 33, BLM Sensitive Species; California Species of Special Concern; California Fully Protected Species under the Fish and Game Code; and plant species designated as Rare, Threatened, or Endangered by the California Native Plant Society (CNPS) or a Special Plant as defined by the California Natural Diversity Database (CNDDB).

Special-status Wildlife

Table BR-1 presents the special-status wildlife species that were identified onsite and those with potential to occur. Banded Gila monster has been reported to the CNDDB in the Kingston Mountains south of the project area and they are known from the Spring Mountains approximately 20 miles to the east in Nevada. No observations were reported in field crew reports. There is low potential for this species to occur on-site.

Very few special status birds have been documented onsite, and based on the winter, spring, and fall avian surveys completed to date, avian use in general is very low. Please refer to Attachment BIO-1, Fall Avian Survey Report, September 29 – November 29, 2012, dated January 7, 2013; DR Set 1B-4 (Exhibit 10), DR Set 1B-5 (Exhibit 11); and AFC Appendix 5.2H (Exhibit 1). A variety migratory and resident birds use the project area for foraging and nesting, and some raptors such as golden eagle, northern harrier (*Circus cyaneus*), prairie falcon (*Falco mexicanus*), Cooper's hawk (*Accipiter cooperii*), short-eared owl (*Asio flammeus*), American kestrel (*Falco sparverius*), merlin (*Falco columbarius*), ferruginous hawk (*Buteo regalis*), and red-tailed hawk (*Buteo jamaicensis*) use the site for foraging at certain times of the year. No raptors are expected to nest onsite due to a lack of documented nests and potential nesting habitat, with the possible exception of burrowing owl. Burrowing owl sign was recorded onsite, although no nesting or wintering individuals were documented. Small numbers of bats may roost in caves and crevices in the surrounding mountains and transit the site. However, acoustic bat detection data from a full year of surveys indicate very low use within the project site. Bighorn sheep occur in the surrounding mountains, and they may, on rare occasions, forage or move through parts of the project site. Sign of the American badger, a California species of special concern, was observed within the project site and desert kit fox burrows have been reported onsite.

[4] As used in this testimony, the term "special-status" species does not mean listed as threatened, endangered or candidate species under the federal ESA or CESA. Instead, the term "special-status" species is a more expansive term, employed by many agencies for the purposes described herein. The term special-status has no relationship to the legal status of any particular species.

TABLE BR-1
Special Status Species Identified or Potentially Occurring Onsite in the Hidden Hills SEGS Project Area

Species Name	Status[1]	Project Impacts
REPTILES		
Desert tortoise *Gopherus agassizii*	FT, CT	Two live desert tortoises were identified on the site during protocol-level surveys. Project development will result in the temporary loss of approximately 1,611 acres of creosote bush scrub and approximately 1,649 acres of shadscale scrub. Approximately 16 acres is composed of ruderal vegetation.
Banded Gila monster *Heloderma suspectum cinctum*		There are few records of this species in California and none on the HHSEGS site.
BIRDS		
Bendire's thrasher *Toxostoma bendirei*	CSC, BLM SS, BCC	Potentially occurring
Brewer's sparrow *Spizella breweri*	BCC	Documented onsite
Burrowing owl *Athene cunicularia*	CSC, BCC, BLM SS	Burrowing owl sign has been observed within the project area during the 2011 and 2012 protocol surveys. Conservation measures will be implemented to minimize and avoid the potential for burrowing owls to be harmed during construction and operation.
Crissal's thrasher *Toxostoma crissale*	CSC	Potentially occurring
Cooper's hawk	WL	Documented onsite
Ferruginous hawk	WL	Documented onsite
Golden eagle *Aquila chrysaetos*	WL, CSC, FP, BLM SS, BGEPA	Golden eagles were detected on the HHEGS project site during winter surveys, but during spring surveys only 1 offsite observation was recorded. No golden eagles were observed during 59 three-hour fixed-point surveys (177 hours of surveying) during fall 2012. The nearest documented golden eagle nest is approximately 7 miles west of the project in the Nopah wilderness. No take of golden eagle is anticipated; however, minor impacts to foraging habitat will occur.
LeConte's thrasher *Toxostoma lecontei*	BCC, BLM SS	Documented onsite
Loggerhead shrike *Lanius ludovicianus*	CSC	Documented onsite
Merlin *Falco columbarius*	WL	Documented onsite
Northern harrier *Circus cyaneus*	CSC	Documented onsite
Prairie falcon Falco mexicanus	BCC, WL	Documented onsite
Purple martin *Progne subis*	CSC	Documented onsite
Short-eared owl *Asio flammeus*	CSC	Documented onsite
MAMMALS		
American badger *Taxidea taxus*	CSC	Burrows thought to be of American badger, but unverified, were found on the project site during surveys. Conservation measures will be implemented to minimize and avoid the potential for badgers to be harmed during construction and operation.
Desert kit fox *Vulpes macrotis*	CFB	Sign of kit fox was observed on the site. If encountered, avoidance measures will be developed in consultation with the CDFG[3] on a project-specific basis. If active

TABLE BR-1
Special Status Species Identified or Potentially Occurring Onsite in the Hidden Hills SEGS Project Area

Species Name	Status[1]	Project Impacts
		dens are encountered (i.e., pups are present), then a buffer and an access corridor to foraging habitat may be established and maintained until the pups leave the den. At other times of the year, dens may be hand excavated and collapsed.
Nelson's bighorn sheep *Ovis canadensis nelsoni*	FSS, BLM SS	Nelson's bighorn sheep have been observed in the Nopah Range and the Kingston Range and partial remains (horn fragment) reported on the project site. The project will have no impact on bighorn sheep.
Pallid bat *Antrozous pallidus*	CSC, BLM SS	Documented onsite
Western small-footed Myotis *Myotis ciliolabrum*	BLM SS	Not documented onsite
Yuma Myotis *Myotis yumanensis*	BLM SS	Documented onsite

[1] Federal-, State-, and CNPS-listed species:

BCC USFWS Bird of Conservation Concern for BCR 33 (USFWS, 2008)
BLM SS BLM Sensitive Species

California Status (California Department of Fish and Game[5] [CDFG], 2011)
CE: California Endangered
CT: California Threatened
CSC: California Species of Special Concern
CFB: California Fully-protected Furbearer
CFP: California Fully Protected Species

Federal Status
FPE: Federal Proposed Endangered
FE: Federally Endangered
FT: Federally Threatened

Special-Status Plants

Prior to performing surveys, a literature review was performed to identify special-status plant species with potential to be found within the study area. A list of special-status plants with known presence in the greater vicinity of the project area was developed through searches of plant databases, including the CNPS online Inventory of Rare and Endangered Plants of California (CNPS, 2011), the CNDDB (CNDDB, 2011a, b), and the Consortium of California Herbaria (Jepson Online Interchange, 2011).

For each potentially occurring special-status plant species, information was compiled on conservation status, distribution, habitat characteristics, blooming time, and presence in the project region (CH2M HILL, 2011). Several special-status plants were identified as having the potential to occur onsite. These species are included in Table 2-1, Appendix B, of the 2011 Botanical Resources site botany report (CH2M HILL, 2011).

Surveys of the HHSEGS site for special-status plants were performed between 2010 and 2012 and included both spring and fall-season surveys. Botanical surveys onsite were conducted in accordance with the recommended protocols for botanical surveys of the

[5] On January 1, 2013, the name of the California Department of Fish and Game was changed to the Department of Fish and Wildlife. However for consistency with the Final Staff Assessment, the Applicant's biology testimony uses the name California Department of Fish and Game.

CDFG (CDFG, 2009), the USFWS (1996b), and the CNPS (2001) (CH2M HILL, 2011). Surveys onsite were floristic in nature (i.e., all plants encountered were identified to a level necessary for detecting special-status species, if present).

A summary of the surveys conducted onsite between 2010 and 2012 is provided below.

Late-Season Surveys

A late-season protocol-level survey was performed in 2010 within the site (the solar fields and common area, totaling 3,096 acres). Prior to the 2010 late-season protocol-level survey, a reconnaissance-level visit to the study area was completed on September 21 and 22, 2010. The 2010 late-season survey was conducted from October 25 through 30, 2010. Subsequent to the 2010 late-season survey, a 180-acre temporary construction laydown and parking area was added to the site in 2011. A protocol-level late-season survey was then conducted of the 180-acre temporary construction laydown and parking area and a 250-foot-wide buffer around the entire site. The 2011 late-season survey was conducted from October 10 through 13, 2011. When added together, the 2010 and 2011 late-season surveys encompass the entire site. The 2010 and 2011 late season surveys are described in: *Attachment DR63-3. Technical Report: Late-Season 2010 and 2011 Surveys for Special-Status Plants for the Hidden Hills Solar Electric Generating System* (CH2M HILL, 2012b).

Spring-Season Surveys

In spring 2011, a botanical survey was performed within the HHSEGS site and the 250-foot buffer (including the 180-acre temporary construction laydown and parking area). The spring 2011 survey included reconnaissance visits, reference site visits, and a protocol-level survey for special-status plants. In addition, eleven non-native invasive plant species (weeds) were mapped and their abundance was estimated; and the vegetation was classified and mapped. Cacti are present in very low numbers, and no individuals of any species of Yucca are present within the study area, so these plants were not mapped. A 1-mile buffer surrounding the site was also surveyed at a reconnaissance-level in spring 2011. The spring 2011 onsite surveys are described in: *Attachment DR63-1A. Spring 2011 Botanical Resource Survey of the Hidden Hills Solar Electric Generating System Site* (CH2M HILL, 2011).

Gravel milk-vetch did not have conservation status at the time that the 2011 HHSEGS site survey or 2011 offsite surveys were conducted; consequently, there were no focused surveys for the species in 2011. It was detected onsite because the surveys in 2011 were floristic; all species were identified to a level necessary to identify new or rare species, if present. Gravel milk-vetch was added to the CNPS Inventory in October 2011.

No additional occurrences of gravel milk-vetch were found during the spring 2012 offsite surveys. However, drought conditions during the 2012 spring surveys likely adversely and negatively affected survey findings.

In May 2012, focused surveys within the site and 250-foot buffer for Torrey's jointfir (*Ephedra torreyana*), were performed. These are described in *Attachment DR175-1. Data Response, Set 2D-5. Technical Report: 2012 Onsite Focused Survey for Torrey's Jointfir (Ephedra torreyana)* (CH2M HILL, 2012d).

Offsite Surveys

Focused surveys for selected special-status plants were also conducted in offsite areas in 2011 and 2012. These surveys are described in the following reports:

- Attachment DR63-2. *Technical Report: Spring 2011 Offsite Surveys for Special-Status Plants for the Hidden Hills Solar Electric Generating System* (CH2M HILL, 2012a).
- Attachment DR174-1, Data Response, Set 2D-4B. *Technical Report: 2012 Offsite Surveys for Special-Status Plants for the Hidden Hills Solar Electric Generating System* (CH2M HILL, 2012e)

Survey Limitations

Rainfall in spring 2012 was substantially below normal and low rainfall conditions strongly influenced survey results. Special-status plant species such as Wheeler's skeletonweed and gravel milkvetch were not observed even in locations where they had previously been identified in 2011, likely due to low rainfall. It is likely that these special-status plants could be present in other areas offsite and in higher numbers than previously documented because the region is in general under surveyed. However, these species can only be identified and documented during years with normal or above-normal rainfall.

As described in the FSA, there is high potential for Torrey's joint-fir to be considerably more common than currently known. To address this in the FSA, Condition of Certification BIO-20 allows pre-construction surveys for Torrey's joint-fir. Surveys for Torrey's joint-fir will be performed onsite and compensatory mitigation for this species will be adjusted based on results of the surveys.

Gravel milkvetch, Preuss' milkvetch, and Wheeler's skeletonweed also have high potential to occur in higher numbers than currently known. Surveys were performed offsite for these species in 2012, but the survey findings were strongly and negatively influenced by the drought conditions. The Applicant requests that any new findings for these three special-status plants be treated consistently with Torrey's jointfir in the Applicant's proposed revisions to BIO-20 and that these finds also be incorporated into the final compensatory mitigation developed for the project.

Waters of the U.S./State

Survey Methods

Jurisdictional waters of the U.S. and State were delineated and mapped within the project boundary, offsite temporary construction area, and 250-foot construction buffer surrounding the project (URS, 2011, 2012). Field work to delineate potential waters of the U.S., including wetlands and other onsite waters, was performed between January 31 and February 4, 2011 (URS, 2011). The wetland delineation report was provided as Appendix 5.2E of the AFC. Methods used to identify and map waters of the U.S. within the project site included:

- A desktop review of recent high resolution aerial imagery (VTN, 2010); U.S. Geological Survey (USGS) topographic maps (Caldera Springs, California; Mound Springs, California; and Stump Spring, Nevada (USGS, 2011); soil surveys of surrounding counties (Natural Resource Conservation Service [NRCS], 2011; note soils within the project area have not been mapped by NRCS).

- Field surveys, using standard methods described in:
  - Field Guide for Wetland Delineation: 1987 Corps of Engineers Manual (U.S. Army Corps of Engineers [USACE], 1987)
  - Interim Regional Supplement to the USACE Wetland Delineation Manual: Arid West Region (USACE, 2006)
  - Final Summary Report: Guidelines for Jurisdictional Determinations for Waters of the United States in the Arid Southwest (USACE, 2001)
  - Coordination on Jurisdictional Determinations under Clean Water Act (CWA) Section 404 in Light of the SWANCC and Rapanos Supreme Court Decisions (USACE, 2007)
  - A Field Guide to the Identification of the Ordinary High Water Mark in the Arid West Region of the Western United States (USACE, 2008a)

Delineated streams were considered to be regulated under the CWA if they exhibited presence of an ordinary high water mark (OHWM) and hydrologic connectivity to the Pahrump Playa (URS, 2011).

Data recorded onsite included width and depth of the OHWM, substrate characteristics and vegetation. Photographs were taken upstream and downstream at survey points. Spatial data were recorded on Trimble GeoXH GPS units with sub-meter accuracy. GPS data collected in the field were exported to Geographic Information System (GIS) and overlaid onto ortho-rectified aerial photographs (URS, 2011).

Waters of the State

State jurisdictional waters were delineated in December 2011 (URS, 2012). The study area included the area within the project boundary, plus a 250-foot buffer around the Project Site and an approximately 180-acre construction lay-down area. Delineation methodology was based on practices that are consistent with requirements of Section 1600 of the California Fish and Game Code, and jurisdictional limits were generally interpreted as any one of the following:

- At minimum, intermittent and seasonal flow through an objectively-defined bed or channel with banks and also supports fish or other aquatic life.
- A watercourse having a surface or subsurface flow regime that supports or has previously supported riparian vegetation or has indications of a zone of influence.
- Hydrogeomorphically distinct top-of-embankment to top-of-embankment limits (i.e., objectively-defined bed and bank).
- Outer ground cover and canopy extent of typical riparian associated vegetation beyond the top-of bank that would be sustained by surface and/or subsurface waters of the watercourse.

Pedestrian surveys were conducted along previously mapped drainages and also around points of interest including sheet flow and ponding areas (URS, 2012). Two points were collected at the outer extent of vegetation associated with each drainage and included two photos at each point (one upstream and one downstream). In addition to these

channels, a number of pooling and ponding areas with wash-dependent vegetation were mapped as potential waters of the State. Soil within areas mapped as alkaline soils areas were examined for hydric soil characteristics and gleying. Data were recorded using a Trimble® Geo-XT sub-foot GPS. General characteristics of the wash, including average channel width, evidence of flow, and general vegetation were noted.

Field data were incorporated into a GIS for subsequent analysis and mapping. Data points collected along transect lines were plotted on recent aerial photographs having one- to two-foot resolution, and drainage features within the survey area were manually digitized in to the GIS using the nearest reference location data to aid in the mapping.

Survey Results

Waters of the U.S.

Sixty-nine desert ephemeral streams, occupying approximately 13.9 acres of the HHSEGS site, were delineated within the project boundary (URS, 2011). Nine of the 69 ephemeral streams are shown on USGS topographic maps as blue-line streams and they enter the project site from the upslope area to the east.

While there are no wetlands mapped by the NWI within the project boundaries, there was some evidence, such as surficial cracking, that water accumulated in pools in some areas; however, wetland vegetation was not present in these areas. The same plant species identified in uplands also occurred along the drainages; however within some drainages, a slightly higher density of vegetation was present. No jurisdictional wetlands were observed onsite, as wetland criteria for soils, hydrology, and vegetation were not met.

The jurisdictional delineation report was submitted to the USACE Los Angeles District office, together with a request for an Approved Jurisdictional Determination (AJD), on May 6, 2011. A site visit was conducted with USACE Regulatory Project Manager, Bruce Henderson, on May 31, 2011, to evaluate mapped ephemeral drainages and determine whether any of the features would be subject to federal jurisdiction under Section 404 of the CWA. USACE issued an AJD on December 14, 2011, and found that two interstate drainages, identified as streams 50-1 and 24-1 in the AJD request (URS, 2011), would be regulated as waters of the U.S. based on: 1) presence of an OHWM; 2) evidence of greater flow volumes and durations compared to adjacent uplands, such as sediment sorting and presence of a vegetation community that differs from that of adjacent uplands. It was determined that the areal extent of federal jurisdiction within the two streams totals approximately 0.42 acre based on presence of OHWM indicators (URS, 2012).

On November 13, 2011, a site visit was conducted with USACE Regulatory Project Manager, Bruce Henderson, to verify the areal extent of waters of the U.S. on the project site. During the site visit, Mr. Henderson voiced concurrence with the delineation as mapped (i.e., 0.42 acre of waters of the U.S.). A formal letter of concurrence is pending. Based on a description of the type of impacts and a map identifying the relationship of impacts to waters of the U.S., Mr. Henderson stated that the project may be authorized under one or more Nationwide Permits and will require no compensatory mitigation for permanent impacts to waters of the U.S.

Waters of the State

Table 1 in the Preliminary Delineation of Jurisdictional Waters of the State report (URS, 2012) summarizes the potential Waters of the State that were delineated on the project site. A total of 28.33 acres of jurisdictional Waters of the State, including single-thread and braided compound channels, were delineated on the proposed project site and within the 250-foot-wide buffer area (23.82 acres within the project site, plus 4.51 acres offsite and within the 250-foot buffer area). Six of the approximately 80 mapped features are depicted as blue line features on the USGS topographic maps, although channel alignments do not necessarily follow USGS mapped flow paths. Upstream of the project, all drainages within the 250-foot survey buffer area lie within the state of Nevada. Of the 23.82 acres of potential Waters of the State on the project site, 0.42 acre was identified as waters of the United States (Drainages 24 and 50; see URS, 2011) based on presence of OHWM indicators.

In subsequent discussions with Regional Water Quality Control Board (RWQCB) and CDFG staff, concurrence was reached with respect to the Delineation Report (URS, 2012). RWQCB and CDFG staff generally agreed with the Delineation Report, but determined that drainages and pooling areas mapped within maintained roadways would not be considered state jurisdictional waters (total of 3.74 acres). In addition, features mapped as “nonjurisdictional waters” in the preliminary State waters delineation report (i.e., pooling areas, moist pooling areas, alkaline soils areas, sheet flow areas) were confirmed by the agencies as not constituting waters of the State.

The CEC and CDFG conducted a site visit to verify the state waters delineation in August 2012. The CEC provided the Applicant with data representing 9 additional drainages, adding an additional 3.13 acres of jurisdictional waters of the state within the project boundary. With the addition of the 3.13 acres by the CEC, the areal extent of State jurisdictional waters within the HHSEGS project boundary totals 23.21 acres (23.82 acres – 3.74 acres + 3.13 acres) (CH2M HILL, 2012f).

B. Potential Construction Related Impacts; Avoidance and Minimization Measures

The construction of HHSEGS would affect natural communities within the project site through the removal of vegetation for permanent facilities and structures and for the temporary disturbances associated with construction. These impacts would result in direct loss of habitat for general and special-status plant and wildlife species. Impacts could occur from removal and crushing of shrubs and herbaceous vegetation (resulting in loss of nesting/breeding and foraging habitat), accidental entombment of animals in dens or burrows, collisions with vehicles, increased predation on sensitive species, disturbance from noise, and fragmentation of habitat. These impacts have the potential to be significant. However, with the implementation of worker awareness training, preconstruction and clearance surveys, avoidance, mitigation and compensation measures proposed by the Applicant and required by the Biological Resources Mitigation Implementation Monitoring Plan (BRMIMP) and the resource agencies, there will be no significant, unmitigated biological impacts associated with the construction and operation of HHSEGS.

Special-status Wildlife Species

Project development will result in the temporary loss of approximately 3,199[6] acres of habitat for variety of common and special-status wildlife species. Wildlife will be directly and indirectly impacted by the physical clearing of the site. Wildlife occurring within the site will be impacted or displaced. Those occurring adjacent to the site may be temporarily impacted by the construction activity levels, noise, increased vehicle traffic, dust, night-time lighting, and habitat fragmentation. Without appropriate mitigation and conservation measures, the increased construction activity may also attract or provide subsidized resources for an increased number of native and non-native predators.

The project includes design features that are intended to minimize and avoid impacts to listed species, special status, and common species. The Applicant will also implement a comprehensive list of conservation measures to minimize and avoid the indirect and direct impacts during construction and operation. These include preconstruction desert tortoise clearance and translocation, typical environmental awareness and biological monitoring as well as compensating for lost desert tortoise habitat. Desert tortoises will be removed from the site and relocated to appropriate habitat nearby. Tortoise relocation may include post-translocation monitoring through an agency-approved plan, depending on the numbers of desert tortoise affected. Efforts will be made to properly relocate and/or exclude other encountered wildlife such as burrowing owls, badgers, nesting songbirds, and Gila monsters. Some tortoise recovery actions have the potential to also benefit other wildlife species that will be affect by the proposed project.

Special-status Plant Species

Eleven special-status plant species were identified onsite and in the 250-foot buffer during the 2010 and 2012 surveys. These species are:

1. *Acleisanthes nevadensis* [*Selinocarpus nevadensis*] (desert wing-fruit)
2. *Androstephium breviflorum* (pink-flowered androstephium)
3. *Astragalus nyensis* (Nye milk-vetch)
4. *Astragalus preussii* var. *preussii* (Preuss' milk-vetch)
5. *Astragalus sabulonum* (gravel milk-vetch)
6. *Astragalus tidestromii* (Tidestrom's milk-vetch)
7. *Chaetadelpha wheeleri* (Wheeler's skeletonweed)
8. *Cymopterus multinervatus* (purple-nerve spring parsley)
9. *Ephedra torreyana* (Torrey's Mormon-tea)
10. *Eriogoum bifurcatum* (Pahrump Valley buckwheat)
11. *Phacelia pulchella* var. *gooddingii* (Goodding's phacelia)

More information on the abundance and distribution of these special-status plants, including maps showing their location onsite and detailed species accounts, are provided in the following late-season and spring botanical reports:

- Attachment DR63-3. Technical Report: Late-Season 2010 and 2011 Surveys for Special-Status Plants for the Hidden Hills Solar Electric Generating System (CH2M HILL. 2012b).

[6] Approximately 77 acres of the 3,277 project site was disturbed by previous development activities including an orchard and roads, for a net area of approximately 3,199 acres that will be affected by the development of HHSEGS.

- Attachment DR63-1A. Spring 2011 Botanical Resource Survey of the Hidden Hills Solar Electric Generating System Site (CH2M HILL, 2011).
- Attachment DR175-1. Data Response, Set 2D-5. Technical Report: 2012 Onsite Focused Survey for Torrey's Jointfir (*Ephedra torreyana*) (CH2M HILL, 2012d).

C. Potential Operational Related Impacts; Avoidance and Minimization Measures

Special-status Wildlife Species

Potential project impacts associated with operation of the HHSEGS were evaluated to determine whether biological resources would be significantly affected. Potential direct and indirect impacts associated with operation of HHSEGS and the mitigation measures designed to avoid or minimize those potential impacts include the following measures and other measures described in the Applicant's testimony and prior filings.

Onsite transmission lines and poles will be designed and constructed with appropriate spacing between conductors and/or bonding wires to avoid electrocution of large birds, as described in Avian Power Line Interaction Committee (APLIC) "raptor-friendly" guidelines (APLIC, 1994, 2006).

Generally, continuous low noise levels from operations does not adversely impact wildlife, as wildlife usually becomes accustomed to routine background noise. Bright night lighting could disturb wildlife (e.g., nesting birds, foraging mammals, and flying insects). Reported instances are most commonly related to guy-wired towers or mirrored buildings adjacent to open spaces. The project site is not within migratory pathways and there will be no guy-wired towers. Red lighting used to mark the solar towers will be intermittent as governed by the FAA, and other lighting will be located near ground level on project structures, pointed downwards and/or hooded, and used with timers or motion sensors to minimize the potential for impacts.

Project features could attract native and non-native wildlife during operation. The Applicant will contain food-related trash and implement an agency-approved raven control plan. Additionally, the Applicant will not use barbed wire on perimeter fencing, to minimize collision risk, and will stow heliostats in the vertical position to avoid potential polarized light pollution that could attract wildlife that might confuse the heliostat field with water/aquatic habitat.

Operational activities may affect the normal behavior of various wildlife species; however, existing data from comparable facilities (e.g., BrightSource's Solar Energy Development Center (SEDC) and Gemasolar) indicate impacts associated with flux affects or collision with project features would be very rare. An avian and bat monitoring program will be implemented to detect such instances, should they occur.

Special-status Plant Species

Prior to commencing surveys of the site in 2010, information on the abundance and distribution of these special-status plants was limited. Because little was known about these special-status plants, offsite surveys were conducted in 2011 and again in 2012 for some species not limited by 2012 drought conditions to obtain additional information. Numerous new offsite localities of eighteen special-status plants were found during the 2011 surveys (CH2M HILL 2011). Offsite surveys in 2011 did not include gravel

milkvetch, a species that was added to the list of special-status plants in October 2011, after surveys were complete.

Spring 2012 was unusually dry, and it was not possible to collect information on some of these special-status plants because some plants did not germinate and/or grow in 2012. Reference sites for some species were visited in spring 2012 and plants were not observed even in places they had been documented the previous year. Data collected from the 2011 and 2012 offsite surveys was submitted to the CNDDB in June, 2012 and results are provided in the following technical reports:

- Attachment DR63-2. *Technical Report: Spring 2011 Offsite Surveys for Special-Status Plants for the Hidden Hills Solar Electric Generating System.* (CH2M HILL, 2012a).
- Attachment DR174-1, Data Response, Set 2D-4B. *Technical Report: 2012 Offsite Surveys for Special-Status Plants for the Hidden Hills Solar Electric Generating System.* (CH2M HILL, 2012e)

As described earlier, the spring of 2012 was extremely dry, and few annual plants grew and were identifiable as a result of the drought. Despite this, the results of the offsite surveys show that that, for some of these special-status plants, there are many more occurrences in the project region than previously known. In spring 2012, new localities of five of the ten special-status plant species were identified offsite in the following survey areas: Stewart Valley and Ash Meadows Area, Central and Southern Pahrump Valley, Chicago Valley, California Valley, Mesquite Valley, the Mesquite Mountains, and Shadow Valley. An overview of the number of localities and individuals found offsite include:

- Offsite, 36 new localities[7] of Preuss' milkvetch were identified in central and southern Pahrump Valley and in Mesquite Valley, totaling approximately 20,516 individuals.
- Tidestrom's milkvetch was observed in 10 localities offsite in central and southern Pahrump Valley, Shadow Valley, and the Mesquite Mountains, with a total of 262 individuals.
- One new locality of Wheeler's skeletonweed was identified using dead, prior-year, plant material. No live plants were detected in 2012. Five individuals of Wheeler's skeletonweed were found offsite in the southern Pahrump Valley, within the BLM Pahrump Valley Wilderness.
- Torrey's jointfir was identified offsite in the southern Pahrump Valley in 54 localities, with 126 female individuals.
- Pahrump Valley buckwheat was observed offsite in 72 new localities within the Stewart Valley and Ash Meadows Area, Central and Southern Pahrump Valley, Chicago Valley, California Valley, and Mesquite Valley. Approximately 7.3 million individuals were observed within these new localities. Pahrump Valley buckwheat was identified using prior-year plant material.

[7] Localities generally refer to populations. Element Occurrences are defined as any population or group of nearby populations [or localities] located more than 0.25 miles from any other population [or locality] (CNDDB, 2012a).

In the case of Pahrump Valley buckwheat, some of the new localities consist of very large populations with millions of individuals. In Mesquite Valley, one population with many millions of Pahrump Valley buckwheat plants covered an area 1.1-mile long, and at least 0.1 to 0.3-mile wide. Additionally, as a result of the offsite surveys for Pahrump Valley buckwheat, this species was found to occur in California Valley, a first report for this species, and an extension of its known range.

Conditions for the offsite surveys in 2012 were extremely challenging due to very low rainfall, yet the above number of plants were still identified. However, below average rainfall strongly influenced survey results. Given that the Applicant found so many plants in an extremely dry year, it is very likely that in an average or above-average rainfall year, many more would be detected. Special-status plant species such as Wheeler's skeletonweed and gravel milkvetch were not observed even in locations where they had previously been identified in 2011. In a spring with average or above-average rainfall, it is very likely that additional special-status plants offsite beyond those identified in 2011 and 2012 could be found.

Direct impacts will be offset through implementation of BIO-20, Compensatory Mitigation. Worker education and standard measures in the BRMIMP and Weed Management Plan will also be implemented. Through implementation of these measures, and measures developed in coordination with the CEC and the resources agencies, the project owner will avoid and minimize potential indirect impacts to special-status plant occurrences offsite.

Waters of the U.S./State

The Waters of the State acreage on the HHSEGS site is estimated at 23.21 acres of ephemeral drainages, which represents less than 1 percent of the total project acreage. Direct physical effects will occur on these ephemeral drainages due to grading, road creation, filling, mowing vegetation, and traffic over the course of the project lifetime. Where these activities result in disturbance to the bed, channel or bank of ephemeral streams over the life of the project, these impacts are considered to be permanent. Furthermore, because of the weakly defined nature of the majority of ephemeral drainages on the site, the physical changes resulting from the project may indirectly impact streams due to changes in existing stream hydraulics and hydrology. Previous development on the site has already altered natural drainage patterns, as evidenced by drainages following existing maintained roadways on the site. Permanent fill impacts will be minimized by siting project structures and other features to avoid ephemeral streams where possible. Since without mitigation the affected drainages would be expected to reform naturally in this landscape where flow patterns are highly variable both temporally and spatially, stream functions associated with physical processes (e.g., groundwater recharge) would not be substantially affected by the project. In addition, compliance with the State's General Permit for Storm Water Discharges Associated with Construction (CGP) will reduce erosion and sedimentation impacts on receiving waters to a less than significant level.

In addition, other types of long-term disturbance, including but not limited to, vegetation removal within drainages and exclusion fencing on the project perimeter, represent a permanent impact on streams for which these activities reduce or eliminate existing wildlife functions, habitat, and connectivity associated with those streams. While it is clear that some onsite drainages support wildlife functions, it is unlikely that

100 percent of the onsite drainages are equally supportive. A formal functional assessment has not been performed to demonstrate a linkage between onsite ephemeral drainages and wildlife functions; however, any compensatory mitigation in the form of preservation of ephemeral drainage area with similar functions and values, together with reestablishment of wildlife functions upon decommissioning, would mitigate any impacts on wildlife functions of streams to a level that is less than significant.

D. Summary of Compliance with Applicable LORS

Applicable Federal, State, and local laws, ordinances, regulations and standards (LORS) are presented in Table 5.2-1 of the AFC (Exhibit 1). These LORS were reviewed and consultations with the appropriate agencies were made to determine if the proposed project could affect sensitive biological resources. Through on site field surveys, agency consultations and guidance, project design modifications, and proposed protection measures, the HHSEGS project will conform to all applicable LORS for protection of biological resources.

The desert tortoise is a federally-listed threatened species and formal consultation with the USFWS is required to comply with the federal Endangered Species Act. Section 7 consultation will be initiated with the BLM in connection with the proposed Valley Electric Association's (VEA) 500-kV Transmission Line and Ancillary System Facilities project (the "VEA project"), the Kern River Gas Transmission (KRGT) Company Hidden Hills Lateral Project ("KRGT project"), and the HHSEGS project (as a connected action).

The project will comply with all applicable LORS. Measures required in the Conditions of Certification BIO-6 through 10, and BIO-12 through 17 will avoid and minimize impacts to non-listed special-status wildlife species.

E. Summary of the Potential Cumulative Impacts

The potential for cumulative impacts associated with HHSEGS is reduced by incorporation of an important solar power tower technology advancement, the 750-foot-tall solar power tower. One principle advantage of the HHSEGS solar power tower design is that it results in more efficient land use and greater power generation. The new, higher, 750-foot solar power tower allows the heliostat rows to be placed closer together, with the mirrors at a steeper angle. This substantially reduces mirror shading and allows more heliostats to be placed per acre. More MWs can be generated per acre and the design is more efficient overall. The result is a smaller footprint and loss of fewer acres of habitat and related impacts.

To reduce cumulative impacts to water resources and save water in the site's desert environment, each solar plant will use a dry-cooling condenser. Cooling will be provided by air-cooled condensers, supplemented by a partial dry-cooling system for auxiliary equipment cooling. Raw water will be drawn daily from onsite wells located in each power block and at the administration complex. Groundwater will be treated in an onsite treatment system for use as boiler make-up water and to wash the heliostats.

The incorporation of avoidance and mitigation measures is expected to reduce impacts to levels that are less than significant. Proposed conservation protection measures to avoid and minimize impacts to biological resources within and adjacent to the HHSEGS project area would include, for example:

1. Conduct Worker Environmental Awareness Training for all construction personnel.
2. Conduct construction monitoring by a qualified Designated Biologist and onsite Biological Monitors during construction activities near sensitive habitats.
3. Prepare a BRMIMP that details how the Applicant would implement protection measures and other conditions of permits that are developed by state or federal agencies to ensure that actions authorized, funded, or carried out are not likely to jeopardize the continued existence of endangered or threatened species.
4. An agency-approved desert tortoise relocation plan and raven control plan would be adopted and implemented.
5. Funding will be provided to implement desert tortoise recovery actions at ratios that are concomitant the variable habitat quality on various parts of the project site.
6. Prepare and implement a Weed Management Plan

IV. Response to Certain Issues Raised in the FSA

The Applicant finds that certain issues presented in the FSA warrant clarification and correction. Additional discussion of these issues is presented in this section.

A. Desert Tortoise

FSA Page 4.2-123 – DESERT TORTOISE ABUNDANCE ESTIMATES

The FSA applied the tortoise abundance from the larger Action Area (i.e., all areas within which tortoises could be affected directly or indirectly by the project) to the number of tortoises that occur on the project site. The FSA states:

> "The number of desert tortoises that may actually occur on the project site is expected to fall somewhere between the upper and lower statistical 95 percent confidence level identified in the USFWS formula. Nonetheless, for the purposes of this analysis, the FSA presents the largest probability estimates of desert tortoise that has the potential to occur *on the project site."* (emphasis added)

Comments on the PSA provided by the Applicant suggested the number of desert tortoises estimated in the PSA is too high, and recommended a reduced estimate. This information was reviewed and considered in the FSA. The PSA estimates are derived from the Applicant's AFC (Appendix 5.2 F, Desert Tortoise Survey Report). The derived numbers are based on the USFWS predictive model and include desert tortoises that were found within 150 meters of the proposed project site. The FSA utilized these numbers as a basis for extrapolating the expected levels of adult, sub-adult, and juvenile desert tortoises and their eggs based on the calculations of Turner et al (1985). The PSA used Applicant data that between six and 33 adult and subadult desert tortoises may occur on the project site and within a 150 meter buffer. The AFC assessment correctly suggested that desert tortoise found within 150 meters of the project boundary may include portions of the project site as part of their home range. These assumptions and

the USFWS model are used in the FSA to calculate the number of desert tortoise affected by the project. Applicant in its comments proposed to exclude from the estimate animals immediately adjacent to the site. However, staff and CDFG believe that this approach would severely underestimate project impacts, as the project is removing part of the home range of these desert tortoises, and the level of disturbance from construction may force temporary abandonment of the remaining portion.

Page 4.2-124 of the FSA states: "As described in Biological Resources Table 15 in the FSA (Desert Tortoise Density Estimates and Impact Summary) approximately six to 33 adult tortoises (lower and upper USFWS 95 percent confidence level), three to 34 juvenile tortoises (based on 31.1 to 51.1 percent of the total population identified by Turner), and 46 and 158 eggs are expected *to occur on the proposed project site."* (emphasis added)."

Comment:

The accurate calculation of tortoise abundance is crucial for evaluating project impacts and determining mitigation and compensation. Furthermore, for the purpose of assessing project impacts to tortoises based on tortoise abundance, it is important to distinguish between tortoises that occupy the project site (i.e., those that will require translocation) versus those in the larger area that will be affected by the project (i.e., the "Action Area"), which includes the project footprint as well as offsite areas in which tortoises will be directly and indirectly affected (e.g. translocation site, control site, buffer areas). Tortoises that occupy the site and will require translocation comprise a subset of the Action Area tortoises.

The FSA merges the estimates of tortoise abundance in the Action Area with that of tortoises occupying the project site. It calculates tortoise abundance by incorporating all tortoises that may occur within 150 m of the project boundary in their density calculations, which is consistent with the Applicant's density calculation in the AFC of 13.8 adult/subadult tortoises (Confidence Interval [CI]: 5.74-33.02). The Applicant subsequently revised their estimate of tortoise density in their response to the PSA, to include only those tortoises observed in the project footprint; the point estimate was 3.8 (CI: 1-15). Understanding that surveys represent a snapshot in time, and given the proximity of some of the adjacent tortoises, the Applicant's more recent estimate may underestimate the number of tortoises that may require translocation. However, by including the 150-m buffer and not accounting for the increase in tortoise sign and greater habitat quality east of the project boundary, the FSA's approach very likely overestimates the number of tortoises that actually occupy the site because most of the tortoises included in the calculation were observed *outside* the site, but within the larger Action Area. In fact, the estimate of tortoises for just the 150-m buffer area outside the eastern project site border was 10.9 adults/subadults (CI: 4 - 28) (CH2MHILL 2012g), almost three times that of the project site alone. Furthermore, the buffer east of the site is a much small area, only 265 acres, compared to the 3,277-acre project site (including construction laydown area). So, the density of tortoises (number per unit area) is much higher east of the site. Accordingly, the true point estimate of tortoises that occupy the project site probably lies somewhere between 3.8 and 13.8.

FSA Page 4.2-127 DESERT TORTOISE COMPENSATORY MITIGATION

The FSA requires a 3:1 compensation ratio for areas supporting creosote bush scrub and a 1:1 ratio for areas of the project site that support shadscale scrub. This is the same ratio that was presented in the PSA. In a detailed analysis of the site's biotic and abiotic conditions and the pattern of tortoise sign, the Applicant recommended that the basis for determining mitigation ratios in the PSA should be refined because these coarse-grained vegetation communities did not adequately reflect tortoise habitat quality and use of the site (PSA Comments Set 1, Exhibit 80). For example, the FSA states that "the highest concentration of desert tortoise or their sign was associated with the creosote bush scrub communities that dominate the eastern portion of the site" (FSA Page 4.2-126: Paragraph 1). In fact, the highest concentrations of desert tortoise sign were primarily in one *patch* of the creosote bush community on the eastern side of the project, with a few, much smaller patches and scattered sign. Tortoise sign was not uniformly distributed throughout the entire creosote bush scrub community. In response to the Applicant's discussion of and recommendations for revisions to the mitigation ratios, Staff addressed several variables in their FSA assessment of tortoise compensation, and increased their analysis. The FSA's conclusion was still to divide the project into two compensation ratios using the two coarse-grained vegetation communities on the site, Mojave Desert scrub and shadscale scrub.

The plant communities on the project site are a function of several factors, including soil type, land use patterns, and many other ecological and environmental factors. In the western approximately two-thirds of the HHSEGS project site, calcareous, clayey silts and clays of the valley bottom support vegetation dominated by shadscale (*Atriplex confertifolia*) as well as other halophytes, both annual and perennial. These include both halogeton (*Halogeton glomeratus*) and inkweed (*Suaeda moquinii*), species tolerant of saline, high-pH soils and characteristic of fine soils that are often inundated.

The plant communities are also not uniform within their coarse designations (e.g., Mojave Desert scrub). For instance, the alluvial ramp leading uphill to the east and northeast reflects a gradual environmental gradient along which the creosote bush scrub community changes in both diversity and density in response to changing edaphic, topographic and, most likely, microclimatic conditions. These changes are more subtle than the relatively abrupt transition from saltbush scrub to creosote bush desert scrub, which is related to an equally abrupt change in subsurface geology.

Desert tortoise sign on the site presents a clear pattern of increasing density from west to east. No desert tortoise and little sign were found in shadscale scrub areas on the HHSEGS site or in the 150-m buffer or zone-of-influence transects. Calculations of tortoise density based on unit of survey effort (i.e., the number of adult desert tortoises detected per acre surveyed) found that the desert tortoise population density of the Mojave Desert scrub on the site was 1/8 the density in the 150-m buffer of Mojave Desert scrub along the eastern edge of the site and 1/56 the density of the zone-of-influence transects further east (CH2MHILL 2012g). The difference in tortoise density inside and outside the project area, in combination with the habitat data, demonstrates that the habitat and tortoise use is not identical throughout the coarse-grained Mojave Desert scrub designation. Accordingly, this entire plant community does not warrant the same compensation ratio throughout. Furthermore, a 3:1 mitigation ratio is excessive in light of the onsite tortoise population density of only 0.7 tortoises per square mile. Even

if one uses only the acreage of Mojave Desert scrub (1,611 acres onsite) for calculating density, 3.8 tortoises translates into only 1.5 tortoises per square mile. Even further, if one uses the FSA's estimate of 13.8 tortoises for the project site and surrounding buffer, and only incorporates Mojave Desert scrub (2,211 acres), the resultant density is only 3.9 tortoises per square mile, a very low density.

In summary, the topographic, geologic, ecologic, and botanical circumstances at the HHSEGS site are consistent with the desert tortoise survey results and support the finding that the habitat quality for desert tortoise is extremely low in the western portions of the site and transitions toward more suitable habitat to the east. The results of the Applicant's analysis indicate that the site ecology, as well as the tortoise survey data, can and should be used to indicate the areas of relative importance to desert tortoise, and thus serve as a better indicator of habitat quality and compensation ratios than the coarse-scale plant community classification. In consideration of these factors, the following compensation ratios for the HHSEGS site represent more appropriate ratios than that presented in the FSA:

- 1.5:1 in the most concentrated tortoise use areas of Soil Type Qa1, which is consistent with the greater concentration of washes and increased plant density and diversity.
- 1:1 over most of the remainder of Qa soil types, plus Qb areas with lower halogeton concentrations, including those areas with scattered tortoise sign
- 0.5:1 throughout the remainder of the site where halogeton populations, characteristic of inundated, fine soils, are abundant; this also coincides with the remainder of the Qb soil type.

The total compensation acreage that would meet these ratios would equal 2,831 acres, compared to the FSA's proposed compensation acreage of 6,358 acres.

B. Avian Flux Impacts

BrightSource Energy, Inc. (BSE) recognizes the potential for solar flux effects to birds and commissioned a study to investigate this potential impact.

A summary of the results of a study conducted at SEDC in Dimona, Israel in July 2012, the SEDC Flux Study (SFS), that investigated the effects of solar flux on birds was provided as a PowerPoint presentation at the August 28, 2012 joint workshop conducted by the CEC, and the Response to Staff Data Request Set 3 (Exhibit 44) was docketed on November 21, 2012. A series of tests were conducted at the SEDC facility to provide direct evaluation of the specific solar flux levels that cause observable harm to bird feathers, skin, or tissues. Such experiments have not been conducted previously making these the only empirical data available to evaluate the effect of solar flux on bird feathers, skin, and tissues.

These studies were specifically undertaken to respond to the CEC staff's repeated requests for additional information regarding potential solar flux avian impacts. As discussed at the workshop and in Exhibit 44 directly analyzing solar flux effects on avian species presents a number of difficult technical issues, primarily due to the fact that no method has yet been identified that can directly measure surface temperatures without also directly exposing measurement instruments to solar flux. In summary, the SFS consisted of exposing recently euthanized chicken, pigeon, and quail test subjects to

various levels of solar flux for 10 to 60 seconds, and in most instances to 30-second exposures, and evaluating observable and measurable effects.

The following section describes the methodology of the SFS in more detail in response to certain questions that have been raised during prior CEC workshops.

Fresh birds were used for the SFS study and three easily-obtainable species were used to represent different size birds that could occur at solar sites. To directly measure temperature in a solar flux field, thermocouples were used to obtain body temperature measurements of birds placed in the solar flux field. The thermocouples were protected and obtained useful measurements of body temperatures by placing one thermocouple under the skin beneath the feathers and another internally. As stated in the SFS report, "thermocouples (Lascar EL-USB-TC with J-type probe [range -130 to 900˚C], 1 sample/second) were placed under the skin on the back, just below the base of the neck of each subject, to measure temperature beneath the feathers (the "under-skin" thermocouples)." To place the thermocouple under the skin, an incision in the skin was made about 5 centimeters (cm) below the base of the neck and the thermocouple was inserted and slid up close to the base of the neck between the skin and muscle. Nothing was used to further secure the thermocouple to avoid affecting the temperature measurements.

The 6-foot beaded Type J thermocouple used had a temperature range from 0°C to 250°C (32°F to 482°F) with accuracy of ±2.2°C (4.0°F). To measure internal body temperatures, Lascar EL-USB-TC (Type K range = -200 to +1350˚C, 1 sample/second) with K-type 10-cm probes (temperature range of the probes was 0°C to 400°C [32°F to 752°F] with accuracy of ±1.0˚C; MicroDAQ.com) were used and placed by way of the throat (at least 10 cm), into the intestinal tract of each subject to measure internal temperatures. In the quail the K-type probe went the entire length of the body from mouth to tail. In addition, an infrared thermometer with a temperature range of -60°C to 500°C (-76°F to 932°F) and an accuracy of ±1°C (±2°F; Supco, Inc.) was used to measure the surface temperature of the feathers, generally within 13 and 20 seconds after the end of each test after the test subject was raised to the balcony. The instruments were not calibrated during the study but ambient air temperatures were compared among the various instruments and on-site temperatures throughout the study period, which provided confidence of accuracy throughout the study. Given these constraints, the SFS primarily focused on documenting direct observations of solar flux effects on feathers (i.e., singeing). Indirect measurements of skin and tissue measured by thermocouples mounted beneath the skin and feathers and inside the subjects to measure internal body temperature, and feather surface temperatures taken before and after solar flux exposure with an infrared thermometer, were also documented to provide supplemental data on solar flux effects.

The FSA provides a very unscientific analysis of solar flux effects to birds and includes several factually and analytically inaccurate statements about the SFS, other research, and potential solar flux effects to avian species, including the following:

1. The FSA i*naccurately extrapolates potential solar flux impacts from effects related to other forms of radiant energy in different wavelengths.* The FSA makes misleading comparisons of certain levels of solar flux to other radiant energy sources of a similar magnitude that occur in different electromagnetic wavelengths. It is basic science that human skin, feathers, or other receptors are affected to a different extent

by radiant energy at different wavelengths. In general, biological receptors are extremely sensitive to far-infrared radiant flux from sources like fires, but less sensitive to wavelengths characteristic of solar flux.

The FSA's references to human and other receptor effects related to flux from fires or other terrestrial (as opposed to solar) sources is particularly misleading because flux energy from sources like fires occurs almost entirely within the far-infrared spectrum, or wavelengths that are longer than red light, the longest wavelength in visible light. Solar flux consists, to a much greater extent, of shorter wavelength visible light and energy in the near-infrared spectrum (wavelengths that are slightly longer than red light).

Almost all far-infrared flux will be absorbed by human skin or wood. In contrast, human skin and other biological receptors are known to reflect and not absorb a significant portion of the radiant energy in the visible and near-infrared wavelengths characteristic of solar flux. Extrapolating solar flux impacts from other forms of radiant energy (e.g., far-infrared flux from fires) is inaccurate and misleading because non-solar energy flux affects skin, wood, and similar materials in markedly different ways than solar flux.

2. The FSA f*ails to consider or recognize that human skin, other receptors, and birds react differently to radiant energy.* The FSA improperly assumes that mammal and bird skin react similarly to radiant energy. Due to substantial structural differences, however, mammal and bird skin does not react in the same manner to solar flux. While mammal and bird skin both provide a layer of protection against pathogens and other potentially harmful substances, retain vital fluids and gases, and serve as a sensory organ, each is notably different in structure.

Degrees of skin burns in humans are based on the depth of injury to the dermis. The dermis in mammals consists of numerous structures, such as sweat and sebaceous glands, which are not present in birds. Avian skin consists of two layers, the epidermis and dermis. Human skin includes a deeper, subcutaneous tissue called the hypodermis characterized by fat and connective tissue. The outer layer of avian skin, the epidermis, is generally very thin and pliable. The avian dermis is thicker than the epidermis and contains blood vessels, fat deposits, nerves and free nerve endings, several types of neuroreceptors, and smooth muscles that move the feathers (Lucas and Stettenheim 1972).

The FSA incorrectly assumes that the blistering of human skin known to occur from infrared (fire-related) flux of 16 kW/m^2 for 5 seconds represents a relevant measure of potential harm to avian skin from solar flux. During the SFS testing, no skin blistering was observed on any of the test subjects exposed to solar flux levels of up to 79 kW/m^2 for 30 seconds, which is a much greater level of exposure than that presented in the FSA (16 kW/m^2 of infrared flux for 5 seconds) as causing harm to avian skin. In the SFS, no feather singeing was observed in any test subject exposed to solar flux levels up to 50 kW/m^2 for up to 30 seconds. These empirical results contradict the FSA analysis and demonstrate that there is little relationship between flux effects to human skin and flux effects to avian feathers, skin, and tissue. Similarly, it is wholly misleading to suggest that the impacts to a house from fire-generated far-infrared flux of 31.53 kW/m^2 over a 15 to 20-minute period are indicative of any potential impacts from solar flux on avian feathers, skin, or tissues. The materials, structure, and radiant flux response of a house are each completely different from the materials, structures, and radiant flux responses

associated with avian feathers, skin, and tissues. These are just two examples of inaccurate and misleading statements and comparisons on flux effects in the FSA.

The FSA analysis is speculative and is not supported with any direct observations or research data regarding solar flux effects on avian feathers. Conversely, the SFS report presents detailed information on direct observations of feathers exposed to elevated solar flux. Page 13 of the report states: "*For each bird tested, feathers were visually and digitally examined by feeling, flexing and "unzipping" and "zipping" the hooklets to identify effects such as dryness, brittleness, and whether the integrity of the feather was compromised (i.e., feathers were checked to determine if the hooklets on the barbules were functioning properly). None of these effects were found in birds that were not singed. Singed feathers were dry and brittle and no longer had functioning hooklets*." In addition, page 16 of the report states that "*The heating did not appear to be uniform in birds and feathers that were singed. In many cases, barbules, hooklets, and texture all appeared to be normal even in locations directly adjacent to observed singed areas.*" These research-based observations contrast with the absence of any empirical support for the assertions in the FSA.

3. *The FSA mischaracterizes other studies as conflicting with the SFS results.* With respect to the SFS results, the FSA states that, "Staff has reviewed these studies, disagrees with conclusions presented, and notes that applicant's results are in stark contrast with other published literature." This statement and similar assertions in the FSA are inaccurate and misleading because there are no other studies that specifically measured concentrated solar flux effects to avian feathers, skin, or tissues. Notably, the FSA does not provide references to any "published literature" that might conflict with the SFS results.

The only peer reviewed document that could potentially be relevant to the SFS results is the McCrary et al. (1986) survey of avian mortality at a since-decommissioned solar facility in Daggett, California. The FSA cites the McCrary et al. report in several locations, but the report does not support the FSA's conclusions for several reasons. McCrary et al. studied the mortality of birds at a solar facility; it did not test hypotheses about, examine, measure, or otherwise document impacts associated with specific levels of solar flux to avian species in any manner. Over a 40-week survey period, and within a 340-acre survey area that included a 79-acre solar field, 13 avian mortalities were detected with evidence of feather singeing. McCrary et al. speculated that these birds may have been harmed by flying through mirror focal "standby points" where unusually high concentrated solar flux levels could have been produced. Even if such speculation was accurate, the Daggett facility's standby point technology is no longer used in modern solar generating facilities, and the standby zone flux levels at the Dagget facility were much higher than would occur at the HHSEGS facility.

It is important to recognize that the McCrary et al. results are consistent with the SFS findings, that avian risks are generally limited to a relatively small portion of the solar field located around the upper reaches of the receiving tower. During a two-week period in May, for example, the McCrary et al. report states that swifts and swallows in excess of 500 birds per day were observed, or at least 7,000 swifts and swallows were observed over a two-week period (14 days × a minimum of 500 birds). The two-week observation total was the highest volume of swifts and swallows detected at any time during the survey. The report further states that the two-week peak swallow and swift

detection period coincided with facility testing in which "…the occurrence and intensity of standby points was probably greater than at other times." Based on the 13 mortalities that showed evidence of singeing, the report suggested that swifts and swallows were the avian species "…most susceptible to this form [singeing] of mortality." Consequently, the McCrary et al. survey observed the highest concentration of birds that were assumed to be at most risk from solar flux effects at the same time that the highest levels of solar flux were likely being generated at the facility. Nevertheless, only 3 of 7,000 swifts and swallows were detected with evidence of feather singeing. This very low rate of avian mortality from singeing, even when the highest flux levels were being generated by the project, is consistent with the SFS results and strongly suggests that the FSA risk assessment is substantially inaccurate with regard to avian effects caused by solar flux.

4. The FSA *mischaracterizes the SFS as anecdotal or inaccurate, in part by relying on clearly anecdotal speculation from other materials.* The FSA disagrees with the SFS conclusions, but does not specifically call into question any of the observations or measurement results. Additionally, the FSA also fails to provide alternative conclusions based on the results of the SFS. The FSA characterizes the SFS as "anecdotal", apparently to suggest either that the results are not direct observations or were not published in a peer-reviewed article. Due to the significant time required to publish a peer-reviewed article, wildlife and other state and federal agencies routinely rely on unpublished, non-peer reviewed reports and studies to inform permitting and regulatory decisions. The SFS is in no way an "anecdotal" report. It relies entirely on facts and research results derived from directly observed phenomena. In contrast, the FSA relies on clearly anecdotal statements (i.e., not supported by any direct evidence or observation) and speculation about the potential but unverified causes of singeing in the McCrary et al. report, output from a purely theoretical and unvalidated model, and the improper suggestion that radiant flux from sources like fire would have the same effects as solar flux on avian tissue or feathers.

The SFS report was prepared immediately after the field studies were completed in July 2012 to respond to CEC staff requests for more information about potential solar flux effects on avian feathers. The results will be included in a peer-reviewed publication in the appropriate time frame. Publication of a scientific paper can take from several months to over a year. The SFS report was provided in a timely manner to respond to CEC staff requests concerning potential solar flux impacts to birds. For 25 years Mr. Santolo has been providing reports to agencies and industry to use for management decisions. For example, for 14 years Mr. Santolo produced biological Monitoring Reports that included surveys and studies used by the U.S. Bureau of Reclamation and USFWS to make management decisions for Kesterson Reservoir, a selenium-contaminated site in the Central Valley. He subsequently published many of the studies he conducted for these reports. For the past 7 years, Mr. Santolo has been conducting studies used by the County of Orange, the Water Quality Control Board, U.S. EPA, CDFG, and USFWS to make management decisions on selenium issues in the Newport Bay Watershed. This past year Mr. Santolo conducted a protocol-level Swainson's hawk survey for California High Speed Train used to determine construction areas and windows. Agency use of unpublished reports prepared by experienced and credible scientists such as Mr. Santolo is a common and standard practice.

5. The *model presented in the FSA is not validated or supported with empirical evidence.* The FSA relies on a wholly speculative unvalidated model, developed without any empirical testing or support, to suggest that a 4 kW/m^2 solar flux level represents the maximum "safe" exposure for birds. Certain basic assumptions and analysis approaches used in the model have been shown to be significantly flawed and do not coincide with the observations and measurements made in the SFS. Models are validated by comparing specific predictions to actual, measured results. If a predictive model does not generate results that are consistent with actual measurements, the model is wrong. Instead of using the results from the SFS to correct and validate the model presented in the FSA, the FSA ignores the data and predicts impacts from solar flux levels approximately 10 times lower than have been documented in real-world tests.

6. *The FSA relies on unsubstantiated speculation and conjecture.* The FSA includes numerous speculative statements about potential solar flux avian impacts that have no empirical or other scientific support, including the following:

- The FSA speculates that "[S]horter exposures at these [higher] energy flux levels would be likely to cause other tissue or feather damage that could impair flight or vision or cause physiological effects and ultimately cause or contribute to mortality from other causes (e.g., reduce ability to forage, escape from predators, or thermoregulate)." This statement is not supported by any data and is in direct contradiction with the SFS results, which detected no feather damage from 10- to 60-second exposures at various solar flux levels below 50 kW/m^2. The FSA's speculation about potential effects from shorter exposures is solely based on the unsubstantiated opinion and it fails to differentiate between the physical differences in solar and other flux types, which influence the effect on biological receptors.
- The FSA dose response and hazard assessments indicate that "…damage to barbules from exposure to concentrated flux will be virtually instantaneous, and damage to barbs, feathers and birds very likely". No supporting evidence or rationale for this assertion is provided. After each SFS test, feathers were physically examined to specifically determine the condition of the interlocking barbules. Even when singeing was detected, feather barbules maintained integrity right up to the singed portion of a feather. This result is not consistent with the assertions in the FSA that barbules are particularly fragile or vulnerable to solar flux effects.
- The FSA dose response assessment includes unsupported statements suggesting that birds in areas of high ambient temperatures and low humidity have low feather moisture content. There is no data to support this assertion. Feather moisture issues were controlled to the extent possible during the SFS testing by using freshly euthanized subjects (generally, within 12 hours or less) with no apparent health other evidence of physiological harm or stress.
- The FSA characterization of risk states that, "Longer but still short term exposures to the 10 to 25 kW/m2 flux densities could cause nearly complete loss of barbules or even complete feather vanes on one or both sides of the rachis and result in loss of flight capability and inability to remain airborne." This statement is purely speculative and contradicted by the empirical data from the SFS. The SFS documentation includes the results for a brown chicken test subject (CH-CS-01) that

was exposed to a solar flux level of 15.8 kW/m2 for 60 seconds. The subject showed no sign of singeing or other feather effects from this exposure, including no loss of barbules or loss of feather vanes on one or both sides of the rachis. Feather surface temperatures rose about 12.4˚C, from a pre-exposure level of 24.9°C, as measured approximately 16 seconds after exposure (Exhibit 45). This level of temperature increase was well below any threshold that could be associated with longer exposure to lower flux levels as incorrectly suggested in the FSA.

C. Response to Appendix BIO-1 and BIO-2, Staff's Flux Model

Introduction

This testimony was prepared by and at the direction of Dr. Sönke Johnsen, Ph.D, Professor of Biology at Duke University in response to the analysis of potential avian solar flux risks in Biology Appendix 1 (BIO-1) and Biology Appendix 2 (BIO-2) of the Final Staff Assessment (FSA) for the Hidden Hills Solar Energy Generating System (HHSEGS) project. Dr. Johnsen's qualifications are as noted on his resume contained in Appendix A to this testimony. In addition to the statements herein, this testimony includes by reference the following documents submitted in this proceeding:

- Document TN # 68785, docketed in this proceeding (11-AFC-2) on December 5, 2012 by the California Energy Commission (CEC) and posted on the CEC website maintained for proceeding 11-AFC-2 as "Presentation by Dr. Sönke Johnsen, Ph.D, from the December 5, 2012 Joint Workshop."
- Document TN # 68266 prepared by and docketed in proceeding 11-AFC-4 on October 30, 2012 by the CEC staff and identified on the CEC website maintained for proceeding 11-AFC-4 as "Methodology To Estimate Avian Exposure To Concentrated Solar Radiation For Rio Mesa Biology Resources Appendix BIO1" (hereinafter referred to as "Methodology I") and the BIO1 appendix prepared by CEC staff and included in the Preliminary Staff Assessment for proceeding 11-AFC-4 and publicly released on October 15, 2012 (hereinafter referred to as "Risk I").

To the best of my knowledge, all of the facts contained in this testimony (including all referenced documents) are true and correct. To the extent this testimony contains opinions, such opinions are my own. I make these statements, and render these opinions freely and under oath for the purpose of constituting sworn testimony in this proceeding.

Summary of Testimony

Overview

At the December 5, 2012 joint workshop conducted in proceedings 11-AFC-4 and 11-AFC-2, the CEC staff explained the basis for the conclusion, which as discussed below is not accurate, that solar flux exposure above 4 kilowatts per meter squared (kW/m^2) would heat surface feathers to 160^o Celsius (C), damage feather keratin and adversely affect avian flight capacity. The avian flux risk assessment discussed at the workshop was described in the Risk I and Methodology I documents and subsequently incorporated without significant changes in the FSA and the FSA BIO-1 and BIO-2 appendices.

Several fundamental analytical and scientific errors in the FSA assessment were identified, discussed, and corrected during my presentation at the workshop. The

presentation demonstrated that, even when subject only to partial correction, the lowest solar flux exposure potentially associated with feather temperatures of 160° C (which was assumed for discussion purposes at the workshop, but has not been conclusively determined to represent an appropriate feather impact threshold) would conservatively range from 40 kW/m^2 to 50 kW/m^2, or at least ten times the level identified by the CEC staff. The analytical approach discussed at the workshop assumes that the maximum level of solar flux that could produce feather temperatures of at least 160° C can be calculated by considering:

(1) Radiant heat losses equal to a bird's emissivity (ε), or natural propensity to emit radiation, times the Stefan-Boltzmann constant, (σ) (discussed below), times the difference between a feather temperature of 160° C ($\boldsymbol{T^4_{feather}}$) and ($\boldsymbol{T^4_{air}}$) the ambient air temperature (each to the fourth power and in degrees Kelvin); plus

(2) Convective heat transfers equal to a heat transfer coefficient (*h*) times the difference between ($\boldsymbol{T_{feather}}$) and ($\boldsymbol{T_{air}}$) in degrees Kelvin; divided by

(3) Emissivity (ε) times the cosine of the angle of incidence, or "view factor" (VF) of solar reflections on feather surfaces.

Mathematically, the FSA approach is summarized as follows, where $\boldsymbol{T_{feather}}$ is the assumed threshold feather surface temperature of 160° C, and $\boldsymbol{T_{air}}$ is the ambient air temperature:

$$\textbf{Max Solar Flux} = \frac{\boldsymbol{\varepsilon\sigma\left(T^4_{feather} - T^4_{air}\right) + h_{convectivity}\left(T_{feather} - T_{air}\right)}}{\boldsymbol{VF\ (view\ factor) * \varepsilon}}$$

As discussed at the workshop and in more detail below, the primary errors in the analysis that contribute to the underestimation of the level of flux that could damage feather by approximately a factor of 10 times include the following:

- Using a VF of 1.0, which improperly assumes that a bird feather is always perfectly perpendicular to each and every solar reflection and at times exposed to the maximum possible level of sunlight during flight. This assumption significantly exaggerates the extent to which feather would be exposed to and absorb solar flux.
- Confusing a bird's emissivity with absorptivity, the extent to which feathers actually absorb rather than reflect or pass through solar flux. Feather absorptivity factors have been empirically measured and are much lower than the emissivity factor of 0.95 improperly used in the FSA. These measured absorptivity values generally range from .065 to 0.85. Even these values are high because they apply to plumage on a bird's body. Flight feathers extend from the trailing edge of the wing and tail, and in certain areas do not overlie avian skin. In many locations, solar flux can pass through flight feathers without being absorbed. As a result, flight feathers likely have absorptivity values that are lower than body feathers and will be heated to a lesser extent than assumed in the FSA.
- Understating by approximately 2.5 times the extent of convective heat transfers, which cool a bird's feathers, due to the improper use of a formula

applicable to laminar rather than the turbulent airflow conditions characteristic of a bird in flight. The FSA analysis inaccurately assumes that the airflow surrounding a bird is analogous to a laminar, perfectly smooth flow around a large, flat and uniform plate. The airflow around a bird's body and wings, however, is more complicated than the simplified model used in the FSA and includes a mixture of laminar and turbulent flows. Overall, turbulent conditions predominate, particularly where the primary flight feathers are located on the trailing edges of the wings and tail. The FSA underestimates the extent of convective heat transfers by using estimation methods that are only applicable to idealized, perfectly laminar flow conditions. To properly account for avian convective heat transfers, estimation methods applicable to real world, turbulent conditions must be used, and these show that convective heat transfers will be approximately 2.5 times higher than assumed in the FSA. This result is also consistent with published estimates of avian convective heat transfer coefficients (see blow). Bird feathers will be more significantly cooled by convective heat losses during flight than assumed in the FSA.

- Assuming that, at all times, including the coldest winter months, the ambient air temperature is 45^{o} C, or 113^{o} F, a level only rarely reached in the vicinity of the project during a few days for a few hours per day in summer, when birds are generally less active. During most of the year, maximum ambient temperatures will be much lower than assumed in the FSA, and birds will transfer heat to the
- Underestimating radiant heat losses by incorrectly assuming that that the radiant temperature of the sky, which is approximately 0^{o} C in the desert, is equal to an assumed ambient temperature of 45^{o} C.

On December 21, 2012, the FSA for the HHSEGS project was issued that included the BIO-1 and BIO-2 appendices. None of the analytical and scientific errors identified at the workshop were substantively addressed in the BIO-1 and BIO-2 analysis, and the FSA continues to inaccurately assert that avian flight feathers would be heated to 160^{o} C (320^{o} Fahrenheit (F)) by flux levels as low as 4 kW/m^2. As a result, the FSA significantly overstates potential solar flux impacts to avian species.

The magnitude of the FSA's risk assessment errors can be readily understood by considering common and easily replicated human experience with concentrated solar flux. Sun bathers, for example, regularly use a doubled mirror to focus multiple solar reflections on their faces for tanning purposes. Since the sun produces solar flux of approximately 1 kW/m^2, these multiple reflections direct solar flux levels in the range of approximately 3 kW/m^2 directly onto sensitive human facial skin. Common experience demonstrates that these solar flux levels do not produce skin temperatures remotely close to 160^{o} C, which would severely damage human skin. It is also possible to use a hand lens to focus sunlight on the palm of a hand and create a spot of concentrated solar flux that is half the diameter of the lens and with a level of approximately 4 kW/m^2. To duplicate the solar reflections characteristic of the HHSEGS facility, the light must pass through an ultraviolet filter, such as a pane of glass. Human skin has an absorptivity of approximately 0.65, which is comparable with measured values for moderately dark (e.g., orange or chestnut colored) feathers (see Table 1, below). Under these conditions, approximately 4 kW/m^2 of solar flux will be generated on the sensitive surface of the palm with a view factor of 1.0, the maximum possible angle of exposure,

and no wind effects that might cool the skin. Nevertheless, no temperature effects approaching 160^{o} C as predicted in the FSA are observed.

These simple examples highlight the fact that none of the FSA's assertions, assumptions or projections, including the fundamental assertion that a temperature of 160^{o} C will cause feather avian flight feather damage, have been subject to even rudimentary empirical testing and validation. In lieu of conducting even simple confirmation experiments, the FSA relies solely on "desktop" assumptions and calculations.

The FSA analysis provides purported examples of flux-related "impacts" that reflect a basic misunderstanding of how electromagnetic wavelengths affect biological receptors, such as human skin or feathers. In BIO-1, Table 1 the FSA attempts to demonstrate the point where flux levels could become "dangerous" to "the reader" whether the flux occurs "near a fireplace, radiant heater, or other warm device." This discussion is misleading because the examples pertain to flux generated largely by fires or other terrestrial heat sources, almost all of which occurs in the far infrared spectrum, which occurs at electromagnetic wavelengths that are substantially longer than and located "above" the red wavelength of visible light (hence the term, "infrared"). Solar flux is much more heavily weighted towards the visible and near-infrared spectrum (wavelengths that are closer to red light) and includes shorter wavelengths than occur in the far infrared spectrum.

It is basic science that flux in different electromagnetic spectra and with different wavelengths affects skin and other biological receptors in different ways. Human skin is extremely sensitive to the far infrared spectrum and will absorb virtually all (absorptivity of near 1.0) of the flux generated by fires or other terrestrial sources in far infrared wavelengths. In contrast, human skin reflects and does not absorb a substantial amount (absorptivity of 0.65) of the visible and near infrared spectrum characteristic of solar flux. It is scientifically inaccurate to associate a certain flux level with specific effects to any receptor without also specifying the wavelengths in which the flux occurs and the extent to which a receptor actually absorbs flux at the applicable wavelengths. Hazard examples drawn from studies of fires or other far infrared heat sources fundamentally mischaracterize potential solar flux impacts to humans and avian species and cannot compensate for the lack of empirical support for the staff's analysis. In short, potential effects from far infrared radiation sources cannot be equated with potential effects from solar flux because far infrared and solar flux-related wavelengths affect human skin and bird feathers in different ways.

The following sections discuss in more detail several of the scientifically unsupportable assumptions and analytical errors in the FSA. Section H demonstrates that even modest corrections to the FSA's analysis result in estimated solar flux levels potentially associated with feather temperatures of 160^{o} C of approximately 39 kW/m^{2} to 50 kW/m^{2}, or approximately ten times higher than the level suggested in the FSA.

Inaccurate View Factor Assumptions

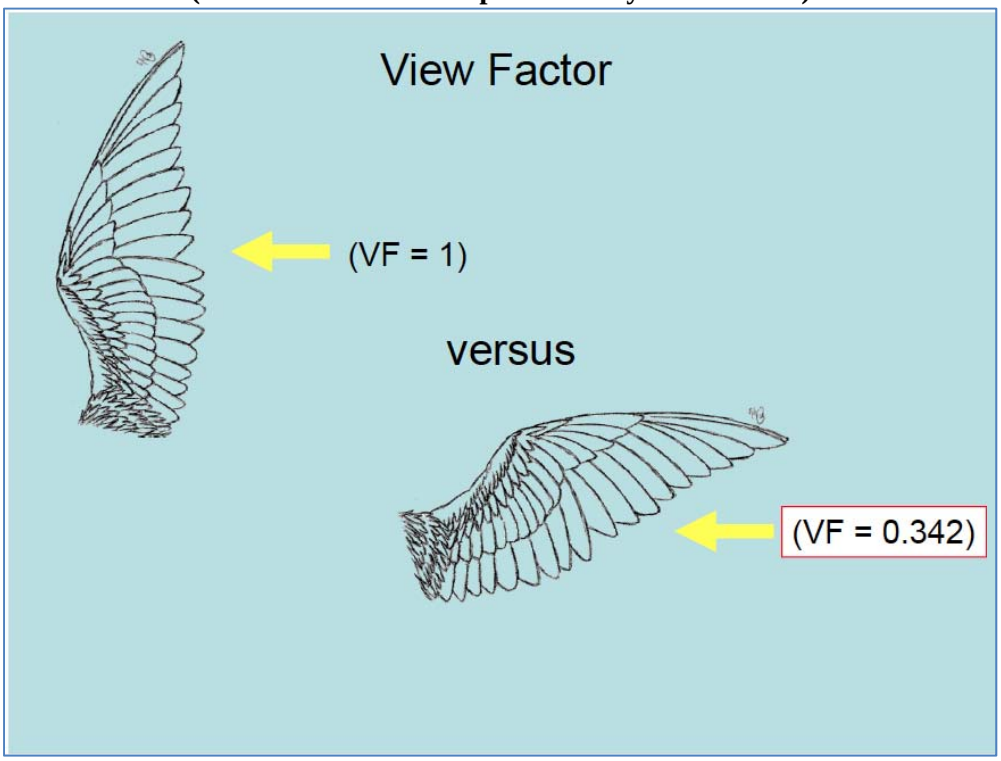
The extent to which solar flux may affect an object is closely related to the object's angle of incidence, or "view factor" relative to the flux direction. The view factor is commonly expressed as the cosine of the angle of incidence from a vertical position relative to directional flux. An object oriented perpendicularly to solar flux, like a flat road surface when the sun is directly at the zenith, would have a view factor of 1.0, the

most efficient possible angle of exposure. In the case of birds in flight over a heliostat field, the view factor (VF) relative to reflected solar flux would, at most, only briefly approximate 1.0, such as at an instant in time when a bird is flapping its wings. Under typical flight conditions, the view factor will be substantially lower than 1.0 and birds will encounter solar flux at an angle of less than 90-degrees. Angled solar flux will have lower potential effects on feather temperatures than assumed in the FSA. Nevertheless, while BIO-1 and BIO-2 examine results potentially associated with view factors other than 1.0, the FSA's risk assessment assumes that a bird in flight will behave like a flying piece of asphalt at high noon and always be perfectly perpendicular to the direction of reflected solar flux. This approach significantly overstates the potential avian risk associated with solar flux.

The proposed facility solar field will extend up to 1,500 meters from each of the two central towers (see, e.g. WebEx Recording, Documents and Presentations, Applicant Submitted Power Point Presentation for 082812 Joint Workshop.pdf, posted on the CEC website for proceeding 11-AFC-2 on August 29, 2012, Slides 20 and 22). The airspace above the solar field where solar flux could occur above ambient, natural levels could extend to approximately 275 meters from the ground surface at the central tower location. Given the geometry of the facility, mirrors located approximately 1,500 to 800 meters from the tower, or over 70% of the solar field, would reflect sunlight towards the tower at angles ranging from approximately 10 degrees to 20 degrees relative to the ground. Mirrors located in the rest of the field and closest to the towers would direct sunlight at steeper angles. Given this distribution, the average solar flux reflection angle within a facility's airspace can be conservatively estimated to be approximately 20 degrees from the ground. A substantial majority of the mirrors would, in fact, reflect sunlight at angles less than 20 degrees.

The FSA uses a view factor of 1.0 to assess avian risks. This approach assumes that all birds in the solar field airspace will, at all times, be oriented perfectly perpendicular to any mirrored reflection. If the average reflection angle in the solar field is approximately 20 degrees, the FSA analysis implausibly assumes that all birds will always be pointed upwards at an angle of 20 degrees from vertical when they fly through the facility airspace. No bird in the real world would ever maintain the permanent, fixed flight angle assumed in the FSA (see Figure 1). It is not appropriate to assess avian risks by using a view factor that cannot occur except for momentary instances during flight. Common experience demonstrates that, in part to conserve energy and optimize aerodynamics, birds typically seek to maintain a horizontal orientation relative to the ground during flight. As a result, under normal flying conditions, sunlight from the solar field would be reflected towards the underside of a bird at an approximately 70 degree angle to the direction of the reflections. The applicable view factor that corresponds with this orientation is approximately 0.342 (the cosine of 70 degrees)(see Figure 1).

Figure 1
Illustration of Wing View Factors of 1.0 and 0.342
(Solar flux direction depicted with yellow arrows)



The FSA significantly overstates the level of solar flux that might harm avian flight feathers by assuming that every bird above a solar facility will always be aligned exactly perpendicular to any source of solar reflection. In the real world, a perpetually perfect orientation as assumed in the FSA will never occur. A view factor of approximately 0.342 represents a much more defensible, yet conservative assumption regarding avian flight behavior relative to the typical angle of reflected sunlight in a solar field. The use of a fixed, 1.0 view factor significantly biases the FSA avian risk assessment towards an inaccurately low level of solar flux.

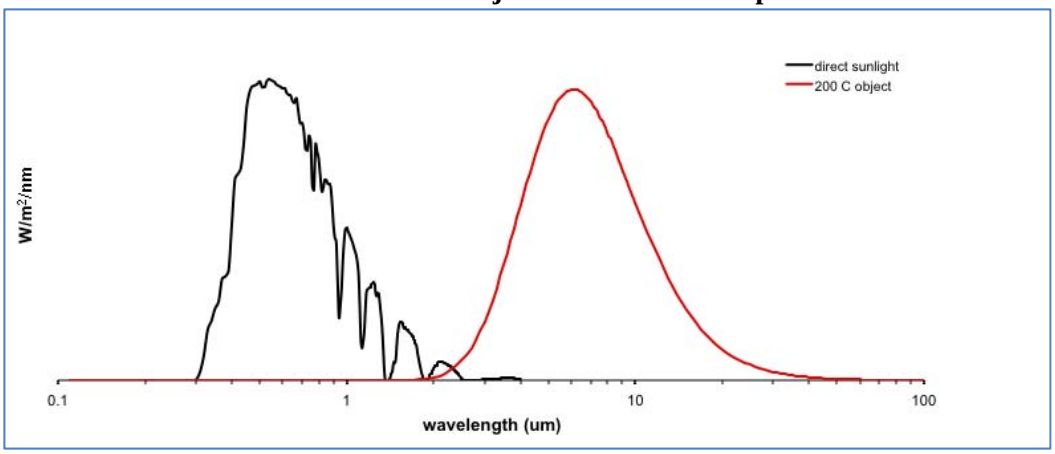
Inaccurate Absorptivity Analysis

The BIO-1, BIO-2 and FSA analysis inaccurately and improperly address absorptivity, the extent to which an object (such as a feather) will actually absorb solar flux. A certain proportion of the solar flux directed towards a feather surface will be reflected by the feather, pass through areas where micro-voids exist, or pass directly through the feather material without being absorbed. Absorptivity is the measure of the net amount of solar flux that is actually absorbed by a feather, and correctly estimating this rate of absorption is critical for understanding how solar flux could heat avian feathers. The FSA appears to equate an object's absorptivity (α) with emissivity (ϵ), the extent to which heat is radiated from an object. This analytical error reflects a common misunderstanding of Kirchhoff's law of thermal radiation, which states that, for an object emitting and absorbing thermal radiation in thermodynamic equilibrium, emissivity equals absorptivity at the same electromagnetic wavelength.

The emissivity of terrestrial objects, which are much cooler than the sun, however, occurs at infrared wavelengths, while solar flux predominantly occurs in the visible spectrum. Consequently the values associated with solar flux absorptivity and emissivity are not the same, or even related. The FSA, however, erroneously assumes that feather absorptivity equals emissivity and has an extremely high value of 0.95. As discussed in further detail below, this assumption is particularly perplexing because actual feather absorptivity values, all of which are lower than assumed in the FSA, are readily available from several scientific publications as summarized below.

As shown in Figure 2, solar flux occurs within a spectrum that is almost completely different from the wavelengths that radiate from cooler (i.e., 200° C or lower) terrestrial objects. More than 95% of the solar spectrum energy occurs in wavelengths from 250 nanometers (nm) to 1800 nm. Approximately 70% of the energy occurs in wavelengths from 400 nm to 1000 nm. The emissivity of objects up to 200° C, however, which is well above the temperature of birds in nature, is heavily weighted to longer wavelengths in the infrared portion of the solar spectrum. According to Planck's Law, electromagnetic radiation from a body at a temperature below 200°C is negligible at wavelengths of less than 2000 nm. Consequently, at wavelengths that correspond with almost all solar spectrum energy, an object's emissivity values are not linked with absorptivity values.

Figure 2
200° C Terrestrial Object and Solar Flux Spectra



The FSA uses a feather emissivity factor of 0.95, which is empirically supportable as a measure of *emissivity* in the infrared spectrum for a terrestrial object (e.g., a object with a temperature below 200 ° C). The analysis incorrectly uses the same 0.95 factor, however, for *absorptivity*, a value that is substantially higher than empirically-validated feather absorptivity measurements, and a level of energy absorption efficiency that is difficult to achieve even under experimental conditions. Feather absorptivity values have been reported in numerous scientific publications (see, e.g., Gates, D. M. (1980), *Biophysical Ecology*, New York: Springer-Verlag; Burtt Jr., E. H. (1986), *An analysis of physical, physiological, and optical aspects of avian coloration with emphasis on wood-warblers*, Ornithological Monographs No. 38). As shown in Table BR-2, feather absorptivity substantially varies with coloration and ranges from approximately 0.380 for white feathers to 0.904 for "jet black" feathers.

Table BR-2
Feather Absorptivity Values

Feather Color	Absorptivity
White	0.380
Spectrum yellow	0.553
Spectrum orange	0.629
Chestnut	0.782
Yellowish olive-green	0.842
Cerulean blue	0.847
Light neutral gray	0.855
Raw umber	0.859
Jet black	0.904

Source: Burtt Jr., E. H. (1986), *An analysis of physical, physiological, and optical aspects of avian coloration with emphasis on wood-warblers*, Ornithological Monographs No. 38

The use of a 0.95 feather absorptivity value represents a major analytical error in the FSA. Empirically-validated feather absorptivity values are substantially below this value, even for darker plumage. The correct analysis of feather absorptivity increases the level of solar flux potentially associated with feather damage significantly above the values suggested in the avian risk assessment.

Inaccurate Convective Heat Transfer Coefficient Analysis

Birds in flight transfer heat to the surrounding air due to convection, or contact with air molecules. The extent of the convective heat transfer is estimated by calculating a heat transfer coefficient using analytical approaches that have been developed to study the dynamics of fluids and gases. The appropriate formula for estimating the heat transfer coefficient, and the coefficient's value, are markedly different under conditions in which the applicable airflow is characterized as laminar or turbulent. A laminar airflow over a body would be perfectly uniform with air molecules moving in the same direction parallel to the body's surface. Under turbulent conditions, air molecules move randomly and are characterized by various eddies and irregular molecular movements relative to a body's surface. In general, birds transfer more heat by convection under turbulent than laminar airflow conditions.

The extent to which airflow conditions are considered to be laminar or turbulent (or the "transition point" between these two conditions) is typically determined with reference to the Reynolds number, a dimensionless factor used to approximate the ratio of inertial forces to viscous forces in fluid and gas dynamics applications. The FSA BIO-2 appendix suggests that the transition between laminar and turbulent flow conditions occurs when the Reynolds number approaches 500,000. This transition value, however, is applicable only to perfectly laminar airflow around a large, smooth flat plate. The airflow around a bird in flight is substantially more complex and consists of areas of laminar and turbulent flow. Most of the flight feathers of concern in the FSA are located along the back or trailing edge of the wings and tail where turbulent conditions occur. The use of an idealized, flat plate approach that assumes a perfect, laminar airflow to estimate an

avian heat transfer coefficient is inappropriate due to the complexity of real world avian airflow conditions, and the exposure of flight feathers to generally turbulent air flows. As discussed below, the only published empirical estimate of an avian heat transfer coefficient identified a value that is consistent with the use of a turbulent flow formula and is inconsistent with the FSA results obtained by using a laminar flow formula (see Ward, et al., Heat Transfer From Starlings *Sturnus Vulgaris* During Flight, *The Journal of Experimental Biology* pp.1589–1602, 1999).

The convective heat transfer coefficient (*h)* is calculated by the formula:

h = k_{air} * Nu / L

Where:

k_{air} is the thermal conductivity of air;

Nu is the Nusselt number, which represents the ratio of convective to conductive heat transfers across a boundary; and

L is a characteristic length (the CEC staff uses 6 inches, for example, to approximate a typical bird chord length, or the distance from the front to the rear of a wing).

The Nusselt number is calculated with reference to the Reynolds number and a second factor, the Prandtl number, which is used to approximate the ratio of specific heat and dynamic viscosity to thermal conductivity. The Prandtl number has been estimated to have a value of approximately 0.7 for dry air under ambient desert temperature conditions. Substantially different equations are used to calculate the Nusselt number when the applicable airflow is characterized by either laminar or turbulent conditions.

The FSA improperly calculates the heat transfer coefficient by using the Nusselt number equation for laminar conditions, which is calculated as:

Nusselt number = 0.664 * Reynolds number^(1/2) * Prandtl number^(1/3)

(Incopera et al., 2007, *Fundamentals of Heat and Mass Transfer* (6th ed.). Hoboken: Wiley, page 408, equation 7.23).

For turbulent conditions, the appropriate Nusselt number formula is:

Nusselt number=0.0592* Reynolds number^(4/5) * Prandtl number^(1/3)

(Incopera et al., 2007, *Fundamentals of Heat and Mass Transfer* (6th ed.). Hoboken: Wiley, page 411, equation 7.36).

Due to this error, the FSA significantly understates the magnitude of the convective heat transfer coefficient and the extent to which heat will be lost by a bird in flight. Under laminar airflow conditions, the heat transfer coefficient as calculated in the FSA is approximately 28.5 watts per meter squared-Kelvin (W/m^2-K).

$$h_c = \frac{k_{air}}{L} Nu = 0.664 \frac{k_{air}}{L} \sqrt{\mathrm{Re}} \sqrt[3]{\mathrm{Pr}} \cong 28.5$$

When the heat transfer coefficient is correctly calculated to account for turbulent conditions, the result is approximately 71.8 W/m^2-K.

$$h_c = \frac{k_{air}}{L} Nu = 0.0592 \frac{k_{air}}{L} (\mathrm{Re})^{4/5} \sqrt[3]{\mathrm{Pr}} \cong 71.8$$

A value of 71.8 W/m^2-K is consistent with the only available published estimate of an avian heat transfer coefficient using empirical measurements (Ward, et al., Heat Transfer From Starlings *Sturnus Vulgaris* During Flight, *The Journal of Experimental Biology* pp.1589–1602, 1999). The study estimated heat transfer coefficients for starlings using several methods, including a laboratory model of a flying bird. Using empirical data, the study concluded that the value of the heat transfer coefficient for an entire starling was approximately 63 W/m^2-C (Ward et al., p. 1594). This estimated value corresponds much more closely with the 71.8 W/m^2-K result assuming turbulent conditions than the FSA estimate of 28.5 W/m^2-K assuming laminar airflow conditions.

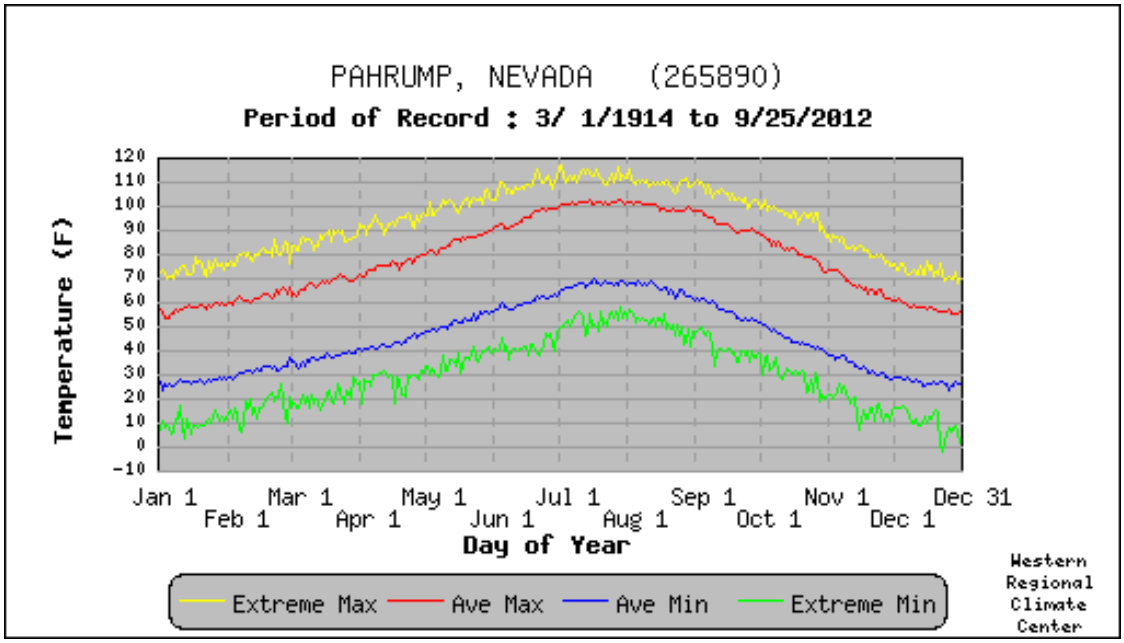
The failure to correctly calculate the convective heat transfer coefficient represents a significant analytical error in the FSA risk assessment. During flight, birds will convectively transfer significantly more heat to the surrounding air than assumed in the FSA analysis. As a result, the FSA substantially overstates the level of solar flux that could potentially produce feather temperatures of 160^o C.

Excessively High Ambient Temperature Assumptions

Ambient air temperatures affect the extent and rate of avian heat transfers to and from the surrounding environment. The FSA uses an extremely high ambient air temperature in the analysis that actually occur only a few days per year and for only for relatively brief periods during these days in the project area. The FSA assumes that each and every day of the year, even during winter months, is characterized by an ambient air temperature of 45^o C, or 113^o F. As shown in Figure 3, average temperatures in the vicinity of the proposed project almost never reach 45^o C. Even the “extreme maximum” temperatures recorded for the region have rarely approached the levels assumed by CEC staff over a 98-year period of record.

Additionally, the FSA fails to consider that during the hottest days, the level of avian activity diminishes as most birds will tend to limit movement or seek shaded microclimates to avoid heat. Summer is also not a significant migratory period in desert regions. These behavioral factors significantly reduce the risk to avian species at times when temperatures in the vicinity of the project would approach the ambient air temperature of 45^o C assumed in the FSA (see, e.g., Wolf, B., *Global warming and avian occupancy of hot deserts; a physiological and behavioral perspective*, Revista Chilena de Historia Natural 73: 395-400, 2000) (“Behaviorally, desert birds respond to heat stress by drastically reducing activity during the hottest parts of the day and selecting cool shaded microsites.”)

Figure 3
Historical Temperatures at Pahrump, Nevada
1914-2012



Source: http://www.wrcc.dri.edu/cgi-bin/cliMAIN.pl?nv5890

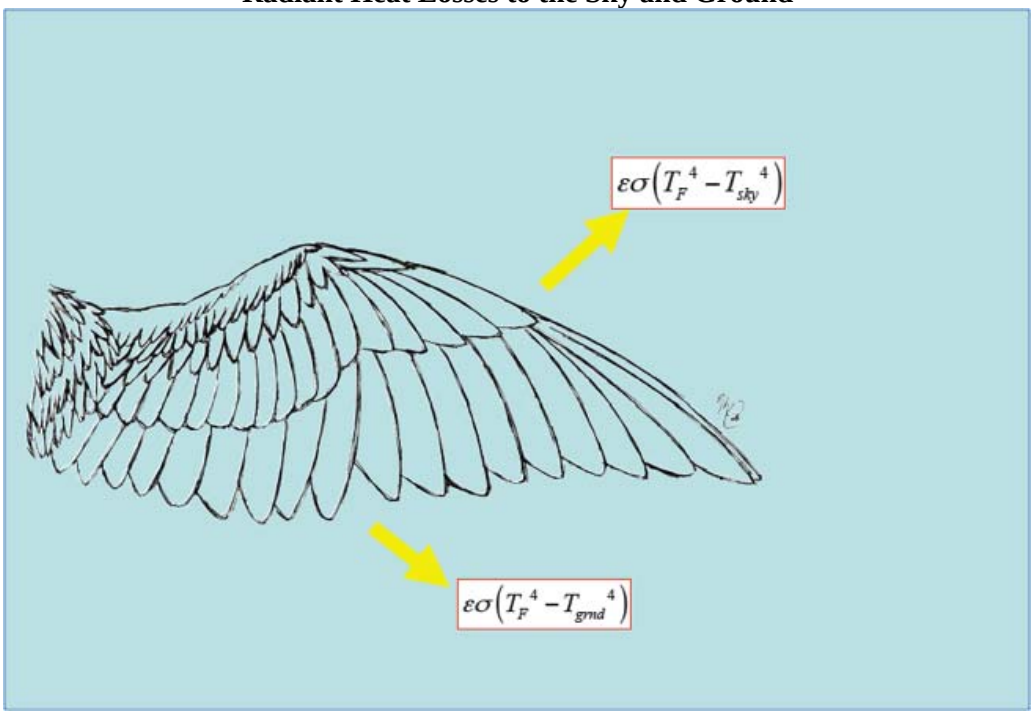
Figure 3 shows that average maximum temperatures from about mid September to mid June do not exceed approximately 32° C or 90° F and do not exceed approximately 27° C or 80° F from mid-October to May in the vicinity of the project. These months correspond with the time of year when resident and migratory birds would likely to be more active in desert regions. The FSA risk assessment substantially mischaracterizes the extent to which solar flux could result in feather temperatures at or above 160° C by overstating the applicable ambient temperature.

BIO-2 acknowledges this problem by conceding that "the flux level to reach 160 °C on a surface" will increase by "about 0.2 kW/m^2" for each 4 °C reduction from the assumed ambient temperature. This factor significantly affects the FSA analysis under normal, typical temperature conditions in the vicinity of the project site. As shown in Figure 3, the average maximum temperature in the region is less than or equal to approximately 27° C (80° F) from mid-October to May. Based solely on adjusting the ambient temperature used in the FSA, the flux levels potentially associated with feather damage are understated by approximately 16% during this period. Consequently, the FSA approach inaccurately characterizes avian flux risks for most of the year, including the months when birds would likely to be more active, by assuming an excessively high, year-round ambient temperature of 45° C.

Inaccurate Radiant Heat Loss Analysis

As shown in Figure 4, birds radiate heat in proportion to the difference between feather surface temperatures and the radiant temperatures of the sky and ground.

Figure 4
Radiant Heat Losses to the Sky and Ground



NOTES:
ε is a body's emissivity;
σ is the Stefan-Boltzmann constant, which is equal to $5.67 \cdot 10^{-8} Wm^{-2}K^{-4}$;
T_F is the feather surface temperature; and
T_{sky} and T_{grnd} represent the radiant temperatures of the sky and ground, respectively.

The FSA does not properly distinguish between radiant heat losses to the ground and sky, and assumes that both sky and ground temperatures are equal to an ambient air temperature of 45 °C. Although this approach may reasonably approximate radiant heat losses to the ground, it significantly understates the extent of radiant heat losses to the sky. In desert regions with low humidity and generally clear skies, the radiant temperature of the sky is approximately 0 °C, substantially lower than the 45 °C temperature erroneously assumed in the FSA (see e.g., C. Bohren and E. Clothiaux, *Fundamentals of Atmospheric Radiation*, John Wiley & Sons, 2006). Many desert animals expose shade portions of their bodies to the desert sky during the day precisely to facilitate heat loss due to the significant differential between body temperatures, ambient temperatures, and the much lower radiant sky temperature. The failure to properly account for radiant sky temperatures significantly biases the FSA analysis towards an insupportably low estimate of the level of solar flux that could heat feather surfaces to 160 °C.

Additional Analytical Errors and Concerns

The FSA risk analysis incorporates several other analytical errors and unsupportable assumptions, which, if corrected, would tend to further increase the potential level of solar flux that might damage feathers, including the following:

1) *Failure to account for three-dimensional nature of the flux field.* The FSA analysis does not appear to recognize that the flux field is three dimensional and that higher flux levels only occur within a relatively narrow elevation band extending from the upper reaches of the central tower. BIO-1, Figure 6, for example, inaccurately depicts varying zones of flux within a solar field as if they extend in only two dimensions, an approach that greatly overstates the extent of potential avian solar flux exposure. The three-dimensional character of the flux field has been documented by the applicant in materials presented to the CEC staff (see, e.g. WebEx Recording, Documents and Presentations, Applicant Submitted Power Point Presentation for 082812 Joint Workshop.pdf, posted on the CEC website for proceeding 11-AFC-2 on August 29, 2012, Slides 20 and 22.) These documents show that, because the flux field is three-dimensional and concentrates sunlight towards the upper location of the central towers, over 93% of the total solar field airspace (the location above the solar field where reflected solar flux occurs above ambient levels due to sunlight reflected by the heliostats) would not experience flux greater than approximately 2.5 kW/m^2. Consequently, most birds that might enter the solar field airspace would be likely to encounter solar flux below the 4 kW/m^2 level inaccurately identified in the FSA as a potential concern. The two-dimensional approach utilized in the analysis significantly overstates the extent to which avian movement within the solar field could result in contact with elevated levels of solar flux.

2) *Lack of backside heat loss and solar flux pass-through analysis*. The FSA includes contradictory, scientifically insupportable assumptions about the nature of the potential flux effects to flight feathers and the physical manner by which avian flight structures will dissipate heat. The effects analysis focuses on the extent to which solar flux exposure could damage feathers used in flight. A bird's primary flight feathers are mounted on the wings and tail, locations that are relatively thin, exposed to the air on top and bottom surfaces, and in some locations partially permeable to light. As a result, avian flight-related feathers will be subject to convective and radiant heat losses from both the upper and backside surfaces of the wings, tail and other thinner, exposed body structures, and a certain proportion of solar flux that may contact these areas will pass completely through gaps in the feather assemblage and not be absorbed in any manner. The FSA analysis, however, improperly assumes that flight feathers will experience no backside or pass-through energy losses of any kind. These assumptions are scientifically insupportable and significantly overstate the potential effects of solar flux on flight feathers.

3) *Unsupported speculation regarding heat conduction from feather barbs.* The FSA speculates, without supporting evidence, that heat generated by solar flux would be conducted from the outside feather barbules to internal feather structures. Keratin, however, is an excellent insulator and functions as the primary heat protection adaptation in birds, humans and other species. Given the primary thermal insulation properties of feathers, it is unlikely that keratin could simultaneously insulate yet also conduct heat as suggested in the FSA.

4) *Unsupported speculation regarding ultraviolet light effects*. The FSA recognizes the fact that mirrors used by the HHSEGS facility will not significantly reflect in

the ultraviolet spectrum. Nevertheless, the BIO-1 assessment speculates that facility-related ultraviolet exposure could in some unexplained manner increase feather damage risks. This speculation is unsupported by any scientific or empirical information and is inconsistent with the fact that the facility mirrors will not significantly reflect ultraviolet wavelengths.

5) *Unsupported speculation regarding the propensity of larger birds to experience greater harm from lower flux levels*. BIO-1 Figure 5 suggests that birds with larger chord lengths are at greater risk of harm from solar flux than smaller birds. This result is contradicted by the empirical data submitted to the CEC derived from tests conducted at the Solar Energy Development Center (SEDC) in Israel in July 2012 (see 2012-11-21_Response_to_Staff_Data_Request_Set_3_ TN-68630, docketed on November 21, 2012 in proceeding 11-AFC-2, Exhibit 44). The SEDC tests showed that feather damage from flux exposure was not different in larger test subjects (recently deceased birds) than smaller test subjects. In all test subjects, feather singeing was observed between 50 and 55 kW/m^2. In addition, the 1986 solar facility report cited in the FSA (McCrary et al. *Avian Mortality at a Solar Power Plant,* January 1986)(McCrary) found that all of observed instances of feather singeing included small birds with short wing chords. There is no empirical support for the FSA's claims, and therefore no factual information of any kind that might indicate that larger birds are more susceptible to solar flux feather damage.

6) *Failure to consider convective heat losses attributable to wing movement or other real-world avian behaviors*. Birds physiologically move during flight, including wing flapping motions that rapidly shift large body surface areas through the surrounding air. It is highly likely that convective heat transfers would be substantially increased by such movements. The FSA analysis fails to account for convective heat losses attributable to common avian flight motions and therefore almost certainly overstates the extent to which heat potentially related to solar flux would affect feather surfaces.

Illustration of the Magnitude of FSA Analytical Errors

The multiple analytical errors in the FSA risk assessment substantially overstate estimates of potential avian solar flux impacts and are not scientifically defensible. The extent of these errors can be illustrated by comparing a partial correction of the Staff's analysis to the results presented in the FSA, including the following four adjustments:

(1) Using empirically-verified feather absorptivity values of 0.65, 0.75, and 0.85, which correspond with generally darker plumage, rather than the inapplicable infrared emissivity factor of 0.95 utilized in the FSA;

(2) Using a view factor of 0.342, which is much more representative of the extent to feathers could be exposed to solar flux in flight, rather than the unrealistic, permanently fixed 1.0 view factor used in the FSA analysis;

(3) Using a convective heat transfer coefficient of approximately 71.8 W/m^2-K, which is appropriate for turbulent airflow conditions, rather than the value of 28.5 W/m^2-K used in the FSA; and

(4) Using a radiant sky temperature of 0 °C rather than incorrectly assuming that the radiant sky temperature is equal to an ambient temperature of 45 °C.

Table BR-3 summarizes the estimated level of solar flux that could heat feathers to 160 °C assuming that only the corrections identified above are made to the FSA analysis.

Table BR-3
Corrected Values* of Solar Flux Potentially Associated with Avian Feather Temperatures of 160 °C

Feather Absorptivity	Solar Flux Level Potentially Associated with Feather Damage
0.65	50 kW/m^2
0.75	44 kW/m^2
0.85	39 kW/m^2

* Based on FSA BIO-1, BIO2 and FSA analysis approach corrected to include feather absorptivity values of 0.65, 0.75 and 0.85, a VF of 0.342, a convective heat transfer coefficient of 71.8 W/m^2-K, and a 0 °C sky radiant temperature.

Table BR-3 shows that the FSA assessment overestimates the potential solar flux level associated with a surface feather temperature of 160 °C by at least a factor of 10. If corrected to address other issues, such as additional convective heat transfers associated with wing movements, lighter colored feathers that have lower absorptivity values, and the use of ambient temperatures more reasonably representative of actual project area conditions, the level of solar flux potentially associated with feather surface damage would likely increase further than indicated in Table BR-3. It is important to note that the Table BR-3 results much more closely correspond with the July 2012 empirical observations documented at the SEDC facility (see 2012-11-21_Response_to_Staff_Data_Request_Set_3_TN-68630, docketed on November 21, 2012 in proceeding 11-AFC-2, Exhibit 44). In contrast, there is no empirical evidence that supports the FSA assertion that avian feathers would be damaged by solar flux exposures as low as 4 kW/m^2.

D. Avian Ocular

Dr. Ivan Schwab's report, "Avian Ocular Protective Mechanisms In Response to Noxious Stimuli" is incorporated into this testimony and is attached at the end as Attachment BIO-2. His analysis concludes:

> Given the well-developed protective visual systems birds have, and the speed of flight though any flux field, I believe the chance of significant visual or heat injury to avian species is insignificant. The unique characteristics of the avian nictitans, saccadic oscillations and retinal adaptations discussed above would likely avoid blindness or other ocular harm from reflected sunlight or heat. More generally, avian species would likely use their well-documented speed and airborne agility, and the rapid recognition of danger facilitated by high flicker

fusion rates to learn to avoid direct injury potentially associated with solar reflections or heat in a heliostat field. (Attachment BIO-2, page 6).

E. Avian Collisions

All physical structures associated with the project pose some risk of collision to avian species. The primary features of concern would include the perimeter fence, above ground electrical transmission lines, the tower and the heliostats. Each of these is discussed below.

Perimeter fencing: The perimeter fencing planned for HHSEGS is typical of many fences in the region and presents minimal collision risk due to its low height (8 feet) and highly visible chain link design. Additionally, studies of avian collision injury and fatality completed at comparable facilities (e.g., BrightSource's Solar Energy Development Center, Gemasolar) indicate avian collision with these structures would be very rare.

Above ground transmission lines: The above ground transmission lines associated with the project are sited to avoid sensitive areas (e.g., waterways, riparian habitats, concentrating topography) and are designed and built to APLIC standards to minimize collision and electrocution risk (APLIC 1994, 2006).

Towers: The towers on the HHSEGS facility would generally present minimal collision risk to birds under normal conditions due to their high degree of visibility during both daytime and nighttime conditions and the fact that tower design considerations (i.e., nonlattice structure, no guy wires) minimize collision risk and preclude birds from using the towers for perching or nesting. Risk of collision at night is further minimized through use of intermittent lighting schemes as prescribed by the FAA, which will enhance visibility of the towers under nighttime conditions, but minimize attraction of avian species to the structure. Nocturnal migrants, if present, would be considered most at risk of colliding with the towers; however, under normal weather conditions the majority of nocturnal migrants fly at altitudes well above tower height and typically descend only to access important stopover habitats (e.g., water bodies, woodlands, riparian habitats). Such habitats are not located near the project site, suggesting the tower would present minimal collision risk to nocturnal migrants under normal conditions. However, low visibility weather conditions, such as fog, clouds, and rain, have been implicated in larger-scale avian collision events at communication towers and other tall structures. Nocturnal migrants may be at risk of colliding with the towers during these low visibility events. Fortunately, the HHSEGS site is not located in a known flyway, and as a result the towers are not expected to present significant risk during these infrequent low visibility conditions.

Heliostats: The heliostat structures would generally present minimal collision risk to birds due to their small size, low height, and high degree of visibility; however, the reflective surface of the mirrors may indeed present confusing visual images to birds under certain circumstances that would increase probability of collision. Each heliostat array at HHSEGS is composed of two mirrors approximately 12 feet high by 8.5 feet wide with a reflecting surface of approximately 205 feet; whereas, mirrors at the Solar One project, where low levels of collision mortality were documented, were substantially larger and taller (approximately 500 square feet and

approximately 25 feet in height). Thus, at HHSEGS, only birds that fly very low to the ground would be at risk of colliding with mirrors. Furthermore, the reduced surface area and fragmented reflections resulting from the side-by side, split mirrors at HHSEGS, will provide visible gaps in the reflected landscape that may help birds perceive the mirrors as something to avoid. During typical diurnal operations, the mirrors will be in tracking mode (i.e., angled positions to reflect sunlight towards the receiver). In tracking mode, mirrors would reflect images of the above airspace for birds flying towards them from most angles, and thus operational heliostats are unlikely to confuse a bird's visual interpretation of its surrounding view. It is reasonable to interpret that a bird flying towards a mirror in tracking mode would recognize the mirror as an obstruction, as it is bordered on all sides with the ground, vegetation, and other heliostats, and a bird would thus tend to avoid the mirror. Klem et al. (2004) studied impacts of reflective glass on birds and found that as the angle of glass increases from vertical towards horizontal, the frequency of bird collisions with glass decreases, suggesting that the angled mirror positions during normal operations (tracking mode) is favorable and horizontal condition is ideal with regard to minimizing risk. Mirrors in the stow (vertical) position likely would present the highest collision risk to birds using the habitat in and amongst the heliostats; however, mirrors will not be in this vertical position during the day. The stow position will be used at night for cleaning when most birds are inactive, and may be used to minimize risk of nocturnal migrants confusing the mirror field for water if this measure proves necessary; however, during high winds and all other nonoperational conditions, mirrors will be in the safe (horizontal) position and present no more collision risk to birds onsite than typical manmade, nonreflective structures present throughout disturbed areas of the desert. Mirrors in the safe position at night would appear from above as shiny or grey squares, or as reflections of the night sky bordered by the ground. The mirror field would not look like a water body due to the disrupted image created by the squares, except perhaps from long distances, and thus would not be expected to attract waterfowl or aquatic oriented species. However, if birds perceived the heliostat field as a large water feature from a distance, it is highly likely that as they would recognized the disrupted field of view as they approached and thus take avoidance measures well in advance of collision with a structure. A body of water such as a lake or calm river would appear to overhead observers at night as a contiguous dark body, potentially with long continuous areas of reflection from moonlight, stars or artificial lighting. The fragmented solar fields would not present this effect to overhead avifauna if large areas of adjacent mirrors were in the safe or stow position.

Of utmost importance in understanding risk of avian collision with project features is the abundance and frequency of occurrence of birds in proximity to the structures. McCrary et al. (1984) documented low numbers of collision fatality in an area presenting special attraction to birds as a result of large man made water impoundments and irrigated agricultural fields, both of which produce an abundance of insects. HHSEGS is in a highly xeric environment, with a much less diverse and abundant avian community supported by the surrounding and onsite habitat (see winter, spring, and attached fall avian survey reports). Furthermore, as cited in the FSA, the Point Reyes Bird Observatory ranked the Calvada Springs area of the Pahrump Valley near the project site as low priority, and recommended that these low priority areas be considered first for siting solar and other

renewable energy installations to minimize impacts on breeding birds (Howell and Veloz 2011). Due to the fact that HHSEGS will not have no evaporation ponds, there are no agricultural fields in close proximity, and the project area presents a low density avian community, collision fatalities at HHSEGS are expected to be substantially less (on a per heliostat, or per unit of reflective surface area, or on a per acre basis) than that documented by McCrary et al at Solar One. Furthermore, no special status species are expected at HHSEGS in any level of abundance that would be of concern in the rare event that collision impacts did occur.

The FSA's linear extrapolation of McCrary et al.'s fatally estimates is in direct contradiction with advice presented in the actual McCrary et al. manuscript. McCrary et al. specifically caution against making linear extrapolations from these results to other projects due to anticipated nonlinear relationships of fatality with facility size. There is no data to suggest mirror area at a concentrated solar facility is linearly correlated with fatality numbers, and to extrapolate on a project on the basis of mirror area, or on a per acre of project area basis, , ignores the most basic aspects of avian ecology and aspects influencing avian survival and distribution at industrial facilities. Issues such as facility size, habitat in and near the project after construction, avian density and community composition, differential risks across a site, and advances in technology and design all warrant consideration, and indicate that linear extrapolation based on mirror surface area or project acreage is entirely unsupported from a biological standpoint. Avian, man-made structural, or environmental features that increase or reduce the density of birds near heliostats can account for strike rates at specific locations; therefore, a combination of interacting factors must be considered to explain strike frequency at any particular impact site. It is very likely that collision fatality at HHSEGS will be substantially less than that documented by McCrary et al. at Solar One on a per acre or per unit of mirror area basis, as the sheer size of the project will severely alter habitat functionality over a much wider area than Solar One and thus affect the bird density and distribution across the site. For the many reasons described in this testimony, the HHSEGS will present a very different risk profile than that observed at Solar One.

Existing Avian Studies

Avian use and mortality surveys have been conducted at two operational concentrating solar power (CSP) facilities, the Solar Energy Development Center (SEDC) located in the Negev desert in southern Israel, and the Gemasolar renewable energy facility in Fuentes de Andalucia, Spain. Both are located in regions that are subject to substantial resident and migratory avian activity. Notwithstanding significant periods of observation, no birds with evidence of solar flux impacts have been detected at either the SEDC or Gemasolar facilities. Nine avian mortalities have been detected at SEDC, of which two exhibited evidence of potential collision injuries. The causes of the other seven mortalities could not be determined.

The absence of any observed solar flux-related avian injury or death, and the low level of potential collision mortalities detected by the SEDC and Gemasolar survey teams does not support the FSA's assertions regarding the extent of avian impacts potentially associated with CSP facilities generally, and the HHSEGS project in particular.

SEDC Avian Surveys

SEDC is owned by BrightSource Industries, Israel (BSII) and is located in the Negev desert region approximately 10 miles west of the African-Syrian Rift Valley, one of the largest bird migration flyways in the world (see Figure 5).

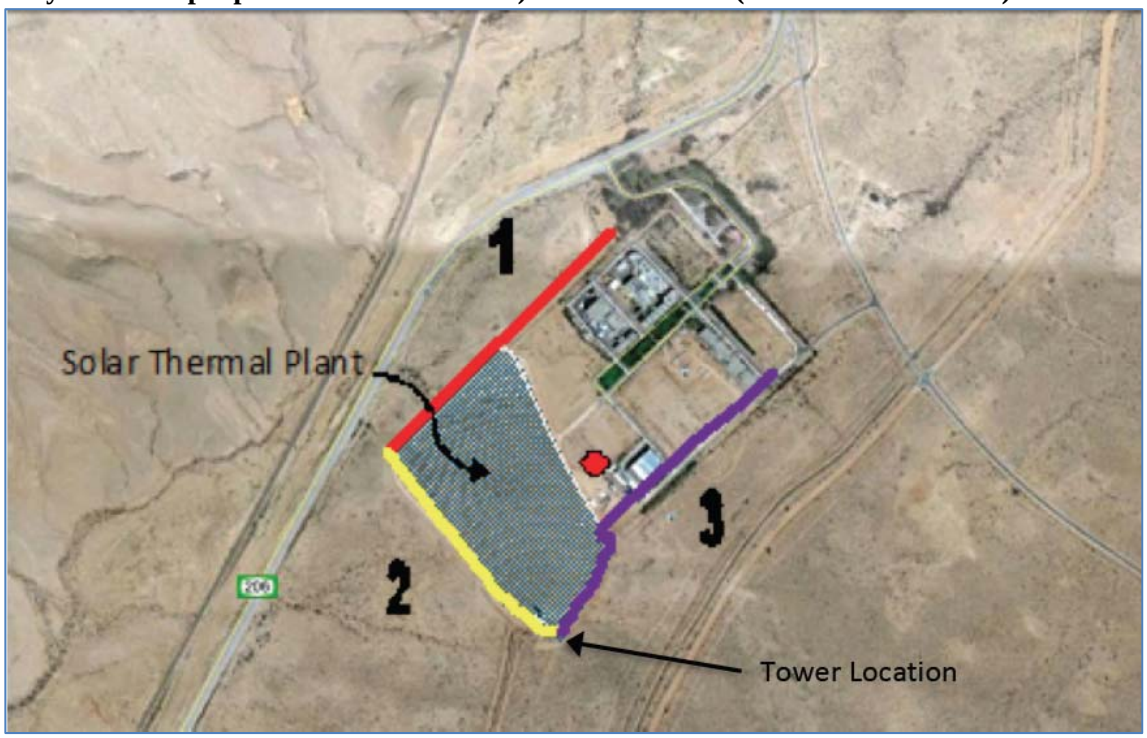
Figure 5
SEDC Facility Regional Location (Point "A")

The facility has been operational since 2008 and consists of more than 1,600 heliostats within an approximately 83,000 square meter (20.5 acre) solar field. The heliostats direct reflected sunlight towards a receiver at the top of a 75-meter tower on the southern edge of the field. SEDC generates the same maximum solar flux intensity of approximately 400-600 kw/m^2 at the receiver surface that would be produced by the proposed HHSEGS project.

In March 2012 BSII contracted with Bio-Logic Consulting and the Society for the Protection of Nature in Israel, Israel Ornithological Center, to conduct seasonal avian use and mortality surveys at SEDC. The SEDC research team has substantial avian survey experience and knowledge of the avian species that occur in the Negev region. The survey protocols developed for the SEDC facility include: (1) point counts from a location with clear visibility of the entire facility and the surrounding landscape, (2) transect surveys from three transects located along the border of the solar field; and (3) mortality surveys of the entire solar field using pedestrian transects spaced at 20 meter intervals. Figure

6 shows the point count location, the three transect survey routes, and the layout of the solar field and adjacent facilities.

Figure 6
SEDC Survey Point Count Location (red dot), Transect Survey Routes (red, yellow and purple lines numbered 1-3) and Solar Field (Solar Thermal Plant)



Three seasons have been evaluated at SEDC, including: (1) spring surveys from March 12 to May 15, 2012 (Exhibit 66); (2) summer surveys in June and July, 2012 (Attachment BIO-3); and (3) autumn surveys from August 15 to October 15, 2012 (Attachment BIO-4). Avian point count and transect surveys were conducted five days each week during the spring and autumn, and five days each month (a total of 10 surveys) during summer, from approximately 7:30 AM to 3:30 PM each day. To date, approximately 90 days of avian use surveys and 16 transect surveys have been conducted at SEDC (Table BR-4). Mortality surveys were conducted approximately four days per week in the spring and autumn, and each day the avian use surveys were conducted during the summer, which resulted in complete solar field coverage often within successive 24-hour intervals. Each mortality survey was initiated at approximately 7:30 AM and extended until the entire solar field was surveyed by walking routes approximately 20 meters apart through the heliostats and in front of the central tower. To date, approximately 74 mortality surveys have been conducted at SEDC, many of which were conducted on consecutive days (e.g., four days in a row)(see Table BR-4).

Table BR-4
Number of Avian Use Transect, and Mortality Surveys Conducted at SEDC, March-October 2012

Survey Season	Avian Use Surveys (days)	Transect Surveys (number)	Mortality Surveys (days)*
Spring	41	7	33
Summer	10	3	10
Autumn	39	6	31
TOTAL	**90**	**16**	**74**

* Minimum survey frequency of four times per week in spring and autumn.

Table BR-5 summarizes the SEDC survey results from March to October 2012. The number of avian species detected by the research team ranged from 62 in spring to 18 in the summer. Approximately 15,088 bird observations were recorded. In approximately 74 days of full field fatality monitoring, nine dead birds and no (0) injured birds were found.

Table BR-5
Avian Species, Individuals and Mortalities Detected during the SEDC Surveys, March-October 2012

Survey Season	Species (number)	Bird Observations (number)	Avian Mortalities (number)
Spring	62	8,805	3
Summer	18	229	0
Autumn	32	6,054	6
TOTAL		**15,088**	**9**

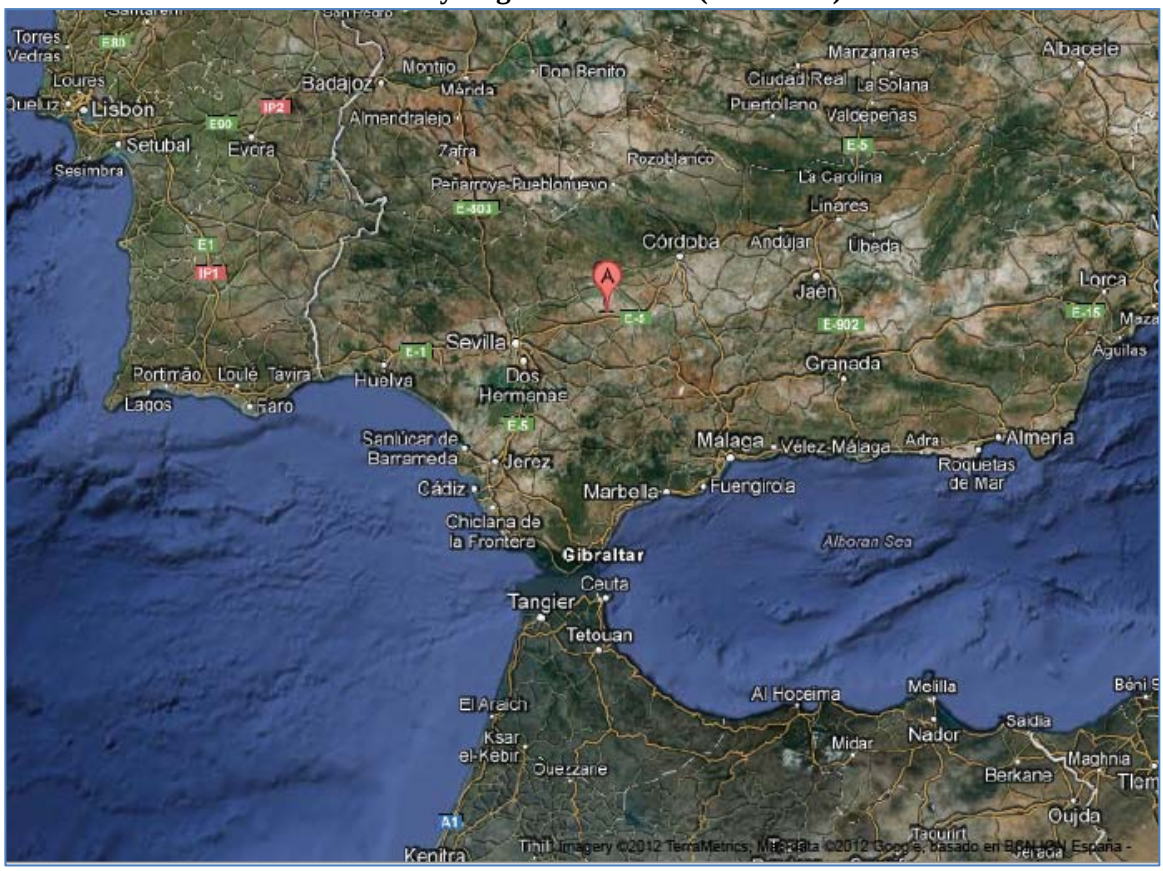
The SEDC facility is sparsely vegetated, resulting in near complete visibility of the ground surface. Thus, avian mortalities within the solar field would be relatively easy to detect, particularly at the 20 meter transect spacing used to conduct each mortality survey. Three avian mortalities were detected in the spring, none in the summer, and six in the fall. The spring mortalities included a chiffchaff, blackcap and nestling Tristram's grackle and the fall mortalities included a Tristram's grackle and five little bitterns. The grackle nestling appeared to have fallen from a nest located on the solar tower. The chiffchaff and blackcap are small migrant passerines with high natural mortality rates, and those found onsite exhibited no evidence of broken bones from collisions or singed feathers. The Tristram's grackle detected in fall was reported to have collided with a mirror, and the five little bitterns were located together, in approximately the same location near the perimeter fence, although cause of death was not determined. None of the bitterns exhibited evidence of broken bones from collisions or singed feathers.

Gemasolar Avian Surveys

Gemasolar is located in the municipality of Fuentes de Andalucia in southern Spain (see Figure 7). Significant avian use is known to occur in this region. The facility was built on a

portion of the approximately 53.5 million square meter (13,220 acre) La Monclova estate, an historic open space and agricultural landholding with substantial avian functions and values. La Monclova is managed by two gamekeepers who are on the site on a daily basis.

Figure 7
Gemasolar Facility Regional Location (Point "A")

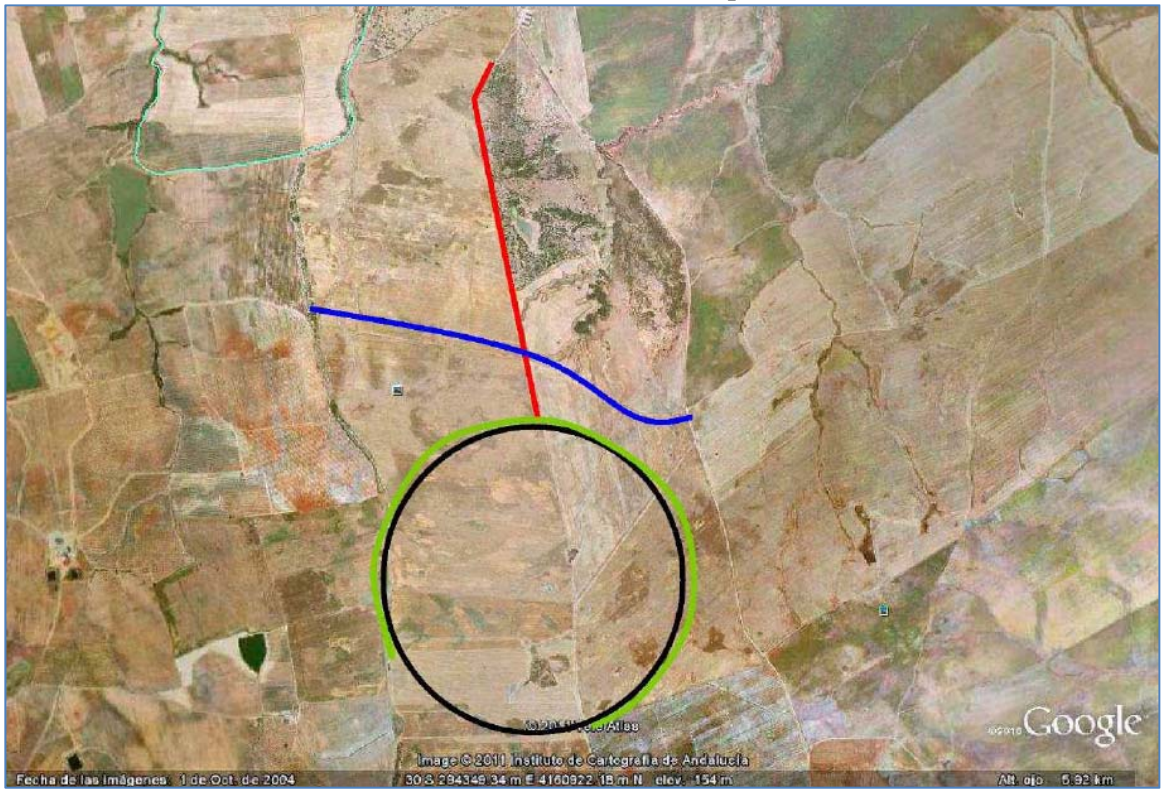


The Gemasolar facility consists of 2,650 heliostats arrayed in a circular area of approximately 1.85 million square meters (457 acres). The heliostats focus reflected sunlight on a central tower that is approximately 140 meters in height (see Figure 8). Gemasolar has been operational since late 2011 and is owned by Torresol Energy Investments (Torresol). Similar to HHSEGS, the heliostat field entirely surrounds the central tower and the tower heights are comparable. In contrast with the proposed project, Gemasolar is located in an area of intensive agricultural activity and adjacent to significant artificial and natural surface water features (see Figure 4, which depicts a large water feature near the upper boundary of the solar field).

Figure 8
Aerial Photograph of the Gemasolar Facility

The permits and approvals for Gemasolar require avian impact monitoring during facility construction and operation. In 2008, Torresol engaged a research team managed by Dr. Juan M. Pleguezuelos, Professor of Zoology at the University of Granada, to design and implement a survey protocol to address this regulatory requirement. The protocol evaluates avian species composition and abundance in three focus areas : (1) within and around the perimeter of the solar facility (the “circle survey area”); (2) an east/west trending transect ranging from approximately 400 to 1,000 meters north of the solar field (the “north circle survey area”); and (3) a north/south trending transect extending to approximately 3,000 meters north of the facility (the “Carril del Marques survey area”) (see Figure 9). These survey locations were selected to provide information concerning avian use and potential impacts within the solar facility, and in adjacent areas located moderately close to and farther from the facility.

Figure 9
Locations of the Circle Survey Area (black and green),
North Circle Survey Area (blue), and Carril del Marques Survey Area (red)
Gemasolar, Fuentes de Andalucia, Spain



Dr. Pleguezuelos and his research team have conducted avian surveys at the Gemasolar site since 2008, and the surveys are scheduled to continue until at least 2014. To date, the following avian surveys have been completed at the facility:

- Preconstruction surveys: three surveys completed during winter 2008-2009 that provided baseline avian use information about the site.
- Construction–period surveys: surveys conducted twice per month during the breeding season (April-July) and once per month outside the breeding season from 2009 to July 2011.
- Operational–period surveys: surveys conducted twice per month during the breeding season (April-July) and once per at other times of the year since July 2011 and extending to 2014.
- Operational mortality surveys: Four focused mortality surveys conducted by physically walking within the heliostat field, including two full-field mortality surveys in 2011 and two full-field mortality surveys in 2012.
- Operational avian risk surveys: Approximately 26 hours of observations focused on avian behavior within the solar field and within areas where elevated levels of solar flux could be encountered by birds in flight.
- Several additional field surveys have been conducted by Dr. Pleguezuelos in the vicinity of Gemasolar for scientific research purposes, and he has coordinated

with the La Monclova gamekeepers regarding assessment of avian injury or mortality in the solar field or on adjacent land.

The Gemasolar surveys have documented 73 avian species within the vicinity of the facility, and 53 were observed within the solar field. Eight species have nested in the facility. The survey team's findings to date include the following:

- The construction and operation of Gemasolar has not adversely affected the diversity and abundance of avian species in adjacent locations.
- Birds have been observed flying through areas of concentrated solar flux on several occasions, but no injuries or mortality from this exposure have been detected.
- The solar field is generally flat and clear of vegetation, and avian mortalities that might occur in the facility would be relatively easy to detect. To date, Dr. Pleguezuelos' survey team has not detected any avian mortality or injured birds within or adjacent to the solar field that exhibit evidence of harm from solar flux or facility-related collisions.
- The La Monclova gamekeepers, who monitor avian and other species activity within the estate on a daily basis, have not reported any avian mortality or injured birds that exhibit evidence of harm from solar flux or facility-related collisions.

F. Golden Eagle/MBTA/Fully Protected Species

Golden Eagles are the only California fully protected Species with potential to occur on the project site. They are further protected under the federal Bald and Golden Eagle Protection Act, federal Migratory Bird Treaty Act, and Sections 3503.5 (raptors) and 3513 (migratory birds) of the California Fish and Game Code. The FSA asserts that project impacts to golden eagles could be potentially significant, and that the project will contribute to significant and unavoidable cumulative impacts to this species even with the implementation of the recommended conditions of certification. The FSA indicates that potential direct impacts could include loss and fragmentation of habitat, disturbance or mortality during construction and operation, displacement and disruption of movement, collision, electrocution, glare, and exposure to solar flux, yet provides no basis for these assertions. The FSA further indicates that indirect impacts include fragmentation of the local population, habitat degradation, and other issues affecting eagle use of the site.

The FSA's significance conclusions are not supported by the applicable evidence of golden eagle use and occurrence in the project area. Surveys completed in accordance with BLM and FWS recommended protocols have documented that the project site, which has been subject to previous disturbance, does not provide any nesting or roosting habitat for golden eagles, and is not subject to regular or consistent foraging use by the species.

Two eagle nest surveys demonstrate that the nearest potentially occupied golden eagle nest is located approximately 5 miles west of the proposed facility. During spring 2011 avian studies, no golden eagles were documented during 26 hours of standardized avian use surveys, although one golden eagle was documented incidentally. During the winter 2011-12 surveys, which consisted of 58 hours avian surveys, 13 eagle observations were

recorded; however, only 7 of these were on the project site, and only 8 were recorded during the 32 hours of standardized raptor-use surveys. Five of the 13 sightings were associated with perching on an existing transmission line located east of the project area, which provides an artificial perch structure within the surrounding habitat. It is likely that the number of observations would have been substantially lower if these artificial perch subsidies were not available because the project area otherwise exhibits little eagle foraging activity based on the survey results, and it is probable that these observations were of the same individuals repeatedly using the project site. Five of the winter 2011-12 observations were also located outside of the project area. During the fall 2012 surveys (Chatfield et al. 2012), no eagles were recorded onsite in 177 hours of raptor use surveys and 26 hours of songbird surveys. Two eagles were reported incidentally, outside of the standardized survey in flight during these surveys, flying over but not using project area habitat (Attachment BIO-1) Winter 2012-13 surveys are currently being conducted, and from December 1, 2012 to January 16, 2013, two observations of eagles in flight over the proposed facility have been made in 126 hours of observation. The limited foraging use of the site, and low occurrence levels in general, even when facilitated by artificially created power line perching subsidies, indicates that project impacts to foraging habitat will not significantly affect or contribute to significant cumulative impacts to golden eagles.

The project could potentially create collision and concentrated solar flux hazards for avian species in general (see “Operational Impacts to Wildlife,” above). The Applicant is coordinating with the USFWS on development of a Breeding Bird Conservation Strategy (i.e., Avian Protection Plan) and robust monitoring and adaptive management plan to avoid, minimize and mitigate potential impacts to avian species in general. No take of eagles is anticipated by this project and an Eagle Conservation Plan will not be generated. Based on the best available information, the incidence of golden eagles in the region is low and expected to remain relatively limited over time. The low latent possibility of golden eagle occurrence near the project will be substantially reduced to an additional extent by construction and operational conditions and applicant measures that will discourage species use. The towers and larger structures designs will eliminate perching opportunities for golden eagles and be incompatible with nesting, and therefore will provide no attraction that would encourage eagle use of the airspace near the facility. Due to the design and geometry of the surrounding heliostat field, high levels of concentrated solar flux occur only around the upper reaches of each central tower. The lack of perching or nesting opportunities on or near the towers, and electrical energy generation noise from turbines and related industrial activities at the base of each tower will discourage, and likely will, any eagle use within these locations. The heliostat fields are also unlikely to attract eagles because they will appear visually to be substantially distinct from the species’ natural habitat. Golden eagles as a rule are known to respond to human activities at greater distances than many other raptors and can be expected to avoid the heliostat field well before any potential concentrated solar flux or collision hazards might be encountered (see, e.g., Pagel et al. 2010, Section V for a discussion of golden eagle response to anthropormorphic activities and Colorado Department of Wildlife, Recommended Buffer Zones And Seasonal Restrictions For Colorado Raptors, 2008 which states, consistent with several published studies, that golden eagles are known to respond to anthropormorphic activities at longer distances than most other raptors) Golden eagles are also diurnal raptors and highly unlikely to collide with facility structures during flight. All project power lines and power poles will be constructed and maintained in a “raptor-safe” manner in accordance with the APLIC (1994, 2006) guidelines, which will eliminate electrocution risks and avoid

transmission facility collisions. As a result, the risk of golden eagle impacts related to facility collisions or concentrated solar flux exposure is remote and no such impacts are anticipated. Golden eagles are expected to avoid the facility during construction and operation.

G. Special-Status Plants

There are no ESA and CESA listed plants on the HHSEGS site. However, the CEC found in the FSA that impacts to four special-status plants are considered significant and mitigation is required. We do not agree that these plants necessarily meet the CEQA definition of "rare". Plants that are not rare as defined by CEQA are subject to the general provisions of CEQA, but they enjoy no "special status" in the eyes of the law; these plants are neither endangered, threatened, rare, listed under the federal or state endangered species acts, nor are they candidates for such lists. "Rare" plants are not protected by CESA which focuses on endangered, threatened, and candidate species.

The designation of a species as "rare" has legal significance under CEQA; however, to be afforded this additional protection, the plant species must meet the legal definition of "rare" under CEQA on the basis of substantial evidence. The applicant argued in its PSA comments that the identified plants do not meet the CEQA definition of rare because there is no substantial evidence showing that the species is existing in such small numbers throughout all or a significant portion of its range that it may become endangered if its environment worsens or is likely to become endangered within the foreseeable future throughout all or a significant portion of its range and may be considered "threatened" as that term is used in ESA. The FSA cannot simply assume that the plants are endangered.

These Plants Are Not As Limited In Distribution or Number as Stated In The FSA.

Prior to commencing surveys of the site in 2010, information on the abundance and distribution of these special-status plants was limited. Because little was known about these special-status plants, offsite surveys were conducted in 2011 and 2012 to obtain additional information. Spring 2012 was unusually dry. Numerous localities for some special-status plant species were identified and documented offsite in 2012 (in some instances by using only prior-year dead plant material). However, due to the drought, some species of special-status plants found in 2011 did not germinate and/or grow in 2012, even in places where they are known to occur. For example, living plants of Wheeler's skeletonweed and gravel milkvetch were not observed in spring 2012 even in locations where they had previously been identified in 2011.

Gravel milk-vetch did not have conservation status at the time that the 2011 HHSEGS site survey or 2011 offsite surveys were conducted; consequently, there were no focused surveys for the species in 2011. It was detected onsite because the surveys in 2011 were floristic; all species were identified to a level necessary to identify new or rare species, if present. Gravel milk-vetch was added to the CNPS Inventory in October 2011.

No additional occurrences of gravel milk-vetch were found during the spring 2012 offsite surveys. However, drought conditions during the 2012 spring surveys likely adversely and negatively affected survey findings.

As described in the FSA, there is high potential for Torrey's joint-fir to be considerably more common than currently known. To address this in the FSA, Condition of

Certification BIO-20 allows pre-construction surveys for Torrey's joint-fir. Surveys for Torrey's joint-fir will be performed onsite and compensatory mitigation for this species will be adjusted based on results of the surveys.

Gravel milkvetch, Preuss' milkvetch, and Wheeler's skeletonweed also have high potential to occur offsite in higher numbers than currently known. For example, Gravel milkvetch was not even added to the CNPS List until October 2011, after 2011 site surveys were completed. Additional offsite surveys were performed for these species in 2012, but the survey findings were strongly and negatively influenced by the drought conditions. Due to the drought in 2012, opportunities to find additional occurrences of the other special-status species were limited as well. As described in the next section below, the Applicant requests that any new findings for these three special-status plants be treated consistently with Torrey's jointfir and that these finds also be incorporated into the final compensatory mitigation developed for the project.

Additional Flexibility in Developing Compensatory Mitigation

BIO-20 describes compensatory mitigation for the special-status plants for which impacts are considered significant. Taking into account the 2:1 and 3:1 mitigation ratios proposed in BIO-20, acquisition of several parcels of private land would be required. Based on the Applicant's experience with special-status plant land acquisition, this amount of private land acquisition will be extremely difficult. First, access agreements and permission to survey must be obtained. Then, surveys need to be performed on numerous properties (and this can be a multiple-year effort, should drought conditions occur) to find the needed number of special-status plant occurrences with habitat conditions the same or better than those impacted. Next, after special-status plants are confirmed on a percentage of the properties surveyed, some small number of landowners would be expected to be willing to sell their land. All of these steps work in combination to shrink the pool of available suitable private land and requires a substantial amount of time and effort to complete. The Applicant understands the CDFG has experienced similar difficulty in finding suitable lands for purchase as it implements its Advanced Mitigation Program and in lieu fee program created by Senate Bill x8 34. Based on the Applicant's similar experiences with finding suitable mitigation lands for the ISEGS project, it could take up to three years or more to complete these tasks, particularly if there is a drought year when plants cannot be detected and surveys are delayed. For these reasons, additional mitigation options to increase flexibility, and adjustments to increase the timeline allotted to complete the mitigation process are necessary.

For the above reasons, the Applicant requests that additional compensatory mitigation options be allowed and that overly-specific language that constrains flexibility in the FSA be modified. Due to the scarcity of private land and challenges finding occurrences for enhancement/restoration, the Applicant requests that an additional mitigation approach, an in lieu mitigation option, be added as a contingency. Under an in lieu special-status plant mitigation approach, the project owner would be solely responsible for establishing and contributing funds to an in lieu mitigation program as described in the Conditions of Certification.

H. Wetlands/Waters of the US: Mitigation and ratios

Applicant is generally in agreement with the FSA, with respect to Waters of the U.S.

I. Waters of the State

Applicant is generally in agreement with the FSA, with respect to the onsite acreage of waters of the State. The FSA contains errors regarding the delineation of State jurisdictional waters (e.g., see paragraph below for suggested correction). In addition, the Applicant provided additional information regarding wildlife habitat values for the desert washes on site. Lastly, the Applicant provided information regarding the staff's proposed mitigation ratio for impacts to state waters.

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Proposed Corrections to "Jurisdictional Waters of the State and Waters of the U.S."

The Applicant has modified the paragraph below to correct an error and to provide more details regarding delineation of the Waters of the State and Waters of the U.S.

> A total of 23.82 acres of jurisdictional Waters of the State, including single-thread channel and braided ephemeral streams, were delineated by the applicant on the proposed project site (URS 2012b). ~~Of these 23.21 acres, 0.42 acres are also Waters of the United States.~~ Six of the features are also depicted as blue line features on the U.S. Geological Survey (USGS) topographic maps. ~~During an August 2012 field verification of the applicant's state waters delineation (URS 2012b), an additional nine ephemeral streams were identified within the project boundary.~~ Features mapped as "nonjurisdictional waters" in the preliminary State waters delineation report (i.e., pooling areas, moist pooling areas, alkaline soils areas, sheet flow areas) were confirmed by the Energy Commission, ~~and~~ CDFG, and the RWQCB as not constituting waters of the State. The CEC and CDFG conducted a site visit to verify the state waters delineation in August 2012. The CEC provided the applicant with data representing 9 additional drainages, adding an additional 3.13 acres of jurisdictional waters of the state within the project boundary. With the addition of the 3.13 acres by the CEC, the areal extent of State jurisdictional waters within the HHSEGS project boundary totals 23.21 acres (CH2 2012mm**)**. Of these 23.21 acres, 0.42 acres are also Waters of the United States.

Offsite Extent of State Jurisdictional Waters: In addition, the Applicant believes that the FSA incorrectly states that there is 0.4 acre of offsite waters upstream of the project site, in California. In fact, all drainages upstream of the eastern boundary are in the state of Nevada.

Wildlife Habitat Functions: Applicant's PSA comments emphasized that BIO-22 should be deleted in its entirety because the HHSEG's potential effects on desert washes and mitigation required are inappropriate; no direct linkage between onsite streams and associated aquatic life and wildlife was made; and the PSA emphasis was on plant life. In the FSA, additional discussion is provided by CEC staff pertaining to habitat functions and values associated with ephemeral desert washes, in general, and on the project site, in particular, based on staff's observations. Staff incorrectly interprets Applicant's PSA comments to state that no washes on the site have wildlife functions and values. The Applicant acknowledges the extensive basis in the scientific literature that documents

the ecological importance of ephemeral streams, and Applicant does not disagree that some of the ephemeral drainages on the site have important wildlife functions; in fact, characteristics such as differences in vegetation communities that suggested a wetter regime compared to adjacent uplands were the basis for USACE's determination that two interstate drainages would be regulated under Section 404 of the CWA.

Instead, Applicant's comments stated that wildlife habitat functions within onsite drainages are not equally reflected across the entire project site; and some drainages that are narrow, shallow and poorly expressed, with vegetation types and densities similar to that of adjacent uplands, likely have little distinct wildlife habitat function that differs substantially from that of the adjacent uplands. The Waters of the U.S. delineation report(s) states "The same vegetation is found along the drainage system as in upland areas. In many drainage locations, however, a higher density of vegetation was observed." Photographs provided in the waters of the U.S./State report(s) document that some streambeds are devoid of vegetation, and the types and densities of vegetation on streambanks appears similar to that of the surrounding uplands (for example, see wash ID #4 in the waters of the State jurisdictional delineation report).

Even if it is assumed that 100% of onsite waters of the State exhibit wildlife habitat functions and require mitigation, the Applicant objects to the 2:1 mitigation ratio for onsite waters. Staff states that the 2:1 mitigation ratio was reduced from a mitigation ratio of 3:1 based on the finding that hydrologic and geomorphic functions would be maintained over the life of the project. In fact, the PSA also proposed a mitigation ratio of 2:1; therefore, there is no reduction in mitigation ratio based on what was proposed in the PSA. In addition, it can be argued that some biological functionality will remain following construction of the project, in addition to hydrologic and geomorphic functions.

Compensatory Mitigation Ratio: The FSA states that compensatory mitigation is typically done at a minimum 3:1 mitigation to effect ratio; however, mitigation ratios vary from project to project depending on the specific nature of the impacts. Table BR-6 below summarizes the compensatory mitigation requirement for large solar projects that have been approved in the recent past.

Table BR-6 Summary of Compensatory Mitigation for Previously-Approved Large Solar Projects

Project Name	Commission Decision Document Date	Impact Acreage on State Jurisdictional Waters	Mitigation Ratio Required
Ivanpah Solar, San Bernardino County, CA	September 2010	175 acres	1:1
Imperial Solar, Imperial County, CA	September 2010	Not stated	1:1
Genesis Solar, Riverside County, CA		Direct Impacts: Permanent loss of 69 acres of state waters, including 16 acres of microphyll woodland. Temporary direct impacts to 18 acres. Loss of important wildlife habitat function and values, and impaired or lost hydrologic	Microphyll woodland – 3:1 (48 acres) Unvegetated ephemeral dry wash – 1:1 (53 acres)

Project Name	Commission Decision Document Date	Impact Acreage on State Jurisdictional Waters	Mitigation Ratio Required
		and geomorphic functions necessary to sustain the habitat Indirect Impacts: Permanent loss of hydrological connectivity downstream of the Project, including 21c acres unvegetated ephemeral wash; head-cutting on drainages upslope and erosion/sedimentation downslope; *	Indirect effects on unveg. Dry wash – 0.5:1 (10 acres)
Calico Solar, San Bernardino County, CA	December 2010	Effected jurisdictional waters were reduced in Scenario 5.5 site will impact an estimated 155.2 acres of Jurisdictional Waters. All of these drainages are ephemeral and are largely characterized by sparse creosote bush scrub with small associations of microphyll woodland species such as catclaw acacia thorn scrub, smoke tree woodland, and big galleta shrub-steppe. In many locations the channels are largely devoid of vegetation or support scattered populations of annual wildflowers and grasses.	1:1
Solar Millenium Palen, Riverside County, CA	December 2010	Grading within the disturbance areas and related ephemeral drainages would directly impact approximately 312 acres of State jurisdictional waters for the proposed Project, 388 acres for Reconfigured Alternative 2, and 366 acres for Reconfigured Alternative 3. The described impacts would eliminate the hydrological, biogeochemical, vegetation and wildlife functions of these drainages.	Vegetated (Dry Desert Wash Woodland) 3:1 Unvegetated Ephemeral Dry Wash -1:1 Indirect effects: 1.5, and 0.5 to 1, respectively
Rice Solar, Riverside County, CA	December 2010	A total of approximately 82.8 acres of state jurisdictional ephemeral channels would be directly or indirectly impacted by construction of the solar generator, generator tie-line, and interconnector substation.	1:1 Staff does not recommend compensatory mitigation for impacts to downstream reaches, because

Project Name	Commission Decision Document Date	Impact Acreage on State Jurisdictional Waters	Mitigation Ratio Required
			the hydrology and sand transport functions of the proposed redirected channels would largely replace function of the existing channel system.

J. Common Wildlife and Plants: Non-Threatened, Non-Endangered

The HHSEGS FSA treated non-threatened and non-endangered animals and plants as if they are listed under the Federal ESA and CESA. The FSA variously refers to certain plant and animal species as “rare,” “sensitive,” “important,” California Species of Special Concern (“CSC”), or, generically, as “special status” plant and animal species. Referring to these non-listed species as “special status” improperly intermingles non-listed species mitigation with listed species mitigation.

As one example, Biological Resources Table 9, “Biological Resources Compensatory Mitigation Summary of Compensation Lands Costs,” lumps together (a) Desert Tortoise mitigation requirements with (b) non-listed species compensation requested by Staff for Burrowing Owl, state waters, and special status plants.

The net effect of bundling listed species issues with non-listed species issues is to create the impression that the project has greater potential impacts to biological resources than it will have in reality. ESA and CESA contain additional legal requirements for listed species, such as the granting of incidental take authority for permitted activities that only applies to ESA and CESA listed species. These same ESA and CESA legal obligations simply do not apply to non-listed species. By bundling listed and non-listed species into a single “special status” category, the FSA blurs the significant distinction the law draws between listed and non-listed species.

This homogenization could create the erroneous impression that listed species and “special status” species are one in the same. As a matter of law, listed species and non-listed species are very different. The FSA should clearly delineate between (1) listed species subject to treatment under ESA and CESA, and (2) all other non-listed species, subject to treatment under CEQA.

The effects of this homogenization re particularly acute with respect to the overreaching on mitigation requested for burrowing owl, discussed next.

K. Burrowing Owl

Consistent with the concerns expressed above about elevating non-listed species to be on-par with listed species, the FSA treats burrowing owl as if they are protected by CESA or ESA. They are not. The 600 acres of burrowing owl mitigation lands requested by the FSA is unprecedented and inconsistent with recently authorized projects. The FSA does not cite any precedent for this type or level of mitigation in other siting proceedings

beyond the 2012 CDFG Staff Report on burrowing owls, which provides two references on home range size to justify 300 acres of mitigation per owl territory; whereas in past guidance burrowing owl foraging habitat was adequately mitigated at 6.5 acres per territory. For HHSEGS, no nesting or wintering burrowing owls were detected onsite during protocol level surveys completed for the project. The species is adequately addressed in the revised COC text proposed by the Applicant.

L. Desert Kit Fox:

The desert kit fox is a common species that is not listed as threatened or endangered under either ESA or CESA (The desert kit fox is not the same species as the San Joaquin kit fox (*Vulpes macrotis mutica*), which is a listed species). The desert kit fox is subject to a fur-trapping prohibition. Fur trapping activities are irrelevant to any activities at the HHSEGS site. Section 460 of the California Code of Regulations (14 CCR 460) does not provide any protections related to desert kit fox. The Applicant will abide by reasonable, CEQA-based avoidance and mitigation measures associated with the desert kit fox as discussed in the revised COC proposed by the Applicant; however, any suggestion of "full protection" or CESA protection for the non-listed desert kit fox is incorrect.

M. Groundwater Dependent Vegetation

Consistent with proposed Condition of Certification BIO-23, the Applicant will implement: (1) a groundwater monitoring program; and (2) a Groundwater Dependent Ecosystem (GDE) monitoring program within the study area recommended in the FSA. Action-level triggers related to potential effects to GDE identified by the monitoring programs will be based on the hydrological data from the groundwater monitoring program, as described in proposed Condition of Certification Water Supply-4. Consequently, the Applicant agrees to implement the primary elements of the GDE monitoring program identified in the FSA. The characterization of existing groundwater information, existing non project-related stresses to GDE in the proposed study area, and the ability to detect project-related groundwater impacts through vegetation monitoring, however, are inaccurately described in the FSA. These issues are discussed below and in the introductory description of the recommended modifications of proposed Condition of Certification BIO-23. BIO-23 must also be revised to refer to, and avoid duplication with, corresponding and complementary provisions of proposed Condition of Certification Water Supply-4.

The FSA does not sufficiently recognize that GDE in the study area is inherently stressed by low rainfall and frequent drought conditions characteristic of desert environments. These existing environmental factors will cause stress to GDE irrespective of groundwater-level changes. The FSA also does not account for the fact that water table declines in the vicinity of the GDE study area, but not at the project site, are well-documented and are currently occurring due to existing, non-project groundwater use in Nevada. Taking account of these factors, the proposed revised groundwater and GDE monitoring programs allow for: (1) the detection of groundwater drawdown from project pumping itself, if any; (2) a baseline characterization of GDE in the study area, including vegetation stress or other impacts that can be attributed to existing groundwater level declines in the study area, caused by non-project groundwater use; and (3) identification of changes in vegetation that may occur utilizing standard ecosystem scale (and in a plant-ecological context, community scale) measurements

that can be applied to a monitoring program without a period of experimentation and calibration.

The FSA inaccurately describes the extent and quality of the existing local groundwater data and analysis as “poor” or incomplete. Based on this mischaracterization, the FSA asserts that certain scientifically invalid, “worst case” groundwater scenarios (for example, the scenarios identified in Figures 19 and 20 of the FSA Water Supply section) could plausibly occur and adversely affect GDE. As discussed in the water supply section of the FSA, the geohydrology of the project area has been subject to many studies since the 1980s. In addition, the groundwater investigations completed to date at the request of the CEC and other agencies have significantly enhanced available information concerning local groundwater conditions. Contrary to the FSA, the local hydrogeology is well understood and well-characterized. This information demonstrates that scenarios described in Figures 19 and 20 of the FSA water supply section are based on unsupported and scientifically indefensible assumptions and are highly unlikely to occur.

The FSA incorrectly characterizes the nature and extent of potential project-related risks to GDE by focusing on information regarding GDE in Nevada in an area that is hydrologically isolated by a significant fault from the project groundwater basin. Table 3 in the Water Supply section of the FSA summarizes groundwater level declines up to -7ft/yr, with a mean decline of -2.18 ft/yr for four wells located on the Nevada side of the Stateline Fault System. This data demonstrates that the GDE in the study area, and elsewhere on the Nevada side of the fault system, is subject to existing, long-term effects from groundwater pumping, chiefly from wells in Nevada. Contrary to the FSA, the fact that fault systems typically preclude significant groundwater connectivity between adjacent groundwater basins has been thoroughly documented and is widely accepted (see e.g., Haynes 1967; Quade et al. 1995, 2002). As a result, the relatively small extent of project-related groundwater use on the California side of the stateline fault system is highly unlikely to have a measureable hydrologic effect on groundwater levels in Nevada where the GDE study area and other GDE of concern exist. In turn, project-related groundwater use is highly unlikely to result in measurable vegetation effects, and effects that can reasonably be distinguished from existing groundwater level declines on the Nevada side of the state line fault system, including those resulting from natural climate variability.

The FSA proposes an unrealistic and impractical and water table decline action threshold of 0.5 feet. A groundwater level change of this magnitude cannot be reliably distinguished from background groundwater level fluctuations due to climate and rainfall variability (please refer to Applicant’s Water Supply testimony). The proposed action thresholds in Condition of Certification Water Supply-4, as revised by the Applicant represent more reasonable, yet still conservative, thresholds for groundwater monitoring.

The vegetation measurement approaches discussed in the FSA would require the development of on-site ecophysiological monitoring procedures that are likely to yield ambiguous results due to the absence of baseline data for evaluating the significance of potential observations, and the likelihood of high measurement variability. Drought stress caused by the extreme natural variations in temperature and precipitation; sand-dune denudation rates; and intraspecific and intraclonal competition, would confound any attempt to associate direct physiological measurements with groundwater level

declines. The monitoring methods proposed in the FSA would therefore not yield data of any immediate use in monitoring. Vegetation impact thresholds that are easily defined, readily detected by appropriately scaled monitoring techniques and that are appropriate for ecosystem-scale monitoring are required to assess potential impacts to mesquite coppices and thickets in arroyos. Other parameters discussed in the FSA, such as "drought stress," should not be utilized to monitor GDE because they cannot be effectively applied, and the resultant data would not be distinguishable from the effects of normal and natural climate and other variability.

V. Proposed Findings of Fact

Based upon the testimony provided above, Applicant proposes the following findings of fact:

1. The HHSEGS project is located in an area of low avian use. No state or federally listed avian species occur within or near the project area, and three seasons of systematic avian surveys have documented low species diversity and avian abundance.

Based upon the testimony provided above, the following findings of fact proposed in the FSA should be revised as follows:

2. FSA Proposed Finding of Fact 3: The plant communities and landscape features in and around the HHSEGS site provide suitable habitat ~~foraging breeding~~ for a variety of wildlife including nesting birds, and may facilitate some wildlife movement throughout the greater region.

3. FSA Proposed Finding of Fact 4: A total of 23.21 acres of sparsely vegetated, ephemeral washes that are jurisdictional Waters of the State, a CDFG-designated sensitive habitat, occur on the project site. A total of 0.42 acres are also Waters of the United States~~, and six of the washes are also depicted as blue line features on the U.S. Geological Survey (USGS) topographic maps~~.

4. FSA Proposed Finding of Fact 5: The project would maintain ~~a portion~~ most of the hydrologic and geomorphic processes of ~~many of~~ the onsite ~~affected~~ washes by maintaining existing flow rates and patterns within surface drainages, limiting grading, significant alteration of ephemeral damages, and minimizing hydromodification by ~~. allowing them to pass through the site, rather than~~ not diverting existing flows ~~them~~ around the site in artificially constructed channels~~;~~ ~~however these .~~ Onsite hydrologic processes would be partially affected ~~altered~~ by a ~~the~~ berm constructed across the ~~downstream~~western boundary of the project to control peak stormwater runoff. Most onsite ephemeral damages would be only minimally affected by~~,~~ partial site grading, primarily for road construction, and the localized obstruction of flow paths by mirror pylons ~~and roads~~.

5. FSA Proposed Finding of Fact 6: The perimeter exclusion fencing, required to exclude desert tortoise, in conjunction with ongoing operational activities c~~w~~ould affect ~~eliminate~~ the habitat function and values of onsite desert washes. ~~for most wildlife.~~ These activities include: regular human disturbance, lighting and glare, noise, regular vegetation ~~mowing~~control, mirror washing, dust and weed control, and other operational activities.

6. FSA Proposed Finding of Fact 7: Ephemeral desert washes comprise the majority of streams in the desert and CDFG recognizes the habitat function and values to wildlife provided by ephemeral desert washes, including: seasonal or temporary sources of water higher biotic diversity; higher moisture content, topographic and habitat complexity; denser and more robust vegetation; shade and cooler temperatures; greater food sources; greater abundance of native annuals.

7. FSA Proposed Finding of Fact 8: Wildlife habitat functions and values ~~in~~ of onsite desert washes were observed and documented by Energy Commission and CDFG staff during multiple site visits, and habitat along most washes was observed to be distinct from the adjacent uplands.

8. FSA Proposed Finding of Fact 9: Condition of Certification **BIO-22** (State Waters Compensatory Mitigation) would offset impacts to state waters through acquisition and preservation of comparable habitat offsite in a manner consistent with mitigation required for previously-approved renewable energy projects that affect ephemeral desert washes with similar vegetative and habitat characteristics. To meet the ~~address a~~ no net loss policy for riparian and riverine (stream) habitat, **BIO-22** would require compensation at a ratio of 1~~2~~:1, or one~~two~~ acre~~s~~ of washes protected for every acre affected, and would fully mitigate loss of state waters.

9. FSA Proposed Finding of Fact 10: Condition of Certification **BIO-8** requires that a copy of the U.S. Army Corps of Engineers Section 404, permit ~~or official communication confirming no permit is necessary be provided to the Energy Commission,~~ including ~~and~~ all requirements ~~implemented on the project site,~~ to mitigate for impacts to waters of the U.S., or confirming no permit is necessary, be provided to the Energy Commission.

10. FSA Proposed Finding of Fact 12: Portions of the project site support relatively intact habitat for desert tortoise, but the habitat value is not uniform. Tortoise habitat values are generally low throughout the project site, and vary primarily in accordance with the site's soils, hydrology, and related vegetation. The highest-quality habitat occurs on the eastern portion of the site where soil type Qa1 occurs. Lower quality habitat occurs where other Qa and Qb soil types occur. The lowest quality habitat occurs in Qbf and Qf soil types – fine, calcareous, clay-rich soils that support plants tolerant of saline, high pH, and seasonally flooded conditions.

11. FSA Proposed Finding of Fact 15: Impacts to desert tortoise can be fully mitigated by requiring compensatory mitigation at a 1.5:1 acreage ratio for impacts to areas where soil type Qa1 occurs, at a 1:1 ratio where other Qa areas, plus areas with Qb soils and low halogeton concentrations occur, and at a 0.5:1 ratio in other locations with higher halogeton concentrations and little or no tortoise sign. ~~3:1 ratio for creosote bush scrub habitat and a 1:1 ratio for shadscale habitat.~~

12. FSA Proposed Finding of Fact 16: FSA Proposed Finding of Fact 3: One state fully protected species, the golden eagle, has been documented to occur rarely within and near the project site. The nearest potentially occupied golden eagle nest is

located approximately seven miles from the ~~forages on the HHSEGS~~ site~~, and nests within ten miles of~~ HHSEGS project site.

13. FSA Proposed Finding of Fact 17: ~~Structures that are part of the HHSEGS project, including the heliostats, ancillary facilities, and the power tower, could cause bird deaths from collisions.~~ McCrary et al. (1986) documented minimal collision fatality at a concentrating solar power facility supporting high levels of avian use, and virtually no collision mortality has been observed in avian mortality studies at operational concentrating solar power facility located in Israel and Spain. **BIO-15** will further avoid and minimize potential collision impacts to avian species.~~The actual frequency of collisions is unknown, and collisions may be secondary to flux exposure.~~

14. ~~FSA Proposed Finding of Fact 18: The impact of avian collisions with project features generally is significant, and is significant, although adaptive measures may reduce the number of such collisions~~

15. FSA Proposed Finding of Fact 19: Operation of the HHSEGS project will ~~concentrate~~ direct reflected sunlight from the heliostat field towards the top of the central tower in the field. This process results in solar flux that increases with proximity to the central tower. Approximately 90% of the total airspace (in which solar flux could occur above each of the proposed HHSEGS facilities) will experience solar flux at levels approximately equal to or less than 2.5 kilowatts per meter squared (kw/m^2), substantially below a level that the most conservative analysis indicates could potentially injure or harm birds. No evidence is currently available to suggest solar flux at HHSEGS will result in significant avian impacts. ~~This is expected to result in bird injury and death from exposure in excess of avian tolerance. Birds may also die from exposure to repeated low levels doses of solar flux, or die from exposure after leaving the project site.~~

16. FSA Proposed Finding of Fact 20: Based on the available evidence, any potential solar flux impacts to birds would be confined to the comparatively small portion of each solar field's airspace surrounding the top of the central tower. Birds in general, and golden eagles in particular, are not expected to occur in this area due to the lack of perching and nesting locations, lack of prey, noise and operational disturbance associated with electrical power generation facilities adjacent to the base of the tower, and the substantial distance from the edge of the solar field where intact avian habitat is present. ~~The impact of solar flux on bird species is potentially significant inasmuch as morbidity and mortality is likely for golden eagle and migratory birds, for which no incidental take is permitted under state law.~~ The potential impact of solar flux on avian species is not expected to be significant or cause significant cumulative impacts. ~~and is significant, although~~ **BIO-15** will further avoid and minimize potential solar flux impacts to avian species.

17. FSA Proposed Finding of Fact 21: The project site supports a variety of common and special status wildlife including the American b~~B~~adger and burrowing owl; species considered by the California Department of Fish and Game as species of special concern. The site also supports desert kit fox. The desert kit fox is designated as a

protected furbearing mammal under Section 460, Title 14 of the California Code of Regulations. ~~bearer, which may not be trapped or taken~~.

18. FSA Proposed Finding of Fact 22: American badger, kit fox, and burrowing owl would potentially be displaced by HHSEGS project construction; however, no direct mortality is anticipated.

19. FSA Proposed Finding of Fact 23: Impacts to American badger, kit fox, and burrowing owl are potentially adverse, but are less than significant with the adoption of feasible mitigation measures required by the Commission.

20. FSA Proposed Finding of Fact 24: The HHSEGS site may provide occasional forage and dispersal pathways for the fully protected Nelson's bighorn sheep. This species would still be able to complete intermountain travel and be unaffected by project construction or operation.

21. FSA Proposed Finding of Fact 27: Implementation of conditions of certification **BIO-1** through **BIO-10**, **BIO-12**, and **BIO-13** will reduce significant impacts to the desert tortoise to less than significant levels.~~, considered "take" under CESA.~~

22. FSA Proposed Finding of Fact 32: None of the affected plant species are state or federally listed Threatened, Endangered, Rare, or Candidate species. ~~but nine of the 11 species have a highly restricted range in California.~~

23. FSA Proposed Finding of Fact 33: All 11 plant species onsite have distribution outside California but are listed as "rare" on the ~~in~~ California Rare Plant Rank (CRPR Ranks 1B and 2; formerly CNPS Lists 1 and 2).~~, and meet the criteria in Section 15380 of the CEQA Guidelines for designation as "rare".~~

24. FSA Proposed Finding of Fact 34: Nine additional occurrences of eight special-status (CRPR rank 1B and 2) plant species were documented offsite in very close proximity to the project boundary.~~, and thus in close proximity to construction and operation.~~

25. FSA Proposed Finding of Fact 36: Condition of Certification **BIO-20** (Special-status Plant Compensatory Mitigation) includes ~~offers two options for~~ offsite mitigation to offset impacts to occurrences onsite~~:~~, including 1) preservation, ~~and~~ 2) enhancement/ restoration of ~~at-risk~~ off-site occurrences, 3) in-lieu fee payments, and/or 4) demonstration that there are more occurrences of the special status plants than currently documented with the available survey data, and mitigation includes performance standards for each option. Mitigation ratios for preservation are based on the degree of rarity and extinction risk.

26. FSA Proposed Finding of Fact 37: The HHSEGS project will lower groundwater levels within an area proximate to the site's pumps, ~~as well as in the water basin generally~~.

27. FSA Proposed Finding of Fact 38: The aerial extent of the ~~How far and fast~~ project-related pumping cone of depression has been estimated using well-established hydrogeological methods and is not expected to result in significant impacts to any

offsite water user or groundwater dependent vegetation ~~will propagate cannot be determined with certainty given certain geological complexities in the area~~.

28. FSA Proposed Finding of Fact 39: Large concentrations of groundwater-dependent mesquite habitats occur ~~in close proximity to the project~~ in Nevada, some within a half-mile ~~or less~~ of the project's eastern boundary, and separated from the project groundwater basin by the state line fault system along the California and Nevada border.

29. FSA Proposed Finding of Fact 40: The mesquite habitats located near the project include the Stump Spring~~s~~ Area of Critical Environmental Concern (ACEC), an area designated for protection of its biological and cultural resources by the Bureau of Land Management. Stump Spring~~s~~ ACEC also contains the site of a~~n~~ formerly active seasonal spring.

30. FSA Proposed Finding of Fact 42: One of the largest concentrations of mesquite patches in southern Nevada occurs in Pahrump Valley; the 9,047-acre Pahrump Valley metapatch. It is hydrologically separated from the project area by the Stateline Fault System; no mesquite or other groundwater-dependent communities occur within the project boundary.

31. FSA Proposed Finding of Fact 43: At least three historically active seasonal seeps and springs occur within a 5-mile radius of the project, and several additional inactive springs that stopped flowing during the period of heavy agricultural pumping in the last century.

32. FSA Proposed Finding of Fact 47: Project groundwater pumping ~~could have~~ is unlikely to have significant direct and cumulative impacts on the mesquite habitats east of the project and at the Stump Springs ACEC ~~if~~ because project pumping ~~should~~ will not result in water levels being lowered below the effective rooting depth of the mesquite and other groundwater-dependent species.

33. FSA Proposed Finding of Fact 48: ~~If mesquite habitats are adversely affected, dependent wildlife would also be affected, including some special-status species.~~

34. FSA Proposed Finding of Fact 50: Groundwater levels across the entire Pahrump Valley ~~have already~~ are declining~~ed~~ as a result of basin groundwater pumping in Nevada, particularly in the northern valley or areas closest to Pahrump, and in areas located to the east of the state line fault system and the groundwater basin that would be utilized by the project.

35. FSA Proposed Finding of Fact 51: ~~There has been a severe over-allocation of water rights in the Pahrump Valley groundwater basin.~~

36. FSA Proposed Finding of Fact 52: Based on well-established and widely accepted hydrogeological research, the ~~There is a~~ state line fault ~~zone~~ system between the project site and Stump Springs ACEC and other mesquite habitats ~~that may~~ will attenuate the extent of any potential hydrologic connectivity between the groundwater basin that will be utilized by the project and groundwater that occurs

within areas of groundwater dependent vegetation outside of the project boundary. ~~buffer the effects of project pumping but the protective properties of this fault zone are not presently known or established.~~

37. FSA Proposed Finding of Fact 53: ~~The hydrogeology of this portion of the Death Valley Regional Flow System is complex and not well understood.~~

38. FSA Proposed Finding of Fact 54: Groundwater and groundwater dependent ecosystem monitoring will be conducted by the project in accordance with **BIO-23** and **Water Supply-4** ~~is necessary~~ to ensure that project groundwater use will not ~~determine whether there will be drawdown that will~~ negatively affect the Stump Springs ACEC and other mesquite habitats and area seeps and springs.

39. FSA Proposed Finding of Fact 55: ~~Vegetation monitoring and/or soil cores to examine rooting depths are necessary to determine the tolerance of mesquite to declining water tables and to determine whether project water use is negatively affecting Stump Springs ACEC and the area mesquite habitats.~~

40. FSA Proposed Finding of Fact 56: There is significant public interest on the groundwater issues of the project, and whether there is ~~the~~ potential for project pumping to negatively impact area mesquite habitats, dependent wildlife, and springs.

41. FSA Proposed Finding of Fact 60: ~~Thirteen~~Eleven species of invasive weeds were documented in the project area during surveys of the site in 2011, including ~~two~~ one California Department of Food and Agriculture (CDFA) A-rated pest~~s~~ (~~Russian knapweed and~~ halogeton) subject to state-enforced actions including eradication.

42. FSA Proposed Finding of Fact 63: The spread of invasive plants is a major threat to biological resources in some parts of the Mojave Desert, and in some areas may cause~~ing~~ destructive changes in ecosystem processes and increase~~ing~~ the risk of catastrophic fire and fire frequency.

43. FSA Proposed Finding of Fact 64: Condition of Certification **BIO-18** (Weed Management Plan) requires the project owner to manage or contain weeds onsite ~~for the life of the project~~ to prevent their spread ~~into adjacent offsite habitat, or to nearby communities~~ via employees and contractors contaminated vehicles and equipment.

44. FSA Proposed Finding of Fact 66: ~~Construction and operation of the project will have effects on a number of biological resources that are individually limited but cumulatively considerable when viewed in connection with the effects of past, current, and probable future projects.~~

45. FSA Proposed Finding of Fact 70: The project's contribution to significant cumulative effects to migratory birds and golden eagles ~~is~~ are not cumulatively considerable when combined with the anticipated indirect effects to ~~remaining~~ habitat and populations and with the implementation of conditions of certification **BIO-8**, **BIO-15**, and **BIO-16** which address impact ~~potential avian impact~~ avoidance and

minimization measures to avian resources ~~would address the project's contribution to this significant cumulative impact~~.

VI. Proposed Licensing Conditions

The Applicant proposes revisions to the following conditions: BIO-1, 2, 7, 8, 9, 10, 12, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 25 and 26. The proposed revisions to each condition along with an explanation of the revisions are included below.

BIO-1: Designated Biologist Selection and Qualifications

Page 4.2-224. For ease of staffing and scheduling, and to ensure that the qualifications requirements (which extend beyond the scope of the USFWS desert tortoise Authorized Biologist) are met, the Applicant requests that multiple Designated Biologists be authorized for the project. All references to the Designated Biologist (DB) should therefore be made in the plural throughout the COCs.

BIO-1 The project owner shall submit the resume of the proposed Designated Biologist(s), with at least three references and contact information, to the Energy Commission Compliance Project Manager (CPM) for approval. Multiple Designated Biologists may be authorized for the project as appropriate to accommodate project staffing and scheduling needs and qualifications requirements for Designated Biologist duties. Each~~The~~ Designated Biologist authorized to oversee tortoise activities must meet all qualifications as stated within the U.S. Fish and Wildlife Service's (USFWS's) Biological Opinion (BO) for the HHSEGS project. Those qualifications at a minimum shall include at least three references and contact information.

The Designated Biologist must meet the following minimum qualifications:

1. Bachelor's degree in biological sciences, zoology, botany, ecology, or a closely related field;

2. Three years of experience in field biology or current certification of a nationally recognized biological society, such as The Ecological Society of America or The Wildlife Society;

3. Have at least one year of field experience with biological resources found in or near the project area;

4. Meet the current USFWS Authorized Biologist qualifications criteria (USFWS 2008), demonstrate familiarity with protocols and guidelines for the desert tortoise, and be approved by the USFWS; and

5. Possess a California ESA Memorandum of Understanding pursuant to Section 2081(a) for desert tortoise.

Verification: No less than ~~9~~30 days prior to the start of any project-related ground disturbing activity, the project owner shall provide the CPM and CDFG a copy of the Commission Designated Biologists ~~(= USFWS Authorized Biologist)~~ selections for the

HHSEGS project and a copy of the above specified qualifications or the qualifications as required by the federal Biological Opinion. The project owner shall submit the specified information to the CPM and CDFG within 1 (one) week of receipt from the USFWS. No site or related ground disturbing activities shall commence until the appropriate number of approved Designated Biologist(s) is/are available to be on site.

If a Designated Biologist needs to be replaced, copies of the above specified information of the proposed replacement, as well as the USFWS new designated Authorized Biologists ~~(= Commission title of Designated Biologist)~~ for the HHSEGS project must be submitted to the CPM and CDFG within 48 hours of receipt of USFWS's authorization of a new Designated Biologist for the HHSEGS project site. In an emergency, the project owner shall immediately notify the CPM, CDFG, and USFWS to discuss the qualifications and approval of a short-term replacement, and/or enact any emergency provisions as specified in the USFWS Biological Opinion for the HHSEGS project.

BIO-2: Designated Biologist Duties

Page 4.2-226, Number 10. Responsibility for onsite dead or injured foxes is appropriately assigned to the Applicant; however, Applicant requests that it be relived of such responsibilities outside the project boundary. This item should be revised as follows:

10. Respond immediately to reports of onsite kit fox mortality or injury, and to the extent possible, reports of dead or injured kit fox offsite ~~and immediately adjacent the project boundaries or on access roads~~, notify the CDFG and CPM within 24 hours, and undertake restorative and/or disease prevention actions as specified within the American Badger and Kit Fox Management Plan, or as directed by the CDFG, with copies of all CDFG guidance provided to the CPM within 24 hours of receipt;

BIO-7: Biological Resources Mitigation Implementation and Monitoring Plan

The BRMIMP is requested to be prepared without coordination with the Designated Biologist (DB) for the project since the plans will likely need to be prepared prior to selection and approval of the DB. The DB will be responsible for implementation of the approved BRMIMP content, but not preparation. Additionally, the following changes are proposed to Bio-7 because golden eagles will be addressed in the Bird and Bat Conservation Strategy to be prepared for the project.

Page 4.2-230, Number 11. There is no such permit as a USFWS Golden Eagle Conservation Permit. The Applicant assumes that the CEC is referring to a programmatic take permit, which is voluntary and will not be pursued for this project.

BIO-7 The project owner shall develop and implement a Biological Resources Mitigation Implementation and Monitoring Plan (BRMIMP) for the project. The BRMIMP shall incorporate avoidance and minimization measures described in final versions of the Desert Tortoise Translocation Plan, the USFWS Biological Opinion for the HHSEGS project, the Raven Management Plan, the American Badger and Kit Fox Management Plan, the Bird and Bat

Conservation Strategy, ~~Avian, Bat, and Golden Eagle Protection Plans~~, Burrowing Owl Impact Avoidance and Minimization Measures, and Closure, Revegetation, and Reclamation Plan.

The BRMIMP shall ~~be prepared in consultation with the Designated Biologist where it involve and~~ include the following:

1. All biological resources mitigation, monitoring, and compliance measures proposed by the project owner and approved by the Commission;

2. All biological resources mitigation, monitoring, and compliance measures specified in the conditions of certification;

3. All biological resource mitigation, monitoring and compliance measures required in state and federal agency terms and conditions, including but not limited to: USFWS Biological Opinion, ~~USFWS Golden Eagle Conservation Permit (if issued),~~ U.S. Army Corps of Engineers Section 404 permit ~~Certification~~, 401 Certification from the Lahontan Regional Water Quality Control Board, California Department of Fish and Game Lake and Streambed Alteration Agreement, and a Food and Agricultural Code Section 80001 native plant harvesting permit;

4. ~~All~~ Legally protected sensitive biological resources to be impacted, avoided, or mitigated by project construction, operation, and closure;

5. All required mitigation measures for sensitive biological resource and remedial actions for standing water onsite, including known or suspected disease outbreaks on the project site;

6. All locations on a map, at an approved scale, of legally protected sensitive biological resource areas and two rain collectors subject to disturbance and areas requiring temporary protection and avoidance during construction and operation;

7. Aerial photographs, at an approved scale, of all areas to be disturbed during project construction activities; include one set prior to any site or related facilities mobilization disturbance and one set subsequent to completion of project construction. Provide planned timing of aerial photography and a description of why times were chosen. Provide a final accounting of the before/after acreages and a determination of whether additional habitat compensation is necessary in the Construction Termination Report;

8. Duration for each type of monitoring and a description of monitoring methodologies and frequency;

9. Performance standards to be used to help decide if/when proposed mitigation is or is not successful;

10. All performance standards and remedial measures to be implemented if performance standards are not met;

11. A discussion of biological resources-related facility closure measures; and

12. A process for proposing plan modifications to the CPM.

Verification: The project owner shall submit two copies of the draft BRMIMP to the CPM for review and approval at least ~~6~~30 days prior to start of any project-related site disturbance activities. No less than ~~3~~10 days prior to any project-related ground disturbing activities, the final revised BRMIMP shall be submitted to the CPM. No ground disturbance may occur prior to approval of the final BRMIMP by the CPM.

If there are any permits that have not yet been received when the BRMIMP is first submitted, these permits shall be submitted to the CPM within five days of their receipt, and the BRMIMP shall be revised or supplemented to reflect the permit condition within at least 10 days of their receipt by the project owner.

The project owner shall notify the CPM no less than five working days before implementing any modifications to the approved BRMIMP.

Any changes to the approved BRMIMP must be approved by the CPM and in consultation with appropriate agencies to ensure no conflicts exist.

Implementation of BRMIMP measures (construction activities that were monitored, species observed) will be reported in the Monthly Compliance Reports by the Designated Biologist. Within 30 days after completion of project construction, the project owner shall provide to the CPM, for review and approval, a written construction termination report identifying which items of the BRMIMP have been completed, a summary of all modifications to mitigation measures made during the project's site mobilization, ground disturbance, grading, and construction phases, and which mitigation and monitoring items are still outstanding.

BIO-8: General Impact Avoidance and Minimization Measures

The Applicant proposes revisions to BIO-8 which remove duplication with other CEC Conditions such as AQ-SC3 Construction Fugitive Dust Control and BIO-18 Weed Management Plan. The Applicant also included clarifying revisions to the condition.

BIO-8 The project owner shall undertake the following measures to manage the construction site and related facilities in a manner to avoid or minimize impacts to biological resources:

1. Limit Disturbance Area. The boundaries of all areas to be disturbed (including staging areas, access roads, and sites for temporary placement of spoils) shall be delineated with stakes and flagging prior to construction activities in coordination with the Designated Biologist. All

disturbances, vehicles, and equipment shall be confined to the flagged areas.

2. Minimize Road Impacts. New and existing roads that are planned for construction, widening, or other improvements shall not extend beyond the flagged impact area without coordination with the Designated Biologist as described above. All vehicles passing or turning around will do so within the planned impact area or in ~~previously disturbed~~ areas in coordination with the Designated Biologist. Where new access is required outside of existing roads (e.g. new spur roads) or the construction zone, the route will be clearly marked (i.e., flagged and/or staked) prior to the onset of construction.

3. Minimize Traffic Impacts. Vehicular traffic during project construction and operation shall be confined to existing routes of travel to and from the project site, and cross country vehicle and equipment use outside designated work areas shall be conducted in coordination with the Desginated Biologist. With the exception of the dirt roads that run between Tecopa Road and the project site, overland vehicle traffic shall be prohibited without coordination with the Designated Biologist. The speed limit shall not exceed the miles per hour limit as described in the Biological Opinion and as specified in Condition AQ-SC-3. ~~25 miles per hour within the project area, on maintenance roads for linear facilities, or on dirt access roads to the HHSEGS site.~~ Vehicles shall abide by posted speed limits on paved roads.

4. Monitor During Construction. The Designated Biologist or Biological Monitor shall be present at the construction site during all project activities that have potential to disturb soil, vegetation, and wildlife. In areas that could support desert tortoise or any other sensitive wildlife species, the USFWS-approved Designated Biologist or Biological Monitor shall walk immediately ahead of equipment during brushing and grading activities.

5. Salvage Wildlife during Clearing and Grubbing. The Designated Biologist or Biological Monitor shall salvage and relocate legally protected sensitive wildlife during clearing and grading operations. The species shall be salvaged when conditions will not jeopardize the health and safety of the monitor and relocated off-site habitat.

6. Avoid Roosting Bats. The project owner shall minimize disturbance to roosting bats. If night or day roosting bats are identified in project structures they shall not be disturbed and a 100 foot non disturbance buffer shall be placed around the bats. If the Designated Biologist, in consultation with a qualified bat biologist, determines roosting bats consist of a non-breeding roost the individuals shall be safely evicted, under the direction of a qualified bat biologist. The CPM and CDFG shall be notified of any bat evictions within 48 hours. Maternity colonies shall

not be disturbed. The CPM shall be notified within 48 hours of any active nurseries that are identified within the construction area.

7. Minimize Impacts of Transmission/Pipeline Alignments, Roads, and Staging Areas. For construction activities ~~outside of the plant site~~ within California (transmission line, pipeline alignments) access roads, pulling sites, and storage and parking areas shall be designed, installed, and maintained with the goal of minimizing impacts to native plant communities and sensitive biological resources. Transmission lines and all electrical components shall be designed, installed, and maintained in accordance with the Avian Power Line Interaction Committee's (APLIC's) *Suggested Practices for Avian Protection on Power Lines* (APLIC 2006)and *Mitigating Bird Collisions with Power Lines* (APLIC 2004)to reduce the likelihood of bird electrocutions and collisions.

8. Avoid Use of Toxic Substances. Road surfacing and sealants as well as soil bonding and weighting agents used on unpaved surfaces shall be non-toxic to wildlife and plants. Anticoagulants shall not be used for rodent control. Only herbicides approved by the California Department of Pesticide Regulation (under the California Department of Environmental Protection) ~~Pre-emergents and other herbicides with documented residual toxicity~~ shall ~~not~~ be used. Herbicides shall be applied in conformance with federal, State, and local laws and according to the guidelines for wildlife-safe use of herbicides in **BIO-18** (Weed Management Plan).

9. Minimize Lighting Impacts. Facility lighting shall be designed, installed, and maintained to prevent side casting of light ~~towards wildlife habitat~~.

10. Cap Vertical Pipes. All vertical pipes greater than 4-inches in diameter shall be capped to prevent the entrapment of birds or bats.

11. Avoid Vehicle Impacts to Desert Tortoise. Parking and storage shall occur within the area enclosed by desert tortoise exclusion fencing to the extent feasible. No vehicles or construction equipment parked outside the fenced area shall be moved prior to an inspection of the ground beneath the vehicle for the presence of desert tortoise. If a desert tortoise is observed, it shall be left to move on its own. If it does not move within 15 minutes, a Designated Biologist or Biological Monitor under the Designated Biologist's direct supervision may remove and relocate the animal to a safe location if temperatures are within the range described in the USFWS' 2009 Desert Tortoise Field Manual (http://www.fws.gov/ventura/speciesinfo/protocols_guidelines). All access roads outside of the fenced project footprint shall be delineated with temporary desert tortoise exclusion fencing on either side of the access road, unless otherwise authorized by the CPM.

12. Avoid Wildlife Pitfalls.

    a. Backfill Trenches. At the end of each work day, the Designated Biologist shall ensure that all potential wildlife pitfalls (trenches, bores, and other excavations) have been backfilled. If backfilling is not feasible, all trenches, bores, and other excavations shall be sloped at a 3:1 ratio at the ends to provide wildlife escape ramps, or covered completely to prevent wildlife access, or fully enclosed with desert tortoise-exclusion fencing. All trenches, bores, and other excavations outside the areas permanently fenced with desert tortoise exclusion fencing shall be inspected periodically, but no less than three times, throughout the day and at the end of each workday by the Designated Biologist or a Biological Monitor. Should a tortoise or other wildlife become trapped, the Designated Biologist or Biological Monitor shall remove and relocate the individual as described in the Desert Tortoise Relocation/Translocation Plan. Any wildlife encountered during the course of construction shall be allowed to leave the construction area unharmed.

    b. Avoid Entrapment of Desert Tortoise. Any construction pipe, culvert, or similar structure with a diameter greater than 3 inches, stored less than 8 inches aboveground, and within desert tortoise habitat (i.e., outside the permanently fenced area) for one or more nights, shall be inspected for tortoises before the material is moved, buried, or capped. As an alternative, all such structures may be capped before being stored outside the fenced area, or placed on pipe racks. These materials would not need to be inspected or capped if they are stored within the permanently fenced area after the clearance surveys have been completed.

13. Minimize Standing Water. Water applied to dirt roads and construction areas (trenches or spoil piles) for dust abatement shall use the minimal amount needed to meet safety and air quality standards in an effort to prevent the formation of puddles, which could attract desert tortoises and common ravens to construction sites. A Biological Monitor shall patrol these areas to ensure water does not puddle and attract desert tortoise, common ravens, and other wildlife to the site and shall take appropriate action to reduce water application where necessary.

14. Minimize Standing Water in the Retention Basin. Water shall be prohibited from collecting or pooling for more than 24 hours after a storm event within the project retention basin. Standing water within the retention basin shall be removed, pumped, raked, or covered. Alternative methods or the time water is allowed to pool may be approved with the approval of the CPM.

15. Minimize Spills of Hazardous Materials. All vehicles and equipment shall be maintained in proper working condition to minimize the potential for fugitive emissions of motor oil, antifreeze, hydraulic fluid, grease, or other hazardous materials. The Designated Biologist shall be informed of any hazardous spills immediately as directed in the project Hazardous Materials Plan. Hazardous spills shall be immediately cleaned up and the contaminated soil properly disposed of at a licensed facility. Servicing of construction equipment shall take place only at a designated area. Service/maintenance vehicles shall carry a bucket and pads to absorb leaks or spills.

16. Dispose of Road-killed Animals. Road-killed animals or other carcasses detected on ~~Tecopa Road and other~~ project roads in the vicinity ~~within one mile~~ of the project site shall be reported ~~picked up immediately and delivered~~ to the Biological Monitor for appropriate action. For legally protected special-status species road kill, the Biological Monitor shall contact USFWS and CDFG within 1 working day of receipt of the carcass for guidance on disposal or storage of the carcass. The Biological Monitor shall report the special-status species record as described in Condition of Certification **BIO-2**.

17. Worker Guidelines. During construction all trash and food-related waste shall be placed in self-closing containers and removed ~~daily~~ from the site. Workers shall not feed wildlife or bring pets to the project site. Except for law enforcement or security personnel, no workers or visitors to the site shall bring firearms or weapons.

18. Avoid Spread of Noxious Weeds. The project owner shall implement ~~the following~~ Best Management Practices during construction and operation, and all other measures as required in the final approved Weed Management Plan (**BIO-18**) to prevent the spread and propagation of noxious weeds and other invasive plants:

    ~~a. Limit the size of any vegetation and/or ground disturbance to the absolute minimum and limit ingress and egress to defined routes;~~

    ~~b. Prevent spread of non-native plants via vehicular sources by implementing Trackclean™ or other methods of vehicle cleaning for vehicles coming and going from construction sites. Earth-moving equipment shall be cleaned prior to transport to the construction site; and~~

    ~~c. Use only weed-free straw, hay bales, and seed for erosion control and sediment barrier installations.~~

19. Implement Erosion Control Measures. Standard erosion control measures shall be implemented for all phases of construction and operation where sediment run-off from exposed slopes threatens to enter “Waters of the State”. Sediment and other flow-restricting

materials shall be moved to a location where they shall not be washed back into the stream. All disturbed soils and roads within the project site shall be stabilized to reduce erosion potential, both during and following construction. Areas of disturbed soils (access and staging areas) with slopes toward a drainage shall be stabilized to reduce erosion potential.

20. Monitor Ground-Disturbing Activities Prior to Site Mobilization. If ground-disturbing activities are required prior to site mobilization, such as for geotechnical borings or hazardous waste evaluations, a Designated Biologist or Biological Monitor shall be present to monitor any actions that could disturb soil, vegetation, or wildlife.

21. Control and Regulate Fugitive Dust. To reduce the potential for the transmission of fugitive dust the owner shall implement dust control measures as set forth in Condition AQ-SC3. ~~These shall include:~~

    ~~a. The owner shall apply non-toxic soil binders, equivalent or better in efficiencies than the CARB- approved soil binders, to active unpaved roadways, unpaved staging areas, and unpaved parking area(s) throughout construction to reduce fugitive dust emissions.~~

    ~~b. Water the disturbed areas of the active construction sites as necessary to control dust at least three times per day and more often if uncontrolled fugitive dust is noted.~~

    ~~c. Enclose, cover, water twice daily, and/or apply non-toxic soil binders according to manufacturer's specifications to exposed piles that may create fugitive dust with a 5% or greater silt content. Agents with known toxicity to wildlife shall not be used unless approved by the CPM.~~

    ~~d. Establish a vegetative ground cover (in compliance with biological resources impact mitigation measures above) or otherwise create stabilized surfaces on all unpaved areas at each of the construction sites within 21 days after active construction operations have ceased.~~

    ~~e. Increase the frequency of watering, if water is used as a soil binder for disturbed surfaces, or implement other additional fugitive dust mitigation measures, to all active disturbed fugitive dust emission sources when wind speeds (as instantaneous wind gusts) exceed 25 mph.~~

All mitigation measures and their implementation methods shall be included in the BRMIMP and implemented. Implementation of the measures shall be reported in the Monthly Compliance Reports by the Designated Biologist. Within 30 days after completion of project construction, the project owner shall provide to the CPM, for

review and approval, a written construction termination report identifying how measures have been completed.

BIO-9: Desert Tortoise Clearance Surveys and Exclusion Fencing

Page 4.2-238, letter c. Applicant requests correction of a typographical error for clarity, as follows:

c. Temporary Construction Activities: Temporary construction activities including staging or parking outside of the permanent fencing shall be temporarily fenced with desert tortoise fencing to fully encompass the area prior to grounds disturbing activities to prevent desert tortoise from entering the area. The ~~fencing~~ use of ~~the~~ fencing in specific areas may be adjusted in consultation with the CPM. All fencing but be installed compliant with the timing and survey requirements identified in paragraph a, above.

BIO-10: Desert Tortoise Relocation/Translocation Plan

Applicant has recommended several edits to BIO-10 to make it consistent with the November 2011 USFWS translocation guidance, or to provide necessary flexibility and/or appropriate biological considerations.

BIO-10 The project owner shall develop and implement a Desert Tortoise Relocation/Translocation Plan (Plan) that is consistent with current USFWS approved guidelines <u>(November 2011) or newer guidance, should the latter become available.</u> The goal of the plan shall be to safely exclude desert tortoises from within the fenced project area and relocate/translocate them to suitable habitat capable of supporting them, while minimizing stress and potential for disease transmission. The plan shall be developed in consultation with the USFWS to ensure the document does not conflict with conditions issued under an Incidental Take Statement. The plan shall include but not be limited to:

1. <u>Translocation and Control Locations</u>. The plan shall identify the proposed translocation recipient sites and control area. Sites shall be ranked based on the distance from the project site; distance from known hazards such as off highway vehicle locations, busy roads, or other known treats; proximity to existing populations; known linkage areas, <u>and similarity of these variables to the area from which the tortoises were translocated.</u> Translocation sites shall consider the value for recovery of local populations. The plan shall utilize the most recent USFWS guidance on translocation that includes required siting criteria. If moved outside their home range the <u>following</u> translocation criteria ~~include~~<u>should be considered</u>:

a. The translocation site supports desert tortoise habitat suitable for all life stages.

b. Disease prevalence within the resident desert tortoise population is less than 20 percent.

c. The site is at least 10 km from major unfenced roads or highways. Distance from roads may be reduced if the proposed action includes provisions to install and maintain desert tortoise exclusion fencing as a minimization measure or if there are topographical or other barriers between the road and the recipient site.

d. The site is within 40 km of the project site, with no natural barriers to movement between them, to ensure that the desert tortoises at the two sites were likely part of a larger mixing population and similar genetically.

e. The site may occur ~~occurs~~ on lands where desert tortoise populations have been depleted or extirpated yet still support suitable habitat. Depleted areas may include lands adjacent to highways.

f. The site has no detrimental rights-of-way (ROWs) or other encumbrances.

g. The site will be managed for conservation so that potential threats from future impacts are precluded. In the project region, DWMAs, designated critical habitat units (CHUs), areas of critical environmental concern (ACECs), National Park Service lands, and BLM Wilderness Areas are managed for conservation.

Rationale for proposed revisions: *The suggested changes are consistent with the November 2011 USFWS translocation guidance, or provide necessary flexibility and/or appropriate biological considerations.*

2. Control Site. The plan shall consider the following USFWS guidelines for the control site.

   a. be similar in habitat type/quality, desert tortoise population size/structure, and disease status to the recipient sites;

   b. not have been previously used as a recipient site for other projects; and

   c. be a minimum distance of 10 km (6 miles) from an unfenced recipient site that has no substantial anthropogenic or natural barriers to prevent the interaction of control, resident, and translocated desert tortoises.

3. Host Population. The plan shall provide an evaluation of the habitat quality on the translocation and control sites; provide a determination

of existing tortoise density, and an assessment of the sites' ability to accommodate additional tortoises above baseline conditions.

4. Holding Pens. The plan shall provide information on the type holding pens for quarantined translocated tortoises prior to their release into host populations. Pens shall be located on the project site in an area capable of ensuring the protection of the tortoises. The size of the pen shall be designed based on the expected number of desert tortoise that occur on the project site or in an area approved by the CPM. The pen shall contain adequate cover and be in an area supporting suitable soils for burrowing.

5. Tracking, Monitoring, Disease Testing, and Reporting. The plan shall provide information on the use of tracking units (GPS VHS transmitters) on tortoises from the project site, translocation site, and control site; provide information on the short and long term monitoring and reporting of control, translocated and host populations; provide information on disease testing for long distance translocated tortoises, host, and control sites; and, identify remedial actions should excessive predation or mortality be observed. The plan shall also include provisions for removing diseased tortoises; the development of quarantine pens; accommodating eggs hatchlings or juvenile tortoise.

Rationale for proposed revision - *The standard method of tracking tortoises is via VHS transmitters. GPS transmitters are experimental for tortoise.*

Verification: At least 90 days prior to the start of any project-ground disturbing activity, the project owner shall submit the draft Desert Tortoise Relocation/Translocation Plan to the CPM for review and approval and to USFWS and CDFG for review and comment. No less than 30 days prior to the start of any project-ground disturbing activity, the project owner shall provide the CPM with the final version of a Desert Tortoise Relocation/Translocation Plan. No relocation/translocation activities may occur prior to approval of the final plan by the CPM. Any modifications to the approved plan shall be made only after approval by the CPM and in consultation with USFWS and CDFG.

Within 30 days after initiation of relocation and/or translocation activities, the Designated Biologist shall provide to the CPM for review and approval, a written report identifying which items of the plan have been completed, and a summary of all modifications to measures made during implementation of the plan. Written monthly progress reports shall be provided to the CPM for the duration of the plan implementation; monthly progress reports may be replaced by quarterly reports after the first year of relocation/translocation, if approved by the CPM.

BIO-12: Desert Tortoise Compensatory Mitigation

The Applicant recommends that the acreage estimates and mitigation ratio set forth in the condition be modified as shown in changes to BIO-12, below. The FSA requires a 3:1 compensation ratio for areas supporting creosote bush scrub and a 1:1 ratio for areas of

the project site that support shadscale scrub. This is the same ratio that was presented in the PSA. In a detailed analysis of the site's biotic and abiotic conditions, and the pattern of tortoise sign, the Applicant recommended that the CEC's basis for determining mitigation ratios in the PSA should be refined because these coarse-grained vegetation communities did not adequately reflect tortoise habitat quality and use of the site (PSA Comments Set 1)[Exhibit 80]., For example, The FSA states that " the highest concentration of desert tortoise or their sign was associated with the creosote bush scrub communities that dominate the eastern portion of the site" (FSA Page 4.2-126: Paragraph 1). In fact, the highest concentrations of desert tortoise sign were primarily in one *patch* of the creosote bush community on the eastern side of the project, with a few, much smaller patches and scattered sign. Tortoise sign was not uniformly distributed throughout the entire creosote bush scrub community. In response to the Applicant's discussion of and recommendations for revisions to the mitigation ratios, The FSA addressed several variables in the assessment of tortoise compensation, and increased their analysis. The FSA's conclusion was still to divide the project into two compensation ratios using the two coarse-grained vegetation communities on the site, Mojave Desert scrub and shadscale scrub.

The plant communities on the project site are a function of several factors, including soil type, land use patterns, and many other ecological and environmental factors. In the western approximately two-thirds of the HHSEGS project site, calcareous, clayey silts and clays of the valley bottom support vegetation dominated by shadscale (*Atriplex confertifolia*) as well as other halophytes, both annual and perennial. These include both halogeton (*Halogeton glomeratus*) and inkweed (*Suaeda moquinii*), species tolerant of saline, high-pH soils and characteristic of fine soils that are often inundated.

The plant communities are also not uniform within their coarse designations (e.g., Mojave Desert scrub). For instance, the alluvial ramp leading uphill to the east and northeast reflects a gradual environmental gradient along which the creosote bush scrub community changes in both diversity and density in response to changing edaphic, topographic and, most likely, microclimatic conditions. These changes are more subtle than the relatively abrupt transition from saltbush scrub to creosote bush desert scrub, which is related to an equally abrupt change in subsurface geology.

Desert tortoise sign on the site presents a clear pattern of increasing density from west to east. No desert tortoise and little sign were found in shadscale scrub areas on the HHSEGS site or in the 150-m buffer or zone-of-influence transects. Calculations of tortoise density based on unit of survey effort (i.e., the number of adult desert tortoises detected per acre surveyed) found that the desert tortoise population density of the Mojave Desert scrub on the site was 1/8 the density in the 150-m buffer of Mojave Desert scrub along the eastern edge of the site and 1/56 the density of the zone-of-influence transects further east (CH2MHILL 2012g). The difference in tortoise density inside and outside the project, in combination with the habitat data, demonstrate that the habitat and tortoise use is not identical throughout the coarse-grained Mojave Desert scrub designation. Accordingly, this entire plant community does not warrant the same compensation ratio throughout. Furthermore, a 3:1 mitigation ratio seems excessive in light of the onsite tortoise population density of only 0.7 tortoises per square mile. Even if one uses only the acreage of Mojave Desert scrub (1611 acres onsite) for calculating density, 3.8 tortoises translates into only 1.5 tortoises per square

mile. Even further, if one uses the FSA's estimate of 13.8 tortoises for the project site and surrounding buffer, and only incorporates Mojave Desert Scrub (2211 acres), the resultant density is only 3.9 tortoises per square mile, a very low density.

In summary, the topographic, geologic, ecologic, and botanical circumstances at the HHSEGS site are consistent with the desert tortoise survey results and support the finding that the habitat quality for desert tortoise is extremely low in the western portions of the site and transitions toward more suitable habitat to the east. The results of the Applicant's analysis indicate that the site ecology, as well as the tortoise survey data, can and should be used to indicate the areas of relative importance to desert tortoise, and thus serve as a better indicator of habitat quality and compensation ratios than the coarse-scale plant community classification. In consideration of these factors, the Applicant recommends that the following compensation ratios for the HHSEGS site may represent appropriate ratios:

- 1.5:1 in the most concentrated tortoise use areas of Soil Type Qa1, which is consistent with the greater concentration of washes and increased plant density and diversity.
- 1:1 over most of the remainder of Qa soil types, plus Qb areas with lower halogeton concentrations, including those areas with scattered tortoise sign
- 0.5:1 throughout the remainder of the site where halogeton populations, characteristic of inundated, fine soils, are abundant; this also coincides with the remainder of the Qb soil type.

These ratios are reflected in Applicant's revised Condition BIO-12, below.[8]

BIO-12 To fully mitigate for habitat loss and potential take of desert tortoise, the project owner shall provide compensatory mitigation for impacts to ~~3,258~~ 3274 acres of habitat or whatever acreage is actually impacted by the project footprint. Impacts to areas supporting those areas of Mojave Desert scrub where most tortoise sign is concentrated shall be mitigated at ratio of ~~3:1 ratio (1580.5 acres)~~ 1.5:1 (362 acres). Areas in both creosote bush scrub and saltbush scrub that host scattered tortoise sign will be mitigated at ~~for and areas that support shadscale scrub communities at~~ a ratio of 1:1 (~~1,616.5~~ 1664 acres). All other lands on the project, even if not occupied, will be mitigated at a 0.5:1 ratio (1248 acres). The total compensatory land acquisition required to mitigate impacts to desert tortoise shall be ~~6,358~~ 2,831 acres or the ratio of lands actually impacted by the project footprint.

1. Responsibility for Acquisition of Lands: The responsibility for acquisition of lands may be delegated by written agreement from the CPM to a third party, such as a non-governmental organization supportive of habitat conservation. Such delegation shall be subject to approval by the CPM, in consultation with USFWS and CDFG, prior to land acquisition, enhancement, or management activities. If habitat disturbance exceeds that described in this analysis, the project owner

[8] The acreages in Condition BIO-12 are from the Desert Tortoise Mitigation Compensation Analysis for the Hidden Hills Electric Generating System. Total acreage does not add up to 3277 due to rounding.

shall be responsible for funding acquisition, habitat improvements, and long-term management of additional compensation lands or additional funds required to compensate for any additional habitat disturbances. Additional funds shall be based on the adjusted market value of compensation lands at the time of construction to acquire and manage habitat. Water and mineral rights shall be included as part of the land acquisition. Agreements to delegate land acquisition to CDFG or an approved third party and to manage compensation lands shall be implemented within 18 months of the Energy Commission's License Decision.

2. Selection Criteria for Compensation Lands. The compensation lands selected for acquisition to meet Energy Commission and CESA requirements shall:

    a. be of equal or better habitat quality for desert tortoise and within the Eastern Mojave Recovery Unit or other location approved by the CPM in consultation with the CDFG and USFWS, with potential to contribute to desert tortoise habitat connectivity and build linkages between desert tortoise designated critical habitat, known populations of desert tortoise, and/or other preserve lands;

    b. provide habitat for desert tortoise with capacity to regenerate naturally when disturbances are removed;

    c. be near larger blocks of lands that are either already protected or planned for protection, or which could feasibly be protected long-term by a public resource agency or a non-governmental organization dedicated to habitat preservation;

    d. be connected to lands currently occupied by desert tortoise, ideally with populations that are stable, recovering, or likely to recover;

    e. not have a history of intensive recreational use or other disturbance that exceed conditions on the project site that might make habitat recovery and restoration infeasible;

    f. Compensation lands may not include existing roads in the calculations of habitat acreages;

    g. not be characterized by densities of invasive species that exceed those on the project site, either on or immediately adjacent to the parcels under consideration, that might jeopardize habitat recovery and restoration; and

    h. not contain hazardous wastes.

3. Review and Approval of Compensation Lands Prior to Acquisition. A minimum of three months prior to acquisition of the property, the

project owner shall submit a formal acquisition proposal to the CPM, CDFG, and USFWS describing the parcel(s) intended for purchase. This acquisition proposal shall discuss the suitability of the proposed parcel(s) as compensation lands for desert tortoise in relation to the criteria listed above. Approval from the CPM, in consultation with CDFG and the USFWS, shall be required for acquisition of all parcels comprising the compensation acres.

4. Commission Mitigation Security: The project owner shall provide written verification to the CPM and CDFG with copies of the document(s) to the USFWS, to guarantee that an adequate level of funding is available to implement the Energy Commission Complementary Mitigation Measures described in this condition. These funds shall be used solely for implementation of the measures associated with the project. Alternatively, financial assurance can be provided to the CPM and CDFG in the form of an irrevocable letter of credit, a pledged savings account or another form of security ("security") prior to initiating ground-disturbing project activities. Prior to submittal to the CPM, the security shall be approved by CDFG and the CPM, in consultation with the USFWS, to ensure funding in the amount of $9,697,591.00 ~~21,779,329.00~~. This security amount was calculated as follows and may be revised upon completion of a Property Analysis Record (PAR) or PAR-like analysis of the proposed compensation lands:

   a. land acquisition costs for compensation lands, calculated at $1,000/acre = $~~6,358,000~~2,831,000;

   b. costs of initial habitat improvements to compensation lands, calculated at $250/acre = $~~1,589,500.00~~707,750.00;

   c. costs of establishing an endowment for long-term management of compensation lands, calculated at $1,450/acre = $~~9,219,100.00~~4,104,950.00;

   d. costs associated with conducting required surveys, assessments for hazardous materials, escrow fees, third party administrative costs and agency costs to accept the parcel; calculated at $2,053,891.00 ~~4,612,729.00 (See Biological resource Table 9 for a breakdown of these costs)~~.

5. Compensation Lands Acquisition Conditions: The project owner shall comply with the following conditions relating to acquisition of the compensation lands after the CPM, in consultation with CDFG and the USFWS, has approved the proposed compensation lands and received security as applicable and as described above.

   a. Preliminary Report: The project owner, or approved third party, shall provide a recent preliminary title report, initial hazardous materials survey report, biological analysis, and other necessary

documents for the proposed acquisition acres. All documents conveying or conserving compensation lands and all conditions of title/easement are subject to a field review and approval by CDFG and the CPM, in consultation with the USFWS, California Department of General Services and, if applicable, the Fish and Game Commission and/or the Wildlife Conservation Board.

b. Title/Conveyance: The project owner shall transfer fee title or a conservation easement to the compensation lands to CDFG under terms approved by CDFG. Alternatively, a non-profit organization qualified to manage compensation lands (pursuant to California Government Code section 65965) and approved by CDFG and the CPM may hold fee title or a conservation easement over the habitat mitigation lands. If the approved non-profit organization holds title, a conservation easement shall be recorded in favor of CDFG in a form approved by CDFG. If the approved non-profit holds a conservation easement, CDFG shall be named a third party beneficiary. If a Security is provided, the project owner or an approved third party shall complete the proposed compensation lands acquisition within 18 months of the start of project ground-disturbing activities.

c. Initial Habitat Improvement Fund. The project owner shall fund the initial protection and habitat improvement of the compensation lands. Alternatively, a non-profit organization may hold the habitat improvement funds if they are qualified to manage the compensation lands (pursuant to California Government Code section 65965) and if they meet the approval of CDFG and the CPM. If CDFG takes fee title to the compensation lands, the habitat improvement fund must go to CDFG.

d. Long-Term Management Endowment Fund. Prior to ground-disturbing project activities, the project owner shall provide to CDFG a capital endowment in the amount determined through the Property Analysis Record (PAR) or PAR-like analysis that would be conducted for the compensation acres. Alternatively, a non-profit organization may hold the endowment fees if they are qualified to manage the compensation lands (pursuant to California Government Code section 65965) and if they meet the approval of CDFG and the CPM. If CDFG takes fee title to the compensation lands, the endowment must go to CDFG, where it would be held in the special deposit fund established pursuant to California Government Code section 16370. If the special deposit fund is not used to manage the endowment, the California Wildlife Foundation or similarly approved entity identified by CDFG shall manage the endowment for CDFG and with CDFG supervision.

e. Interest, Principal, and Pooling of Funds. The project owner, CDFG and the CPM shall ensure that an agreement is in place with the endowment holder/manager to ensure the following conditions:

   i. Interest. Interest generated from the initial capital endowment shall be available for reinvestment into the principal and for the long-term operation, management, and protection of the approved compensation lands, including reasonable administrative overhead, biological monitoring, improvements to carrying capacity, law enforcement measures, and any other action approved by CDFG designed to protect or improve the habitat values of the compensation lands.

   ii. Withdrawal of Principal. The endowment principal shall not be drawn upon unless such withdrawal is deemed necessary by the CDFG or the approved third-party endowment manager to ensure the continued viability of the species on the compensation lands. If CDFG takes fee title to the compensation lands, monies received by CDFG pursuant to this provision shall be deposited in a special deposit fund established pursuant to Government Code section 16370. If the special deposit fund is not used to manage the endowment, the California Wildlife Foundation or similarly approved entity identified by CDFG would manage the endowment for CDFG with CDFG supervision.

   iii. Pooling Endowment Funds. CDFG, or a CPM and CDFG approved non-profit organization qualified to hold endowments pursuant to California Government Code section 65965, may pool the endowment with other endowments for the operation, management, and protection of the compensation lands for local populations of desert tortoise. However, for reporting purposes, the endowment fund must be tracked and reported individually to the CDFG and CPM.

   iv. Reimbursement Fund. The project owner shall provide reimbursement to CDFG or an approved third party for reasonable expenses incurred during title, easement, and documentation review; expenses incurred from other State or State-approved federal agency reviews; and overhead related to providing compensation lands.

The project owner is responsible for all compensation lands acquisition/costs, including but not limited to, title and document review costs, as well as expenses incurred from other State agency reviews and overhead related to providing compensation lands to the department or approved third party; escrow fees or costs; environmental contaminants clearance; and other site cleanup

measures. The project owner shall receive a credit or refund of commission mitigation securities for all unused project areas.

Verification: No less than 30 days prior to beginning project ground-disturbing activities, the project owner shall provide written verification to the CPM that the security has been established in accordance with this condition of certification. No less than 90 days prior to acquisition of the property, the project owner shall submit a formal acquisition proposal to the CPM, CDFG, and USFWS describing the parcels intended for purchase.

The project owner, or an approved third party, shall complete and provide written verification of the proposed compensation lands acquisition within 18 months of the start of project ground-disturbing activities. Within 180 days of the land or easement purchase, as determined by the date on the title, the project owner, or an approved third party, shall provide the CPM, CDFG, and USFWS with a management plan for the compensation lands and associated funds. The CPM shall review and approve the management plan, in consultation with CDFG and the USFWS.

Within 90 days after completion of project construction, the project owner shall provide to the CPM and CDFG an analysis with the final accounting of the amount of habitat disturbed during project construction.

BIO-14: American Badger and Desert Kit Fox Management Plan

AMERICAN BADGER AND DESERT KIT FOX MANAGEMENT PLAN

The Applicant notes that there are no CDFG guidelines for American badger or desert kit fox and therefore provides the following revisions to ensure effective management of the species. In addition, the Application modified the condition by putting the details of the management plan in the Verification section of the condition.

BIO-14 The owner shall prepare and implement an American Badger and Desert Kit Fox Management Plan. ~~The plan shall be prepared in accordance with the most current CDFG guidelines for these species~~.

Verification: The Management Plan must be approved by the CPM prior to implementation, and shall contain the following provisions:

Preconstruction surveys and mapping efforts: biological monitors shall perform pre-construction surveys for badger and kit fox dens in the project area, including areas within 250 feet of all project facilities, utility corridors, and access roads. Preconstruction surveys may be completed concurrent with the preconstruction nesting bird surveys, burrowing owl surveys, or desert tortoise clearance surveys. If dens are detected, each den shall be classified as inactive, potentially active, or known active, including characterization of den type for kit fox (natal, pupping, likely satellite, atypical) per CDFG and/or CPM guidance, and mapped along with major project design elements.

Directions for collapse of inactive dens. Inactive dens that would be directly impacted by construction activities shall be excavated by hand and backfilled to prevent reuse by badgers or kit fox. Potentially and known active dens shall not be disturbed during the whelping/pupping season (approximately February 1 – September 30). A den may only be declared "inactive" after three days of monitoring via camera(s) or ~~and~~ tracking medium that have shown no kit fox or American badger activity.

Monitoring requirements: potentially and definitely active dens that would be directly impacted by construction activities shall be monitored by the Biological Monitor for three consecutive nights (during weather conditions favorable for detection) using a tracking medium (such as diatomaceous earth or fire clay) and/or infrared camera stations at the entrance. If no tracks are observed in the tracking medium or no photos of the target species are captured after three nights, the den shall be excavated and backfilled by hand. Backfilling dens ensures no badgers or kit fox are trapped in the den.

Passive relocation strategies: the management plan shall contain~~, at a minimum, several~~ strategies to passively relocate animals from the site. These methods may entail strategic mowing, fencing, or other feasible ~~construction~~ methods to assist in moving animals offsite toward desirable land. The plan shall also ~~detail methods used to discourage occupation of dens within the project site, such as use of noisemakers, citronella-based chemical deterrents, strobe lighting, ect., and shall~~ incorporate temperature constraints if requested by the CPM or CDFG. The Plan shall address location of preferred offsite movement of animals, based on CDFG data and land ownership. Private land is to be avoided to the maximum extent practicable. The Plan shall also indicate that passive hazing is not to be used at natal dens, and shall include guidelines specific to determining when kit fox pups are functioning independently, and when passive relocation strategies may be safely implemented. The Plan shall also prescribe use of buffer zones around dens to protect against accidental collapse or crushing by people or equipment.

Kit fox disease prevention measures. The Designated Biologist shall notify the CDFG and CPM within 24 hours if a dead kit fox is found or appears sick. The plan must also detail a response to a kit fox injury and~~, including a necropsy plan,~~ reporting methods~~, and scope of adaptive methods in the event of a known or suspected outbreak. The project owner will pay for any necropsy work~~.

~~Verification:~~ ~~—~~At least ~~6~~30 days prior to any project-related ground disturbing activity, the project owner shall submit an American badger and desert kit fox management plan to the CPM for review and approval and to CDFG for review and comment. No less than ~~3~~10 days prior to any ground disturbing activity, the project owner shall provide one copy of the final approved plan to the CPM and implement the plan.

The project owner shall submit a report to the CPM and CDFG within 30 days of completion of badger and kit fox surveys. The report shall describe survey methods, findings, provide preliminary classification of dens and rationale, and map dens along with project features. Results of ongoing monitoring and relocation efforts shall be reported in the Monthly Compliance Reports. The project owner shall provide the CPM 24 hour notice before excavating a den classified as natal.

BIO-15: Avian, Bat, and Golden Eagle Protection Plan

The Applicant requests that golden eagles be addressed via the condition for a monitoring plan and Bird and Bat Conservation Strategy, as no Eagle Conservation Plan will be prepared for the project. As explained in the testimony, take of golden eagle that might require permitting under the Bald and Golden Eagle Protection Act, is not expected to occur. An ECP is a component of a voluntary process that the USFWS is developing to support the issuance of eagle programmatic take permits. The revisions to BIO-15 include substantive golden eagle survey and monitoring requirements consistent with the comparable provisions in the USFWS Draft ECP Guidance and clarify the FSA option to include golden eagle in the required BBCS rather than in a stand-alone plan. The Applicant also provides recommendations to focus the BBCS on information relevant to the project-specific interests of the agency. Applying "all applicable guidelines recommended by the USFWS" is broad and unspecific, and requires implementation of voluntary measures not required by federal or state law.

BIO-15: AVIAN, BAT, AND GOLDEN EAGLE POPULATION MONITORING AND ENHANCEMENT

BIO-15 The project owner shall implement the following measures to monitor, mitigate and adaptively manage operational impacts to birds and bats.

1. Monitoring Study: The project owner shall prepare and implement a monitoring study to monitor the potential death and injury of birds and bats caused by collisions with project facilities including heliostats, ~~and~~ solar receiver towers ~~injury caused by~~ flying through concentrated solar energy within the solar field, or by other project-related causes ~~of injury or mortality including the gen-tie line and evaporation ponds~~. The study design shall be based on the USFWS's Monitoring Migratory Bird Take at Solar Power Facilities: An Experimental Approach (Nicolai et al 2011) or more current guidelines if available. Visual surveillance of the heliostat field shall be incorporated into study design, with the intent of documenting species and flight behavior of birds entering heliostat field, measuring elevation at which birds are flying, and documenting ~~ation of~~ effects of solar flux exposure. ~~Special effort shall be made to collect the c~~The carcass of any bird observed colliding with project features or coming to the ground within the project boundaries will be collected if possible, along with ~~including recording~~ Global Positioning Satellite (GPS) data. The Monitoring Study shall be subject to review and approval by the CPM in consultation with CDFG and USFWS, shall be incorporated into the project's BBCS and BRMIMP, and implemented by the Designated Biologist, in coordination with the project owner, CPM, CDFG, and USFWS. The study shall be implemented, for a period of up to ~~not less than~~ 5 years (60 months) total, including the entire construction phase and not less than 2 years during the operational phase and shall continue until the CPM concludes, in consultation with

the other agencies, that the cumulative monitoring data provide sufficient basis for estimating long-term bird mortality for the project. ~~Compensatory mitigation, if required by the CPM, shall be developed using results of the monitoring study, and in consultation with the USFWS and CDFG.~~

The Monitoring Study shall also detail disposition of avian and bat carcasses~~. All carcasses found on the solar field should be collected, labeled, and stored in a freezer.~~ The Monitoring Study shall provide techniques and protocols to follow in proper techniques for collection, processing, and preservation of carcasses~~; and specifically, shall specify that flight feathers must be plucked and bagged separately from the carcass. Feather samples are not to be frozen or refrigerated~~. Carcass and feather samples shall be provided to the CPM or CPM's designee upon request. The CPM shall receive notification within 24 hours of detection of a threatened, endangered, or special status bird or bat carcass, and procedures to report other mortality or sublethal injury will also be included in the Monitoring Study.

~~2.~~ Bird and Bat Conservation Strategy (BBCS): The project owner shall prepare and implement a Bird and Bat Conservation Strategy adopting **BIO-16**~~, and all applicable guidelines recommended by the USFWS (2010e) or more current guidelines that may be released~~. The BBCS will describe all proposed measures to minimize death and injury of birds or bats from (1) collisions with facility features including the heliostats, power towers, and ~~gen-tie line~~ towers or transmission lines within the project site, and electrocutions potentially associated with these facilities, and (2) concentrated solar energy (flux) present in the airspace over each heliosat field, and require implementation of conservation actions in response to bird, bat, and golden eagle mortality should such impacts be documented. The BBCS shall describe all available baseline data on golden eagle occurrence, seasonality, activity, and behavior throughout the project area and vicinity, and, a study protocol, as may be required or necessary to include additional annual pedestrian and/or helicopter surveys of golden eagle breeding sites within a 10 mile radius of the project site, to be reviewed and approved by the CPM, in consultation with the project owner and the USFWS . If required or necessary based on the results of the monitoring data, an inventory of existing electrical distribution lines within a 20-mile radius of the project site that do not conform to APLIC (2006) design standards will be provided.

3. ~~Eagle Conservation Plan (ECP): The project owner shall prepare and implement an Eagle Protection Plan adopting all applicable guidelines recommended by the USFWS (2011b) or more current guidelines that may be released. The ECP may be prepared as a stand-alone document or it may be included as a chapter within the BBCS. The ECP shall describe all available baseline data on golden eagle occurrence, seasonality, activity, and behavior throughout the project area and~~

~~vicinity. The ECP shall outline a study protocol to include annual pedestrian and/or helicopter surveys of golden eagle breeding sites within a 10 mile radius of the project site, to be reviewed and approved by the CPM, in consultation with the USFWS~~.

~~The ECP shall describe all proposed measures to minimize death and injury of eagles from (1) collisions with facility features including the heliostats, power towers, and gen-tie line towers or transmission lines, electrocutions on transmission lines or other project components, and (3) concentrated solar flux created over the solar field. The ECP shall specify the project owner's anticipated take of golden eagles. The ECP shall provide an inventory of existing electrical distribution lines within a 20-mile radius of the project site that do not conform to APLIC (2006) design standards to prevent golden eagle electrocution. The inventory shall identify the owner or operator and estimate the number of non-conforming poles for each distribution line. The ECP shall specify that for each anticipated project-related take of a bald or golden eagle, 11 utility poles will be retrofitted to APLICstandards within one year of the take.~~

~~The ECP shall also include any feasible modifications to proposed plant operation to avoid or minimize focusing heliostats at standby points and, instead, move heliostats into a stowed position or another alternative configuration when the power plant is in partial standby mode. The ECP also shall identify any additional feasible conservation measures to minimize collisions and exposure to solar flux. The ECP shall provide a reporting schedule for all monitoring or other activities related to bird or bat conservation or protection to be taken during project construction or operation. The ECP shall be subject to review and approval by the CPM in consultation with CDFG and USFWS, and shall be incorporated into the project's BRMIMP and BBCS, and implemented.~~

Verification: The draft Monitoring Study~~,~~ and BBCS ~~and ECP~~ shall be submitted to the CPM for review in consultation with CDFG, and USFWS, and shall be finalized by the project owner and submitted to the CPM and other agencies no less than 30 days prior to construction. ~~At least 30 days prior to the start of any project-related ground disturbance activities, the project owner shall provide the CPM, CDFG, and USFWS with the a final draft of all three documents, as reviewed and approved by the CPM in coordination with the other agencies.~~ The project owner shall obtain the CPM's written approval of the Monitoring Study~~,~~ and BBCS ~~and ECP~~ prior to the start of construction. ~~any project-related ground disturbance activities~~.

The project owner shall provide the CPM with copies of any written or electronic transmittal from the USFWS indicating the status of Monitoring Study~~,~~ and BBCS ~~and ECP~~ review ~~and any permit that may be required~~, and any follow-up actions required ~~by~~ of the applicant, within 30 days of receiving such transmittal from USFWS. If comments are not received within 30 days after the project owner's submittal of the Monitoring Study and BBCS to USFWS, it will be assumed that the USFWS has no comments for consideration.

Methods and results of the Monitoring Study shall be submitted to the CPM in ~~Monthly~~ seasonal and Annual ~~Compliance~~ Monitoring Reports throughout the course of the study and until the CPM, in consultation with the other agencies, concludes that the cumulative monitoring data provide sufficient basis for estimating long-term bird mortality for the project. The Reports will include all monitoring data required as part of the monitoring program.

Each year throughout the ~~minimum~~ maximum 5 year monitoring period, the Designated Biologist shall submit an Annual Monitoring Report ~~cover~~ to the CPM, CDFG, and USFWS by January 31 of each calendar year, summarizing all available bird and bat mortality data (species, date and location collected, evidence of injury and cause of death) collected over the course of the year through the preceding fall season. The report shall provide any recommendations for future monitoring and adaptive management actions. The report also shall summarize any additional wildlife mortality or injury documented on the project site during the year, regardless of cause. The Annual Monitoring Report shall be subject to review and approval by the CPM in consultation with CDFG and USFWS. The project owner shall submit revisions within 30 days of receiving written comments from the CPM. At the direction of the CPM, in consultation with the other agencies, the study period will be extended or reduced based on data quality and sufficiency for analysis or if needed to document efficacy of any adaptive management measures undertaken by the project owner. If a carcass of a golden eagle or any state or federally listed threatened or endangered species is found at any time on the project site the project owner or Designated Biologist shall notify ~~contact~~ CDFG and USFWS within one working day of ~~receipt of~~ finding the carcass to report the mortality and for guidance on disposition of the carcass.

BIO-16: Pre-Construction Nesting Bird Surveys

The Applicant requests modifications to Bio-16 to allow surveys to be completed only where access is legally available due to private land access restrictions and to ensure predefined response to nesting birds that ensures impact avoidance while allowing construction to proceed in a timely manner.

BIO-16 Pre-construction nest surveys shall be conducted if construction activities will occur from February 1 through August 1~~5~~. The Designated Biologist or Biological Monitor conducting the surveys shall be experienced bird surveyors and familiar with standard nest-locating techniques. Surveys shall be conducted in accordance with the following guidelines:

1. Surveys shall cover all potential nesting habitat in the project site and within 500 feet of the boundaries of the plant site and linear facilities where access is legally available;

2. At least two pre-construction surveys shall be conducted, separated by a minimum 10-day interval. One of the surveys shall to be conducted within the 10 days preceding initiation of construction activity. Additional follow-up surveys may be required if periods of construction inactivity exceed one week in any given area, an interval during which birds may establish a nesting territory and initiate egg laying and incubation;

3. If active nests are detected during the survey, a no-disturbance buffer zone (protected area surrounding ~~the~~ a nest), shall be established, the size of which is to be determined by the Designated Biologist as specified in the nesting bird plan. ~~in consultation with CDFG, USFWS, and CPM) and a monitoring plan for identified nests shall be developed. The nesting bird plan shall identify the types of birds that may nest in the project area, the proposed buffers, monitoring requirements, and reporting standards that will be implemented to ensure compliance with the Migratory Bird Treaty Act and Fish and Game Codes 3505 and 3505.3~~. Nest locations shall be mapped using GPS technology and submitted, along with a weekly report stating the survey results, to the CPM; and a nesting bird plan identifying the proposed buffers, monitoring requirements, and reporting standards that will be implemented to ensure compliance with the Migratory Bird Treaty Act and Fish and Game ~~Codes~~ Code Sections 3505 and 3505.3 will be submitted to the CPM.

4. The Designated Biologist shall monitor the nest until he or she determines that nestlings have fledged and dispersed. Activities that might, in the opinion of the Designated Biologist and in consultation with the CPM, disturb nesting activities shall be prohibited within the buffer zone until such a determination is made.

Verification: At least 10 days prior to the start of any project-related ground disturbance activities, the project owner shall provide the CPM a letter-report describing the findings of the pre-construction nest surveys, including the time, date, and duration of the survey; identity and qualifications of the surveyor(s); and a list of species observed. If active nests are detected during the survey, the report shall include a map or aerial photo identifying the location of the nest and shall depict the boundaries of the no-disturbance buffer zone around the nest and the nesting bird plan described in BIO-16 Section 3. All nest avoidance measures will be implemented and reported in the Monthly Compliance Report.

BIO-17: Burrowing Owl Impact Avoidance, Minimization, and Compensation Measures

The Applicant proposes the following BIO-17 condition to identify impact avoidance minimization and compensation measures consistent with recent CEC authorized projects and with the lack of evidence that two owl territories would be lost due to the project.

BIO-17 The project owner shall implement the following measures to avoid and offset impacts to burrowing owls:

1. Pre-Construction Surveys. The project biology staff shall conduct pre-construction surveys for burrowing owls within the project site in accordance with CDFG guidelines (CDFG Staff Report Burrowing Owl Mitigation March 2012~~c~~). The survey area shall include the project disturbance area (i.e., all lands disturbed in the construction

and operation of the Hidden Hills SEGS Project) and surrounding 500-foot survey buffer where access is legally available. The surveys may be conducted concurrently with desert tortoise clearance surveys if field crews are suitably qualified and survey dates are compatible.

2. Implement Avoidance Measures. If an occupied (= owl present) burrowing owl burrow is located within 500 feet from the any project work area or disturbance are the following avoidance and minimization measures shall be implemented:

    a. Designate Non-Disturbance Buffer. Fencing shall be installed at a 250-foot radius from the occupied burrow to create buffer area where no work activities may be conducted. The non-disturbance buffer and fence line may be reduced to 160 feet if all project-related activities that might disturb burrowing owls would be conducted during the non-breeding season (i.e., conducted September 1st through January 31st). Signs shall be posted in English and Spanish at the fence line indicating no entry or disturbance is permitted within the fenced buffer.

    b. Monitoring: If construction activities would occur within 500 feet of the active (= with eggs or chicks) burrow during the nesting season (February 1 – August 31st) the project biology staff shall monitor to determine if these activities have potential to adversely affect nesting efforts, and shall implement measures to minimize or avoid such disturbance.

3. Prepare and Implement a Burrowing Owl Relocation and Mitigation Plan. The project owner shall prepare and implement a Burrowing Owl Relocation and Mitigation Plan, in addition to the avoidance measures described above. The final Burrowing Owl Relocation and Mitigation Plan shall be approved by the CPM and shall:

    a. Ensure that a minimum of two suitable, unoccupied burrows are available off-site for every burrowing owl or pair of burrowing owls to be passively relocated, including a discussion of timing of burrow improvements, specific location of burrow installation, and burrow design; design of the artificial burrows shall be consistent with CDFG guidelines (CDFG Staff Report Burrowing Owl Mitigation March 2012~~c~~) and shall be approved by the CPM;

    b. If artificial burrows will be constructed, identify and describe suitable burrow replacement sites within one (1) mile of the project site and describe measures to ensure that burrow installation or improvements would not affect sensitive species habitat or any burrowing owls already present in the relocation area; burrow replacement sites shall be in areas of suitable habitat for burrowing owl nesting;

c. Provide detailed methods and guidance for passive relocation of burrowing owls within the project disturbance area; active nest burrows may not be disturbed during the nesting season (February 1 to August 31) to avoid take under the MBTA and Fish and Game codes unless authorized by the appropriate agencies;

d. Describe monitoring and management of the replacement burrow site(s), and provide a reporting plan; the objective shall be to manage the sites for the benefit of burrowing owls, with the specific goals of:

i. Maintaining the functionality of the burrows for a minimum of two years; and

ii. Minimizing weed cover.

4. Acquire Compensatory Mitigation Lands for Burrowing Owls. The project owner shall acquire, in fee or easement, 13 acres of land for each burrowing owl or nesting pair that is displaced by the project of compensatory mitigation lands. The number of burrowing owls will be determined by the number of burrowing owls that are located on the site during pre-construction surveys. If burrowing owls are observed to occupy the compensation lands, then only 6.5 acres per single bird or pair is required.

Verification: If pre-construction surveys detect an occupied burrowing owl~~s~~ burrow within 500 feet of proposed construction activities, the Designated Biologist shall provide to the CPM, BLM, CDFG and USFWS documentation indicating that non-disturbance buffer fencing has been installed at least 10 days prior to the start of any construction-related ground disturbance activities. The project owner shall report monthly to the CPM, CDFG, and USFWS for the duration of construction on the implementation of burrowing owl avoidance and minimization measures. Within 30 days after completion of construction, the project owner shall provide to the CPM, BLM, CDFG, and USFWS a written construction termination report identifying how mitigation measures described in the plan have been completed.

If pre-construction surveys detect an occupied burrowing owls burrow within the project disturbance area, the project owner shall notify the CPM, CDFG, and USFWS within 10 days of completing the surveys that a relocation of owls is necessary. The project owner shall do all of the following if relocation of one or more burrowing owls is required:

1. Within 30 days of completion of the burrowing owl pre-construction surveys, submit to the CPM, BLM, CDFG, and USFWS a Burrowing Owl Relocation and Mitigation Plan.

2. By January 31st of each year following construction for a period of five years, the Designated Biologist shall provide in the ACR a report to the CPM, BLM, USFWS, and CDFG that describes the results of monitoring and management of the burrowing owl relocation area, if applicable. The annual report shall provide an assessment of the status of the relocation area with respect to burrow

function and weed infestation, and shall include recommendations for actions the following year for maintaining the burrows as functional burrowing owl nesting sites and minimizing the occurrence of weeds.

BIO-18: Weed Management Plan

This condition requires that the Applicant monitor and control weeds off-site. Changes to this condition have been made to clarify that weed control monitoring or weed control activities will not be performed offsite since the Applicant has no control over that property. Paragraph 6, requesting additional funding, has been struck entirely. As stated in page 19 of the Socioeconomics section of the FSA, " With the inclusion of Conditions of Certification as described in Biological Resources section requiring HHSEGS to develop and implement a weed management plan, it is expected that additional weed management by the County will not be necessary."

BIO-18 To minimize the potential indirect effects of weeds on biological resources adjacent to the project, the project owner shall submit a draft Weed Management Plan subject to review and approval by the CPM. The general objective of the Weed Management Plan shall be to: 1) manage or contain weed species of greatest environmental concern for the life of the project to prevent their spread into adjacent offsite habitat, and 2) prevent the accidental introduction of new weed species from contaminated vehicles and equipment ~~entering the site~~ during construction or soil disturbing activities.

"Target" weed species ~~for long~~ to be included in the Weed Management Plan ~~term containment~~ shall include any weed ~~occurring within the WMAs described above~~ that meets the following definition: a) California Invasive Plant Council (Cal-IPC) "High"-rank weeds (excluding grass species such as red brome and cheatgrass that are ranked by Cal-IPC as "High" but are so widespread that they are not feasibly controlled); b) California Department of Food & Agriculture (CDFA) ~~and Nevada Department of Agriculture (NDA)~~ "A"-rated and "B"-rated weeds~~, and c) all weeds on the Federal weed list.~~ Only the species of greatest environmental concern and/or limited distribution onsite shall be mandated for control and/or eradication. Weed management is not required for common and widespread weed species.

The draft weed management plan shall include the following:

1. Weed Plan Requirements. The draft plan shall include the following information: a) specific weed management objectives and measures for each target non-native weed species; b) description of the baseline conditions; c) maps ~~of the weed management and monitoring areas~~ showing locations of existing populations of target weeds; d) weed risk assessment based on Cal-IPC[9],Nature Conservancy[10]; BLM, or other

[9] Warner, Peter J., Carla C. Bossard, Matthew L. Brooks, Joseph M. DiTomaso, John A. Hall, Ann M. Howald, Douglas W. Johnson, John M. Randall, Cynthia L. Roye, Maria M. Ryan, and Alison E. Stanton. 2003. *Criteria for Categorizing Invasive Non-Native Plants that Threaten Wildlands.*California Exotic Pest Plant Council and Southwest Vegetation Management Association. 24 pp. Online:.

acceptable criteria, and e) measures that would be used to contain, manage, or monitor identified priority weed species; f) measures that would be used to prevent the introduction and spread of weeds on vehicles, equipment, and materials (e.g., infested seed, straw, gravel, etc.); g) measures to minimize the risk of unintended harm to wildlife and other plants from weed control activities; h) monitoring and surveying methods; and i) reporting requirements.

2. Avoidance and Treatment of Dense Weed Populations. The draft plan shall include guidelines for avoiding or treating dense populations of the weed species identified as priorities for containment. If grading and construction cannot avoid the worst, they shall be contained by one of the following methods to be selected by the project owner: a) requiring tires of vehicles and equipment operating in infested areas to be cleaned before leaving the infested area; or b) treating the infested areas in the season prior to construction and spraying the new crop of plants that emerge in early spring.~~, c) removing the upper 2 inches of soil and disposing it offsite at a sanitary landfill or other site approved by the County Agricultural Commissioner, or d) burying the infested soil, e.g., under the solar facility or in a pit, and covering the infested soil with at least three feet of uncontaminated soil.~~

3. Cleaning Vehicles and Equipment. The draft plan shall include specifications and requirements for establishing a cleaning station for removal of weed seed and weed plant parts from vehicles and equipment entering and leaving the site. Vehicles and equipment working in weed-infested areas (including previous job sites) shall be required to clean the equipment tires, tracks, and undercarriage before entering the project area~~ and before moving from infested areas of the project site to uninfested areas.~~ The washing station shall be sized to accommodate large vehicles and construction equipment. Security or cleaning station staff will actively monitor vehicles and provide records in the monthly logs. Cleaning shall adequately remove all visible dirt and plant debris. ~~Cleaning using hand tools, such as brushes, brooms, rakes, or shovels, is preferred.~~ If water must be used to clean vehicles, the water/slurry shall be contained to prevent seeds and plant parts from washing ~~into adjacent habitat~~offsite.

4. Treatment of Weed Populations near Special-status Plants. The draft plan shall include a requirement to prioritize the containment of ~~invasive~~ target non-native weeds onsite that occur onsite and within 100 feet of any of the nine offsite special-status plant occurrences immediately adjacent to the project boundary. Weeds that are located

[10] Morse, L.E., J.M. Randall, N. Benton, R. Hiebert, and S. Lu. 2004. *An Invasive Species Assessment Protocol: Evaluating Non-Native Plants for Their Impact on Biodiversity.*[v1]. The Nature Conservancy. Arlington, Va. Online: http://www.natureserve.org/library/invasiveSpeciesAssessmentProtocol.pdf

offsite will not be controlled. The draft plan shall also include measures for preventing accidental harm to the adjacent offsite occurrences during spraying or other weed management activities according to the guidelines in #6, below. The plan shall not include spraying or mechanical treatments of common and widespread weeds around the perimeter to avoid harming wildlife; the focus shall instead be on spot treatment of new outbreaks and small populations of the most invasive species, and according to the guidelines for wildlife-safe herbicide use described under #7 and #8, below.

5. Employee Weed Awareness Training. A program shall be developed and incorporated into the WEAP and BRMIMP to train construction and operation employees to recognize the most common and most invasive species in the area, how to avoid contaminating vehicles and equipment, how to avoid spreading weeds offsite or introducing new weed species onsite, and how to protect wildlife and adjacent offsite special-status plant occurrences from accidental harm during weed management activities. Employees shall be trained to understand the common vectors and conduits for spread, the economic and ecological impacts of weeds, and trained on procedures for reporting infestations.

~~6. Compensate Local Agencies for Increased Weed Monitoring and Abatement. The project owner and the Inyo/Mono Agricultural Commissioner shall establish an amount for a fee to be paid annually by the project owner to the local agency for increased offsite monitoring and abatement costs resulting from the construction and operation of the project. A summary of California's weed laws is available online: <http://www.cdfa.ca.gov/plant/ipc/encycloweedia/winfo_weedlaws.htm>~~

7. Safe Use of Herbicides. The draft plan shall include a list of herbicides and soil stabilizers that will be used on the project with manufacturer's guidance on appropriate use. The draft plan shall indicate under what circumstances herbicides will be used, and what techniques will be used to avoid chemical drift. Guidance for safe herbicide use is available in *Safe Herbicide Handling in Natural Areas* (Hillmer et al. 2003). Only weed control measures for target weeds with a demonstrated record of success shall be used, based on the best available information from sources such as The Global Invasive Species Team "Invasipedia"[11], Cal-IPC Invasive Plant Profiles[12],and the California Department of Food & Agriculture Encycloweedia[13].

[11] http://wiki.bugwood.org/Invasipedia

[12] http://www.cal-ipc.org/ip/management/plant_profiles/index.php

[13] http://www.cdfa.ca.gov/plant/ipc/encycloweedia/encycloweedia_hp.htm

8. Weed Control Methods. The methods for weed control described in the draft plan shall meet the following criteria:

    a. Manual: Seed heads and plants removed manually must be disposed of in accordance with guidelines from the Inyo County Agricultural Commissioner (or Clark or Nye County commissioners if disposed in Nevada).

    b. Chemical: Herbicides known to have residual toxicity, such as soil fumigants, ~~pre-emergent herbicides~~ and pellets shall not be used. Post- emergent herbicides known to have minimal toxicity to birds and other wildlife will be used in weed control. This includes selective or non-selective types depending on target weed species. In sensitive areas immediately adjacent to offsite special-status plant occurrences, sprayers shall be operated at low pressure or with a shield attachment to control drift, and spraying conducted on windless days;

    c. Biological: Biological methods, if used, shall be subject to agency review to avoid inadvertent naturalizing, hybridizing with native species;

    d. Mechanical: Mechanical trimmers shall not be used during periods of high fire risk or shall only be implemented during early morning hours when the fire risk is lowest. Contact information for the local fire department and Cal-Fire shall be clearly posted at all times. A live water supply, shovels, and fire extinguishers shall be available at all times during mowing and other mechanical weed controls.

Verification: At least 90 days prior to the start of any project-ground disturbing activity, the project owner shall submit the draft Weed Management Plan to the CPM for review and approval. No less than 30 days prior to the start of any project-ground disturbing activity, the project owner shall provide the CPM with the final version of the Weed Management Plan. Any modifications to the approved plan shall be made only after approval by the CPM.

~~No less than 60 days prior to start of any project-related ground disturbance activities, the project owner shall provide the CPM with a copy of an agreement between the project owner and local agricultural commissioner(s) regarding compensation for increased weed monitoring and abatement costs, and provide written evidence that the first annual fee has been paid.~~

Within 60 days after completion of project construction, the project owner shall provide to the CPM for review and approval a written report identifying which items of the Weed Management Plan have been completed, a summary of all modifications to mitigation measures made during the project's construction phase, and which items are still outstanding.

As part of the Annual Compliance Report, each year following construction the Designated Biologist shall provide a report to the CPM that includes: a) a summary of

the results of noxious weed surveys and management activities for the year; b) discussion of whether weed management goals and objectives for the year were met; c) ~~documentation that weeds targeted for containment did not spread offsite (beyond existing background levels for species that also occur offsite);~~ documentation that methods were employed to prevent accidental harm to adjacent sensitive resources, and d) recommendations for weed management activities for the upcoming year.

BIO-19: Special-Status Plant Impact Avoidance and Minimization Measures

The Applicant requests that Condition BIO-19 be revised to clarify protection of special status plants located off-site. In addition, language in paragraph (a) on modification of construction methods is already discussed in BIO-8, General Impact Avoidance and Minimization Measures. To avoid redundancy, and possible discrepancies in mitigation language if measures are included in several different Conditions, BIO-19 should just reference BIO-8 rather than reiterate details here. The rest of the paragraph has therefore been removed. This approach is consistent with BIO-19 (d) which describes weed control measures (by referencing the original measure, and then this COC does not provide the details).

In the description of verification section, the requirement to monitor the temporary ESAs for the life of the project has been changed to "during construction". A perimeter fence will be installed permanently demarking the project boundary and no construction equipment or personnel will be working outside the fence. Monitoring the temporary ESA signage for the life of the project for avoidance of construction impacts is unnecessary.

Paragraphs (a) and (f), requesting that spoil piles or laydown areas or other project construction elements be placed at least 100 feet from any offsite special-status plants, and modify construction methods in these areas, would place excessive constraints to construction activities around a 100 foot wide swath within the entire project site for an offsite resource that will already be protected through an ESA designation. These paragraphs have therefore been deleted. Minor changes and clarifications to the condition language below have also been added.

BIO-19 The project owner shall prevent accidental impacts to <u>known</u> special-status plant occurrences offsite that are in close proximity to project activities <u>(within 100 feet)</u> through the measures described below. The project owner is not responsible for managing or monitoring special-status plant occurrences offsite. The project owner shall incorporate all measures for protecting offsite special-status plants in close proximity <u>(within 100 feet)</u> to the site into the BRMIMP (BIO-7). These measures shall include the following elements:

~~a. Modify construction techniques~~: ~~Incorporate modifications to construction techniques to avoid accidental and indirect impacts to special-status plants around the project perimeter. Examples include: limiting the width of the work area; adjusting the location of staging areas, lay downs, secondary access roads; and modifying the location of~~

~~discharge points of any diverted channels to maintain existing surface drainage patterns.~~

b. Establish Environmentally Sensitive Areas (ESAs). Prior to the start of any ground- or vegetation-disturbing activities, the Biological Monitor shall designate ~~establish special-status plants located outside of the project and adjacent to the project boundary as~~ temporary Environmentally Sensitive Areas (ESAs) to protect ~~the~~ offsite special-status plant occurrences within 100 feet of the project boundary from accidental impacts during construction and operation. The location of the adjacent offsite occurrences shall be marked at the project boundary with ~~temporary construction fencing and~~ temporary signage during construction ~~activities in close proximity to the offsite occurrences~~. The adjacent offsite occurrences shall also be clearly depicted on construction drawings as ESAs. As part of regular monitoring activities, the Biological Monitor will verify that ESA signage is in good repair and, by doing so, will verify that avoidance of offsite special-status plant occurrences is performed during construction.

c. Worker Environmental Awareness Program (WEAP). The WEAP **(BIO-6)** shall include a requirement for informing employees and contractors about the presence of the special-status plant ESAs ~~adjacent offsite special-status plant occurrences~~ and components specific to ~~protection~~ avoidance of ESAs ~~special-status plants as outlined in this condition~~.

d. Herbicide and Soil Stabilizer Drift Control Measures. Special-status plant occurrences offsite shall be protected from potential herbicide drift as described in the Weed Management Plan (**BIO-18**), and through implementation of standard air quality and dust control measures, they shall also be protected from fugitive dust and soil stabilizer drift.

e. Avoid Weed Contaminated Erosion and Sediment Control Materials. Any seed mixes used for erosion control shall not include invasive plants. Erosion-control seed mixes, straw, and other mulches, if used, shall be certified weed-free. These specifications shall be incorporated in the Drainage, Erosion, and Sedimentation Control Plan required under **SOIL-1**.

~~f. Locate Staging, Parking, Spoils, and Storage Areas Away from Special-Status Plant Occurrences. Spoil piles, equipment, vehicles, and materials storage areas, parking areas, equipment and vehicle maintenance areas, and wash areas shall be placed at least 100 feet from any offsite special-status plant occurrences.~~

g. Monitoring and Reporting Requirements. The Designated Biologist shall conduct regularly scheduled monitoring of the ESAs ~~and other measures~~ designed to ~~protect~~ avoid inadvertent trespass offsite where adjacent offsite special-status plant occurrences are located during construction

~~activities in close proximity~~. The monitoring report shall include: a) dates of worker awareness training sessions and attendees; b) map showing the location of all special-status plant occurrences within 100 feet of the project boundary (including linears and access roads); c) location and description of the ESA signs~~,avoidance measures implemented~~; ~~d) description of the status, health, and threats to special-status plant occurrences adjacent to the project boundary;~~ ed) location description of any unanticipated or unpermitted ~~adverse impacts~~ trespass into ESAs ~~to occurrences~~ and any ~~remedial~~ corrective action taken; and e~~f~~) outstanding follow-up items and recommendations for ~~remedial~~ action in the next year.

Verification: The Monthly Compliance Reports prepared by the Designated Biologist during construction shall include documentation that the special-status plant ESAs were designated on construction drawings, and temporary ESA signage was installed and is in operational condition ~~special-status plant avoidance and minimization measures were implemented~~ as described in this condition.

The project owner shall submit a monitoring report every year during construction ~~for the life of the project~~ according to the specifications listed above to monitor effectiveness of ~~protection~~ temporary during-construction avoidance measures for ~~all avoided~~ the special-status plant~~s~~ ESAs to the CPM.

BIO-20: Special-Status Plant Compensatory Mitigation Plan

BIO-20 describes compensatory mitigation for the special-status plants for which impacts are considered significant. Taking into account the 2:1 and 3:1 mitigation ratios proposed in BIO-20, acquisition of several parcels of private land would be required. Based on the Applicant's experience with special-status plant land acquisition, and the low percentage of private landownership in Inyo County, this amount of private land acquisition will be extremely difficult. First, access agreements and permission to survey must be obtained. Then, surveys performed on numerous properties (and this can be a multiple-year effort, should drought conditions occur) to find the needed number of special-status plant occurrences with habitat conditions the same or better than those impacted. Next, after special-status plants are confirmed on a percentage of the properties surveyed, some small number of landowners would be expected to be willing to sell their land. Based on the experience with finding suitable lands for the ISEGS project, it may take three years to complete these tasks, particularly if there is a drought year when plants cannot be detected and surveys are delayed. For these reasons, language that adds other mitigation options to increase flexibility, and adjustments to the timeline to complete the mitigation process, have also been proposed.

As described in BIO-20, there is high potential for Torrey's joint-fir to be considerably more common than currently known. To address this, BIO-20 allows pre-construction surveys for Torrey's joint-fir. Compensatory mitigation for this species will be adjusted based on results of surveys. Gravel milkvetch, Preuss' milkvetch, and Wheeler's skeletonweed also have high potential to occur offsite in higher numbers than currently known. For example, Gravel milkvetch was not even added to the CNPS List until October 2011, after 2011 site surveys were completed. Additional offsite surveys were

performed for these species in 2012, but the survey findings were strongly and negatively influenced by the drought conditions. Due to the drought in 2012, opportunities to find additional occurrences of the other special-status species were limited as well. Changes to BIO-20 have been made so that any new findings for these three special-status plants will be treated the same as Torrey's jointfir, and results of surveys will be incorporated into the final compensatory mitigation developed for the project.

In addition, BIO-20 has been revised to include mitigation flexibility to address local land tenure considerations in the project region and feasibility.

BIO-20 To mitigate for significant impacts to special-status plants that occur on the project site, the project owner shall implement mitigation to offset the impact as described below. One or more mitigation options could be implemented to fulfill the ~~mitigation ratios and~~ requirements described below. These options include: a) acquisition of mitigation lands containing viable occurrences that meet the criteria and performance standards described below, and protecting those occurrences in perpetuity under a conservation easement, ~~or~~ b) enhancement/restoration of at-risk occurrences according to the criteria and performance standards described below, or c) in lieu payments as described below . The project owner shall provide funding for the acquisition and long-term maintenance and management of the acquired lands as described below.

1) Compensatory Mitigation Ratio for Compensation Lands. Significant impacts to four species (gravel milk-vetch, Wheeler's skeletonweed, Torrey's joint-fir, and Preuss' milk-vetch) shall be mitigated by acquiring and preserving offsite occurrences under a permanent conservation easement. Three offsite occurrences shall be protected for every S1 ("critically imperiled") species affected and two offsite occurrences protected for every S2 ("imperiled") species affected. Range ranks (e.g., an S1S2 rank) shall defer to the more imperiled rank. Acquisition lands containing more than one of the affected species shall be credited for both species. Integration of special-status plant mitigation land with other mitigation lands is described below.

   The compensation lands selected for acquisition must meet the following selection criteria: a) the compensation lands selected for acquisition shall be occupied by the target plant ~~population~~ species and shall be characterized by site integrity and habitat quality adequate to sustain the population, and b) shall be of equal or better habitat quality than that of the affected occurrence. unless enhancement actions are proposed to the acquisition property. The occurrence of the target special-status plant on the proposed acquisition lands should be viable, stable or increasing, or be made so, with implementation of enhancement actions.

2) Review and Approval of Compensation Lands Prior to Acquisition. A Draft Special-status Plant Mitigation Plan (Plan) shall be prepared

subject to review and approval of the CPM prior to acquisition. The Draft Plan shall discuss the suitability of the proposed parcel(s) as compensation lands for special-status plants in relation to the criteria listed above. The project owner shall submit the final Plan and formal acquisition proposal to the CPM describing the parcel(s) intended for purchase, and must be approved by the CPM.

3) Management Plan. The project owner, or approved third party as described below under "Title and Conveyance", shall prepare a management plan for the compensation lands in consultation with the entity that will be managing the lands. The goal of the management plan shall be to ~~support and enhance~~ maintain the long-term viability of the target special-status plant occurrences to be viable, stable, or increasing. The management plan shall also include long-term monitoring and reporting on the implementation, effectiveness and compliance with the conservation goals and objectives of the mitigation. The Management Plan shall be submitted for review and approval to the CPM.

4) Integrating Special-Status Plant Mitigation with Other Mitigation Lands. If all or any portion of the acquired Desert Tortoise, Waters of the State, or other required compensation lands meets the criteria above for special-status plant compensation lands, the portion of the other species' or habitat compensation lands that meets any of the criteria above may be used to fulfill that portion of the obligation for special-status plant mitigation. Mitigation obligations for special-status plants shall not be fulfilled by nesting with other mitigation lands if the lands do not meet all the criteria and performance standards described in this condition. Potential mitigation lands containing more than one of the significantly affected species would be credited for both species, i.e., one parcel could be used to fulfill the mitigation obligations for more than one special-status plant species providing the parcel met all the selection criteria. If mitigation lands contain more than one occurrence then credit will be given for multiple occurrences.

5) Compensation Lands Acquisition Requirements. The project owner shall comply with the following requirements relating to acquisition of the compensation lands after the CPM, has approved the proposed compensation lands:

    a. Preliminary Report. The project owner, or an approved third party, shall provide a recent preliminary title report, biological analysis, and other necessary or requested documents for the proposed compensation land to the CPM. All documents conveying or conserving compensation lands and all conditions of title are subject to review and approval by the CPM.

b. Title/Conveyance. The project owner shall acquire and transfer fee title to the compensation lands, a conservation easement over the lands, or both fee title and conservation easement, as required by the CPM. Any transfer of a conservation easement or fee title must be to a non-profit organization qualified to hold title to and manage compensation lands (pursuant to California Government Code section 65965), or to CDFG or other public agency approved by the CPM. If an approved non-profit organization holds fee title to the compensation lands, a conservation easement shall be recorded in favor of the deed holder approved by the CPM. The CPM may require that another entity approved by the CPM be named a third party beneficiary of the conservation easement. The project owner shall obtain approval of the CPM of the terms of any transfer of fee title or conservation easement to the compensation lands.

c. Initial Protection and Habitat Improvement. The project owner shall fund activities that the CPM requires for the initial protection and habitat improvement of the compensation lands, if habitat improvement is necessary. These activities will vary depending on the condition and location of the land acquired, but may include: initial enhancement (e.g., signs, fencing, protection from off-road vehicles); restoration actions needed to maintain the viability of the occurrences (e.g., removal of invasive species, barricading and decommissioning off-road vehicle trails, protection from herbivores, managing public access, enforcement); and monitoring and reporting on implementation, effectiveness and compliance with the conservation goals and objectives of the mitigation. For determining the amount of security, the cost of these activities ~~would~~may use the estimated cost per acre for Desert Tortoise mitigation as a ~~best available~~ proxy or other estimates proposed by the project owner and approved by the CPM. The actual costs will vary depending on the measures that are required for the compensation lands and shall be determined by a PAR or similar analysis. A non-profit organization or another public agency may hold and expend the habitat improvement funds if it is qualified to manage the compensation lands (pursuant to California Government Code section 65965), and if it meets the approval of the CPM.

d. Property Analysis Record. Upon identification of the compensation lands, the project owner shall conduct a Property Analysis Record (PAR) or PAR-like analysis to establish the appropriate amount of the long-term maintenance and management fund to pay the in-perpetuity management of the compensation lands. The PAR or PAR-like analysis must be approved by the CPM before it can be used to establish funding levels or management activities for the compensation lands.

e. Long-term Maintenance and Management Funding. The project owner shall deposit into an account managed by a land trust or other non-profit organization to fund a capital long-term maintenance and management fee (endowment) in the amount determined through the Property Analysis Record (PAR) or PAR-like analysis conducted for the compensation lands. The CPM may designate another non-profit organization to hold the long-term maintenance and management fee if the organization is qualified to manage the compensation lands in perpetuity.

f. Interest, Principal, and Pooling of Funds. The project owner shall ensure that an agreement is in place with the long-term maintenance and management fund (endowment) holder/manager to ensure the following requirements are met:

   i. Interest. Interest generated from the initial capital long-term maintenance and management fund shall be available for reinvestment into the principal and for the long-term operation, management, and protection of the approved compensation lands, including reasonable administrative overhead, biological monitoring~~, improvements to carrying capacity, law enforcement measures,~~ and any other action that is approved by the CPM and is designed to protect or improve the habitat values of the compensation lands related to the special-status plants.

   ii. Withdrawal of Principal. The long-term maintenance and management fund principal shall not be drawn upon unless such withdrawal is deemed necessary by the CPM or by the approved third-party long-term maintenance and management fund manager, to ensure the continued viability of the target species on the compensation lands.

   iii. Pooling Long-Term Maintenance and Management Funds. An entity approved to hold long-term maintenance and management funds for the project may pool those funds with similar funds that it holds from other projects for long-term maintenance and management of compensation lands for special-status plants. However, for reporting purposes, the long-term maintenance and management funds for this project must be tracked and reported individually to the CPM.

g. Other Expenses. In addition to the costs listed above, the project owner shall be responsible for all other costs related to acquisition of compensation lands and conservation easements, including but not limited to the title and document review costs incurred from other state agency reviews, overhead related to providing compensation lands to an approved third party, escrow fees or

costs, and environmental contaminants clearance.~~, and other site cleanup measures~~.

h. Mitigation Security. The project owner shall provide financial assurances to the CPM to guarantee that an adequate level of funding is available to implement any of the mitigation measures required by this condition that are not completed prior to the start of ground-disturbing project activities. Financial assurances shall be provided to the CPM in the form of an irrevocable letter of credit, a pledged savings account or another form of financial security ("Security") approved by the CPM. The estimated acquisition costs and amount of the security ~~shall~~may be calculated based on the estimated cost per acre for Desert Tortoise mitigation or other estimate as approved by the CPM as a best available proxy. The actual costs to comply with this condition will vary depending on the actual costs of acquiring compensation habitat, the costs of initially improving the habitat, and the actual costs of long-term management as determined by a PAR report. Prior to submitting the Security to the CPM, the project owner shall obtain the CPM's approval of the form of the Security. The CPM may draw on the Security if the CPM determines the project owner has failed to comply with the requirements specified in this condition. The CPM may use money from the Security solely for implementation of the requirements of this condition. The CPM's use of the Security to implement measures in this condition may not fully satisfy the project owner's obligations under this condition, and the project owner remains responsible for satisfying the obligations under this condition if the Security is insufficient. The unused Security shall be returned to the project owner in whole or in part upon successful completion of the associated requirements in this condition.

2. Compensation through Enhancement/Restoration of At-Risk Occurrences. As an alternative or adjunct to acquisition of compensation lands, the project owner may undertake or fund habitat enhancement or restoration for at-risk occurrences of the target special-status plant species. Examples of suitable restoration projects include but are not limited to the following: a) control of unauthorized vehicle use into an occurrence; b) control of invasive non-native plants that pose an immediate threat to an occurrence; c) fencing to exclude grazing by wild burros or livestock from an occurrence; d) protection from other herbivores (e.g. lagomorphs) if damaging to the occurrence, or e) restore lost or degraded hydrologic or geomorphic functions critical to the species (e.g., restoring previously diverted stream flows, removing obstructions to the wind sand transport corridor above an occurrence, or increasing groundwater availability for dependent species). Ex-situ mitigation through transplanting or replacement planting is not an acceptable mitigation option due to the high rate of failure.

i. Performance Standards. If the project owner elects to undertake a habitat enhancement project for mitigation, the project must meet the following performance standards: The proposed enhancement project shall achieve ~~rescue~~enhancement/restoration of an off-site occurrence that is currently in decline. The NatureServe ranking system, or another equivalent system, may be used to evaluate threats to the occurrence.~~that is currently assessed, based on the NatureServe threat ranking system, with one or more of the following: a) long-term decline >30%; b) an immediate threat that affects >30% of the population, or c) has an overall threat impact that is High to Very High. Rescue~~Enhancement/restoration would be considered successful if it achieves an improvement in the occurrence trend as measured using the Natureserve ranking system, or other equivalent threat-ranking system. ~~to "stable" or "increasing" status, or downgrading of the overall threat rank to slight or low (from "High" to "Very High")~~.

ii. Mitigation Security. The project owner shall provide financial assurances to the CPM to guarantee that an adequate level of funding is available to implement the restoration/enhancement project. Financial assurances shall be provided to the CPM in the form of an irrevocable letter of credit, a pledged savings account or another form of financial security ("Security") approved by the CPM. The amount of the security shall be based on the estimated total cost for the restoration project, including implementation, monitoring, and contingency measures. The implementation and monitoring of the restoration may be undertaken by an appropriate third party, or the project owner may fund an agency to implement the restoration, subject to approval by the CPM. Any restoration undertaken on private lands must be protected in perpetuity under a conservation easement.

iii. Prepare Enhancement/Restoration Plan. If the project owner elects to undertake an enhancement/restoration project for mitigation, they shall submit an Enhancement/Restoration Plan to the CPM for review and approval. The Enchancement/Restoration Plan shall include each of the following components:

i. Goals, Objectives, and Performance Standards. Define the goals of the restoration or enhancement project and a measurable course of action developed to achieve those goals. The objective of the proposed habitat enhancement plan shall include enhancement/restoration of a target special-status plant occurrence ~~that is currently threatened with a long-term decline~~. The proposed enhancement plan shall achieve an improvement in the occurrence threat trend compared to pre-enhancement/restoration conditions using NatureServe or other threat-ranking system.~~to "stable" or "increasing" status,~~

~~or downgrading of the overall threat rank to slight or low (from "High" to "Very High")~~.

ii. Baseline, Historical, and Desired Conditions. Provide a description of the pre-project baseline conditions (prior to the start of restoration), an estimate of the pre-impact historical conditions (before the site was degraded by weeds or grazing or ORV, etc.), and the desired conditions.

iii. Site Characteristics. Describe other site characteristics relevant to the restoration or enhancement project (e.g., composition of native and pest plants, topography and drainage patterns, soil types, geomorphic and hydrologic processes important to the site or species).

iv. Ecological Factors. Describe other important ecological factors of the species being protected, restored, or enhanced such as total population, reproduction, distribution, pollinators, etc.

v. Methods. Describe the restoration methods that will be used (e.g., invasive exotics control, site protection, seedling protection, propagation techniques, etc.) and the long-term maintenance required. The implementation phase of the enhancement must be completed within five years of the completion of construction.

vi. Budget. Provide a detailed budget and time-line, and develop clear, measurable, objective-driven annual success criteria.

vii. Monitoring. Develop clear, measurable monitoring methods that can be used to evaluate the effectiveness of the enhancement/restoration and the benefit to the affected species. The Plan shall include a minimum of five years of ~~quarterly~~ monitoring, and then a longer-term ~~annual~~ monitoring component for the remainder of the enhancement/restoration project, ~~and~~ until the performance standards ~~for rescue of a threatened occurrence~~ are met. At a minimum the progress reports shall include: quantitative measurements of the projects' progress in meeting the enhancement/restoration project success criteria, detailed description of remedial actions taken or proposed, and contact information for the responsible parties.

viii. Reporting Program. The Plan shall ensure accountability with a reporting program that includes progress toward goals and success criteria. Include names of responsible parties.

ix. Contingency Plan. Describe the contingency plan for failure to meet ~~annual~~ success criteria~~goals~~.

x. Long-term Protection. Include proof of long-term protection for the restoration site. For private lands this ~~would~~ could include conservations easement~~s~~ or other deed restrictions; projects on

public lands must be protected under a Wilderness designation, ACEC, DWMA, National Park or State Park lands.

3. Preservation of the Germplasm of Affected Special-Status Plants. This is not an alternative to mitigation by acquisition or restoration, but is a required contingency measure for all significantly affected special-status plants as a contingency in the event of mitigation failure. ~~Mitigation by acquisition or restoration shall also include s~~Seeds ~~or propagule~~ will be ~~collection~~ collected from the affected special-status plant~~s~~ occurrences ~~population~~ onsite prior to construction to conserve the germplasm. ~~and provide a seed source for restoration efforts~~. The seed shall be collected under the supervision or guidance of a reputable seed storage facility such as the Rancho Santa Ana Botanical Garden Seed Conservation Program, San Diego Natural History Museum, or the Missouri Botanical Garden. The costs associated with the long-term storage of the seed shall be the responsibility of the Project owner. ~~Any efforts to propagate and reintroduce special-status plants from seeds in the wild shall be carried out under the direct supervision of specialists such as those listed above and as part of a Restoration Plan approved by the CPM.~~

4. Criteria for Adjusting Mitigation Ratio for Torrey's joint-fir. Due to the ~~uniquely~~ high potential for finding many additional Torrey's joint-fir occurrences (see Special-status Plant Impacts subsection for explanation), the project owner may conduct pre-construction surveys ~~before June 1, 2013,~~ focused on Torrey's joint-fir. ~~Surveys must be conducted onsite as well as offsite.~~ If the discovery of new occurrences ~~in fall 2012 or spring 2013~~ results in a downgrading of the CNDDB Element Rank from an S1 to S2, the species will be mitigated as an S2 species (see subparagraph #1). If the new occurrences result in a downgrading from S1 to S3 ("vulnerable but not under immediate threat of extinction"), ~~AND~~ or the proportion of the statewide distribution affected by the project is less than 10 percent, then mitigation for Torrey's joint-fir shall no longer be required.

5. Criteria for Adjusting Mitigation Ratio for Wheeler's skeletonweed, gravel milkvetch, and Preuss' milkvetch. Conditions in spring 2012 were unusually dry and rainfall conditions severely and adversely impacted survey efforts to determine if additional Wheeler's skeletonweed, gravel milkvetch, and Preuss' milkvetch special status plant occurrences exist beyond those located and documented in 2011. The region is botanically under surveyed. In the case of gravel milkvetch, this species was added to the CNPS Inventory following completion of the 2011 surveys. For these reasons, the project owner may elect to conduct surveys focused on Wheeler's skeletonweed, gravel milkvetch, and Preuss' milkvetch. If the discovery of new occurrences results in a downgrading of the CNDDB Element Rank from an S1 to S2, the species will be mitigated as an S2 species (see subparagraph #1). If the new occurrences result in a downgrading from S1 to S3 ("vulnerable but not under immediate threat of extinction"),or the proportion of the

statewide distribution affected by the project is less than 10 percent, then mitigation for these species shall no longer be required.

6. In-Lieu Mitigation. Compensatory special-status plant mitigation requirements may be fulfilled at the election of the project owner by using an in-lieu funding option for acquisition or enhancement/restoration of special-status plant occurrences. The in-lieu mitigation approach would be consistent with the provisions included in BIO-25 (In-Lieu Fee and Advanced Mitigation Option).

Verification: No fewer than 90 days prior to the start of project ground-disturbing activities, the project owner shall submit to the CPM for review and approval a conceptual proposal for mitigation ~~by one or both of the two methods described in this condition (acquisition and enhancement/restoration)~~ that meets the criteria and performance standards described above~~, and according to the mitigation ratios described above~~.

The project owner shall provide the CPM, no less than 30 days prior to the start of any project related ground-disturbing activities, written verification that an approved financial security in accordance with this condition of certification has been established.

No later than June 15 of the first summer following the Final Decision, the project owner shall provide the CPM documentation that seed ~~or other propagules have~~ has been collected for all the affected species and submitted to either Rancho Santa Ana Botanical Garden Seed Conservation Program, San Diego Natural History Museum, or the Missouri Botanical Garden.

No later than 30 days following the discovery of any new occurrences of Torrey's joint-fir, Wheeler's skeletonweed, gravel milkvetch, or Preuss' milkvetch, the project owner shall submit raw GPS data, metadata, and CNDDB field forms to the CPM. The project owner shall immediately provide written notification to the CPM~~, CDFG and/or USFWS and BLM~~ if it detects a state- or federal-listed plant species.

Prior to acquisition of ~~the~~ property, the project owner shall submit a formal acquisition proposal to the CPM describing the parcels intended for purchase, or final enhancement/restoration plan, according to the minimum requirements for a plan described above.

The project owner, or an approved third party, shall complete and provide written verification of the proposed compensation lands acquisition no later than ~~18~~ 36 months following the start of project ground disturbing activities. Within 180 days of the land or easement purchase, as determined by the date on the title, the project owner, or an approved third party, shall provide the CPM, with a management plan for the compensation lands and associated funds. The CPM shall review and approve the management plan.

No fewer than 30 days after acquisition of the property the Project owner shall deposit the funds required for long term management, as described above, and provide proof of the deposit to the CPM.

The Project owner or an approved third party shall complete the acquisition and all required transfers of the compensation lands, and provide written verification to the CPM of such completion no later than ~~12~~ 36 months after the start of Project ground-disturbing activities. If NFWF or another approved third party is being used for the acquisition, the Project owner shall ensure that funds needed to accomplish the acquisition are transferred in timely manner to facilitate the planned acquisition and to ensure the land can be acquired and transferred prior to the ~~18~~36-month deadline. If habitat enhancement/restoration is proposed, no later than ~~six~~ 36 months following the start of ground-disturbing activities, the Project owner shall obtain CPM approval of the final Habitat Enhancement/Restoration Plan, prepared in accordance with Section D, and submit to the CPM or a third party approved by the CPM Security adequate for long-term implementation and monitoring of the Habitat Enhancement/Restoration Plan.

Enhancement/r~~R~~estoration activities shall be initiated no later than ~~12~~36 months following the start of construction. ~~The implementation phase of the enhancement project shall be within five years of initiation. Until completion of the five-year implementation portion of the enhancement action, a report~~ A report describing the progress of the enhancement/restoration shall be prepared and submitted as part of the Annual Compliance Report. This report shall provide, at a minimum: a summary of activities for the preceding year and a summary of activities forecast for the following year; quantitative measurements of the Project's progress in meeting the enhancement/restoration project success criteria; detailed description of remedial actions taken or proposed; and contact information for the responsible parties.

In lieu fee payments to compensate for all or a portion of the project's impacts to special status plants shall be subject to the notice and other provisions of BIO-25.

BIO-21: Botanist Qualifications and Duties

The Applicant requests that Condition BIO-21 be revised to reflect that with specialized training, the Designated Biologist may implement the duties of the Designated Botanist. General impact avoidance and minimization measures included in the verification paragraph of this measure have been deleted because these are already described in BIO-8 and BIO-19 and they are redundant.

BIO-21 The project owner's approved Designated Biologist shall oversee the selection and hiring of qualified botanist(s) to implement the tasks in **BIO-18** (Weed Management Plan), **BIO-19** (Special-status Plant Avoidance and Minimization Measures), **BIO-20** (Special-status Plant Compensatory Mitigation), and **BIO-23** (Groundwater-dependent Vegetation Monitoring) specified below that must be accomplished by a qualified botanist. All other tasks described in these measures not contained in the list below may be accomplished by the Designated Biologist. The Designated Biologist shall submit to the CPM for approval the resume, at least three references, and contact information for the qualified botanist(s) to fulfill the tasks below. The resume(s) shall demonstrate, to the satisfaction of the CPM the appropriate education and experience to accomplish the assigned botanical resource tasks. If the Designated Biologist posseses these qualifications, the

Designated Biologist may perform these duties and a separate Designated Botanist position will not be unnecessary.

Botanist(s) must meet the following minimum qualifications:

1) Demonstrated knowledge of: a) general plant taxonomy and natural community ecology; b) familiarity with the plants of the area, including special status species; and c) familiarity with natural communities of the project area;

2) At least five years experience conducting floristic field surveys;

3) At least five years experience working in the California Desert region;

4) Familiarity with the appropriate state and federal statutes related to plants and protocols or guidelines for conducting botanical inventories; and

5) At least five years experience analyzing the impacts of development on native plant species and natural communities.

Tasks requiring a qualified botanist shall include the following:

1) Advise the project owner's construction and operation managers, and the Designated Biologist on the implementation of botanical resource conditions of certification;

2) Conduct and/or train, supervise and coordinate botanical resources compliance efforts ~~in close proximity to special-status plant occurrences~~ as described in **BIO-18** (Weed Management Plan) and **BIO-19** (Special-status Plant Avoidance and Minimization Measures);

3) Conduct and/or train, supervise, and coordinate marking ~~Mark~~ any special-status plant ESAs ~~occurrences~~ in close proximity to the project and inspect ~~these~~ the integrity of the ESA signage ~~areas~~ at appropriate intervals for compliance with conditions of certification affecting or relating to special-status plants as described in **BIO-19**;

4) Prepare the Weed Management Plan as described in **BIO-18** and conduct and/or train, supervise, and coordinate the surveying and ~~annual~~ monitoring required in the plan;

5) Consult and/or prepare the Special-status Plant Compensatory Mitigation plans for enhancement/restoration and/or proposals for acquiring compensation lands, and conduct and/or train, supervise, and coordinate ~~annual~~ monitoring required in the plans; and

6) Conduct and/or train and supervise the Designated Biologist in the implementation of **BIO-23** (Groundwater-dependent Vegetation Monitoring).

Verification: At least 60 days prior to construction-related ground disturbance, the project owner shall submit the resume to the CPM for a botanist to conduct the tasks described above under tasks #1 and #2. Once approved, the project owner shall provide written verification to the CPM that the qualified botanist is available to implement the required mitigation measures during construction. ~~No construction-related ground disturbance, site mobilization, grading, boring, trenching, chemical spraying, or weed management within 100 feet of a special-status plant occurrence shall commence until an approved botanist has surveyed and marked the special-status plant occurrences adjacent to the project as Environmentally Sensitive Areas as described in **BIO-19** (Special-status Plant Avoidance and Minimization Measures).~~

BIO-22: State Waters Compensatory Mitigation and Impact Avoidance & Minimization Measures

Proposed revisions to Condition BIO-22 are discussed in the following paragraphs and incorporated into the Condition text in either underlined new text or and strikethrough formats. Below is an explanation of the proposed revisions. A complete redline/strikeout of the condition follows.

Page 4.2-271 Section 1600 Notification Form and Fees. Applicant has already submitted to CDFG the 1600 Notification and Fees together with updated information and maps of state waters; therefore, Item 1 of the condition should be deleted.

Page 4.2-271 Compensatory Mitigation. For item 2, first sentence, consistent with the mitigation ratio discussion above for other large scale solar projects, the mitigation ratio has been revised to reflect the 1:1 mitigation ratio required for impacts to similar ephemeral washes in other CEC-approved projects.

Page 4.2-272 b. Integrating Special-Status Plant Mitigation with Other Mitigation Lands. A typo correction has been made to the condition language.

Page 4.2-273 Avoidance and Minimization Measures. For subsection 3.c, "Documentation at the Site and Project Entry," the CPM on behalf of the Commission has the right to issue a stop work order if non-compliance with a Condition occurs. There is no need to re-state this authority in the Condition. The CPM cannot stop work "for other reasons" unrelated to compliance. Moreover, the CPM acting for the Commission has sole authority over State law matters and cannot "allow CDFG" or any other entity to issue a stop work order. The simplest fix would be to delete the third sentence and all that follows in its entirety (as noted below if Applicant's edits to the full condition). Otherwise, the language should be revised as follows:

> ***"The CPM reserves the right to issue a stop work order ~~or allow CDFG to issue a stop work order~~ after giving notice to the project owner ~~and the CPM~~, if the CPM ~~in consultation with CDFG,~~ determines that the project owner has breached any of the terms or conditions ~~or for other reasons~~, including but not limited to the following:
>
> i) The information provided by the project regarding impacts to waters of the state is incomplete or inaccurate in some materials manner;
>
> ii) New materials information becomes available that was not known in preparing the terms and conditions; or

iii) The project or project activities as described in the ~~Staff Assessment~~ the Commission's Final Decision have changed.

Page 4.2-273 b) Diffuser Design. Replace "volume" with "rate" because retention area is designed to maintain peak flow rates.

Page 4.2-274 d) Best Management Practices. Revise language to be consistent with the requirements of the Construction General Permit.

Page 4.2-274 Delete section d)iii) in its entirety because the CGP contains requirements for construction activities based on storm probabilities, which differ from condition iii). Compliance with the CGP should constitute compliance with CWA, and more prescriptive requirements from the Commission are unwarranted.

Page 4.2-275 e) Changes of Conditions. Changes are recommended to make it clear that physical changes that are common with streams on alluvial fan systems, and changes that are part of the project description (e.g., vegetation removal or trimming) do not qualify as physical changes that require formal notification.

Page 4.2-276 Revisions to Verification are recommended to conform to other recommended changes to BIO-22.

BIO-22 To satisfy requirements of California Fish and Game Code sections 1600 and 1607, the project owner shall implement measures contained herein for: 1) compensating unavoidable impacts to all Waters of the State located within the project footprint, and 2) for avoiding and minimizing accidental, incidental and indirect impacts to waters located outside the project footprint. For purposes of this condition, "project footprint" means all lands contained within the boundaries of the project components, including access roads, utility and transmission alignments, staging areas, and temporary construction areas. Avoidance and minimization measures for work within or adjacent to waters shall be implemented during construction, operation, and decommissioning, including site mobilization.

~~1. Complete and Submit Section 1600 Notification Form and Fees. Coordinate with CDFG to submit a formal 1600 application and associated fees. Submit a final revised state waters delineation report to include additional features identified during the field verification of the state waters delineation.~~

2. Compensatory Mitigation. The project owner shall acquire and preserve under a permanent conservation easement a parcel or parcels of land that contain jurisdictional state waters in an amount equal to the area of state waters delineated within the project footprint and mitigated at a ratio of ~~2~~1:1 (~~two~~ one acre~~s~~ for every acre of state waters onsite) for permanent impacts to habitat functions and values. This ratio assumes that impacts to the hydrologic and geomorphic functions will be minimized by not diverting streams around the site in artificial channels. If the channels are diverted around the site, the mitigation ratio shall increase to a ratio of 3:1. The project owner shall provide associated

funding for the long-term stewardship of the acquired lands, as specified below.

a. Selection Criteria. Compensation lands for impacts to state waters shall meet the following criteria:

   i. Located in California and within the Pahrump Valley Hydrologic Unit. If the project owner demonstrates that suitable compensation lands are not available within Pahrump Valley, lands may be acquired in California Valley, or the California portions of Sandy (Mesquite) Valley and Stewart Valley or other adjacent watersheds.

   ii. Contain waters in a general physiographic setting similar to the affected waters (i.e., alluvial fan washes) or that provide similar habitat function and values. Proposed mitigation sites shall be described in terms of habitat function and values, in the context of the habitat function and values that were impacted at the project site, in a proposal submitted to the CEC and subject to approval by the CPM in consultation with CDFG;

   iii. Contain waters of a similar or better quality than the affected waters. Subject to review and approval of the CPM in consultation with CDFG, lands degraded by unauthorized off-road vehicles (ORV) may be considered if the project owner can demonstrate that the unauthorized ORV can be excluded and controlled with road decommissioning and signage;

   iv. Contain waters that are hydrologically unimpaired upstream by dams or diversions. Subject to review and approval of the CPM in consultation with CDFG, impaired waters may be considered if it can be demonstrated that the hydrologic functions can be restored and are accompanied by a restoration proposal;

   v. Do not contain hazardous wastes that cannot be removed; and

   vi. Contain water and mineral rights as part of the acquisition, unless the CPM, in consultation with CDFG, agrees in writing to the acceptability of the land.

b. Integrating Special-Status Plant Mitigation with Other Mitigation Lands. Any portion of the acquired Desert Tortoise or other required compensation lands that meets the criteria above for state waters may be used to fulfill that portion of the obligation for state waters mitigation.

c. Security for Implementation of Mitigation: The project owner shall provide financial assurances to the CPM to guarantee that an adequate level of funding is available to implement the acquisitions

and enhancement of state waters as described in this condition. These funds shall be used solely for implementation of the measures associated with the project. Financial assurance can be provided to the CPM in the form of an irrevocable letter of credit, a pledged savings account or Security prior to initiating ground-disturbing project activities. Prior to submittal to the CPM, the mitigation security shall be approved by the CPM, in consultation with CDFG. The final amount due shall be determined by updated appraisals and the PAR analysis conducted pursuant to **BIO-12** (Desert Tortoise Compensatory Mitigation).

d. Prepare Management Plan for Stewardship of Acquired Lands: The project owner shall submit a draft State Waters Mitigation Management Plan subject to review and approval by the CPM and CDFG. The goal of the plan is to protect the integrity of the washes and their habitat functions and values from unauthorized ORV and other threats, or to restore degraded functions and values as described in #2 (a) above. Acquired lands must be protected in perpetuity under a conservation easement as described in **BIO-12** (Desert Tortoise Compensatory Mitigation).

e. Compensation Lands Acquisition Requirements. The project owner shall comply with the requirements relating to acquisition of the compensation lands described in **BIO-12** (Desert Tortoise Compensatory Mitigation).

3) Avoidance and Minimization Measures. The measures described below shall be implemented during construction, operation, and closure for any project-related activity that may directly or indirectly affect offsite waters adjacent to the project boundary, and to minimize impacts to the hydrologic and geomorphic functions of waters onsite, including water quality. Such activities include ground or vegetation disturbing activities, weed and vegetation management activities, and pre-construction mobilization. The project owner shall provide a discussion of work in or adjacent to Waters of the State, and the avoidance and minimization measures employed to protect offsite waters from accidental or indirect effects in the Annual Compliance Reports.

a) Guidelines for Stream Crossings. The project owner shall minimize disturbance to surface drainage patterns and sediment transport in watercourses downstream of the project. Arizona crossings shall be employed for improvements to project access roads wherever such crossings do not present a safety hazard and where the roadbed elevation allows the construction of such crossings. Crossings shall be constructed to accommodate the full natural width of the channel (bank-to-bank) for single-thread channels, and the full width of the floodplain for braided distributary channels. Streams that have been graded for temporary construction access shall be

restored to original contours and surface drainage patterns and shall be stabilized according to specifications in **SOIL-1**.

b) Diffuser Design. For any diverted watercourse, the project owner shall maintain pre-development surface drainage patterns downstream of the project, in location and approximate ~~volume~~ rate of flows. Flows shall not be discharged indiscriminately as sheet flow across the entire length of the diffusers, irrespective of the natural surface drainage patterns, but shall instead be designed to discharge within existing watercourse boundaries downstream, or within the active floodplain of braided distributary stream types.

c) Documentation at the Site and Project Entry. The project owner shall provide a copy of this condition from the Energy Commission Decision to all contractors, subcontractors, and the owner's project supervisors and Designated Biologist. Copies shall be readily available at work sites at all times during periods of active work and must be presented to any CDFG personnel upon demand. ~~The CPM reserves the right to issue a stop work order or allow CDFG to issue a stop work order after giving notice to the project owner and the CPM, if the CPM in consultation with CDFG, determines that the project owner has breached any of the terms or conditions or for other reasons, including but not limited to the following:~~

~~i) The information provided by the project regarding impacts to waters of the state is incomplete or inaccurate;~~

~~ii) New information becomes available that was not known in preparing the terms and conditions; or~~

~~iii) The project or project activities as described in the Staff Assessment have changed.~~

d) Best Management Practices. A site-specific SWPPP will be implemented in accordance with requirements of the Construction General Permit (CGP). The SWPPP will identify appropriate BMPs, as well as monitoring, sampling and inspections consistent with the project's calculated risk level. During construction, operation, closure, and pre-construction mobilization, the following Best Management Practices (BMPs) shall be implemented to avoid accidental impact during construction or indirect effects to state waters:

i) During the pre-construction planning stage identify gravel storage areas, staging areas, access roads, parking, turnarounds, and equipment refueling & maintenance areas to minimize impacts to any delineated state waters outside of the permitted work area. Staging, storage, equipment maintenance and re-fueling shall be located a minimum of 30 feet from the uphill

side of streams and their active floodplain to protect water quality downstream. The boundaries of those work areas shall be clearly marked on all final site plan and construction drawings.

ii) Prior to the start of construction, establish the stream zones offsite or outside the permitted work area that are adjacent to work activities as Environmentally Sensitive Areas (ESAs). No earth-moving activities, vegetation removal, vehicles, heavy equipment, material storage, equipment maintenance or re-fueling, or other construction activities shall be permitted within the ESAs. Work shall not begin until the boundary of the ESAs are delineated on the ground with orange safety netting where they occur adjacent to work activities (e.g., along the project boundary) under supervision of the Biological Monitor. The ESAs shall be depicted on all final maps and specifications.

~~iii) Construction activities shall be timed with awareness of precipitation forecasts, and shall be started only if the local weather forecast predicts no probability of rain for a period of 72 hours. Construction activities shall cease and water quality, erosion and sediment control measures shall be implemented prior to storm events to prevent erosion and sedimentation, and contamination of stormwater runoff. Activities outside of the sensitive areas described above are not confined to this time period, but at no time shall heavy equipment operate during wet weather.~~

iv) The project owner shall minimize road building, construction activities and vegetation clearing on streams within the site wherever possible by limiting the width of the work area. Access to the site shall be on existing access roads.

v) In the event of wet weather, the project owner shall not allow water containing mud, silt, or other pollutants from grading, aggregate washing, or other activities to enter streams outside the permitted work area, or be placed in locations that may be subjected to storm runoff. Prior to the start of work, including any equipment move-on or materials storage, install silt-fencing, straw bales, sediment catch basins, straw or coir logs or rolls, or other sediment barriers to keep erodible soils and other pollutants from entering state waters outside the permitted work area. Extra sediment, pollutant, and erosion control materials shall be stockpiled onsite to address any unanticipated rain events, problems and emergencies.

vi) No broken concrete, debris, soil, silt, sand, gravel, rubbish, cement or concrete wash water, oil or petroleum products, or

other contaminants shall be allowed to enter into, or placed where it may be washed by rainfall or runoff into waters of the state outside the permitted work area. The contractor shall immediately contain and clean up any petroleum or other chemical spills with absorbent materials such as sawdust or cat litter. For other hazardous materials, follow cleanup instructions on the package.

e) Changes of Conditions. A formal notification shall be provided to the CPM and CDFG if a change of conditions is identified. As used here, change of condition refers to the process, procedures, and methods of operation of a project; the biological and physical characteristics of a project area; or the laws or regulations pertinent to the project as defined below. A copy of the change of conditions notification shall be included in the annual reports or until it is deemed unnecessary by the CPM, in consultation with CDFG. A change in biological conditions includes, but is not limited to, the following: the presence of biological resources within or adjacent to the project area, whether native or non-native, not previously known to occur in the area; or the presence of biological resources within or adjacent to the project area, whether native or non-native, the status of which has changed to endangered, rare, or threatened, as defined in section 15380 of Title 14 of the California Code of Regulations. A change in physical conditions includes unexpected, substantial physical changes that result from project implementation, and do not include the types of changes that are typical of alluvial fan stream systems; such changes include, but ~~is~~ are not limited to, the following: ~~a~~an adverse, substantial change in the morphology of a river, stream, channel or lake, such as the lowering of a bed or scouring of a bank, or substantial changes in stream form and configuration caused by storm events; the substantial movement of a river or stream channel to a different location; a substantial reduction of or other change in vegetation on the bed, channel, or bank of a drainage that is outside of approved vegetation management; or substantial changes to the hydrologic regime such as fluctuations in the timing or volume of water flows in a river or stream.

f) ~~Legal Conditions: a change in legal conditions includes, but is not limited to, a change in Regulations, Statutory Law, a Judicial or Court decision, or the listing of a species, the status of which has changed to endangered, rare, or threatened, as defined in section 15380 of Title 14 of the California Code of Regulations.~~

Verification: No less than 60 days prior to beginning project ground-disturbing activities, the project owner shall provide to the CPM design drawings of drainage diffusers or other discharge points depicting how these structures restore pre-development drainage patterns (location and ~~volume~~ rate of flows) to any watercourses

located downstream of the project boundaries. At the same time the project owner shall provide design drawings for temporary and permanent stream crossings.

No less than 30 days prior to the start of construction-related ground disturbance activities, the project owner shall provide written verification (i.e., through incorporation into the BRMIMP) to the CPM that the above BMPs will be implemented. ~~No later than 60 days prior to beginning ground-disturbing activities, a formal 1600 application and fees shall be submitted to CDFG, and the project owner shall provide the CPM a copy of the 1600application and verification of payment of CDFG 1600 fees. A copy of the final state waters delineation shall be incorporated into the BMIMP.~~

The project owner shall provide the CPM, no less than 30 days prior to the start of any project related ground-disturbing activities, written verification that an approved security for compensatory mitigation in accordance with this condition of certification has been established. The financial security will be used to purchase compensatory habitat for impacts to state waters and must be accomplished no later than ~~18~~ 24 months ~~from~~ after the start of any on-site project-related construction activities. As evidenced by a~~A~~ copy of the final recorded deed showing transfer of mitigation land or documentation of other approved mitigation transaction as approved by the CPM.

No less than 90 days prior to the acquisition of the compensation lands, the project owner shall submit a formal acquisition proposal, including PAR analysis, to the CPM and CDFG. The draft State Waters Mitigation Management Plan shall be provided to the CDFG and CPM no less than 60 days after acquisition of the compensation lands.

BIO-23: Groundwater-Dependent Vegetation Monitoring Plan

The Applicant proposes revisions to Condition BIO-23, which accompany its proposed revisions to Condition Water Supply-4. For ease the Applicant's proposed condition appears below. Due to the length of the condition, the revisions were not made in redline/strikeout. However, an explanation of the modifications is below.

The 2nd paragraph of **BIO-23** has been revised to avoid potential delays in the development of baseline data. Sufficient knowledge of local groundwater conditions and resources currently exists to initiate the baseline research effort. The third paragraph and most of the text of the following subsection 1 of **BIO-23** have been deleted to avoid potential confusion and redundancy with the provisions in **Water Supply–4.** Subsection 2 of **BIO-23** has been simplified to streamline the applicable review requirements and avoid delaying the baseline data collection effort. Subsection 3 of **BIO-23** ("Monitoring Objectives and Performance Standards") has been modified to address several issues, including: (1) recognition that groundwater level drawdowns are presently occurring due to non-project, existing pumping in Nevada and that such declines are not related to and cannot be avoided by the project; (2) the inclusion of additional information to reflect current conditions and the identification of reasonable and objectively definable groundwater measurement and GDE observation parameters; and (3) to clarify the relationship between the GDE and groundwater monitoring programs. Subsection 4 of **BIO-23** ("Definitions") was revised to include time limits and intervals consistent with mesquite phenology and the applicable, drought-impacted environment where the GDE occurs. Subsection 5 of **BIO-23** has been deleted to avoid

potential confusion and redundancy with the same provisions in **Water Supply–4.** Some of the plant species listed in subsection 6 of **BIO-23** have been deleted because they are not phreatophytes (e.g. *Atriplex polycarpa, A. spinescens*) and are not GDE vegetation, and other plant species have been added because they are to be expected to occur in GDE in the Pahrump Valley. The study of facultative phreatophytes also is not recommended because virtually any vascular plant in the area could be a facultative phreatophyte, the identity of obligate phreatophytes is not open to interpretation, and the latter include the principal vegetation of GDE (mesquite). Subsection 7 of **BIO-23** has been revised to allow for a study plot located in mesquite vegetation immediately west of the ACEC boundary if approval of proposed study plots in the ACEC is not forthcoming from the BLM. Subsection 10 of **BIO-23** has been revised to include applicable time spans and to reference specific hydrologic thresholds, including five years of vegetation studies for the initial baseline and an updated baseline every five years thereafter for the life of the project. Subsection 11 of **BIO-23** has been revised to remove the implication that "drought stress" in drought-adapted plants, such as mesquite, can be defensibly directly related to water-table drawdowns in general and project-specific water-table drawdowns in particular. Subsection 13 of **BIO-23** was revised to remove the requirement for coring, which would yield ambiguous results in the geologically highly complex terrain of these GDE. Requirements that are technically difficult or impossible to achieve (e.g., 100% recovery) and that are unlikely to be permitted by the applicable agencies are deleted. The verification section of **BIO-23** has been revised to include: (1) a time line for the start of groundwater pumping and the finalization and acceptance of the monitoring plan; (2) a schedule for submitting annual reports that is consistent with annual monitoring, and annual baseline data collection for the first five years of the monitoring program**.**

BIO-23 The project owner shall prepare a draft and final Groundwater-dependent Vegetation Monitoring Plan (GDVMP) that will be implemented in conjunction with the Groundwater Monitoring, Mitigation, and Reporting Plan (**WATER SUPPLY-4**). By monitoring for groundwater level changes at the project boundary, **Water Supply-4** will protect groundwater-dependent ecosystems (GDEs) within the influence of the project pumping wells from the impacts of project-related groundwater drawdown. Through the implementation of the GDVMP, **BIO-23** will require monitoring of groundwater-dependent vegetation to track the potential impacts of changing groundwater levels as they develop during the life of the project. **Water Supply-4** defines triggers for monitoring to be implemented if data indicate groundwater drawdown at the boundary of the project site.

The project owner shall submit a draft GDVMP to the CPM for review and approval by the CPM within 30 days of submittal. The GDVMP shall meet the performance standards, monitoring objectives, and guidelines for content of the plan specified in this condition.

The GDVMP shall meet the following performance standards, monitoring objectives, and guidelines:

1. Definitions. “Sampling”, as used in this condition, is the process of selecting a part of something with the intent of showing the quality or nature of the whole. “Baseline monitoring” is the assessment of existing (pre-project pumping) conditions to provide a standard, or baseline against which future change is measured. “Variability within the population” shall be established by measuring differences in the vegetation attributes between plots. “Groundwater-dependent vegetation” shall include any plant communities dominated by obligate “phreatophytes” (groundwater-dependent plant). GDEs include these plant communities and aquatic habitats that are groundwater-supported, such as seeps and springs. In the monitoring area, virtually all groundwater-dependent plant communities are dominated by mesquite, which is dormant and generally deciduous during the winter half-year, and which displays maximum vigor in the months of May, June and July.

    a. *Establish Baseline*. The GDVMP will describe which groundwater-dependent vegetation patches will be used as monitoring stations, and what data will be gathered to establish baseline conditions. Because these are almost exclusively dense coppices or arroyo-bottom thickets, and because the vitality of the ecosystem as a whole is of concern, data collection will focus on canopy cover and extent, prior signs of die-back, and current evidence of die-back or of expansion. Baseline conditions will be gathered after the spring green-up and before mid-summer die-back. At a minimum seven monitoring stations in separate coppice dunes or arroyos will be established. The following are part of baseline establishment.

    b. *Establishment of Monitoring Stations*: Monitoring stations will be established within 45 days of project approval.

    c. *Identify Groundwater-dependent Species and Ecosystems*: An updated Inventory and Map of Groundwater-dependent Species and Ecosystems (GDEs). The map of GDEs prepared for this project (CH2 2011c, Data Response Set 1A, Figure D48-1), shall be amended to include seeps and springs identified by BLM within that map coverage area, and any additional plant communities dominated by phreatophytes. The map shall be accompanied by a list of all phreatophytes contained in each GDE, as well as other vascular plant species present. Phreatophytes in this desert region include (but are not limited to): cottonwood (*Populus fremontii*), willow (*Salix* spp.), yerba mansa (*Anemopsis californica*), mesquite (*Prosopis glandulosa*; *P. pubescens*), saltgrass (*Distichlis* spicata), desert baccharis (*Baccharis sergiloides*), and the non-native salt cedar (*Tamarix* spp.).

    d. *Accommodate Phenology of Target Species*: Because mesquite is dominant in virtually all GDEs in the monitoring area, baseline conditions will be gathered after the species’ spring green-up and before mid-summer drought (May 15 to July 15). Because it is not a

monsoonal desert, summer rains are not reliable in this region. At a minimum seven Baseline stations in separate coppice dunes or arroyos will be established.

e. *Permanent Monitoring Stations.* The vegetation monitoring shall be conducted within GDEs located on public land: a) east of the project and nearest to the project boundary, as depicted in HHSEGS Data Response Set 1A, Figure D48-1 (CH2 2011c), b) within the BLM Stump Spring ACEC, and c) between the ACEC and the project pumping wells. No GDEs occur within the project boundary and monitoring plots shall not be located in upland plant communities that are not groundwater-dependent.

2. *Field Techniques.* Vegetation monitoring shall employ field measurement techniques that can most accurately and immediately (without experimentation or interannual calibration) reflect long-term GDE expansion, dieback, or stasis. Because GDEs can extend over areas of thousands of square meters, techniques will focus on macro-scale recording. Meter-scale grids will be established that encompass the edges of mesquite coppices using permanent staking and sub-meter accuracy GPS. Plot measurements will be accurate to at least 10 cm. Repeat photography (an established technique where precisely the same view is photographed years apart) will be used to document the expansion or die-back of individual mesquites, and of entire coppices. The GDVMP must demonstrate knowledge of the biology of the species and their morphological responses to stress. The draft Plan shall describe how the data will be recorded in the field, processed and stored.

3. *Sample Size and Detectable Change:* Sampling size shall be sufficient to achieve adequate statistical power of 90 percent or better. The minimum detectable change, and biologically significant change (if any) in vegetative measurements, will be described in the GDVMP, and is anticipated to be on the order of several centimeters per year growth on the edge of mesquite coppices, to potentially an order of magnitude greater retreat in the case of die-back. The draft GDVMP shall also describe how groundwater elevation monitoring data collected pursuant to WATER SUPPLY-4 will be considered in concert with the vegetation data.

4. *Timing.* Vegetation monitoring shall be conducted at least once annually during the same time period (July 1 – August 31), immediately after the peak growing period for most perennials.

5. *Parties Responsible for Monitoring.* The project owner will be responsible for retaining qualified biologists to prepare the GDVMP, establish baseline, and conduct the monitoring should the monitoring threshold be triggered. Monitoring data shall be quality-checked annually by the CPM. Both the assembly of the GDVMP and the subsequent monitoring will be directed by specialists with experience in the vegetation ecology of the northeastern Mojave Desert, the phenology of mesquite, local groundwater hydrogeology,

and field techniques for the long-term monitoring of vegetation plots in the interior west. Monitoring data shall be quality-checked annually by the CPM.

6. *Access to Monitoring Data*. Copies of monitoring reports and data shall be available to the CPM at all times.

7. *Monitoring Reports*. Monitoring Reports shall be submitted to the CPM annually during the first five years of baseline data collection, and shall be submitted every fifth year thereafter unless WATER SUPPLY-4 Vegetation Monitoring is triggered, in which case monitoring reports shall continue annually. Monitoring Reports shall include: names and contact information for the responsible parties and monitoring personnel; description of sampling and monitoring techniques; results of the vegetation monitoring in a station-by-station enumeration of the data and photographic record; comparison of versus actual water table changes for the previous year and previous sequence of years since baseline was established;-trends and other analyses based on the statistical tests and methods described in this condition and in the final GDVMP; photos; and conclusions and recommendations. Monitoring Reports shall also include an appropriate statistical analysis of baseline and monitoring data to assess whether the sampling design was adequate to attain sampling precision as described above.

Baseline Monitoring:

1. The Baseline definition will include the current (pre-project) trend of groundwater decline in the immediate vicinity of the monitoring stations, and the likely outcome of that decline in terms of senescence and dieback in the absence of project build-out and pumping.

2. *Baseline and Long-term Data Collection*. Initial baseline data shall be collected immediately after station establishment at all monitoring stations. Annual baseline data collection will commence no later than the first growing season (July 1-August 31) after project approval. Data on existing or baseline conditions shall be updated each year for the first five years, and then every fifth year thereafter for the life of the project to incorporate responses to interannual variability in climate, which is pronounced in this desert region, and other long term trends. Evidence for prior dieback, or recent expansion, of groundwater-dependent species will be mapped and recorded. Future change is compared against the baseline, and adjusted for any background decline, such as vegetation decline from climate conditions, or regional scale aquifer decline, and incorporated in the baseline trend.

3. *Use of Baseline Controls*. The “baseline control” shall consist of the data collected at monitoring stations during the baseline data collection period compared against future change. Because of the potential for variability in GDE characteristics and depth to groundwater among the different monitoring stations, the study design shall treat the monitoring data and corresponding control data (e.g., baseline data from the same monitoring station) as a pair,

rather than comparing the mean of all monitoring plots to the mean of all control plots. Appropriate statistical methods shall be used to analyze the differences between the control and monitoring stations.

WATER SUPPLY-4 Vegetation Monitoring:

1. Trigger for *Water Supply-4 Vegetation Monitoring (WS-4 Vegetation Monitoring).* The trigger to begin groundwater dependent vegetation monitoring at the previously established stations (see above), will be the threshold(s) as described in the Groundwater Monitoring Plan developed pursuant to **WATER SUPPLY-4**. Once monitoring is triggered it will continue annually for the life of the project.

2. *Monitoring Objectives*. The goal(s) of *WS-4 Vegetation Monitoring* is to determine whether GDEs that are dependent on shallow or emergent groundwater are changing (either dying back or expanding), based on comparisons with previously established baseline data. As an objective, analysis of the monitoring data in annual reports will include assessments of whether GDEs are responding to groundwater drawdown including that potentially caused by project pumping. The techniques for field measurements and establishing normal seasonal variation and variability between populations are described in his condition under "Field Techniques". To the extent feasible, efforts will be made to distinguish the effects of the groundwater decline that is occurring presently, and is expected to continue, largely as a consequence of excessive groundwater withdrawal in Nevada. Distinguishing project water level effects from background effects or the effects of nearby wells shall be accomplished through the monitoring plan described in **WATER SUPPLY-4**.

Verification: No less than 90 days prior to start of any project-related groundwater pumping, the project owner shall provide a draft GDVMP to the CPM for review. The CPM shall provide review comments within 30 calendar days, and the project owner shall revise the final draft based on the review within 20 days, and submit the final draft to the CPM for review and approval within 10 days.

Collection of baseline monitoring data shall begin following the acceptance of the final GDVMP. If no comments are received from the CPM within 20 days of delivery of the final GDVMP, it will be considered the approved and implementable version of the Plan.

The GDVMP annual monitoring reports shall be provided to the CPM no more than 120 days following the completion of annual baseline data collection. It is anticipated that reports will be provided only during the establishment of the necessary baseline unless the monitoring threshold is triggered and, if so, collection of monitoring data would then continue for the life of the project.

BIO-25: In-Lieu Fee and Advance Mitigation Option

While the Applicant is currently unaware of any other in lieu fee programs that have been approved by the responsible resource agencies, the Applicant believes that it is

prudent to leave open the possibility that other such in lieu fee programs may be established by new legislation or executive agency action. Leaving open this possibility to use future in lieu fee programs will avoid the need for future amendment and is, of course, subject to the approval of the Commission through the projects CPM. The Applicant also changed Commission "Decision" to "certification" as the latter reflects the Commission's approval as amended.

BIO-25 The project owner may choose to satisfy certain compensatory mitigation obligations identified for desert tortoise, burrowing owls, special status plants, ~~and~~ jurisdictional waters, and other mitigation requirements set forth in the Commission's certification by paying an in lieu fee to the Department of Fish and Game pursuant to Fish and Game code sections 2069 and 2099, or the Advanced Mitigation option available through the California Department of Fish and Game's Advanced Mitigation Program established by Senate Bill X8 34 or other in lieu fee programs that may be established. If the project owner chooses to satisfy its mitigation obligations through ~~this~~ the Department's program, the advance mitigation lands shall meet the criteria as stated in all applicable compensation conditions of certification in the Commission Decision.

Verification: If electing to use ~~this~~ these options, the project owner shall notify the CPM that it has chosen to take advantage of the options available through the Department of Fish and Game's program or other in lieu fee programs that may be established. If approved by the CPM ~~and~~in consultation with CDFG, the project owner shall provide written verification that adequate funds have been provided to CDFG to meet the mitigation requirements identified in the Commission ~~Decision~~certification and that the advanced mitigation lands meet selection criteria as stated in all applicable compensation conditions of certification in the Commission ~~Decision~~certification. As with the other compensatory mitigation, this compensatory mitigation must be completed within 18 months of the start of any project-related ground disturbing activity.

If the project owner chooses the Advance Mitigation option, the owner shall submit to the CPM a copy of the final recorded deed showing transfer of mitigation land or other mitigation transaction documentation as approved by the CPM, within 60 days of CDFG finalizing land transactions.

Condition BIO-26: Facility Closure, Revegetation, and Reclamation Plan

Facility closure and decommissioning requirements are already provided for in the COMPLIANCE conditions of certification, including COM-14, which requires the project owner to submit a closure plan that takes into consideration the applicable laws, ordinances, regulations, standards, and local/regional plans in existence at the time of closure. Not only is BIO-26 duplicative of the requirements of COM-14, but could be potentially conflicting as well. Therefore the Applicant requests that Condition BIO-26 be deleted.

References

Avian Power Line Interaction Committee(APLIC). 1994. Mitigating Bird Collisions with Power Lines: The State of the Art in 1994. Edison Electric Institute. Washington, D.C

Avian Power Line Interaction Committee (APLIC). 2006. *Suggested Practices for Avian Protection on Power Lines: The State of the Art in 2006*. Edison Electric Institute, APLIC, and the California Energy Commission. Washington, D.C. and Sacramento, CA.

Bureau of Land Management (BLM). 2002. Final Environmental Impact Statement Final California Desert Conservation Area Plan Amendments for the Northern and Eastern Mojave Planning Area. July 2002. Available from the BLM California Desert District Office at (909) 697-5200.

California Department of Fish and Game (CDFG). 2009. Protocols for Surveying and Evaluating Impacts to Special Status Native Plant Populations and Natural Communities. State of California. California Natural Resources Agency. November 24. Available at: http://www.dfg.ca.gov/biogeodata/cnddb/pdfs/Protocols_for_Surveying_and_Evaluating_Impacts.pdf

CDFG. 2011. State of California, The Natural Resources Agency Department of Fish and Game Biogeographic Data Branch, California Natural Diversity Database Special Animals, January 2011. (http://www.dfg.ca.gov/biogeodata/cnddb/pdfs/spanimals.pdf)

California Natural Diversity Database (CNDDB). 2011a. RareFind3, version 3.0.5. Electronic database. Sacramento, California. Species accounts, and database searches for the 7.5' USGS quadrangles in the vicinity of the project area. Available online by subscription only.

CNDDB. 2011b. Quickviewer on-line database. Accessed at: http://imaps.dfg.ca.gov/viewers/cnddb_quickviewer/app.asp

CNDDB. 2011c. Special vascular plants, bryophytes and lichens list. January 2011. Accessed at: www.dfg.ca.gov/whdab/pdfs/spplants.pdf

California Native Plant Society (CNPS). 2011. Inventory of rare and endangered plants of California (online edition, version 7.07c, and version 8). Accessed at: http://www.cnps.org/inventory

CH2M HILL. 2011. Attachment DR63-1A. *Spring 2011 Botanical Resource Survey of the Hidden Hills Solar Electric Generating System Site*. Prepared for Hidden Hills Solar I, LLC,

and Hidden Hills Solar II, LLC. Data collected by GANDA. Data Response Set 1B-2. Available at: http://www.energy.ca.gov/sitingcases/hiddenhills/index.html [Exhibit 8]

CH2M HILL. 2012a. Attachment DR63-2. *Technical Report: Spring 2011 Offsite Surveys for Special-Status Plants for the Hidden Hills Solar Electric Generating System*. Prepared for Hidden Hills Solar I, LLC, and Hidden Hills Solar II, LLC. Prepared by CH2M HILL. Data collected by GANDA. Data Response Set 1B-3. January. [Exhibit 9]

CH2M HILL. 2012b. Attachment DR63-3. *Technical Report: Late-Season 2010 and 2011 Surveys for Special-Status Plants for the Hidden Hills Solar Electric Generating System*. Prepared for Hidden Hills Solar I, LLC, and Hidden Hills Solar II, LLC. Data collected by GANDA. Data Response Set 1B-3. January. [Exhibit 9]

CH2M HILL.2012c. Technical Report: Spring 2011 Botany Surveys of the Valley Electric Association 500 kV Transmission Line and Ancillary System Facilities Project. Prepared for Valley Electric Association. Prepared by CH2M HILL. Data collected by GANDA. April.

CH2M HILL. 2012d. Attachment DR175-1. Technical Report: 2012 Onsite Focused Survey for Torrey's Jointfir (*Ephedra torreyana*). Hidden Hills Solar Electric Generating System. Prepared for Hidden Hills Solar I, LLC, and Hidden Hills Solar II, LLC. Data collected by Garcia and Associates and Clark Biological Consulting. Data Response, Set 2D-5. September 28. [Exhibit 40]

CH2M HILL. 2012e. Attachment DR174-1, Technical Report: 2012 Offsite Surveys for Special-Status Plants for the Hidden Hills Solar Electric Generating System. Prepared for Hidden Hills Solar I, LLC, and Hidden Hills Solar II, LLC. Data collected by Garcia and Associates and Clark Biological Consulting. Data Response, Set 2D-4B. October. [Exhibit 39]

CH2M HILL. 2012f. Attachment DR87-1, California Department of Fish and Game Notification of Lake or Streambed Alteration, Hidden Hills Solar Electric Generating System. Data Response Set 1C-4.October 22. [Exhibit 20]

CH2M HILL. 2012g. Draft Proposed Desert Tortoise Translocation Plan Revision 1, Hidden Hills Solar Electric Generating System (11-AFC-02).-Submitted as Attachment DR 66-1, Data Response Set 1B-8. Docketed November 22, 2012 [Exhibit 16]

Howell & Veloz 2011 – Howell, C.A., and S. D. Veloz, Priority Areas for Breeding Birds within the Planning Area of the Desert Renewable Energy Conservation Plan, PRBO Technical Report. PRBO contribution #1823 http://www.prbo.org/cms/574

Jepson Online Interchange. 2011. Consortium of California Herbaria on-line database. Accessed at: http://ucjeps.berkeley.edu/interchange.html

Klem Jr., D., D. C. Keck, K. L. Marty, A. J. Miller Ball, E. E. Niciu, and C. T. Platt. 2004. Effects of window angling, feeder placement, and scavengers on avian mortality at plate glass. Wilson Bulletin 116:69–73.

Lundstrom, S. C., S. A. Mahan, R. J. Blakely, J. B. Paces, O. D. Young, J. B. Workman, and G. L. Dixon. 2002. *Geologic Map of the Mound Spring Quadrangle, Nye and Clark Counties, Nevada, and Inyo County, California*. U. S. Geological Survey, Miscellaneous Field Studies Map MF–2339. Version 1.0. Denver, CO.

Natural Resource Conservation Service (NRCS). 2011. Web Soil Survey: National Cooperative Soil Survey. Accessed from: http://websoilsurvey.nrcs.usda.gov/app/HomePage.htm

Scheirer, D. S., D. S. Sweetkind and J. J. Miller. 2010. Multiple phases of basin formation along the Stateline fault system in the Pahrump and Mesquite Valleys, Nevada and California. *Geosphere* 6(2): 93-129.

Sundance Biology, Inc. 2011. *Presence/Absence Survey for the Desert Tortoise (*Gopherus agassizii*) and other Sensitive Wildlife on the Proposed Hidden Hills SEGS Project, Inyo County, California*. November 30.

URS. 2011. Approved Jurisdictional Determination, Hidden Hills Ranch Solar Project, Inyo County, California. May 6.Submitted as AFC Appendix 5.2E. [Exhibit 1]

URS. 2012. Brightsource Energy Hidden Hills Solar Project, Inyo County, CA, Preliminary Delineation of Jurisdictional Waters of the State. March 20. Filed as Attachment DR88-1, Data Response Set 1C-2 [Exhibit 18]

U.S. Army Corps of Engineers (USACE). 1987. Corps of Engineers Wetland Delineation Manual Online Edition. Environmental Laboratory, Wetlands Research Program Technical Report Y-87-1 (on-line edition). Accessed from: http://el.erdc.usace.army.mil/elpubs/pdf/wlman87.pdf.

USACE. 2001. Final Summary Report: Guidelines for Jurisdictional Determinations for Waters of the United States in the Arid Southwest. U.S. Army Corps Engineers, South Pacific Division.

USACE. 2006. Interim Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region. Final Report, December 2006. ERDC/EL TR-06-16

USACE. 2007. Coordination on Jurisdictional Determinations under Clean Water Act Section 404 in Light of the SWANCC and Rapanos Supreme Court Decisions.

USACE. 2008. A Field Guide to the Identification of the Ordinary High Water Mark (OHWM) in the Arid West Region of the Western United States. ERDC/CRREL TR-08-12

U.S. Fish and Wildlife Service (USFWS). 1996. Guidelines for conducting and reporting botanical inventories for federally listed, proposed and candidate plants. Sacramento, CA. Available at: http://www.fws.gov/sacramento/es/Survey-Protocols-Guidelines/Documents/Listed_plant_survey_guidelines.pdf

USFWS. 2008. Birds of Conservation Concern. 2008. U.S. Fish and Wildlife Service Division of Migratory Bird Management, Arlington, Virginia, December 2008. (http://library.fws.gov/Bird_Publications/BCC2008.pdf)

USFWS. 2009. Desert tortoise (Mojave population) field manual (*Gopherus agassizii*). December 2009. Region 8, Sacramento, California.

USFWS. 2010. Translocation of Desert Tortoises (Mojave Population) from Project Sites: Plan Development Guidance. August 2010. Available online at: http://www.fws.gov/ventura/species_information/protocols_guidelines/index.html U.S. Fish and Wildlife Service (FWS). 2011. Revised recovery plan for the Mojave Population of the desert tortoise (*Gopherus agassizii*). U.S. Fish and Wildlife Service, Pacific Southwest Region, Sacramento, California. 222 pp.

USFWS. 2011a. Revised recovery plan for the Mojave Population of the desert tortoise (*Gopherus agassizii*). U.S. Fish and Wildlife Service, Pacific Southwest Region, Sacramento, California. 222 pp.

USFWS. 2011b. Translocation of Mojave desert tortoises from project sites: plan development guidance. Desert Tortoise Recovery Office, Reno, NV. 27 pp.

U.S. Geological Survey (USGS). 2011. The National Map. Accessed from: http://nationalmap.gov/

VTN Consulting (VTN). 2010. Aerial Photography for Hidden Hills Ranch SEGS. Inyo County, CA.

Attachment BIO-1
Fall Avian Surveys for the Proposed HHSEGS, Fall Report September 25-November 29, 2012

Fall Avian Surveys for the Proposed Hidden Hills Solar Electric Generating System Inyo County, California

Fall Report

September 25 – November 29, 2012

Prepared for:

CH2M HILL

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January 7, 2013

WEST Inc.

NATURAL RESOURCES ◆ SCIENTIFIC SOLUTIONS

EXECUTIVE SUMMARY

Western EcoSystems Technology, Inc. (WEST) conducted fixed-point raptor use and songbird point count surveys at the Hidden Hills Solar Electric Generating System (HHSEGS) site in Inyo County, California, to assess fall raptor and songbird use within the study area.

Fixed-point raptor use surveys were conducted twice per week from September 25 through November 28, 2012, at three points established within the HHSEGS site. A total of 59 3-hour fixed-point surveys (six per week) were completed. A total of 63 individual observations, comprising seven raptor species, were recorded. The number of raptor observations was highest at survey point 2 (28 observations), which is located near the western central edge of the site, and lowest at point 1 (10 observations), which is located in the northern part of the site. No obvious flyways or concentration areas were observed for any species or portions of the study area. During the raptor use surveys, the majority (67.7%) of recorded raptor flight heights, based on initial observation, were from one to 20 meters (m; 3.3 to 66 feet [ft]) above ground level.

Songbird point count surveys were conducted once every other week from October 3 to November 29, 2012, at 31 points established along three transects within the HHSEGS site. One-hundred-fifty-five 10-minute surveys were completed. A total of 839 individual observations, comprising 21 species, were recorded, including four raptor species and 17 songbird species. Based on initial observation, 65.4% of birds were observed flying below five m (16 ft) and 89.9% were observed flying below 10 m (33 ft). During the songbird surveys, approximately 10% of birds were observed flying above 10 m.

Consistent with previous surveys conducted within the HHSEGS site, no state or federally listed threatened or endangered avian species were detected during any of the surveys. Two adult golden eagles, detected incidentally, were observed soaring together over the southeastern portion of the site in mid-November. Other special status species observed during the surveys included: northern harrier and short-eared owl, which are state species of special concern; prairie falcon, Le Conte's thrasher, and ferruginous hawk, which are federal birds of conservation concern; and loggerhead shrike, which is both a state species of concern and a federal bird of conservation concern. No other special status species were identified.

STUDY PARTICIPANTS

Western EcoSystems Technology

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REPORT REFERENCE

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INTRODUCTION

BrightSource Energy, Inc. (BrightSource) is proposing to develop the Hidden Hills Solar Electric Generating System (HHSEGS) in Inyo, California. CH2M HILL Engineers, Inc. (CH2M HILL), a contractor to BrightSource, contracted Western EcoSystems Technology, Inc. (WEST) to develop and implement a standardized protocol for avian use surveys in the HHSEGS site during fall, 2012. Protocols for this study were generated based on detailed recommendations provided by the US Fish and Wildlife Service (USFWS) to the California Energy Commission (USFWS 2011b), Bureau of Land Management Solar Facility Point Count Protocol (BLM 2009), and by incorporating surveys approaches developed more generally for renewable energy projects (USFWS 2011a, 2012; CEC and CDFG 2007). Additionally, the survey protocols were based on WEST's experience with studying wildlife, including diurnal raptors and songbirds, at existing and proposed renewable energy facilities throughout the western US.

The purpose of this report is to present the results of raptor use and songbird point count surveys conducted at the HHSEGS site from September 25 to November 29, 2012. This report presents preliminary data on the number of observations by species and bird type, raptor use estimates, raptor flight path information, raptor and songbird flight height information, incidental wildlife observations, and special status species observations.

STUDY AREA

The proposed HHSEGS site encompasses approximately 3,273 acres (5.1 square miles [mi^2]) in southeastern Inyo, County, California (Figure 1). The site lies along the California-Nevada border, approximately eight miles (13 kilometers [km]) south of the city of Pahrump, Nevada, and 40 miles (64 km) west of Los Vegas, Nevada. The HHSEGS site is located within the Mojave Basin and Range Ecoregion, characterized by high desert plains and scattered mountains, very little rainfall (two to eight inches [five to 20 centimeters (cm)] per year) and extreme summer temperatures (USEPA 2003). The site is characterized by flat to gently sloping topography with elevations ranging from 2,303 to 2,677 feet (ft; 702 to 816 meters [m]).

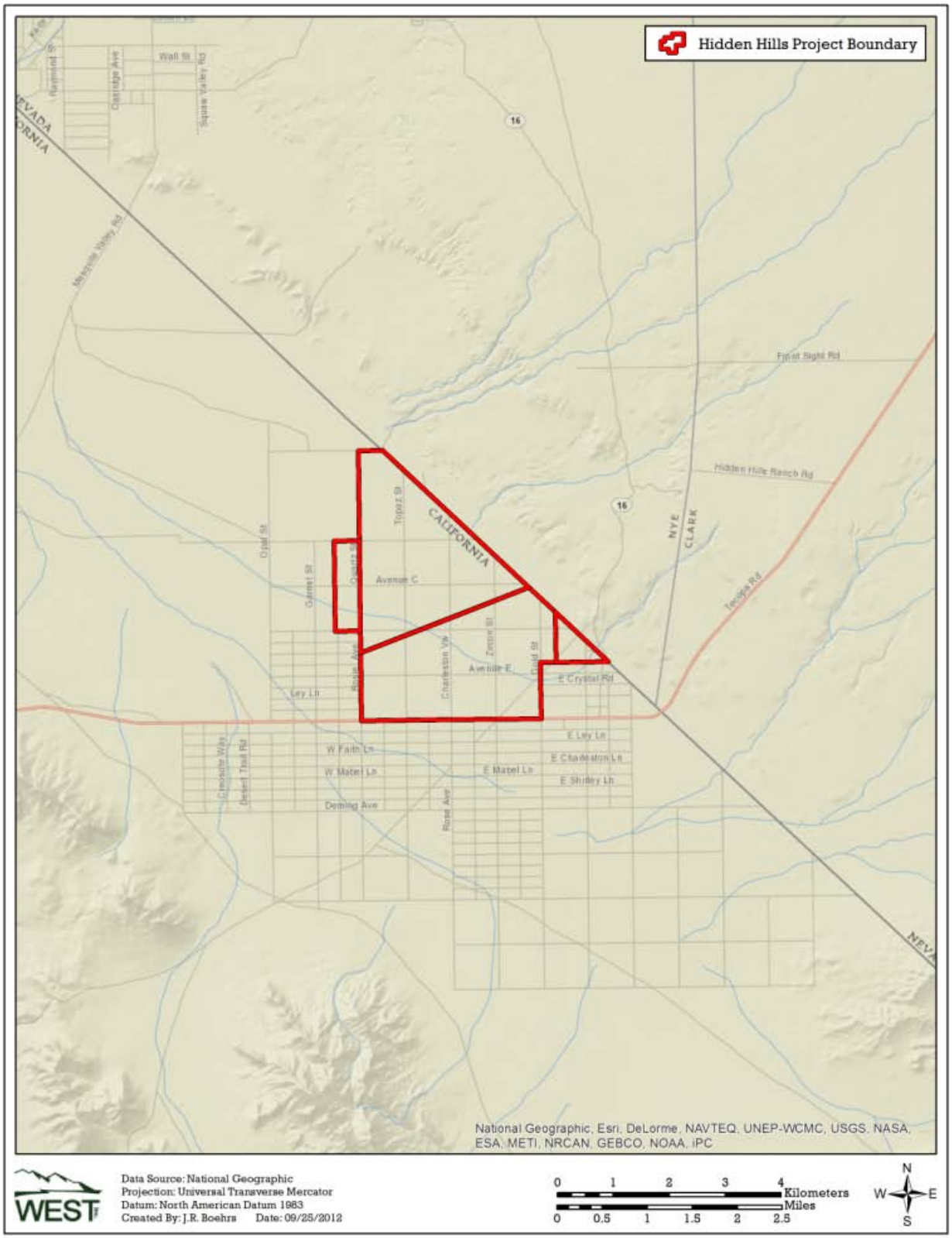

Figure 1. Location of the proposed Hidden Hills Solar Electric Generating System site.

The vegetation community within the site is dominated by Mojave Desert scrub in the eastern portion and shadscale scrub in the western portion. The Mojave Desert scrub portion consists primarily of evergreen and drought-deciduous shrubs one to four ft (0.3 to 1.2 m) in height, dominated by creosote bush (*Larrea tridentata*) and white bursage (*Ambrosia dumosa*). Common associated shrubs include rabbit-thorn (*Lycium pallidum var. oligospermum*) and shadscale (*Atriplex confertifolia*). The shadscale scrub habitat consists primarily of low-growing, salt-tolerant shrubs that are widely spaced and less than two ft (0.6 m) in height. Common plant associates in this community include shadscale, winterfat (*Kraschenninikovia lanata*), desert allysum (*Lepidium fremontii*), Anderson's boxthorn (*Lycium andersonii*), rabbit-thorn, Emory's globemallow (*Sphaeralcea emoryi*), and prince's plume (*Stanleya pinnata).* Invasive weeds are common, particularly within the shadscale scrub community in the western portion of the project. The project site also contains approximately 77 acres (0.12 mi^2) of topographically disturbed habitat, including dirt roads, a graded area, and a fallow orchard. Mojave Desert scrub and shadscale scrub also dominate the 1-mile (1.6-km) buffer surrounding the project site.

METHODS

The avian use study at the HHSEGS consisted of two components, fixed-point raptor use surveys and songbird point count surveys.

Fixed-Point Raptor Use Surveys

The objective of the raptor use surveys was to estimate the spatial and temporal use of the HHSEGS by vultures and diurnal raptors, including kites, accipiters, buteos, harriers, eagles, falcons and osprey. Point counts using circular plots (similar to those described by Reynolds et al. 1980, Bibby et al. 1992) were conducted within the HHSEGS site, consistent with methods used by the Hawk Migration Association of North America (HMANA), with observers continuously scanning the sky and surrounding areas for raptors in the survey area in an unlimited viewshed. Surveys were designed to document use of the site by resident and migrating raptor species.

Survey Plots

Three survey points were established within the HHSEGS site to survey for raptors (Figure 2). The points were selected to provide good visual coverage from each point, in all directions, including the locations of the two proposed solar collection towers. Each survey plot included 800-m (2,625-ft) and 1,600-m (5,248-ft) radius buffers centered at the point. The location of the survey point was recorded on a hardcopy map and global positioning system (GPS) coordinates were collected.

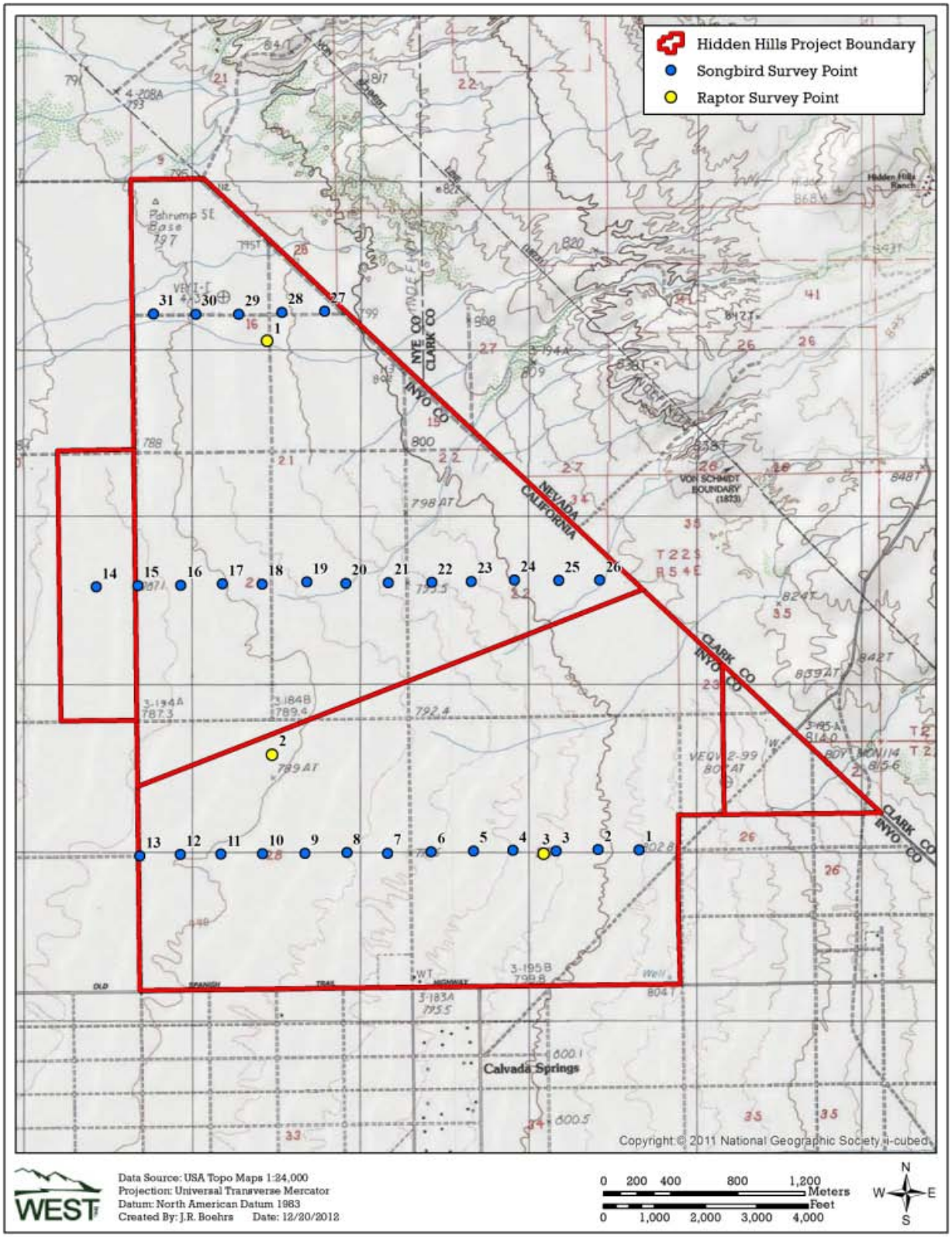

Figure 2. Location of raptor use survey points and songbird survey points at the proposed Hidden Hills Solar Electric Generating System site.

Survey Methods

Surveys at each point were three hours in duration. All raptors observed during the survey were recorded, regardless of distance from observer. Data recorded for each survey included the date, start and end time of the observation period, and weather information such as temperature (degrees Fahrenheit [°F]), wind speed (miles per hour [mph]), wind direction, and cloud cover (percent). Species or best possible identification, number of individuals, sex and age class (if possible), distance from plot center when first observed (in meters), altitude above ground (in meters), activity (behavior), and habitat(s) were recorded for each observation. Approximate flight paths or perched locations were mapped for all raptors seen. The behavior and habitat were recorded based on the point of initial observation. Behavior categories included perched, soaring, flapping, hunting, gliding, hovering, auditory, and other (noted in comments). The approximate flight height and distance from the point at first observation were recorded to the nearest 5-m (16-ft) interval. For observations of golden eagles (*Aquila chrysaetos*), information on flight height, distance, and activity was recorded for every minute the eagle was visible during the survey, as recommended by the USFWS (2011a). Comments, if any, were recorded in the comments section of each data sheet.

Observation Schedule

Surveys at each of the three points were conducted twice per week from September 25 through November 28, 2012. Surveys were carried out during daylight hours (approximately 9:00 am to 5:00 pm), and survey periods varied to cover all daylight hours during the season. To the extent practical, each point was surveyed roughly the same number of times. A total of 59 3-hour fixed-point raptor use surveys (177 hours of surveys) were conducted at the project location.

Songbird Point Count Surveys

The objective of the point count surveys was to characterize use of the HHSEGS site by resident and migrating birds, particularly songbirds, during the late fall season. Survey methods were consistent with surveys conducted at the HHSEGS site during the winter of 2011/12 and spring of 2012 and used applicable BLM protocols (BLM 2009). All birds seen or heard during the songbird surveys were recorded.

Survey Plots

Thirty-one survey points were established along three transects running east to west across the site (Figure 2). Points were established approximately 250 m (820 ft) apart along each transect. Each survey point was recorded with a GPS unit.

Survey Methods

Surveys at each point consisted of 10-minute (min) passive listening surveys, during which time all species seen or heard were recorded. Data recorded for each survey included: date, start and end time of observation period, point number, species or best possible identification, sex, age, number of individuals, distance from point, behavior, first altitude above ground, flight direction, and whether or not the observation was auditory-only. Behavior categories recognized included perched (PE), soaring (SO), flapping (FL), foraging (FO), gliding (GL), hovering (HO),

auditory (AUD), and other (O). Weather information, such as temperature, wind speed, wind direction, precipitation, and cloud cover also were also recorded for each survey point.

Observation Schedule

All 31 points were surveyed once every two weeks from October 3 through November 29, 2012. Surveys were conducted only during morning hours, between dawn and approximately 10:00 am. A total of 155 10-min surveys (approximately 26 hours of surveys) were conducted within the study area from October 3 to November 29, 2012.

Incidental Wildlife Observations

Incidental wildlife observations, including all raptors, special status species, mammals, reptiles, and amphibians observed outside of the standardized survey periods or survey area were recorded in a similar manner as in the raptor and songbird surveys. The observation number, date, time, species, number of individuals, sex/age class, distance from observer, activity, height above ground (for bird species) and habitat were recorded. The location of special status species incidentally observed was also recorded by Universal Transverse Mercator coordinates using a hand-held GPS unit.

RESULTS

Twenty-six bird species, three mammal species, and one reptile species were identified during the raptor and songbird surveys, and incidentally, at the HHSEGS site from September 25 through November 29.

Raptor Use Surveys

A total of 59 3-hour fixed-point raptor use surveys (177 hours of surveys) were conducted within the proposed HHSEGS site during from September 25 to November 28, 2012 (Table 1).

Table 1. Summary of fall raptor observations, sample size, and mean raptor use by survey point during raptor use surveys at the proposed Hidden Hills Solar Electric Generating System site from September 25 – November 28, 2012.

Survey Point	# Surveys Conducted	# Observations	# Species	Mean Use[1]
1	20	10	5	0.13
2	19	28	6	0.40
3	20	25	4	0.30
Overall	**59**	**63**	**7**	**0.26**

[1] Mean Use - mean number of raptors observed per hour per station

A total of 63 individual raptor observations, comprising seven species, were recorded during surveys (Tables 1 and 2). The most common raptor species observed included red-tailed hawk (*Buteo jamaicensis*; 26 observations), prairie falcon (*Falco mexicanus*; 12 observations), and northern harrier (*Circus cyaneus*; 10 observations). These three species accounted for 77.4% of all raptor observations. The number of raptor observations was highest at survey point 2 (28 observations) and lowest at point 1 (10 observations; see Table 1, Figure 2). Overall mean

raptor use, expressed as the mean number of raptors observed per hour per station, was 0.26, and ranged from 0.13 to 0.40 raptors/hour/point at the three survey points (Table 1).

Table 2. Summary of individual raptor observations, mean raptor use (mean number of raptors/hour/point), and state/federal conservation status, by species and bird type during raptor use surveys at the proposed Hidden Hills Solar Electric Generating System site from September 25 to November 28, 2012.

Species	Scientific Name	Status*	# observations	Mean Use
Diurnal Raptors			**62**	**0.26**
Accipiters			*3*	*0.01*
Cooper's hawk	*Accipiter cooperii*	WL	1	<0.01
unidentified accipiter			2	0.01
Buteos			*28*	*0.12*
ferruginous hawk	*Buteo regalis*	WL, BCC	2	0.01
red-tailed hawk	*Buteo jamaicensis*		26	0.11
Northern Harrier			*10*	*0.04*
northern harrier	*Circus cyaneus*	SSC	10	0.04
Falcons			*17*	*0.06*
American kestrel	*Falco sparverius*		5	0.02
prairie falcon	*Falco mexicanus*	WL, BCC	12	0.04
Other Raptors			*4*	*0.02*
unidentified hawk			3	0.02
unidentified raptor			1	<0.01
Owls			**1**	**<0.01**
short-eared owl	*Asio flammeus*	SSC	1	<0.01
Overall			**63**	**0.26**

*WL = State Watch List Species (CDFG 2011); BCC = Federal Bird of Conservation Concern (CDFG 2011, USFWS 2008); SSC = State Species of Special Concern (CDFG 2011).

Flight paths and perched locations of all raptors observed during surveys are presented in Figure 3. No obvious flyways or concentration areas were observed for any species or any portion of study area; however, the transmission line located offsite to the south of the HHSEGS project area experienced consistent use by red-tailed hawks. Based upon initial observation, the majority (21 observations; 67.7%) of recorded flight heights were from one to 20 meters (3.3 to 66 ft) above ground level (AGL; see Figure 4). Five raptors were observed flying at or above 100 m (328 ft), including two observations of red-tailed hawks (100 and 200 m [656 ft]), one of ferruginous hawk (*Buteo regalis*; 100 m), one of short eared owl (*Asio flammeus*; 100 m), and one of an unidentified hawk (150 m [492 ft]; Appendix A). A total of 32 raptor observations (50.8%) were of raptors perched upon initial observation, primarily on the ground or on the transmission line along the southern boundary of the site (see Figures 3 and 4; Appendix A).

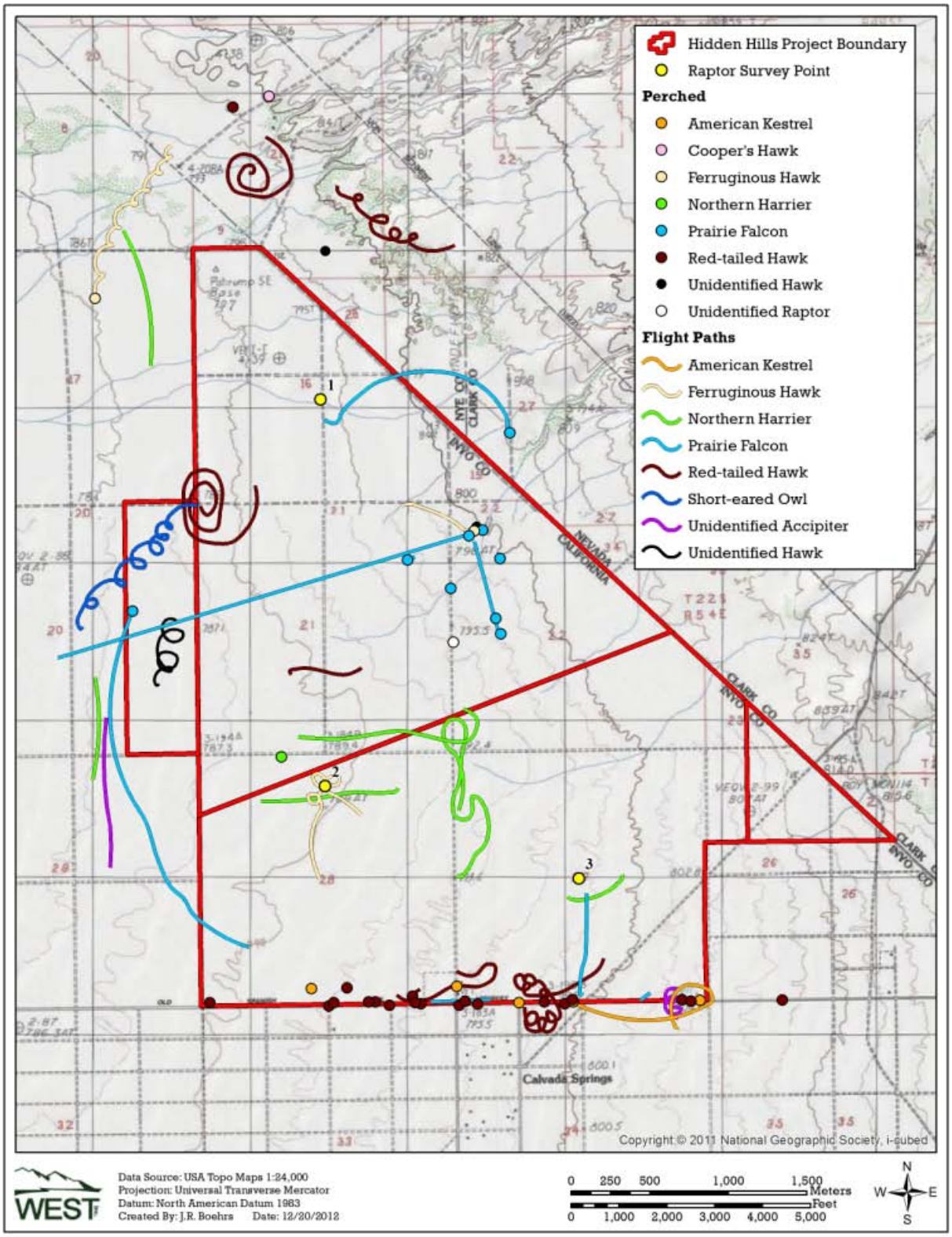

Figure 3. Flight paths of all raptors observed at the proposed Hidden Hills Solar Electric Generating System site during fixed-point raptor use surveys from September 25 to November 28, 2012.

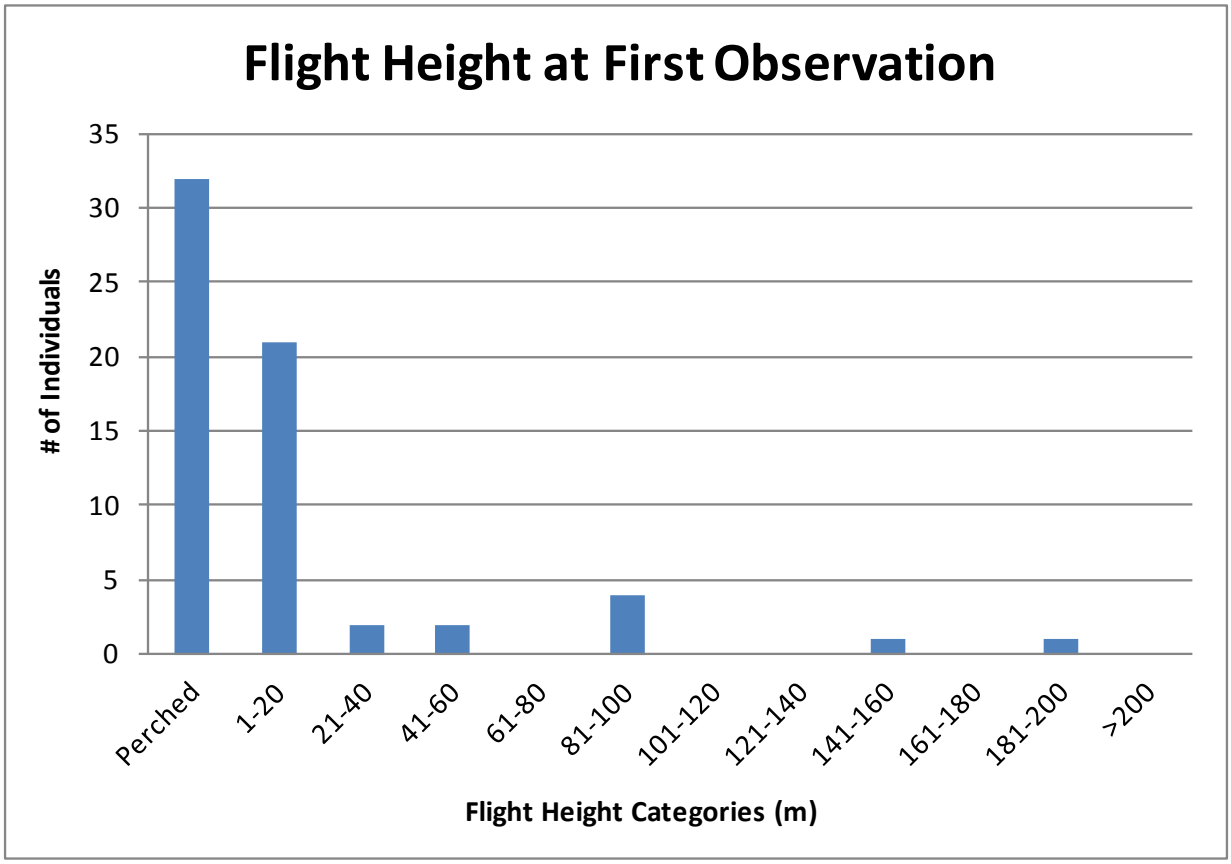

Figure 4. Flight height of raptors (based on initial observation) recorded during raptor use surveys at the proposed Hidden Hills Solar Electric Generating System site from September 25 to November 28, 2012.

Songbird Point Count Surveys

Songbird point count surveys were conducted at the HHSEGS site five times during the fall survey period. A total of 155 10-min surveys (approximately 26 hours of surveys) were conducted within the study area from October 3 to November 29, 2012 (Table 3).

Table 3. Summary of fall species diversity and sample size during the songbird point count surveys at the proposed Hidden Hills Solar Electric Generating System site from October 3 – November 29, 2012.

Season	# Visits	# Surveys Conducted	# Species
Fall	5	155	21

Twenty-one species were identified during point count surveys, including four raptor species and 17 passerine (songbird) species (see Tables 3 and 4). A total of 839 individual bird observations were recorded. The following four species accounted for 89.8% of the total individual songbird survey observations: horned lark (*Eremophila alpestris;* 639 observations), sage sparrow (*Amphispiza belli;* 42 observations), western meadowlark (*Sturnella neglecta;* 36 observations), and house finch (*Carpodacus mexicanus*; 36 observations). Of the four raptor

species observed during songbird surveys, only merlin (*Falco comlumbarius*; one observation), was not also recorded during the raptor use surveys (see Tables 2 and 4).

Table 4. Summary of individual avian observations by species and bird type detected during songbird point count surveys at the proposed Hidden Hills Solar Electric Generating System site from October 3 – November 29, 2012.

Bird Type / Species	Scientific Name	# observations
Diurnal Raptors		**7**
American kestrel	*Falco sparverius*	1
merlin	*Falco columbarius*	1
northern harrier	*Circus cyaneus*	4
red-tailed hawk	*Buteo jamaicensis*	1
Passerines		**832**
Corvids		*11*
common raven	*Corvus corax*	11
Blackbirds/Orioles		36
western meadowlark	*Sturnella neglecta*	36
Finches/Crossbills		*38*
house finch	*Carpodacus mexicanus*	36
pine siskin	*Carduelis pinus*	2
Flycatchers		*2*
Say's phoebe	*Sayornis saya*	2
Grassland/Sparrows		*720*
American pipit	*Anthus rubescens*	13
Brewer's sparrow	*Spizella breweri*	16
horned lark	*Eremophila alpestris*	639
sage sparrow	*Amphispiza belli*	42
savannah sparrow	*Passerculus sandwichensis*	3
unidentified sparrow		1
white-crowned sparrow	*Zonotrichia leucophrys*	6
Mimids		*3*
Le Conte's thrasher	*Toxostoma lecontei*	3
Swallows		*5*
barn swallow	*Hirundo rustica*	5
Shrikes		*9*
loggerhead shrike	*Lanius ludovicianus*	9
Titmice/Chickadees		*3*
verdin	*Auriparus flaviceps*	3
Warblers		*4*
yellow-rumped warbler	*Dendroica coronata*	4
Wrens		*1*
Bewick's wren	*Thryomanes bewickii*	1
Total		**839**

Based on initial observation, 65.4% of birds were observed flying below five meters (16 ft) AGL, and 89.9% were observed flying below 10 m (33 ft) AGL (see Figure 5). Approximately 10% of birds were observed flying above 10 m, based on initial observation, including: horned lark (50 observations), house finch (eight observations), common raven (*Corvus corax*; three observations), yellow-rumped warbler (*Dendroica coronata*; two observations), verdin (*Auriparus flaviceps*; one observation), red-tailed hawk (one observation), and American kestrel (*Falco sparverius*; one observation). Of these, only the red-tailed hawk was observed flying above 30 m (98 ft; Figure 5).

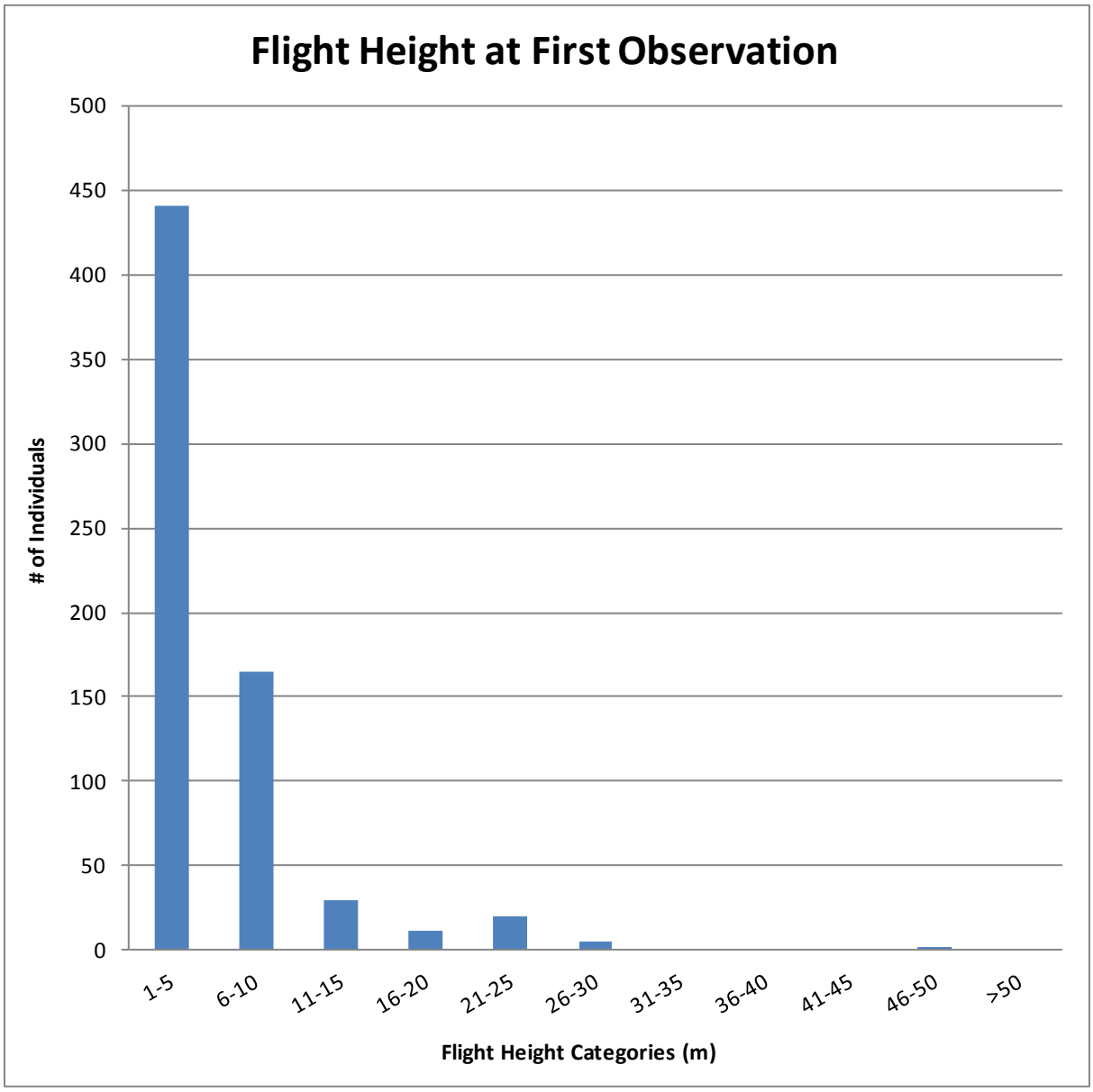

Figure 5. Flight height of raptors and passerines (based on initial observation) recorded during songbird point count surveys at the proposed Hidden Hills Solar Electric Generating System site from October 3 to November 29, 2012.

Incidental Wildlife Observations

Table 5 summarizes wildlife detected incidentally during the surveys. The only avian species recorded incidentally was a single detection of two adult golden eagles on November 16. The eagles were observed soaring between 200 and 400 m (1,312 ft) AGL in the southeast region of the HHSEGS site for approximately 18 min before leaving the study area to the north. Three mammal species and one reptile species were also observed incidentally during surveys (see Table 5), but none of these were special status species.

Table 5. Incidental wildlife observed during raptor and songbird surveys at the proposed Hidden Hills Solar Electric Generating System site from September 25 to November 29, 2012.

Species	Scientific Name	# observations
Birds		
golden eagle	*Aquila chrysaetos*	2
Mammals		
white-tailed antelope squirrel	*Ammospermophilus leucurus*	3
black-tailed jackrabbit	*Lepus californicus*	2
coyote	*Canis latrans*	1
Reptiles		
common side-blotched lizard	*Uta stansburiana*	3

Special Status Species Observations

No state or federally listed threatened or endangered species were observed during the surveys or incidentally at the HHSEGS site. Table 6 summarizes the number of observations of individual special status birds observed during the study, including incidental observations. Two golden eagles (a state fully protected species [CDFG 2011] and protected under the federal Bald and Golden Eagle Protection Act [BGEPA 1940]) were observed in a single incidental detection located in the southeast region of the site near raptor survey station 3. Other special status species detected include northern harrier and short-eared owl which are considered to be state species of special concern (CDFG 2011); prairie falcon, Le Conte's thrasher [*Toxostoma lecontei*], and ferruginous hawk which are considered to be federal birds of conservation concern (CDFG 2011, USFWS 2008); and loggerhead shrike (*Lanius ludovicianus*) both a species of special concern and a federal bird of conservation concern (CDFG 2011, USFWS 2008; see Table 6). Additionally, prairie falcon, ferruginous hawk, and Cooper's hawk (*Accipiter cooperii*) are considered state watch list species (CDFG 2011; see Table 6).

Table 6. Summary of special status species observed at the proposed Hidden Hills Solar Electric Generating System site during raptor and songbird surveys, and incidentally from September 25 to November 29, 2012.

			Number of Observations			
Species	**Scientific Name**	**Status**	**Songbird Survey**	**Raptor Survey**	**Incidental**	**Total**
northern harrier	*Circus cyaneus*	SSC	4	10	0	14
prairie falcon	*Falco mexicanus*	WL, BCC	0	12	0	12
loggerhead shrike	*Lanius ludovicianus*	SSC, BCC	9	0	0	9
Le Conte's thrasher	*Toxostoma lecontei*	BCC	3	0	0	3
golden eagle	*Aquila chrysaetos*	FP, BGEPA	0	0	2	2
ferruginous hawk	*Buteo regalis*	WL, BCC	0	2	0	2
Cooper's hawk	*Accipiter cooperii*	WL	0	1	0	1
short-eared owl	*Asio flammeus*	SSC	0	1	0	1
Total	**8 species**		**16**	**26**	**2**	**44**

BGEPA = Bald and Golden Eagle Protection Act (BGEPA 1940); BCC = Federal Bird of Conservation Concern (CDFG 2011, USFWS 2008); FP = State Fully Protected Species (CDFG 2011); SSC = State Species of Special Concern (CDFG 2011); WL = State Watch List Species (CDFG 2011).

DISCUSSION

Species diversity of birds observed during raptor use surveys and songbird point count surveys was consistent with the expected avian community occurring in the high desert scrub habitats comprising the HHSEGS site. Overall, species abundance and diversity were quite low, which was to be expected given the dry, sparsely vegetated study area, and the timing of the surveys (late fall). Species observed during the survey period consisted of both year-round or winter residents of the region, as well as migrants passing through the site during the latter half of the migration period. The most common raptor species observed during the surveys included red-tailed hawk, northern harrier, and prairie falcon. The most abundant songbird species observed were horned larks, house finches, and western meadowlarks, all of which are common residents of dry, open scrub habitat and are generally low-flying species. Species observed during surveys that were likely migrating through the area included short-eared owl (one observation), merlin (one), barn swallow (*Hirundo rustica*; five), and yellow-rumped warbler (four). The low number of potentially migrating species detected during these surveys suggests this site is not an important or heavily used fall migration pathway for songbirds.

Generally, the majority of avian observations were very low or near to ground level. Approximately 90% of all songbirds observed during songbird point count surveys were below 10 m AGL, and about 68% of raptors observed during raptor use surveys were below 20 m AGL. Only five of the 63 raptor observations recorded during standardized surveys were observed at or above 100 m based on initial observation. No state or federally listed threatened or endangered species were observed during the raptor and songbird surveys or incidentally at the HHSEGS site.

REFERENCES

Bald and Golden Eagle Protection Act (BGEPA). 1940. 16 United States Code (USC) § 668-668d. June 8, 1940.

Bibby, C.J., N.D. Burgess, and D.A. Hill. 1992. Bird Census Techniques. Academic Press, New York. 257 pp.

Bureau of Land Management (BLM). 2009. Solar Facility Point Count Protocol. 1 p.

California Department of Fish and Game (CDFG). 2011. Special Animals (898 Taxa). State of California Natural Resources Agency, Biogeographic Data Branch, California Natural Diversity Database (CNNDB). January 2011. http://www.dfg.ca.gov/biogeodata/cnddb/pdfs/SPAnimals.pdf

California Energy Commission (CEC) and California Department of Fish and Game (CDFG). 2007. California Guidelines for Reducing Impacts to Birds and Bats from Wind Energy Development. . Commission Final Report. California Energy Commission, Renewables Committee, and Energy Facilities Siting Division, and California Department of Fish and Game, Resources Management and Policy Division. CEC-700-2007-008-CMF.

DeLorme. 2012. Topo North America. Digital Topographic Map Data. DeLorme, Yarmouth, Maine.

ESRI. 2012. Geographic Information System (GIS) Online Topographic Base Map. ESRI, producers of ArcGIS software. Redlands, California.

Hawk Migration Association of North America (HMANA) website. HawkWatch Site Profiles and Hawk Count Summaries. http://www.hmana.org/sitesel.php

National Geographic Society (National Geographic). 2012. TOPO! Digital Topographic Map.

NAVTEQ. 2012. Digital map data. Chicago, Illinois.

North American Datum (NAD). 1983. NAD83 Geodetic Datum.

Reynolds, R.T., J.M. Scott, and R.A. Nussbaum. 1980. A Variable Circular-Plot Method for Estimating Bird Numbers. Condor 82(3): 309-313.

US Environmental Protection Agency (USEPA). 2003. Level III Ecoregions of the Continental United States. (Revision of Omernik, 1987). National Health and Environmental Effects Research Laboratory, Map M-1, various scales. USEPA. Corvallis, Oregon.

US Fish and Wildlife Service (USFWS). 2008. Birds of Conservation Concern 2008. December 2008. Division of Migratory Bird Management. Arlington, Virginia. http://www.fws.gov/migratorybirds/NewReportsPublications/SpecialTopics/BCC2008/BCC2008.pdf

US Fish and Wildlife Service (USFWS). 2011a. Draft Eagle Conservation Plan Guidance. January 2011. Available online at: http://www.fws.gov/windenergy/docs/ECP_draft_guidance_2_10_final_clean_omb.pdf

US Fish and Wildlife Service (USFWS). 2011b. Hidden Hills Solar Electric Generating System, 11-AFC-2-Golden/Eagle Migratory Bird Surveys. Email correspondence from Heather Beeler, Eagle Permit Specialist, USFWS, provided to Amy Golden, California Energy Commission (CEC). November 1, 2011, 1:57 pm.

US Fish and Wildlife Service (USFWS). 2012. Final Land-Based Wind Energy Guidelines. March 23, 2012. 82 pp. Available online at: http://www.fws.gov/windenergy/docs/WEG_final.pdf

US Geological Survey (USGS). 2012. The National Map/US Topo. Last updated October 26, 2012. Homepage available at: http://nationalmap.gov/ustopo/index.html

Appendix A. Data Collected during Raptor Use Surveys at the Hidden Hills Solar Electric Generating System Site from September 25 to November 29, 2012

Appendix A. Data collected during raptor use surveys at the proposed Hidden Hills Solar Electric Generating System site, September 25 to November 28, 2012.

Date	Station	Species	# Individuals	First Distance (m)	First Activity	First Flight Height (m)
10/2/12	2	unidentified accipiter	1	1500	flapping	50
10/2/12	2	northern harrier	1	75	flapping	3
10/2/12	3	prairie falcon	1	300	flapping	20
10/4/12	3	prairie falcon	1	800	flapping	15
10/4/12	3	red-tailed hawk	1	800	soaring	200
10/9/12	2	northern harrier	1	900	flapping	3
10/10/12	3	northern harrier	4	200	flapping	2
10/10/12	3	red-tailed hawk	1	800	perched	-
10/11/12	3	red-tailed hawk	1	1500	perched	-
10/16/12	3	red-tailed hawk	1	1000	perched	-
10/17/12	2	red-tailed hawk	1	2000	soaring	25
10/17/12	3	unidentified accipiter	1	800	soaring	90
10/18/12	1	red-tailed hawk	1	2000	perched	-
10/18/12	1	Cooper's hawk	1	2000	perched	-
10/18/12	2	red-tailed hawk	1	1500	flapping	8
10/18/12	2	unidentified hawk	1	1900	perched	-
10/23/12	2	red-tailed hawk	1	1400	perched	-
10/23/12	2	prairie falcon	1	1200	flapping	10
10/23/12	3	northern harrier	1	1500	flapping	2
10/24/12	2	unidentified raptor	1	1200	perched	-
10/29/12	2	red-tailed hawk	1	700	soaring	25
10/29/12	3	red-tailed hawk	1	1100	perched	-
10/30/12	1	unidentified hawk	1	1700	soaring	150
10/30/12	2	red-tailed hawk	1	1800	perched	-
10/30/12	2	northern harrier	1	300	perched	-
10/30/12	3	American kestrel	1	1000	flapping	10
10/30/12	3	red-tailed hawk	1	1200	flapping	8
10/31/12	1	unidentified hawk	1	1200	perched	-
11/6/12	1	northern harrier	1	1500	flapping	3
11/6/12	3	red-tailed hawk	1	1200	perched	-
11/7/12	2	ferruginous hawk	1	1800	flapping	2
11/7/12	2	short-eared owl	1	2000	soaring	100
11/7/12	2	prairie falcon	1	1800	perched	-
11/7/12	2	red-tailed hawk	1	1600	perched	-
11/10/12	3	red-tailed hawk	1	810	perched	-
11/10/12	3	prairie falcon	1	600	flapping	15
11/14/12	2	red-tailed hawk	1	1300	perched	-
11/14/12	2	prairie falcon	1	1800	perched	-
11/15/12	2	prairie falcon	1	1500	perched	-
11/15/12	2	American kestrel	1	1500	flapping	20
11/15/12	3	American kestrel	1	900	perched	-
11/15/12	3	red-tailed hawk	1	800	perched	-
11/19/12	1	prairie falcon	1	1300	flapping	2
11/19/12	1	red-tailed hawk	1	1800	soaring	100
11/19/12	2	American kestrel	1	1200	perched	-
11/19/12	2	red-tailed hawk	1	1200	perched	-
11/19/12	3	American kestrel	1	1100	perched	-
11/20/12	2	prairie falcon	1	1700	perched	-
11/20/12	3	red-tailed hawk	1	800	perched	-
11/27/12	1	red-tailed hawk	1	1500	soaring	50

Appendix A. Data collected during raptor use surveys at the proposed Hidden Hills Solar Electric Generating System site, September 25 to November 28, 2012.

Date	Station	Species	# Individuals	First Distance (m)	First Activity	First Flight Height (m)
11/27/12	2	red-tailed hawk	1	1300	perched	-
11/27/12	2	prairie falcon	1	1700	flapping	15
11/27/12	2	northern harrier	1	300	flapping	2
11/27/12	3	red-tailed hawk	1	1000	perched	-
11/27/12	3	red-tailed hawk	1	1500	perched	-
11/28/12	1	prairie falcon	1	250	flapping	20
11/28/12	1	ferruginous hawk	1	1700	flapping	100
11/28/12	2	prairie falcon	1	1500	perched	-
11/28/12	2	red-tailed hawk	1	1400	perched	-
11/29/12	3	red-tailed hawk	1	1700	perched	-

Attachment BIO-2
Avian Ocular Protective Mechanisms in Response to Noxious Stimuli

Avian Ocular Protective Mechanisms
In Response to Noxious Stimuli

Ivan R. Schwab M.D. F.A.C.S.
18 January 2013

1.0 Purpose

Assess the risk of birds being blinded by concentrated solar power (CSP) facilities that concentrate sunlight reflected by a field of heliostat mirrors to a solar energy receiver located at the top of a central tower. Such a risk is difficult to assess completely, but avian physiology and anatomy provides several innate protections that would be active to protect birds from any noxious stimulus.

2.0 Summary of Avian Ocular Protection Mechanisms

Almost all avian species rely upon vision as much or more than other lineages. At least three principal, interacting mechanisms protect against avian eye damage from noxious stimuli: (1) the third eyelid, which can cover the cornea of avian species rapidly in response to noxious stimuli; (2) the oscillatory motion of the eye known as microsaccades, and (3) the rapid pupillary constriction to any bright stimulus.

Given the well developed protective visual systems birds have developed and the speed of flight though any flux field, I believe the chance of significant visual or heat injury to avian species is insignificant. Avian species will consciously avoid any direct injury and protect themselves with their well-documented speed and airborne agility and ability to rapidly recognize and respond to potential ocular hazards.

3.0 Introduction

Almost all avian species are “eye-minded” and depend upon vision as much or more than other lineages. Visual abilities are highly important for reproduction, nutrition, shelter, and in some species for migration. Some avian species have evolved specialized visual adaptations to achieve the finest visual systems on earth. Avian species have developed sophisticated mechanisms to protect their extraordinary visual capabilities.[6,10]

4.0 Orbital Protection

Human eyes are recessed beneath, and protected by, an orbital rim or brow. Certain birds, such as hawks and eagles have a brow ridge that provides some shade and protection from intense light from above. For most birds, however, much of the eye is exposed especially on the temporal or lateral aspects, as if the eye has evolved almost

beyond the orbit.[6] To protect exposed ocular structures, most birds have developed a thin vertebral column and strong muscles permitting rapid and precise swiveling movements of the neck and head.[11] Rapid head and neck movements provide protection by repositioning the eyes to avoid noxious stimuli, including bright light.

4.1 Nictitans

The anatomical model of the lids for all birds consists of three lids for each eye: an upper lid, a more active lower lid (in most species), and an inner lid—the nictitans. In many birds, smooth muscle moves the two outer lids slowly and infrequently. In some birds, the outer eyelids may close only a few times during the day and fully close only during sleep. The lower lid contains a semicircular fibrous plate and covers a larger portion of the eye during blinking than the upper eyelid does. The nictitans is the most important lid structure for moistening and protecting the avian eye.[5,11,12,13]

Avian species have developed unique functions of the nictitans compared with other lineages that possess nictitating membranes. Since the outer lids are comprised of smooth muscles that cannot move quickly and rarely close, birds clean and moisten the surface of their eyes with the nictitans.[5,11,12,13] In birds, specialized muscles draw this thin, tough, and well-developed membrane across the globe from the nasal (or ventral-nasal) aspect of the globe nearest the beak to the temporal (or superior-temporal) aspect. Although cleansing the ocular surface is its main function, the nictitans serve other purposes, such as protection.

Unlike other lineages, the avian nictitans moves in a fast and efficient manner with a true and active blink. In fact, birds' nictitans move much faster than passive nictitating membranes in mammals or active nictitating membranes in reptiles. The avian nictitating membrane has evolved to operate rapidly to protect the cornea and globe from flying debris and minute airborne particulate matter, especially in birds with fast or intricate flying skills. In most bird species, the nictitans slides or flashes in front of the cornea when the eyeball is retracted slightly into the eye socket. The nictitans' movement is managed by a "pulley system" detailed elsewhere.[11,12,13]

4.1.1 How the Nictitans Works in Birds

The nictitans is capable of extremely rapid sweeps across the ocular surface to clear the cornea of debris. The nictitans also moistens the ocular surface with an oily or sometimes aqueous substance, especially in birds.[5,11,12,13]

Woodpeckers illustrate the ocular protection provided by the nictitans. In the millisecond before strike, woodpeckers pull their tough and thick nictitans across the globe to hold the globe in place, much like a seat belt. This adaptation protects the eye from the intense force of the strike that could make the globes pop out of their sockets. The nictitans also protects woodpeckers from wood fragments or splinters that might otherwise cause eye injuries.

Woodpeckers, like most birds, also have a Harderian gland, associated with the leading edge of the nictitans and is a major source of fluid for surface lubrication in most birds. Diving birds such as cormorants probably exploit the oily liquid to prevent crenation, or drying out, of the membrane by salt water.[17,18,25] Falcons also use the oily tear film generated by the nictitans to keep the ocular surface hydrated during the high speed of flight, which can approach 300 km/hr.[22,23]

The nictitans of falcons and many similar birds has a cartilaginous-like connective-tissue fold along the leading edge of the membrane. This flange-like fold is called a marginal plait. With each blink, the marginal plait collects the tear film and any associated debris to drain through the enlarged puncta (tear drainage ducts) into the nasolacrimal system. A surface layer of "feather epithelium," believed to be unique to birds and reptiles, probably aids this corneal cleansing.[22,23]

In addition, long microvilli with club-like termini and many secondary projections from the long axis extend from the apical membrane of epithelial cells lining the bulbar surface of the third eyelid in birds. Those on the peregrine falcon are extremely robust and likely form a "histologic feather duster" that sweeps the cornea clean with each darting excursion of the nictitans.[22,22b] In general the cornea is relatively small in most birds compared to eye size. As a result, the nictitans can rapidly and completely cover the avian eye.[22]

As described above, avian species have developed a unique nictitating membrane that provides rapid and effective protection against potential ocular damage. Unlike other lineages, the avian nictitans can flash in front of the relatively small cornea in birds and instantly create a barrier between the eye and potentially harmful stimuli, including heat and light.

4.2 Pecten

Avian species have developed unique methods to provide nutrition for their inner retina that also help to protect against potential eye damage. . In many lineages, the retina is relatively simple and thinner than about 150μm, and nutrients can diffuse from the choroid.[28] Birds rely on vision to a greater extent than other lineages, and avian retinae have evolved to be thicker and more complex, with a larger number of amacrine and horizontal cells, than all other species to enhance the speed of retinal processing. Unlike other lineages, such as primates that have intraretinal blood vessels, birds do not possess obvious inner retinal mechanisms that can provide nutrients and oxygen to the high concentration of amacrine, horizontal, and ganglion cells present in the inner retina. Avian species sustain these cells through the pecten, comb-like structure of blood vessels located in the back of the eye, and ocular oscillations (saccades) that distribute nutrition from the pecten throughout the eye.[28] The oscillatory movement required to provide nutrition in avian eyes also protects against light-related retinal damage.

The pecten projects a vascular plexus into the vitreous with multiple macroscopic and microscopic pleats to increase the surface area. The pecten is permeable to small molecules including fluorescein that will diffuse out of the pecten after injection. Fluorescein will remain pooled in the inferior vitreous immediately adjacent to the pecten until the bird performs a saccade, a rapid intermittent eye movement in which the eyes fix on one point after another in a visual field. Avian saccades are unique and do not occur in other lineages. In birds, each saccade has an associated oscillation of the globe that includes a pronounced cyclotorsion or rotary component. Each saccade creates plumes of fluorescein rising from the inferior vitreous, billowing like steam rising off the spout of a kettle, to spread nutrients while the pecten acts as an agitator to diffuse oxygen to the inner retina. Using fluorescein angiography, it has been shown that during every saccade, the pecten acts as an agitator that propels perfusate towards the central retina much more effectively than is observed during intersaccadic intervals.[1,20] Absent their nutritive function, saccades would not be otherwise particularly necessary or helpful since most avian extraocular muscles are rudimentary and such movements would not greatly improve the bird's visual field, or field of vision.[20]

Saccadic oscillations allow for inner retinal nutrition without intraretinal or epiretinal vascularization. Evolutionarily, this nutritive mechanism permits significant retinal thickening. In some birds, the retina may be 300μm thick and in these birds, it possesses an amacrine concentration that is three times higher than that in primates.

The protective functions associated with saccadic oscillations are associated with the large cyclotorsional component that occurs during every saccadic eye movement. Saccades occur at intervals of 0.5 to 40 seconds, and may include up to 13 oscillations with frequencies of 15-30 Hz and amplitudes of about 10 degrees in certain avian species. Therefore, as much as 12 percent of some birds' total viewing time may be subject to image instability caused by saccadic oscillations.

These cyclotorsional movements, or microsaccades, prevent the potential fatigue of a set of photoreceptors in birds that would otherwise extinguish an image. Continued projection of any single set of light rays on the same set of photoreceptors will cause the photoreceptors to fatigue. This fatigue will lead to loss of the visual signal sent to the brain and hence loss of the perception of the image. Consequently, saccadic oscillations ensure that any incoming light ray would not have a singular position on any portion of the retina for longer than an instant. Such measurements have not been made on all birds although all flying birds will require such rapid retinal processing.

The flight speed and wing motion would also rapidly move any single set of light rays, however concentrated, from any single set of photoreceptors instantly before damage to any individual cell could occur.

4.3 Pupillary Constriction

The avian iris contains muscles to constrict the pupil much like many vertebrate species. Birds, however, have striated muscles in their iris as compared to smooth muscle in the human iris. Striated muscles, as would be found in your biceps, are much faster

than smooth muscles as would be found in your gut. Although the speed of pupillary constriction of most birds has not been measured, a related mechanism, accommodation, has been measured and found to be 40 to 100 times faster.[23b] Furthermore, these striated muscles are under voluntary control to maximize the speed of constriction when necessary. Such speed of constriction will limit light entry into the eye as rapidly as possible, certainly faster than a human pupil.

5.0 Retinal adaptations

The avian retina includes retinomotor responses that provide protection at the cellular level against bright light. The cones can be isolated with pigment granules from the retinal pigment epithelium, much like sheathing a sword. These pigment granules are organic blinders to keep the rods from being bleached by too much bright light and permit more rapid cell recovery when a bird enters a dimmer environment.

5.1 Flicker Fusion Rates and Responses to Potentially Harmful Stimuli

Some birds' movement skill is highly developed[7] although not all birds have been studied. It seems likely that all birds that fly must have highly a highly developed skill of movement detection for the purpose of flight. To survive high speeds in a tangled environment, birds have to sense and react to oncoming obstacles or predators. As a result, avian species have higher rapid flicker fusion rates compared with other lineages. The flicker fusion rate is the speed at which a retina unites images from individual "frames" or pictures of the world, refreshes itself to process the next image, then unites the images to generate a seamless moving image.

Some birds have a flicker fusion rate of approximately 175 cycles per second, almost four times as fast as the human rate (about 48 cycles per second). Birds can distinguish much more rapid movement and more movement detail than humans or other lineages with lower flicker fusion rates.[13,15a] Rapid avian image at a retinal or subcortical level facilitates rapid responses during flight, to prey capture, or to avoid noxious stimuli. Changes in light or heat that could be associated with concentrated solar flux would be immediately perceived by avian species, and it is reasonable to expect that birds will act to avoid such stimuli.

6.0 Potential Reaction to Heliostat Field Conditions

Avian species have populated all continents and all manner of extreme conditions. Light that is more intense than ambient solar conditions, such as that expected in certain portions of the proposed solar field, is not typically encountered by birds and would generally be a new stimulus.

Many avian species encounter intense light stimuli that could easily resemble a second sun. For example, birds such as gulls or other water birds flying or migrating over

flat water would experience intense glare and reflection that would damage a human retina with prolonged observation. Or, penguins, skuas, and other arctic and Antarctic birds would experience reflections from ice fields with high intensity and glare. These birds are not attracted to or damaged by such second sun reflections.

Certainly, when exposed to direct sunlight or alternate sources of reflected light, birds are quite capable of avoiding injury. Alternate sources of bright reflected light such as ice, snow, or water surfaces could also be considered novel and birds satisfactorily avoid such noxious stimuli.

Certain studies of avian responses to light that is more intense than ambient solar conditions, however, suggest that birds will generally act to avoid such illumination. Lasers and focused light beams of up to one million candle power have been successfully used to disperse birds at airports or other locations, for example, although some species do not respond in the same manner. Bird species that have been documented to avoid such stimuli, including Canada geese, cormorants, wading birds, gulls, crows, vultures, starlings, mallards, and partial avoidance responses have been observed in herons, certain waterfowl and some species of gulls. Many birds become habituated or learn to avoid bright lights, and some have been observed to actively land in shadowed areas to avoid such stimuli (although artificial lighting may attract certain birds in hazy or foggy conditions).[2,3,4,9,15b,16,19] Bright light (2000 watts) has also been used to decrease or eliminate crop depredation by duck species in rice fields.[2,3,4,9,15b,16,19]

Direct ocular exposure to sun light also does not seem to harm birds. Some birds will gaze at the sun to obtain an azimuth orientation. Other avian species are believed to fly over the Himalayas while viewing the sun from altitudes of over 7,000 meters to maintain direction with no harm to their eyes.[14,15]

Finally, avian species have over time experienced often novel visual and thermal stimuli from intense fires, volcanoes, ignited gas plumes, and other unknown sources of heat and light. The innate ocular protective mechanisms that birds have evolved over 150 million years to protect vision have proven to be effective at avoiding and protecting against potentially harmful stimuli. It is likely that these adaptations will protect also protect avian species from ocular harm potentially related to concentrated solar flux.

7.0 Summary of Risk

Given the well-developed protective visual systems birds have, and the speed of flight though any flux field, I believe the chance of significant visual or heat injury to avian species is insignificant. The unique characteristics of the avian nictitans, saccadic oscillations and retinal adaptations discussed above would likely avoid blindness or other ocular harm from reflected sunlight or heat. More generally, avian species would likely use their well-documented speed and airborne agility, and the rapid recognition of danger facilitated by high flicker fusion rates to learn to avoid direct injury potentially associated with solar reflections or heat in a heliostat field.

8.0 Footnotes

1. Bellhorn, M.B., R.W. Bellhorn, and D.S. Poll, Permeability of fluorescein-labeled dextrans in fundus fluorescein angiography of rats and birds. Experimental Eye Research, 1977. 24(6): p. 595-605.
2. Blackwell, B.F., B.E. Bernhardt, and J.D. Cepek. 2001 Efficacy of pulsing landing lights in stimulating avoidance behavior in birds: preliminary investigations. Interim report submitted to DOT/FAA, William J. Hughes Technical Center USDA/WS/NWRC
3. Blackwell, B.F., B.E. Bernhardt, and R.A. Dolbeer. 2002. Lasers as non-lethal avian repellents. J. Wildl. Manage. 66:250-258.
4. Blackwell BF: Understanding Avian Vision: The Key to Using Light in Bird Management. 2002 USDA National Wildlife Research Center-Staff Publications Paper 465
5. Bohorquez Mahecha, G.A. and C. Aparecida de Oliveira, An additional bone in the sclera of the eyes of owls and the common potoo (Nictibius griseus) and its role in the contraction of the nictitating membrane. Acta Anat (Basel), 1998. 163(4): p. 201-11.
6. Chiappe, L.M., Glorified dinosaurs : the origin and early evolution of birds. 2007, Sydney, Australia
   Hoboken, N.J.: University of South Wales Press ;
   John Wiley & Sons. ix, 263 p.
7. Davies, M.N.O. and P.R. Green: Head-Bobbing During Walking, Running and Flying: Relative Motion Perception in the Pigeon. J Exp Biol, 1988. 138(1): p. 71-91.
8. Edwards, L., Sharp-eyed robins can see magnetic fields. physorg.com, 2010.
9. Gorenzel P, Salmon T: Bird Hazing Manual: Techniques and strategies for Dispersing Birds. 2008; University of California Agriculture and Natural Resources Publication 21638 pp39-41
10. Hackett, S.J., et al., A phylogenomic study of birds reveals their evolutionary history. Science, 2008. 320(5884): p. 1763-8.
11. Hall, M.I., The anatomical relationships between the avian eye, orbit and sclerotic ring: implications for inferring activity patterns in extinct birds. J Anat, 2008. 212(6): p. 781-94.
12. Johnston, M.C., et al., Origins of avian ocular and periocular tissues. Exp Eye Res, 1979. 29(1): p. 27-43.
13. Jones, M.P., K.E. Pierce Jr, and D. Ward, Avian Vision: A Review of Form and Function with Special Consideration to Birds of Prey. Journal of Exotic Pet Medicine, 2007. 16(2): p. 69-87.
14. Kramer, G: 1961. Long-distance orientation. Biology and Comparative Physiology of Birds. Academic Press, pp. 351-369.

15a. Lisney, TJ, Rubene D, Rozsa J, et al: Behavioural assessment of flicker fusion frequency in chicken Gallus gallus domesticus. 2011 Vis Res 51: 1324-1332

15b. Lustick S The effect of intense light on Bird Behavior and Physiology. 1973. Bird Control Seminars Proceedings. Paper 119.

16. Lustick, S. 1970. Absorption of radiant energy in redwinged blackbirds (Agelalus phoenicecos). Condor 72: 471-473.
17. May, P.R., et al., Woodpecker drilling behavior. An endorsement of the rotational theory of impact brain injury. Arch Neurol, 1979. 36(6): p. 370-3.
18. May, P.R., et al., Woodpeckers and head injury. Lancet, 1976. 1(7957): p. 454-5.
19. Meanley, T. 1971 Blackbirds and the southern rice crop. Res Publ 100. U.S. Depat. Int. Fish and Wildl. Serv. Pp 64.
20. Pettigrew JD, Wallman J, Wildsoet CF: Saccadic oscillations facilitate ocular perfusion from the avian pecten. Nature. 1990 ;343(6256):362-3.
21. Schwab IR, Pettigrew: With just a quiver. Br J Ophthalmol. 2006 January; 90(1): 10.
22. Schwab IR, Maggs, D: The falcon's stoop. Br J Ophthalmol 2004,88:4.
22b. Schwab IR: Evolution's Witness: How Eyes Evolved. 2011, New York, Oxford University Press pp. 191.
23. Tucker, V.A., The deep fovea, sideways vision and spiral flight paths in raptors. J Exp Biol, 2000. 203(Pt 24): p. 3745-54.
23b. Walls, Gordon Lynn (1942) The vertebrate eye and its adaptive radiation. Hafner Publishing Co. New York..
24. Wood, C.A., The fundus oculi of birds, especially as viewed by the ophthalmoscope; a study in the comparative anatomy and physiology. 1917, Chicago,: The Lakeside Press. 3 p. ., 5-180 p.
25. Wygnanski-Jaffe, T., et al., Protective ocular mechanisms in woodpeckers. Eye, 2005. 21(1): p. 83-89.
26. Xu, X., et al., Four-winged dinosaurs from China. Nature, 2003. 421(6921): p. 335-40.
27. Young, S.R. and G.R. Martin, Optics of retinal oil droplets: a model of light collection and polarization detection in the avian retina. Vision Res, 1984. 24(2): p. 129-37.
28. Yu C, Schwab IR, Dubielzig RR. Feeding the vertebrate retina from the Cambrian to the tertiary. Journal of Zoology. 2009:1-11.

Attachment BIO-3

Assessment of Potential Impacts to Birds from a Solar Thermal Power Plant, Dimona, Israel Draft Interim Report, Summer Survey 2012

ASSESSMENT OF POTENTIAL IMPACTS TO BIRDS FROM A SOLAR THERMAL POWER PLANT, DIMONA, ISRAEL

Draft Interim Report- Summer Survey, 2012

Pair of Tristram's Starling (photo: Zev Labinger)

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החברה להגנת הטבע
Israel Ornithological Center

Contents

1. Introduction

BrightSource Industries is operating a demonstration plant, SEDC (Solar Energy Development Center) near Dimona, Israel (31° 1'22.75"N, 35° 5'20.95"E). This desert region of the northern Negev is located approximately 10 miles west of the African-Syrian Rift Valley, which supports one of the largest and most concentrated bird migration flyway in the world. The plant is located within a small business park and is bordered by the Dimona Nature Reserve and closed military lands.

This plant has approximately 1600 heliostats (rotating mirrors, mostly single mirror LH-1 design), with an 60-m high central tower (excluding the boiler), 75 meter total, covering a total of 82,000 m^2. The boiler produces superheated steam, with high flux concentration on the panels. The boiler receiver panels are at 400 C° and 600 C° temperature as a pilot mimicking panels for the large tower power plants, that have smaller surfaces but same temperature and same flux intensities. SEDC began operation in June 2008. The system uses tracking mirrors (heliostats) to directly concentrate sunlight onto a boiler filled with water that sits atop a tower. When the sunlight hits the boiler, the water inside is heated and creates high temperature steam. Once produced, the steam is used either in a conventional turbine to produce electricity or in industrial process applications, such as thermal enhanced oil recovery (EOR).

1.1 Aims

This project aims to assess the potential impact to birds from the solar thermal plant activities. Bird use of the area includes resident, breeding, wintering and migrating individuals, and therefore it is important to employ a variety of methods over the course of a full year.

2. Methods

The methodology involves three main types of surveys aimed at assessing a wide range of bird use and potential impacts over the course of the year. All surveys were conducted by an experienced bird watcher Liron Ziv.

2.1 Flight Behavior Survey

During the summer, surveys were conducted during 10 visits, 5 per month (June and July). Dates are as follows: 17-21 June, and 15-19 July.

Methods are based on surveys the SPNI conducts annually for monitoring migrating soaring birds during autumn (Alon et al 2004) with modifications used for assessing flight behavior within proposed wind turbine farms. The observer was stationed in a location where the entire project area is visible (Figure 1). All birds flying over the site and larger soaring birds up to 2 kilometers from the site were recorded. Data include species, number, minimum height above ground (0=ground, 1=1-60m, 2= 61-100m, 3=101-150m, 4= 151-200m, 5=201-500, 6=>500), nearest location relative to the tower, flight direction, weather variables and time of passage. Birds that remained in the immediate area for extended periods, including residents, are noted inn comments. Surveys hours were restricted to 07:30 to 16:30 due to the site's working hours; however, this period covers the peak hours of activity for most diurnal soaring birds.

2.2 General Bird Community Survey

Three transects were laid out along the perimeter of the main plant, which allowed for the detection of birds found both inside and outside the power plant area (Figure 1). The outer area is mostly natural desert habitats and contrasts greatly with the developed area inside. Transect survey method follows Bibby et al. (1993) and involves walking a given transect and recording all bird species detected according to distance from transect (<50m, >50m, flying), habitat type, survey time for each 100m section, and weather variables. Transect counts were conducted during early morning hours from sunrise to 10:00, earlier if temperatures are high (based on bird activity) during June (18th, 21rst) and July (19th) for a total of 3 complete surveys. Transects are not conducted during heavy winds, rain or stormy weather.

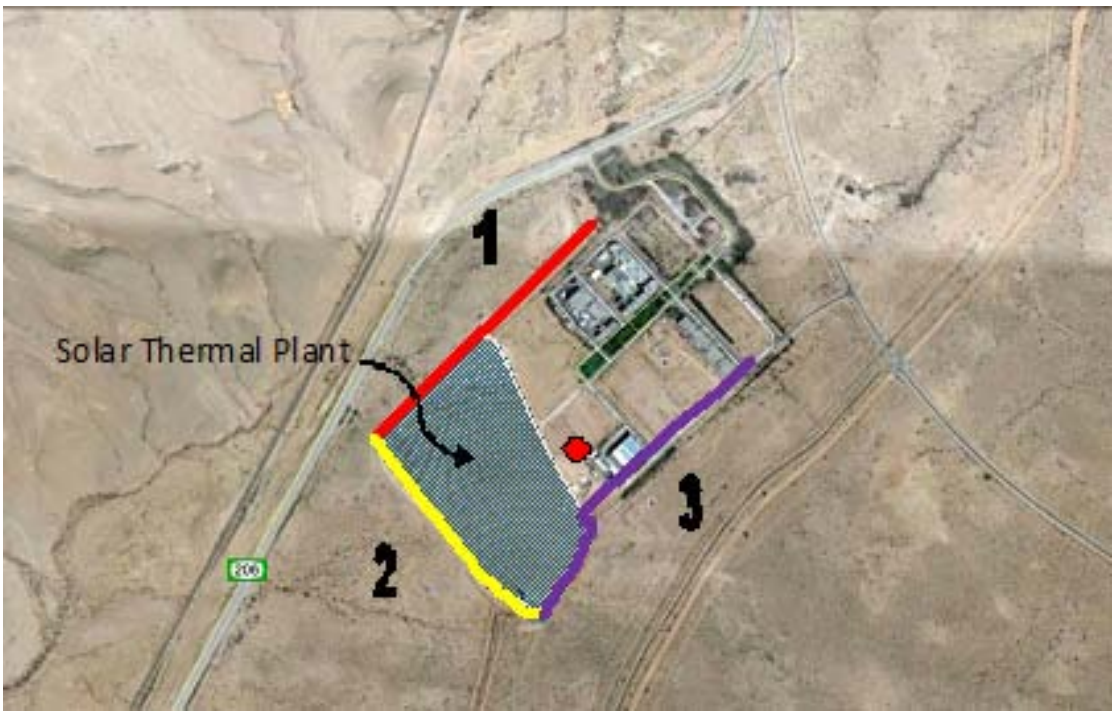


Figure 1. Study area showing Solar Thermal Plant (light blue), transects (red, yellow and blue), and location of observer for flight behavior survey (red circle).

2.3 Dead or Injured Bird Search

Each of the 10 survey days included a thorough search through the plant area during the morning hours beginning at 06:30 to 07:30 and lasting approximately 1 hour. A search consists of slowly walking the paths between the heliostats, alternating between starting at the tower and working outward and visa-versa. The paths are approximately 20m apart. Carcasses should be easy to detect given the sparse vegetation and relatively flat sandy soils Areas outside of the Heliostat field could not be searched due to military restrictions. A data Form was filled out for each search even if no dead birds were found. In the event that dead birds are found, their carcasses are left in place in order to assess delectability and scavenger removal rates according to methodology of United States Fish and Wildlife Service (2011).

3. Results

During the 10 day surveys a total of 18 species were observed. These are all breeding species with the majority being residents (15) year round (Table 1).

Table 1. All species observed during the summer season listed according to survey type, distribution status, and threatened listing status (regional and global; definitions described in Appendix 1).

Species		Survey		Distribution			Status	
Latin	English	Behavior	Transect	Resident	Breeding	Migrant	Israel	Global
Alectoris chukar	Chukar		X	X			NT	
Aquila chrysaetos	Golden Eagle	X		X			EN	LC
Circaetus gallicus	Short-toed Eagle	X			X	X		LC
Columba domestica	Domestic Pigeon	X	X	X				
Corvus ruficollis	Brown-necked Raven	X	X	X				
Falco pelegrinoides	Barbary Falcon	X		X			NT	
Falco tinnunculus	Common Kestrel	X	X	X				LC
Galerida cristata	Crested Lark		X	X				
Gyps fulvus	Eurasian Griffon Vulture	X		X			EN	LC
Hirundo fuligula/obsoleta	Pale-Crag Rock Martin		X	X			LC	
Nectarinia osea	Palestine Sunbird		X	X				
Neophron percnopterus	Egyptian Vulture	X			X	X	EN	EN
Onychognathus tristramii	Tristram's Starling	X	X	X				
Passer domesticus	House Sparrow		X	X				
Pycnonotus xanthopygos	White-spectacled Bulbul		X	X				
Streptopelia senegalensis	Laughing Dove		X	X				
Turdoides squamiceps	Arabian Babbler		X					
Vanellus spinosus	Spur-winged Lapwing		X	X				
Total	18	9	13	15	2	2	6	5

3.1 Flight Behavior Survey

During this survey period we observed 127 individual birds of 9 species. The most common species are Tristram's Starling (37), Domestic Pigeon (34) and Brown-necked Raven (28).

Flight patterns during the summer do not appear to be specific to certain periods of the day although the late morning hours from 09:30-11:00 had relatively low flight activity (Figure 2). It is important to note that the survey hours were limited due to restrictions at the site and thus late afternoon activity went unobserved.

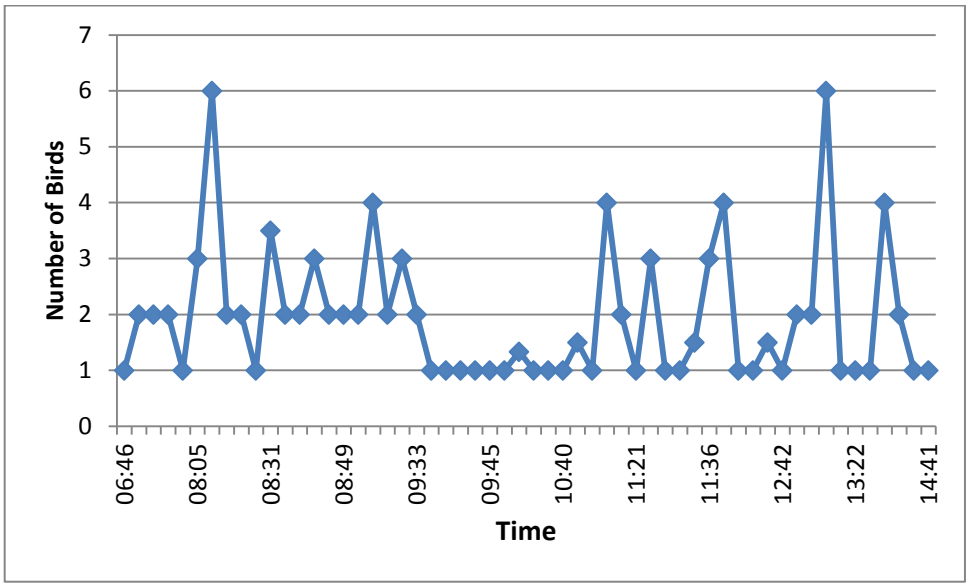
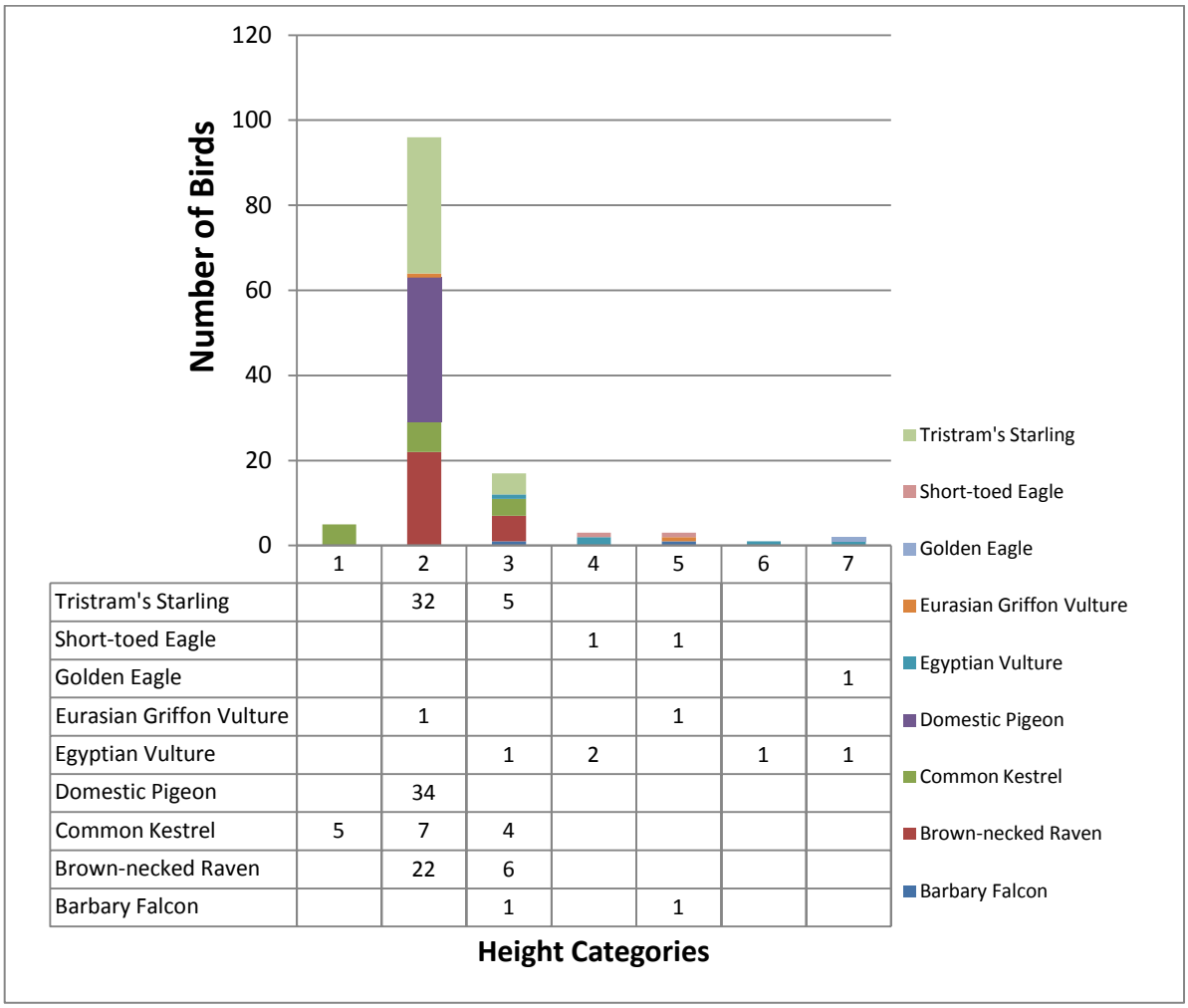


Figure 2. The maximum number of flying birds observed according to time of passage during the summer survey.

We also looked at flight behavior in terms of spatial movement relative to the solar plant. During the survey 76% of the birds observed were flying below 100m and therefore the tower (75m) could cause collisions (Figure 3).



	1	2	3	4	5	6	7
Tristram's Starling		32	5				
Short-toed Eagle				1	1		
Golden Eagle							1
Eurasian Griffon Vulture		1			1		
Egyptian Vulture			1	2		1	1
Domestic Pigeon		34					
Common Kestrel	5	7	4				
Brown-necked Raven		22	6				
Barbary Falcon			1		1		

Figure 3. Number of birds observed according to flight height above the ground during autumn (0=ground, 1=1-60m, 2= 61-100m, 3=101-150m, 4= 151-200m, 5=201-500, 6=>500).

In addition to flight height, we also examined distance and direction of each flying bird from the solar thermal tower. In general, most birds flew less than 200m from the tower (Figure 4). Flight distance varied greatly between species with large soaring raptors such as Griffon and Egyptian Vultures flying farther away compared to smaller birds such as Tristram's Starling and even the medium sized Brown-necked Raven. The figure also shows clearly the large number of domestic pigeons that fly over and near the tower. Most birds flew over the site to the north of the tower and therefore, were also over the mirror part of the plant (Figure 5).

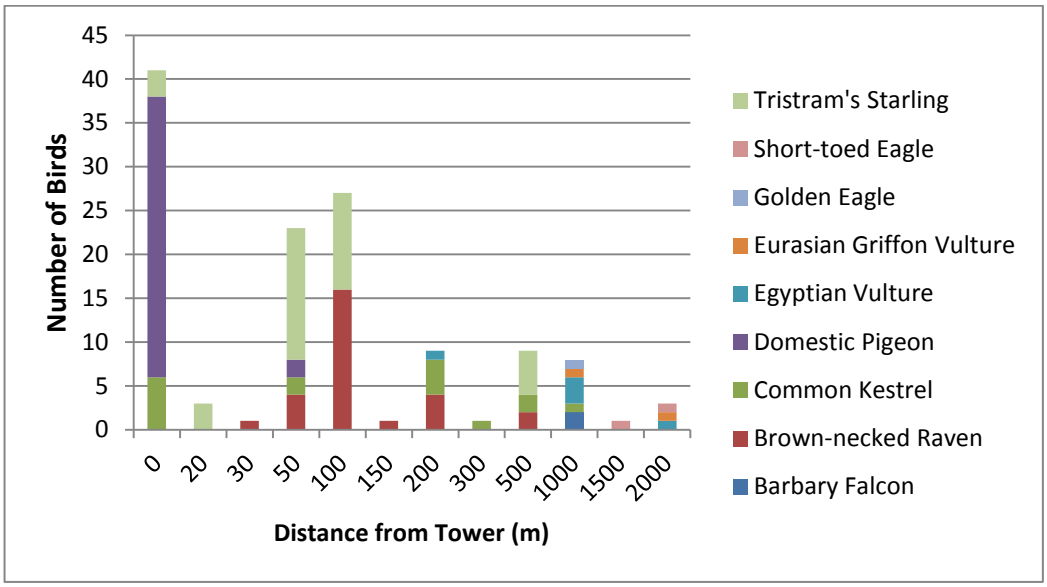


Figure 4. Number of birds observed according to distance from solar thermal tower.

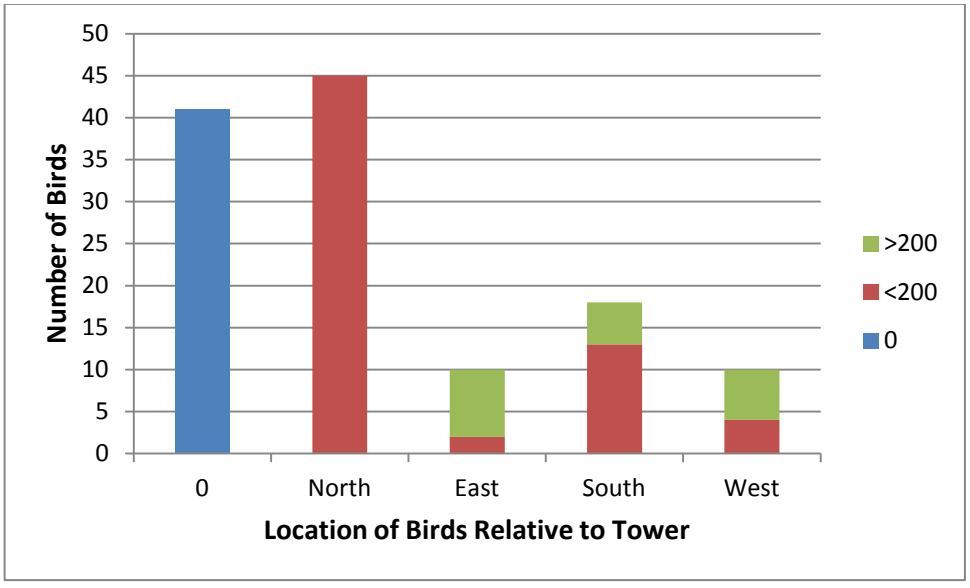


Figure 5. Location of flying birds in relation to the solar thermal tower divided into 3 distance categories (Blue=over tower, Green=less than 200m, Red=greater than 200m).

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Although a full assessment of the impacts of the solar thermal plant will be dealt with only in the final report, we assume that impacts will be related to the proportion of birds flying directly over the plant and their flight height. The overall plant area is approximately 82,000 m^2 (roughly 350m x 200m; see Figure 1). A total of 105 birds flew over the actual plant area (within 200m of the tower) and all of these individuals (5 species) were flying relatively low (under 100m; Table 2).

Table 2. Total number of individuals that flew low (less than 100m) over the project area (within 200m of the tower) according to flight height.

Species		Flight Height			
		0	**<50**	**50-100**	**Total**
Columba domestica	Domestic Pigeon		34		34
Corvus ruficollis	Brown-necked Raven		22	4	26
Falco tinnunculus	Common Kestrel	5	6	1	12
Neophron percnopterus	Egyptian Vulture			1	1
Onychognathus tristramii	Tristram's Starling		32		32
Total		**5**	**94**	**6**	**105**

3.2 General Bird Community Survey

Considering the arid conditions, the results of the general bird surveys (transects) show that the project area supports a relatively diverse avifauna. A total of 102 individuals of 13 species were observed during 3 transect visits (Table 3). It is assumed that all of these species bred nearby.

Restricting the data to birds observed within 50m of the transect allows a higher degree of certainty and statistical robustness (Bibby et al. 1993). The overall relative abundance per survey visit is 7.67 (SE= 2.62) and species richness is 3.67 (SE= 0.94). Relative abundance and species richness varied greatly between transects when data was limited to less than 50m (Figure 6). Species richness and relative abundance was greatest along transect 3 (8 species and 3.67 birds; respectively); and lowest along transect 2 (2 species and 0.67 birds; respectively). This result

varies substantially from the spring survey probably reflecting a difference between habitat use of the breeding population versus migrants.

Table 3. Maximum number of birds observed during the transect survey presented by transect number and distance from transect (< and > 50m).

		1		2		3	
Species		**Total Count**	**50m>**	**Total Count**	**50m>**	**Total Count**	**50m>**
Alectoris chukar	Chukar	3	3	10	2		
Columba domestica	Domestic Pigeon			10		6	3
Corvus ruficollis	Brown-necked Raven	2		1		4	1
Falco tinnunculus	Common Kestrel			1			
Galerida cristata	Crested Lark	1				3	1
Hirundo fuligula/obsoleta	Rock Martin			2			
Nectarinia osea	Palestine Sunbird	3	2	1		3	
Onychognathus tristramii	Tristram's Starling	5				7	2
Passer domesticus	House Sparrow	8	4	9		6	2
Pycnonotus xanthopygos	White-spectacled Bulbul	3		1		1	1
Streptopelia senegalensis	Laughing Dove	1				2	1
Turdoides squamiceps	Arabian Babbler	5	1				
Vanellus spinosus	Spur-winged Lapwing	2				2	
Relative Abundance (mean individuals per survey)		11	**3.33**	11.67	**0.67**	11.33	**3.67**
Species Richness		10	**5**	8	**2**	9	**8**

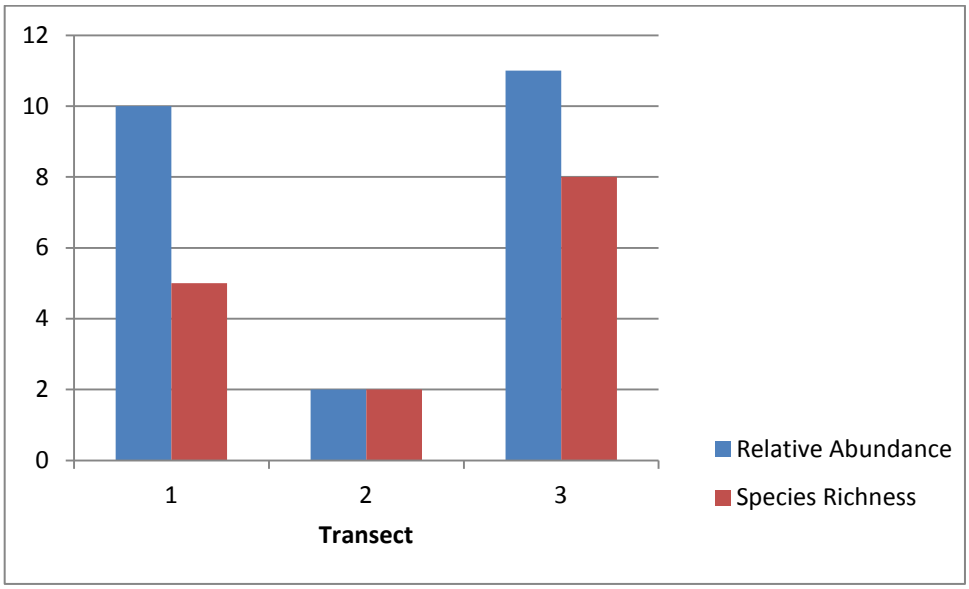

Figure 6. Relative abundance (mean number of individuals) and species richness (total number of species) according to transect. Data are total numbers observed within 50m of the transects.

3.3 Dead or Injured Bird Search

During the 10 carcass search days, no dead birds were found within the study area during the spring period.

4. Discussion

The overall avifauna found at the project site during summer is relatively diverse considering the arid desert conditions. A total of 18 species were observed, of which all breeding species with the majority being residents year round (15 species).

The majority of birds flew over the area at relatively low heights with 76% of the birds flying below 100m. Flight direction was primarily northerly (90%) and to the east of the solar plant (50%).

The general bird community was assessed through a set of 3 transects surveyed 3 times. A total of 102 individuals of 13 species were observed, and it is assumed that all of these species bred nearby. Overall relative abundance and species richness did not vary significantly between transect. However,when limiting the data to birds found within 50m of the transect we found that transect 3 supported the highest overall diversity. This result is different than what was found in spring and probably reflects different habitat use of the breeding populations versus the spring migrants.

We observed birds in all areas of the plant. Some species such as pigeons and House Sparrows regularly fly around the mirrors, around and in the tower and around the equipment. However, we did not find any dead birds during this period.

Assessing the potential impacts from the solar thermal plant on birds is complex. A full assessment will be dealt with in the final report and will be based on a combination of extrapolative data from found carcasses, overall exposure to the site and a comparison of bird population and flight behavior factors in relation to actual mortality estimates. The number of birds flying low directly over the plant would be assumed to have the highest exposure to any negative effects of the plant. We found 92 birds of 4 species flew directly over the site (72% of the total birds observed) and within 100m from the ground. Threatened regional and/or global species found and assumed to be breeding in the area include: Griffon Vulture, Egyptian Vulture, Golden Eagle and Barbary Falcon.

5. Acknowledgements

Meidad Goren, Director of the Negev Bird Center (SPNI) coordinated the field team and logistics. Liron Ziv conducted most of the surveys and entered the data into our data base. The BrightSource team at the plant was very helpful and assisted our field workers when needed.

6. Literature

Meyrose, A. and D. Alon. 2002. *Birds*, Chapter in: Red Book for Vertebrate Species in Israel. Eds: Dolev, A. and A. Perevloski. Society for the Protection of Nature in Israel and Nature and National Parks Authority.

Bibby, C.J., N.D. Burgess, & D.A. Hill. 1993. *Bird census Techniques*. Academic Press, London.

Bruderer *et al.* 1994. Three decades of tracking radar studies on bird migration in Europe and the Middle East. *Ardea* 82: 111-122

Nicolai, C., Abele, S., Beeler, H., Doster, R., Kershner, E. and T. McCabe. 2011. US Fish and Wildlife Service- Pacific Southwest Region, Monitoring Migratory Bird Take at Solar Power Facilities: An Experimental Approach. US Fish and Wildlife – Pacific Southwest Region Report.

IUCN 2012. 2012 IUCN Red List of Threatened Animals. IUCN, Gland, Switzerland and Cambridge, UK. Web site: http://www.iucnredlist.org/

Appendix 1. Explanation for the Threatened species listings (Meyrose and Alon 2002).

EXTINCT (EX): A taxon is Extinct when there is no reasonable doubt that the last individual has died.

REGIONALLY EXTINCT (RE): A taxon is Regionally Extinct when there is no reasonable doubt that the last individual potentially capable of reproduction within the region has died or disappeared from the region.

CRITICALLY ENDANGERED (CR): A taxon is Critically Endangered when it is facing an **extremely high** risk of extinction in the wild in the immediate future (the population is expected to decrease by ≥80% within the next decade), as defined by any of the criteria (A to E) as described below.

ENDANGERED (EN): A taxon is Endangered when it is not Critically Endangered but is facing a **very high** risk of extinction in the wild in the near future (the population is expected to decrease by ≥50% within the next decade), as defined by any of the criteria (A to E) as described below. **VULNERABLE (VU)**: A taxon is Vulnerable when it is not Critically Endangered or Endangered but is facing a high risk of extinction in the wild in the medium-term future (the population is expected to decrease by ≥30% within the next decade), as defined by any of the criteria (A to E) as described below.

NEAR THREATENED (NT): A taxon is Near Threatened when it is not Critically Endangered, Endangered or Vulnerable now, but is close to qualifying for or is likely to qualify for Vulnerable, as defined by any of the criteria (A to E) as described below.

LEAST CONCERN (LC): A taxon is Least Concern when it is not Critically Endangered, Endangered, Vulnerable, but may qualify for Near Threatened in the near future.

DATA DEFICIENT (DD): A taxon is Data Deficient when there is inadequate information to make a direct, or indirect, assessment of its risk of extinction based on its distribution and/or population status.

NOT EVALUATED (NE): A taxon is Not Evaluated when information regarding its distribution and abundance is unavailable, making it impossible to assess its risk of extinction or to evaluate it against the criteria.

Attachment BIO-4
Assessment of Potential Impacts to Birds from a Solar Thermal Power Plant, Dimona, Israel
Draft Interim Report, Autumn Survey 2012

DRAFT

ASSESSMENT OF POTENTIAL IMPACTS TO BIRDS FROM A SOLAR THERMAL POWER PLANT, DIMONA, ISRAEL

Interim Report- Autumn Survey, 2012

Tristram's Starlings perched on solor heliostat panels, Dimona, Israel (photo: Liron Ziv)

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Society for the Protection of Nature in Israel

Contents

1. Introduction

BrightSource Industries is operating a demonstration plant, SEDC (Solar Energy Development Center) near Dimona, Israel (31° 1'22.75"N, 35° 5'20.95"E). This desert region of the northern Negev is located approximately 10 miles west of the African-Syrian Rift Valley, which supports one of the largest and most concentrated bird migration flyway in the world. The plant is located within a small business park and is bordered by the Dimona Nature Reserve and closed military lands.

This plant has approximately 1600 heliostats (rotating mirrors, mostly single mirror LH-1 design), with an 60-m high central tower (excluding the boiler), 75 meter total, covering a total of 82,000 m^2. The boiler produces superheated steam, with high flux concentration on the panels. The boiler receiver panels are at 400 C° and 600 C° temperature as a pilot mimicking panels for the large tower power plants, that have smaller surfaces but same temperature and same flux intensities. SEDC began operation in June 2008. The system uses tracking mirrors (heliostats) to directly concentrate sunlight onto a boiler filled with water that sits atop a tower. When the sunlight hits the boiler, the water inside is heated and creates high temperature steam. Once produced, the steam is used either in a conventional turbine to produce electricity or in industrial process applications, such as thermal enhanced oil recovery (EOR).

1.1 Aims

This project aims to assess the potential impact to birds from the solar thermal plant activities. Bird use of the area includes resident, breeding, wintering and migrating individuals, and therefore it is important to employ a variety of methods over the course of a full year.

2. Methods

The methodology involves three main types of surveys aimed at assessing a wide range of bird use and potential impacts over the course of the year. All surveys were conducted by experienced bird watchers Liron Ziv and Tuvia Kahn.

2.1 Flight Behavior and Migration Survey

During migration periods (spring and autumn) surveys are conducted 5 days per week (Friday and Saturday the site is closed). The autumn survey was conducted from 1 August – 11 October..

Methods are based on surveys the SPNI conducts annually for monitoring migrating soaring birds during autumn (Alon et al 2004) with modifications used for assessing flight behavior within proposed wind turbine farms. The observer was stationed in a location where the entire project area is visible (Figure 1). All birds flying over the site and larger soaring birds up to 2 kilometers from the site were recorded. Data include species, number, minimum height above ground (0=ground, 1=1-60m, 2= 61-100m, 3=101-150m, 4= 151-200m, 5=201-500, 6=>500), nearest location relative to the tower, flight direction, weather variables and time of passage. Birds that remained in the immediate area for extended periods, including residents, are noted in comments. Surveys hours were restricted to 07:30 to 16:30 due to the site's working hours; however, this period covers the peak hours of activity for most diurnal migrant birds.

2.2 General Bird Community Survey

Three transects were laid out along the perimeter of the main plant, which allowed for the detection of birds found both inside and outside the power plant area (Figure 1). The outer area is mostly natural desert habitats and contrasts greatly with the developed area inside. Transect survey method follows Bibby et al. (1993) and involves walking a given transect and recording all bird species detected according to distance from transect (<50m, >50m, flying), habitat type, survey time for each 100m section, and weather variables. Transect counts were conducted during early morning hours from sunrise to 1000, earlier if temperatures are high (based on bird activity) from August (2 times), September (3 times) and May (1 time) for a total of 6 complete surveys. Transects are not conducted during heavy winds, rain or stormy weather.

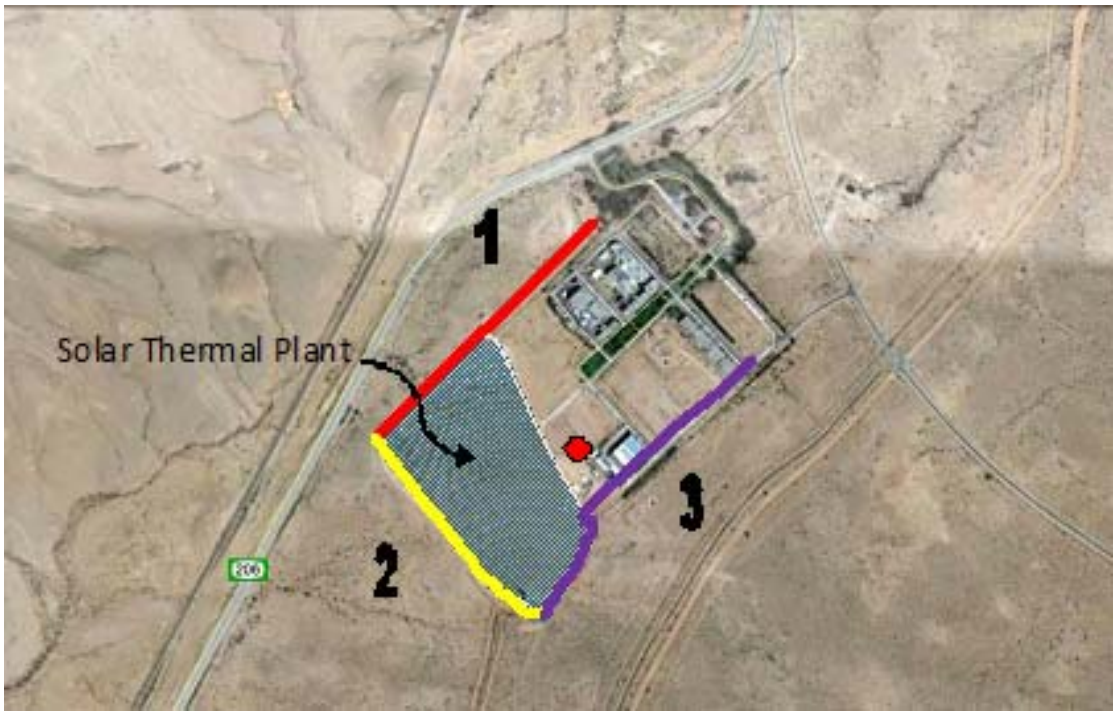


Figure 1. Study area showing Solar Thermal Plant (light blue), transects (red, yellow and blue), and location of observer for flight behavior survey (red circle).

2.3 Dead or Injured Bird Search

At least four times per week, a thorough search was made through the plant area during the morning hours beginning at 06:30 to 07:30 and lasting approximately 1 hour. A search consists of slowly walking the paths between the heliostats, alternating between starting at the tower and working outward and visa-versa. The paths are approximately 20m apart. Carcasses should be easy to detect given the sparse vegetation and relatively flat sandy soils Areas outside of the Heliostat field could not be searched due to military restrictions. A data Form was filled out for each search even if no dead birds were found. In the event that dead birds are found, their carcasses are left in place in order to assess delectability and scavenger removal

rates according to methodology of United States Fish and Wildlife Service (Nicholai et al. 2011).

3. Results

During 39 days of surveys a total of 32 species were observed. The majority of the species were migrants (16), 4 species breed in the area and 15 species are resident year round (Table 1).

Table 1. All species observed during the autumn season listed according to survey type, distribution status, and threatened listing status (regional and global; definitions described in Appendix 1). (*Little Bittern only found during carcass search).

Species		Survey		Distribution			Status	
Latin	English	Migration	Transect	Resident	Breeding	Migrant	Israel	Global
Arabian Babbler	Turdoides squamiceps	X	X	X			LC	LC
Barn Swallow	*Hirundo rustica*	X			X	X	LC	LC
Black Kite	*Milvus migrans*	X				X	RE	LC
Blackcap	*Sylvia atricapilla*		X			X		
Booted Eagle	*Hieraaetus pennatus*	X				X		LC
Brown-necked Raven	*Corvus ruficollis*	X	X	X				
Chukar	*Alectoris chukar*		X	X			NT	
Common Kestrel	*Falco tinnunculus*	X	X	X				LC
Common Whitethroat	*Sylvia communis*		X			X		
Crested Lark	*Galerida cristata*		X	X				
Domestic Pigeon	*Columba domestica*	X	X	X				
Egyptian Vulture	*Neophron percnopterus*	X			X	X	EN	EN
Eurasian Griffon Vulture	*Gyps fulvus*	X		X			EN	LC
European Honey-buzzard	*Pernis apivorus*	X				X		LC

Species		Survey		Distribution			Status	
Latin	English	Migration	Transect	Resident	Breeding	Migrant	Israel	Global
House Sparrow	*Passer domesticus*		X	X				
Laughing Dove	*Streptopelia senegalensis*		X	X				
Little Bittern*	*Ixobrychus minutus*				X	X		LC
Little Green Bee-eater	*Merops orientalis*		X	X			LC	
Marsh Harrier	*Circus aeruginosus*	X				X	RE	LC
Montagu's Harrier	*Circus pygargus*	X				X		LC
Palestine Sunbird	*Nectarinia osea*		X	X				
Red-backed Shrike	*Lanius collurio*		X			X	NT	
Red-rumped Swallow	*Hirundo daurica*	X	X		X	X	LC	
Short-toed Eagle	*Circaetus gallicus*	X			X	X		LC
Southern Grey Shrike	*Lanius meridionalis*		X	X			LC	
Spotted Flycatcher	*Muscicapa striata*		X			X		
Spur-winged Lapwing	*Vanellus spinosus*	X	X	X				
Tristram's Starling	*Onychognathus tristramii*	X	X	X				
White Stork	*Ciconia ciconia*	X				X	NT	LC
White-spectacled Bulbul	*Pycnonotus xanthopygos*		X	X				
Willow Warbler	*Phylloscopus trochilus*		X			X		
Yellow Wagtail	*Motacilla flava*	X	X			X	CR*	
Total	32	18	21	15	4	16	13	12

3.1 Flight Behavior and Migration Survey

During this survey period we observed 5,807 individual birds of 18 species. Given that many migrant birds fly in flocks the actual number of observations is actually 157. The most common species is European Honey-buzzard (4,291) and then the White Stork (1,045).

During this period the numbers of migrants vary greatly on a daily basis. There appeared to be at least 2 peak periods of relatively heavy movement (Figure 2). The

first peak (primarily White Storks) occurred during the second half of August and the second peak occurred at the beginning of September and consisted primarily of European Honey-buzzards. Figure 3 shows that most migration occurred during September in absolute numbers and daily averages.

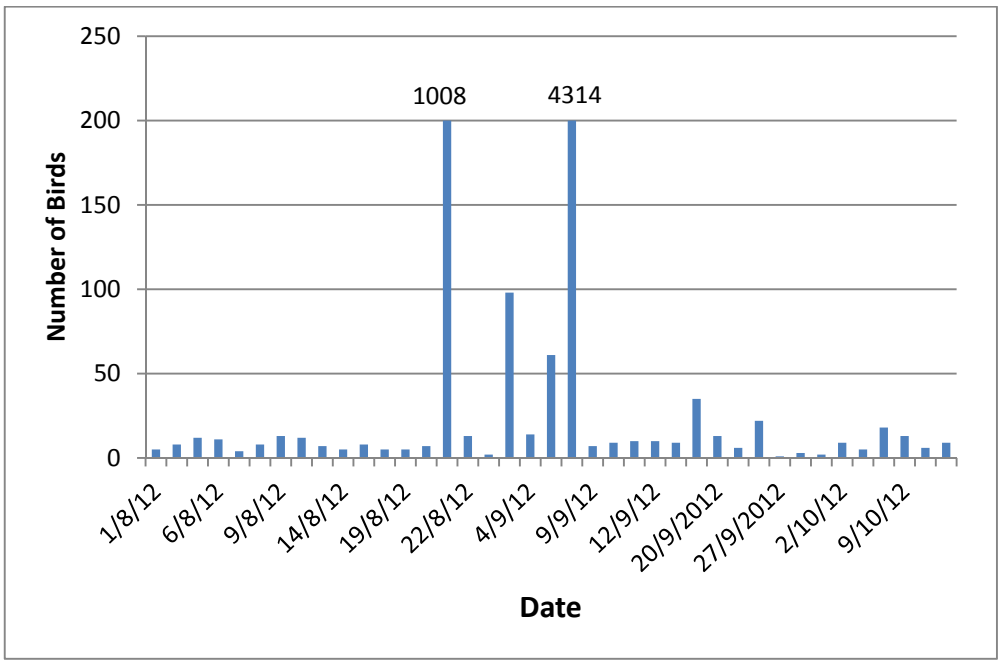


Figure 2. Number of individual birds observed during the flight behavior and migration survey.

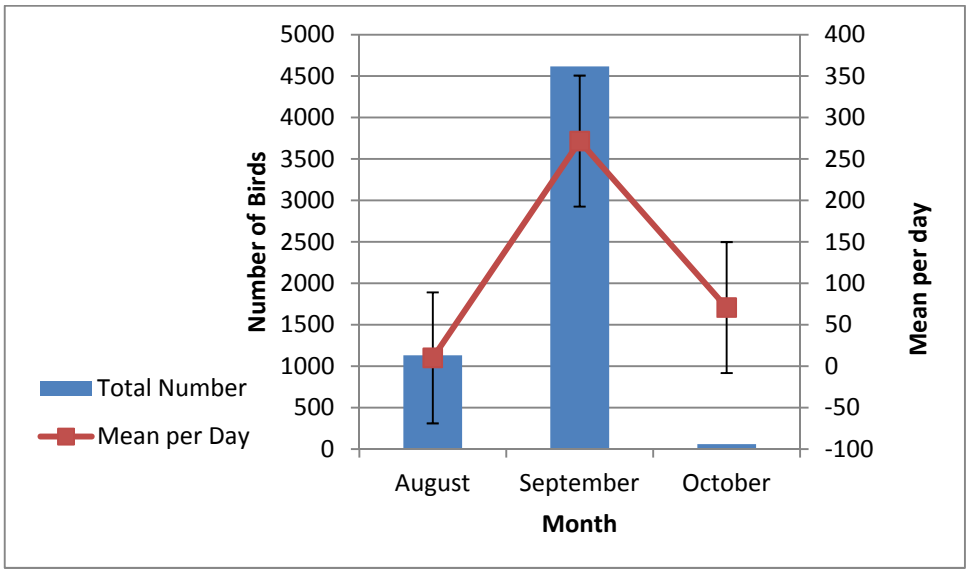


Figure 3. Total number of individuals and daily means according to month.

The general movement of birds during the day also varies greatly with a peak of activity usually occurring between 08:00 and 12:00 in the morning (Figure 4). Of the three major peak days, two occurred during these morning hours. It is important to note that the survey hours were limited due to restrictions at the site and thus some migrant birds went unobserved. However, most diurnal, soaring migrants are known to pass during this period of the day (Alon et al. 2004).

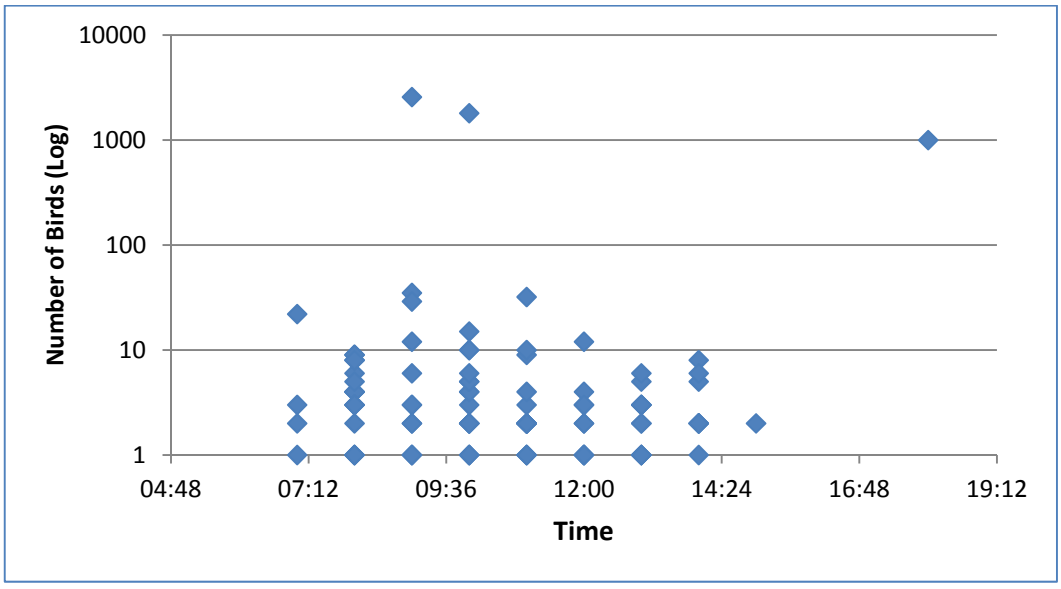


Figure 4. The total number of birds observed according to time of passage during autumn migration.

An analysis of flight direction shows that most birds were headed in a southerly direction as would be expected for autumn migrants (Figure 5). A minimum number of birds were observed flying in other directions and most likely represent resident birds or migrants searching for food or rest areas.

We also looked at flight behavior in terms of spatial movement relative to the solar plant. During the survey 94% of the birds observed were flying above 100m and therefore above the tower (75m) that could cause collisions (Figure 6).

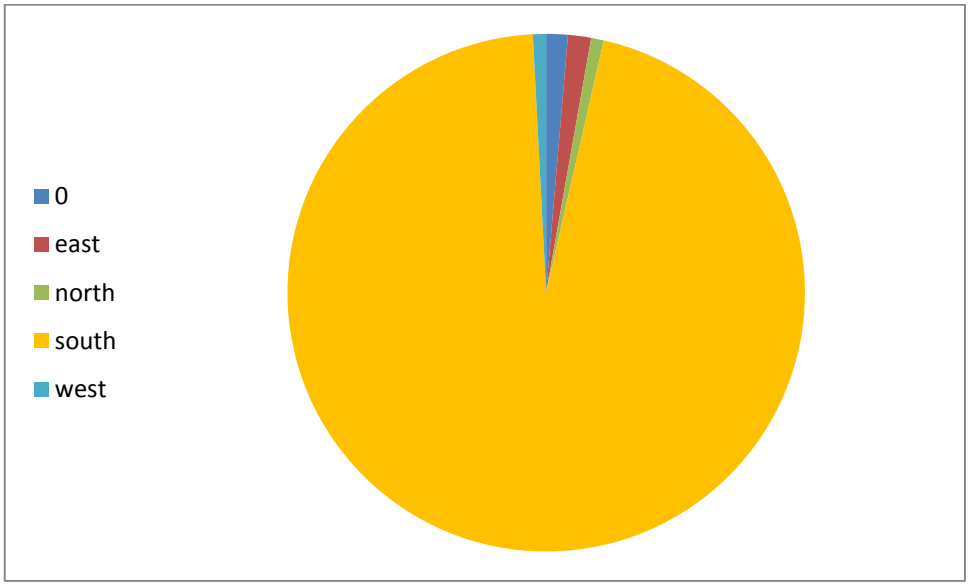


Figure 5. Flight direction of birds passing through the project area during autumn.

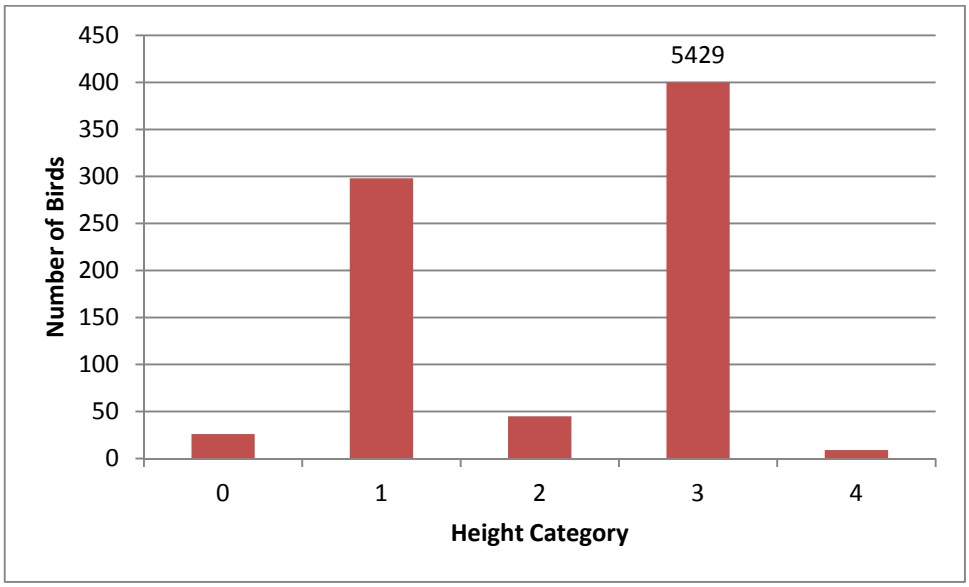


Figure 6. Number of birds observed according to flight height above the ground during spring (0=ground, 1=1-60m, 2= 61-100m, 3=101-150m, 4= 151-200m, 5=201-500, 6=>500). Note that the actual number of birds for category 3 is 5,429 (altered for graphical purposes)>

In addition to flight height, we also examined distance and direction of each flying bird from the solar thermal tower. In general, most birds flew over 200m from the tower (Figure 7). Minimum distance data per species is presented in Appendix 2. Flight distance varied greatly between species even within migrating soaring birds such as White Storks (farthest) compared to European Honey-buzzard that flew on average within a few 100's of meters from the tower. Resident species showed much less variation in flight distance. Most birds passed to the east of the plant (3,618) and approximately half that number passed to the north (1,968; Figure 8). Figure 9 shows the number of birds, flight height and distance in relation to the solar thermal tower in 3 dimensions.

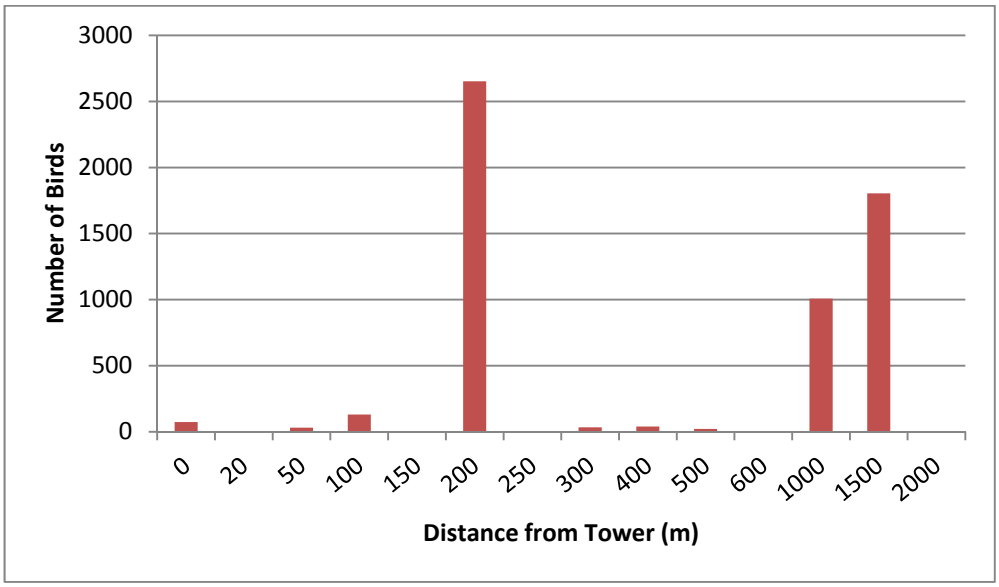


Figure 7. Number of birds observed according to distance from solar thermal tower.

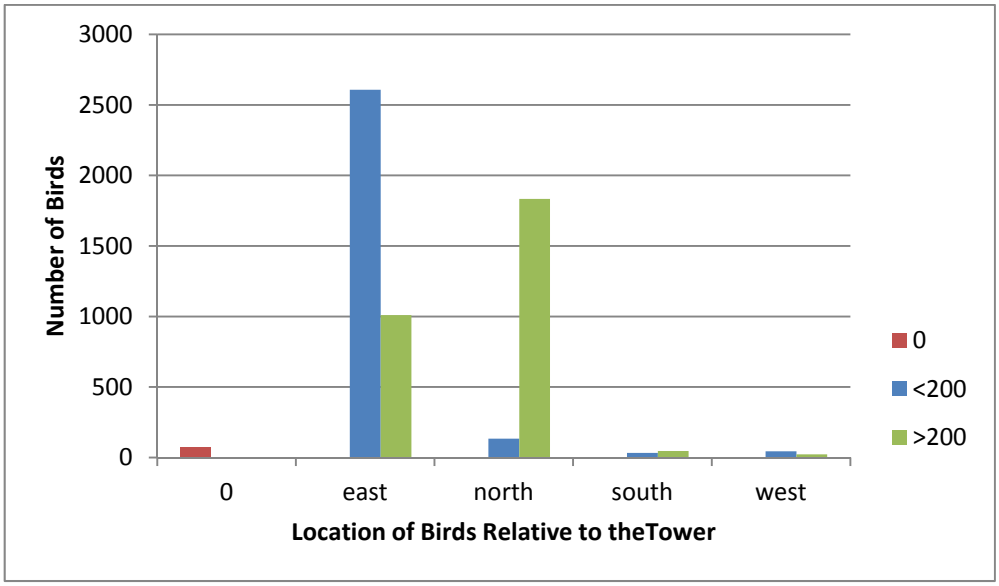


Figure 8. Location of flying birds in relation to the solar thermal tower divided into 3 distance categories.

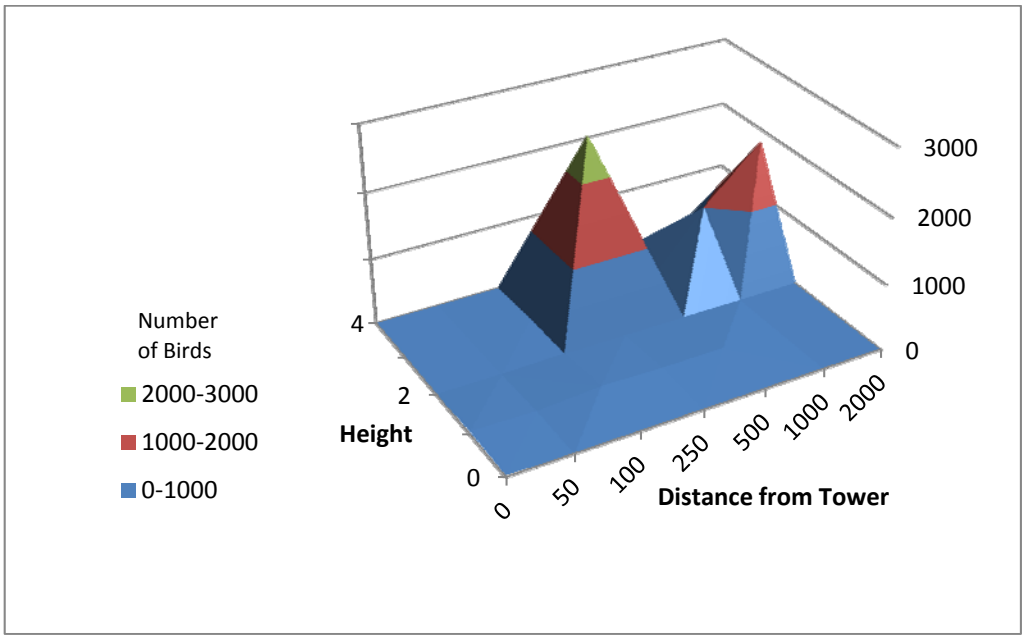


Figure 9. Number of birds, flight height and distance in relation to the solar thermal tower.

Although a full assessment of the impacts of the solar thermal plant will be dealt with only in the final report, we assume that impacts will be related to the proportion of birds flying directly over the plant and their flight height. The overall plant area is approximately 82,000 m^2 (roughly 350m x 200m; see Figure 1). A total of 2,816 birds of 10 species flew over the actual plant area, and all of them were flying relatively low (under 200m; Table 2). Two of the low-flying species are listed as Threatened regionally and/or globally (Eurasian Griffon Vulture and White Stork; IUCN 2012).

Table 2. Total number of individuals that flew low (less than 200m) over the project area according to flight height.

Species		Flight Height (m)					
		0	1	2	3	4	Total
Barn Swallow	Hirundo rustica		30				30
Black Kite	Milvus migrans			2			2
Booted Eagle	Hieraaetus pennatus				1		1
Brown-necked Raven	Corvus ruficollis		6	9			15
Common Kestrel	Falco tinnunculus	1	7				8

Species		Flight Height (m)					
		0	1	2	3	4	Total
Domestic Pigeon	Columba domestica	24	60				84
Egyptian Vulture	Neophron percnopterus					1	1
European Honey-buzzard	Pernis apivorus			5	2586		2591
Marsh Harrier	Circus aeruginosus			1			1
Red-rumped Swallow	Hirundo daurica		15				15
Short-toed Eagle	Circaetus gallicus		1	5	2		8
Spur-winged Lapwing	Vanellus spinosus		5				5
Tristram's Starling	Onychognathus tristramii		25				25
White Stork	Ciconia ciconia				10		10
Yellow Wagtail	Motacilla flava		20				20
		25	**169**	**22**	**2599**	**1**	**2816**

3.2 General Bird Community Survey

Considering the arid conditions, the results of the general bird surveys (transects) show that the project area supports a relatively diverse avifauna. A total of 247 individuals of 21 species were observed during 6 transect visits (Table 3). The majority of these species are resident birds.

Restricting the data to birds observed within 50m of the transect allows a higher degree of certainty and statistical robustness (Bibby et al. 1993). The overall relative abundance per survey visit is 15.83 (SE= 8.15) and species richness is 7.8 (SE= 1.57). Relative abundance and species richness varied greatly between transects (Figure 10). Species richness and relative abundance was greatest along transect 1 (14 species and 4.33 birds; respectively); and lowest along transect 3 (7 species and 2.17 birds; respectively). Given the limited number of surveys and the high number of migrants, a thorough analysis will be possible only at the completion of the project.

Table 3. Maximum number of birds observed during the transect survey presented by transect number and distance from transect (< and > 50m).

Species		1 Total Count	1 50m>	2 Total Count	2 50m>	3 Total Count	3 50m>
Arabian Babbler	Turdoides squamiceps	4	4				
Blackcap	Sylvia atricapilla	1					
Brown-necked Raven	Corvus ruficollis	2	1	2	1	2	1
Chukar	Alectoris chukar	4	4	4	4		
Common Kestrel	Falco tinnunculus	1	1				
Common Whitethroat	Sylvia communis			1	1		
Crested Lark	Galerida cristata	1	1				
Domestic Pigeon	Columba domestica	3	2	3	2	4	3
House Sparrow	Passer domesticus	3	2	3	2	3	2
Laughing Dove	Streptopelia senegalensis	2	1	2	1	3	3
Little Green Bee-eater	Merops orientalis	1	1				
Palestine Sunbird	Nectarinia osea	1		1	1		
Red-backed Shrike	Lanius collurio	1	1				
Red-rumped Swallow	Hirundo daurica					2	
Southern Grey Shrike	Lanius meridionalis	1		1		1	1
Spotted Flycatcher	Muscicapa striata	1	1				
Spur-winged Lapwing	Vanellus spinosus	3	3	2			
Tristram's Starling	Onychognathus tristramii	3	2	2	2	3	1
White-spectacled Bulbul	Pycnonotus xanthopygos			2	2	2	2
Willow Warbler	Phylloscopus trochilus	2	2	1	1		
Yellow Wagtail	Motacilla flava			20			
Relative Abundance (mean individuals per survey)		5.67	**4.33**	7.33	**2.83**	3.33	**2.17**
Species Richness		17	**14**	13	**10**	8	**7**

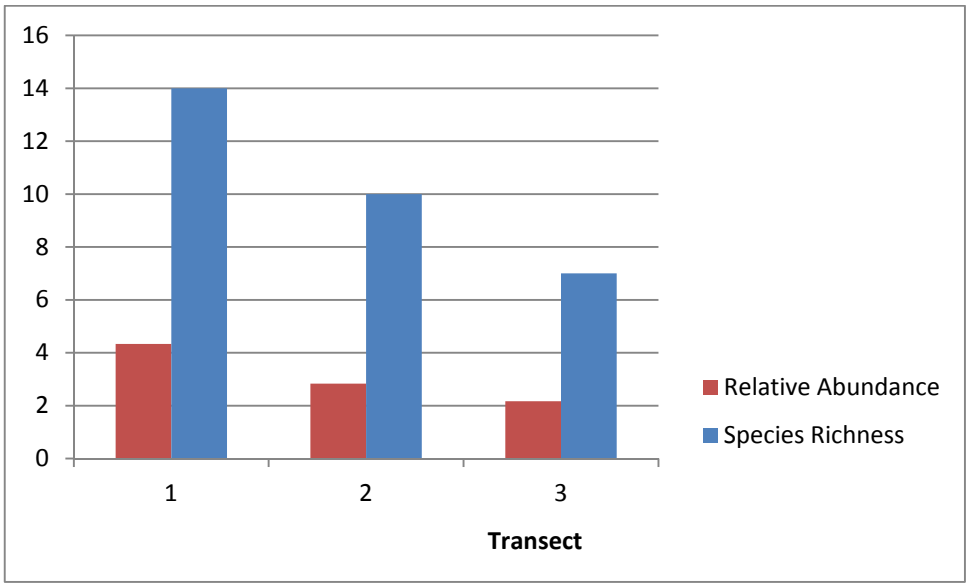


Figure 10. Relative abundance (mean number of individuals) and species richness (total number of species) according to transect. Data are maximum numbers observed within 50m of the transects.

3.3 Dead or Injured Bird Search

During 38 carcass search days, we found 6 dead birds within the study area during the autumn period (Figure 11):

-Tristram's Starling found approximately 50m north of the tower under a mirror on 6 August. The bird appeared to have collided with the mirror. A bird was photographed and remained until 12 August (6 days).

-5 Little Bitterns were found dead on 3 September. The birds were located at the far north east side of the plant between mirrors and the fence. The cause of death could not be determined, although evidence suggested collision with the perimeter fence for at least one of the five birds, which was physically stuck on the fence. The birds were photographed and remained for only one day, likely removed by scavengers (raven foot prints were found in the area).

Figure 11. Locations of the six bird carcasses found during autumn surveys.

Results of this survey will be analyzed only at the completion of the project using Mark-capture software for estimating delectability and extrapolating total potential bird deaths at the site.

4. Discussion

The overall avifauna found at the project site during autumn is relatively diverse considering the arid desert conditions. During 39 days of surveys a total of 32 species were observed. The majority of the species were migrants (16), 4 species breed in the area and 15 species are resident year round.

The project area and general surroundings appear to be situated within an intermediate migration flyway relative to the major flyways known for this region. During this survey period we observed 5,807 individual birds of 18 species. Given that many migrant birds fly in flocks the actual number of observations is actually 157. The most common species is European Honey-buzzard (4,291) and then the White Stork (1,045). The majority of these migrants passed through the project area during September. It is estimated that up to 500 million birds migrate across Israel

twice a year (Bruderer 1999). The majority of these birds (up to 99%) are nocturnal migrants that were not monitored during this study. Moreover, migration is unevenly distributed both in terms of space (horizontal and vertical) and time with large fluctuations occurring between years. Thus it is difficult to determine for one season the proportional significance of this migration location within the context of the great Eastern Mediterranean Flyway.

All of the birds flew over the area at relatively low heights (lower than 200m) and only 369 (6%) flew below 100m. Flight direction was primarily southerly (95%) as is expected for autumn migration.

The general bird community was assessed through a set of 3 transects surveyed 6 times. A total of 247 individuals of 21 species were observed, the majority of which were resident species. Relative abundance and species richness varied between transects with transect 1 supporting the highest overall diversity. A more thorough analysis will be possible only at the completion of the project.

We observed birds in all areas of the plant. Some species such as pigeons and House Sparrows regularly fly around the mirrors, around and in the tower and around the equipment. We found 6 dead birds during this period: one Tristram's Starling that appeared to have collided with a mirror; and 5 Little Bitterns found close together near the fence (one stuck on the fence). The bitterns are migrant waterbirds and therefore, not in their regular habitat, although they are known to migrate over desert regions (Shirihai 1996).

Assessing the potential impacts from the solar thermal plant on birds is complex. A full assessment will be dealt with in the final report and will be based on a combination of extrapolative data from found carcasses, overall exposure to the site and a comparison of bird population and flight behavior factors in relation to actual mortality estimates. The number of birds flying low directly over the plant would be assumed to have the highest exposure to any negative effects of the plant. We found 2,816 birds of 10 species flew directly over the site (50% of the total birds observed) and 853 birds of 30 species that flew over the site and all of them were flying lower

than 200m. It is important to note that 2 of these species are listed as Threatened regionally and/or globally: Eurasian Griffon Vulture and White Stork.

5. Acknowledgements

Meidad Goren, Director of the Negev Bird Center (SPNI) coordinated the field team and logistics. Liron Ziv conducted most of the surveys and entered the data into our data base. The BrightSource team at the plant was very helpful and assisted our field workers when needed.

6. Literature

Meyrose, A. and D. Alon. 2002. *Birds*, Chapter in: Red Book for Vertebrate Species in Israel. Eds: Dolev, A. and A. Perevloski. Society for the Protection of Nature in Israel and Nature and National Parks Authority.

Alon, D. Granit, B. Shamoun-Baranes, J. Leshem, Y. Kirwan, G. and Shirihai, H. 2004. Soaring bird migration over northern Israel in autumn. *British Birds*. 97, 160-182.

Bibby, C.J., N.D. Burgess, & D.A. Hill. 1993. *Bird census Techniques*. Academic Press, London.

Bruderer. B. 1999. Three decades of tracking radar studies on bird migration in Europe and the Middle East. ***Migrating Birds Know Boundaries***, *Proceedings of International Seminar on Birds and Flight Safety in the Middle East*, Tel Aviv University and the Society for the Protection of Nature in Israel.

Nicolai, C., Abele, S., Beeler, H., Doster, R., Kershner, E. and T. McCabe. 2011. US Fish and Wildlife Service- Pacific Southwest Region, Monitoring Migratory Bird Take at Solar Power Facilities: An Experimental Approach. US Fish and Wildlife – Pacific Southwest Region Report.

IUCN 2012. 2012 IUCN Red List of Threatened Animals. IUCN, Gland, Switzerland and Cambridge, UK. Web site: http://www.iucnredlist.org/

Appendix 1. Explanation for the Threatened species listings (Meyrose and Alon 2002).

EXTINCT (EX): A taxon is Extinct when there is no reasonable doubt that the last individual has died.

REGIONALLY EXTINCT (RE): A taxon is Regionally Extinct when there is no reasonable doubt that the last individual potentially capable of reproduction within the region has died or disappeared from the region.

CRITICALLY ENDANGERED (CR): A taxon is Critically Endangered when it is facing an **extremely high** risk of extinction in the wild in the immediate future (the population is expected to decrease by ≥80% within the next decade), as defined by any of the criteria (A to E) as described below.

ENDANGERED (EN): A taxon is Endangered when it is not Critically Endangered but is facing a **very high** risk of extinction in the wild in the near future (the population is expected to decrease by ≥50% within the next decade), as defined by any of the criteria (A to E) as described below. **VULNERABLE (VU)**: A taxon is Vulnerable when it is not Critically Endangered or Endangered but is facing a high risk of extinction in the wild in the medium-term future (the population is expected to decrease by ≥30% within the next decade), as defined by any of the criteria (A to E) as described below.

NEAR THREATENED (NT): A taxon is Near Threatened when it is not Critically Endangered, Endangered or Vulnerable now, but is close to qualifying for or is likely to qualify for Vulnerable, as defined by any of the criteria (A to E) as described below.

LEAST CONCERN (LC): A taxon is Least Concern when it is not Critically Endangered, Endangered, Vulnerable, but may qualify for Near Threatened in the near future.

DATA DEFICIENT (DD): A taxon is Data Deficient when there is inadequate information to make a direct, or indirect, assessment of its risk of extinction based on its distribution and/or population status.

NOT EVALUATED (NE): A taxon is Not Evaluated when information regarding its distribution and abundance is unavailable, making it impossible to assess its risk of extinction or to evaluate it against the criteria.

Appendix 2. Number of birds observed according to species and minimum distance from solar thermal tower during the spring survey.

Species		Distance from Tower (m)							Total
		0	50	100	150	200	300	>500	
Arabian Babbler	Turdoides squamiceps					1			1
Barn Swallow	Hirundo rustica			30					30
Black Kite	Milvus migrans			2			4	105	111
Booted Eagle	Hieraaetus pennatus				1		1		2
Brown-necked Raven	Corvus ruficollis		2	21		8	5	16	52
Common Kestrel	Falco tinnunculus	4		2		3			9
Domestic Pigeon	Columba domestica	62	23	20					105
Egyptian Vulture	Neophron percnopterus					3	2	5	10
Eurasian Griffon Vulture	Gyps fulvus						1		2
European Honey-buzzard	Pernis apivorus			26		2565		1700	4291
Marsh Harrier	Circus aeruginosus					1			1
Montagu's Harrier	Circus pygargus					1	1		2
Red-rumped Swallow	Hirundo daurica					15			15
Short-toed Eagle	Circaetus gallicus		1	3	1	6	6	4	21
Spur-winged Lapwing	Vanellus spinosus			3		6	7	2	18
Tristram's Starling	Onychognathus tristramii	8	6	24	2	13	9		62
White Stork	Ciconia ciconia					10		1035	1045
Yellow Wagtail	Motacilla flava					20		10	30
Total		74	32	131	4	2652	36	2877	5807

Cultural Resources

I. Introduction

A. Names: Clint Helton, RPA; W. Geoffrey Spaulding, M.S., Ph.D.; and Natalie Lawson, RPA.

B. Qualifications: The panel's qualifications are as noted in their resume(s) contained in Appendix A.

C. Prior Filings: In addition to the statements herein, this testimony includes by reference the following documents submitted in this proceeding:

- Application for Certification, Volume 1 & Volume 2, dated August 5, 2011 [Exhibit 1]
- Applicant's Data Adequacy Supplement, dated September 7, 2011 [Exhibit 2]
- Applicant's Data Adequacy Supplement B, dated September 23, 2011 [Exhibit 3]
- Applicant's Data Response, Set 1D, dated January 6, 2012. Responses to Data Requests 97 through 134 [Exhibit 21]
- Applicant's Data Response, Set 1D-2, dated January 20, 2012. Responses to Data Requests 104 and 115 through 117 [Exhibit 22]
- Applicant's Supplemental Data Response, Set 1A, dated December 30, 2011. Response to Data Request CR-1 [Exhibit 45]
- Applicant's Preliminary Staff Assessment Comments, Set 2, dated July 23, 2012. [Exhibit 69]

D. Confidential Filings: The following were submitted with a Request for Confidential Treatment:

- Applicant's Data Response, Set 1D-3 (Confidential Cultural), dated February 6, 2012. Response to Data Request 127 [Exhibit 23]
- Applicant's Data Response, Set 1D-5 (Confidential Cultural), dated March 30, 2012. Response to Data Request 125 [Exhibit 25]
- Applicant's Data Response, Set 1D-6 (Confidential Cultural), dated May 8, 2012. Response to Data Request 128 [Exhibit 26]
- Applicant's Data Response, Set 1D-7 (Confidential Cultural), dated May 17, 2012. Response to Data Request 105 [Exhibit 27]

To the best of our knowledge, all of the facts contained in this testimony (including all referenced documents) are true and correct. To the extent this testimony contains opinions, such opinions are our own. We make these statements, and render these opinions freely and under oath for the purpose of constituting sworn testimony in this proceeding.

II. Summary of Testimony

A. Affected Environment

The HHSEGS project lies in the axial basin of the Pahrump Valley and within the northern Mojave Desert, an arid region with little rain and extreme temperatures. The arid climate is responsible for

very low ecological carrying capacity, meaning that food resources are sparse, in terms of both plant as well as animal resources. As a consequence of the region's low carrying capacity, the ethnographic record as well as the archaeological record indicate that human populations were low, and focused on the relatively narrowly distributed areas where resources were common to abundant, at least seasonally, in this desert region.

As a result of extensive archival research, one previously documented resource, CA-INY-2492, which is a prehistoric lithic scatter, was identified within the HHSEGS project site. A second resource, NV-CK-3848, the OST-MR District in Nevada, was documented in the 1-mile literature search buffer.

An intensive pedestrian cultural resource field survey was conducted and resulted in the documentation of 17 archaeological sites. All of these sites were evaluated for their potential to meet the eligibility criteria for listing on the California Register of Historical Resources (CRHR).

In addition to the intensive pedestrian surface inventory of the HHSEGS site, subsurface archaeological testing of six of the total 17 sites present within HHSEGS was conducted to satisfy Data Request 127 (preparation of research designs and work plans) and Data Request 128 (investigate the sites) as part of the CEC's discovery phase under the AFC licensing process. The six sites include five small prehistoric lithic scatters and one large lithic procurement site. As a result of the evaluative testing, two sites were combined bringing the total number of sites within the project footprint to 16. No intact subsurface cultural deposits were identified at any of the five prehistoric archaeological sites. A total of 11 prehistoric archaeological sites were identified within the HHSEGS project footprint. These sites could be aptly described as lithic prospects; only limited testing and possible removal of acceptable lithic material appears to have occurred at these sites. The source material at these locations is limited to igneous and siliceous clasts found in alluvium within the HHSEGS site and vicinity. In fact, the scientific data indicates use of the HHSEGS site was limited to opportunistic lithic procurement by mobile groups who traversed the area en route to various springs and other areas with exploitable resources. Staff concurs that all of the 16 archaeological sites documented within the HHSEGS are not eligible for the CRHR, and consequently none represent historical resources under CEQA criteria.

The Applicant and Staff are thus in agreement that there are no CRHR-eligible archeological resources on site, the site was not used extensively by Native Americans in the past, and no significant direct impacts to archaeological resources will result from construction or operation of the project.

Furthermore, to investigate the broader geoarchaeological potential of the HHSEGS project area, three backhoe trenches were excavated at locations pre-selected to further elucidate the relationship between geomorphic setting and site distribution. No artifacts were encountered during geoarchaeological test trenching, nor were any indications of subsurface archaeological potential encountered, such as features, anthrosols, or paleosols. Data from separate geotechnical and paleontological investigations of the project area also indicated a low sensitivity for buried archaeological resources to be present within the HHSEGS.

In summary, to date, the Applicant has completed the following studies, with corresponding technical reports, in order to identify and assess potential impacts of the HHSEGS project on cultural resources.

- A search of the Eastern Information Center (EIC) database, the Harry Reid Center (HRC)database, and the Nevada State Historical Office database of previous cultural studies and previously recorded cultural resources within the HHSEGS project area, the 200 foot buffer, and a one-mile radius around the HHSEGS project area (AFC, Section 5.3).

- A pedestrian survey of the entire HHSEGS project area and the 200 foot buffer (AFC, Section 5.3, Appendices 5.3A-5.3E).
- A windshield survey of the built environment within 1 mile of the HHSEGS project (DR 122, Set 1D)
- A Phase II testing program for six prehistoric archaeological sites within the HHSEGS project (Attachment DR 128-1). As a result of this study, two sites were found to be continuous and were combined. Thus, a total of five sites are discussed in the results section of the technical report.
- A geoarchaeology study of the deposition within the HHSEGS project (Attachment DR128-1).
- Remote sensing, archival research of primary sources related to the OST-MR and historic travel in the Pahrump Valley, road specific search of the EICdatabase and the NVCRIS database, and field study to identify and examine pre-1960 trails and roads within the HHSEGS project and within the HHSEGS project vicinity (Attachment DR 125-1). This road specific database search expanded the literature search boundary to nearly 9 miles outside of the HHSEGS project in order to locate records and previous studies related to the OST-MR and other pre-1960 travel in the Pahrump Valley.
- Additional research, including additional literature searches at the EIC, the Nevada Cultural Resource Information System (NVCRIS), and the HRC, was also completed in response to several data requests. The additional literature searches expanded the literature search boundary to nearly 7 miles, in order to respond to Staff requests for information on site types found in the Pahrump Valley (DR Set ID; Supplement B).

The project is situated in a border region between territories inhabited by the Southern Paiute and the Panamint, a Western Shoshone group. The Chemehuevi and Mohave also ventured into the areas near the project. The Native American Heritage Commission (NAHC) record search of the Sacred Lands file failed to indicate the presence of Native American cultural resources in the immediate project area. The record search conducted at the California Historical Resources Information System (CHRIS) confirmed the lack of presence of Native American traditional cultural properties.

Subsequent to the cultural resources inventory, additional work was undertaken to compile and assess available information on any prehistoric and historic trails, tracks, and roads within the HHSEGS site, and extended out to within a 1-mile radius beyond the project boundaries in response to Data Request 125 from the CEC. The research was multidisciplinary, and incorporated information from not only historical accounts, but also archaeological surveys and reconnaissance, remote imagery analysis, and geological investigations. A total of four prehistoric or historic trail and road segments were identified within the HHSEGS project site. None of these road or trail segments were deemed eligible for the CRHR.

In summary, CH2M HILL conducted archival research; contacted other interested agencies, Native American groups, and historical societies; and conducted a complete field investigation, including pedestrian surveys and subsurface testing. These efforts indicate no historical resources will be impacted by the HHSEGS.

B. Potential Construction Related Impacts; Avoidance and Minimization Measures

Archival research, outreach to other interested agencies, Native American groups, and historical societies, and a complete field investigation, including intensive survey and subsurface testing have failed to identify any historical resources. Consequently, construction-related site preparation and excavations, including pylon installation, in the HHSEGS project area will not result in adverse impacts to cultural resources.

To reduce any potential impacts to cultural resources from an unexpected discovery during construction to a level below that of significant, project construction will incorporate the following minimization measures. Incorporation of these measures will reduce impacts to cultural resources to below that of significant.

- A project archaeologist will be selected, and that archaeologist will prepare a project-specific Cultural Resources Monitoring and Mitigation Plan (CRMMP) to be implemented on the commencement of construction;
- The worker health, safety, and environmental education program provided to workers will include a cultural resources module advising workers to be on the lookout for cultural resources, and describing the procedures for avoidance and notification if they are encountered; and
- The CRMMP will provide procedures for monitoring, notification, construction avoidance, and scientific recovery of discovered archaeological materials, if such a discovery occurs.

C. Potential Operational Related Impacts; Avoidance and Minimization Measures

No excavations that would disturb known historical resources or culturally-sensitive sediments will be part of the operation of this facility, and the CRMMP will govern unexpected discoveries, therefore no operational impacts to cultural resources will occur. Views impacts are minimized by conditions of certification proposed in the Visual Chapter of this testimony and interpretive kiosks proposed by the Applicant in CUL-10, as revised, below.

D. Summary of Compliance with Applicable LORS

Cultural resources are non-renewable scientific and educational resources and are protected by several federal and state statutes (California Office of Historic Preservation, 1983), most notably by the NHPA (36 California Code of Regulations [CFR] 800), the 1906 Federal Antiquities Act, and by the State of California's environmental regulations (CEQA, Section 15064.5). HHSEGS construction will be conducted in accordance with all LORS applicable to cultural resources. Federal, state, and local LORS applicable to cultural resources are summarized in Table CUL-1 below.

TABLE CUL-1
Laws, Ordinances, Regulations, and Standards Applicable to Cultural Resources

LORS	Requirements/Applicability	Administering Agency	AFC Section Explaining Conformance
Federal			
Antiquities Act of 1906	Protects archaeological resources on federal lands; requires inventory, assessment of effects, and mitigation if appropriate.	BLM	Section 5.3.6
National Historic Preservation Act	Protects archaeological resources on federal lands; requires inventory, assessment of effects, and mitigation if appropriate.	BLM	Section 5.3.6
Archaeological Resources Protection Act	Protects archaeological resources from vandalism and unauthorized collecting on federal land	BLM	Section 5.3.6
BLM State Office Cultural Resource Use Permit	General Permit to be obtained by archaeological contractor; Archaeological contractor to obtain Cultural Resource Use Permit from BLM prior to beginning work.	BLM	Section 5.3.8
BLM Field Use Authorization	Holder of Cultural Resource Use Permit obtains a Fieldwork Authorization for the project from BLM Field Office.	BLM	Section 5.3.8
Archaeological Resources Protection Act (ARPA) of 1979, as amended Section 4	Holder of Cultural Resource Use Permit provides a research design and plan of work for the research project to obtain an ARPA permit. This permit would be needed if subsurface investigations are needed to identify the National Register of Historic Places significance of an identified site	BLM	Section 5.3.8
Native American Graves Protection and Repatriation Act	Assigns ownership of Native American graves on federal land to Native American descendants or culturally affiliated organizations.	BLM	Section 5.3.8
State			
California Environment Quality Act Guidelines	Project construction may encounter archaeological and/or historical resources.	CEC	Section 5.3.6
Health and Safety Code Section 7050.5	Construction may encounter Native American graves; coroner calls the Native American Heritage Commission (NAHC).	CEC	Section 5.3.6

TABLE CUL-1
Laws, Ordinances, Regulations, and Standards Applicable to Cultural Resources

LORS	Requirements/Applicability	Administering Agency	AFC Section Explaining Conformance
Public Resources Code Section 5097.98	Construction may encounter Native American graves; NAHC assigns Most Likely Descendant.	CEC	Section 5.3.6
Local			
Inyo County General Plan	Section 8.7.4 discusses protection, regulatory compliance, and Native American consultation.	County of Inyo	Section 5.3.6

E. Summary of the Potential Cumulative Impacts

Application of minimization measures combined with the low cultural resources sensitivity of the sediments affected will result in no cumulative impacts to historical resources. Even if archaeological resources are encountered during construction or operation, implementation of the CRMMP would result in the recovery of the associated scientific values, which could be considered a net benefit since these resources would not have been otherwise discovered. Therefore, the contribution of this project to cumulative adverse impacts to cultural resources is negligible.

III. Response to Certain Issues Raised in the FSA

This testimony responds to the FSA, including incorrect assertions of fact and assumptions supporting the analysis of potential impacts to cultural resources in the FSA. This testimony is organized to address issues raised in relation to the following resources identified in the FSA: the Pahrump Metapatch Mesquite Woodland-Coppice Dune Archaeological Landscape and the Old Spanish Trail-Mormon Road Northern Corridor. Testimony regarding ethnographic landscapes is provided separately by Lynne Sebastian, PhD, SRI Foundation.

1. Issues Regarding Pahrump Metapatch Mesquite Woodland-Coppice Dune Archaeological Landscape

As explained below, the FSA's conclusions regarding the historical significance of the Pahrump Metapatch Mesquite Woodland-Coppice Dune Archaeological Landscape ("Pahrump Metapatch") are not supported by available data, and improperly assume a geographic boundary for the purported resource that is not grounded on fact. Particularly troubling is that the FSA recommends mitigation to ascertain whether this resource is, in fact, a historical resource. The determination of whether a resource is a cultural resource is a threshold issue that must be supported by substantial evidence- the Commission should not impose mitigation to prove an assumption in the FSA. The Commission should find that the Pahrump Metapatch does not constitute a significant cultural resource under CEQA. In the alternative, even if the Pahrump Metapatch does constitute a cultural resource, the Commission should find that the project will not physically impact the resource in a manner that will affect the historical significance of the resource.

General Issues

- The FSA's identification of the Pahrump Metapatch as a CRHR-eligible historical resource is significantly flawed.

Despite the fact that (i) "no systematic survey of the landscape has been done" (p. 4.3-64); (ii) "[t]he frequency and the character of the archaeological deposits that make up the cultural elements of the landscape are unclear" (p. 4.3-65); (iii) "[r]epresentative archaeological data for the landscape is presently unavailable" (p. 4.3-65); (iv) "[t]he information that would be necessary to develop meaningful discussions of these and other potential landscape characteristics is not presently available" (p. 4.3-66); (v) the boundary identified in the FSA "is provisional and would require significant future refinement" (p. 4.3-67); and (vi) the FSA acknowledges that "[t]here is presently not enough information on the Pahrump Metapatch Landscape to make a formal determination," the FSA nonetheless asserts that it will "assume" eligibility of the Pahrump Metapatch (p. 4.3-67). CEQA does not permit a lead agency to draw conclusions without substantial evidence.

The FSA's statement that nothing is known about this area is incorrect. In response to Data Request 105, the Applicant provided *Research Design: Landforms and Resource Complexity of an Oasis System in the Northern Mojave Desert* by W.G. Spaulding, submitted May 17, 2012 as Data Response Set 1D-7. The FSA fails to cite this document and appears to have failed to consult other important archaeological studies of this resource in other northern Mojave Desert Valleys, cited in the above reference.

The conclusion in the FSA of "assumed" eligibility is based on guesses and conjecture. The entire analysis of this landscape is discussed using the terms "probably", "most likely", "can be surmised", "potential to possess characteristics" (see pp. 4.3-64-67). Most astoundingly, despite citing no archeological data, the FSA proposes to recognize the Pahrump Metapatch as a CRHR-eligible *archeological landscape*. This flies in the face of CEQA and constitutes an arbitrary and capricious finding.

- <u>The FSA is internally contradictory regarding the location of the landscape.</u>

On page 4.3-1, the FSA states that the Pahrump Metapatch landscape is located "with portions in both California and Nevada." The boundary is depicted in Cultural Resources Figure 6, which encompasses the project site and includes large swaths of California and Nevada. However, in the majority of references to the landscape, the Staff states that the Pahrump Metapatch is "adjacent and parallel to the northeastern boundary" (p. 4.3-63), that it is "located just to the northeast of the project (p. 4.3-127), and that it is "[l]argely just to the NE of the project area in Nevada" (Table 7, p. 4.3-41). The Pahrump Metapatch occurs on private and federally managed lands in Nevada. Therefore, the description of this resource should be clarified to state that this resource occurs only in Nevada, and its distribution is restricted to discrete areas there, as described in Data Response Set 1D-7.

- <u>The FSA's "assumption" regarding the Pahrump Metapatch's eligibility for the California Register of Historical Resources (CRHR) is premised on a portion of the landscape existing in California; however, that assumption is unsupported by the facts in the record; the boundary of the Pahrump Metapatch is solely in Nevada and therefore, the Pahrump Metapatch is not eligible for listing in the CRHR.</u>

In Cultural Resources Figure 6, the FSA misapplies a figure from an unrelated BLM report to try to create a California nexus for landscape's eligibility in the CRHR, explaining on page 4.3-67 that:

> "The provisional boundary for the landscape is the boundary delineated for the Pahrump Metapatch in the Conservation Management Strategy for Mesquite and Acacia Woodlands in Clark County, Nevada (BLM 2006) (Cultural Resources Figure 6). This boundary is meaningful because it relates the resource to a

> discontiguous series of mesquite woodland populations that can be conceptually unified largely on the basis of their association with the near-surface water sources along the Pahrump-Stewart Valley fault system. This boundary is provisional and would require significant future refinement."

The FSA appears to have selected a larger boundary based on an illustrative box provided in a map from a BLM document, but that box does not have a true relationship to the elements of the landscape as described - that is, the mesquite coppices that anchor sand dunes along discrete local fault zones and aquifer discharge points, in Nevada (Data Response Set 1D-7). The FSA attempts to assume CRHR-eligibility of a resource that it incorrectly defines, and that actually exists in Nevada, not in California. This is not supported by law.

Specifically, in Cultural Resources Figure 6, the polygon labeled as the Pahrump Metapatch bears no relationship whatsoever to the structural or archaeological elements that comprise that resource, other than encompassing them due to its vastness. It encompasses every conceivable habitat in the Pahrump Valley including the project, a dry lake bed, alluvial fans, and the Town of Pahrump . To see what the actual geographic distribution of this resource is in the project vicinity, refer to Figure DR105-2, provided to Staff in the aforementioned May, 2012 submittal (Data Set 1D-7). As can be seen, the dunes, sand sheets, and areas of mesquite ("Groundwater Dependent Vegetation") comprising the Pahrump Metapatch according to the definition offered in the FSA(p. 4.3-64), are discretely and very discontinuously distributed in a northwest to southeast trending zone congruent with the Stateline Fault System (see Chapter 4). To the west in California where the project is located, the combination of resources that comprise the Pahrump Metapatch does not occur. In encompassing dry lake, alluvial fan, bolson, and developed urban habitat in the "Pahrump Metapatch", Cultural Resources Figure 6 presents an entirely unrepresentative depiction of its geographic distribution.

Eligibility Under the CRHR Criteria

- <u>The FSA offers no factual evidence to support its finding of CRHR eligibility for the Pahrump Metapatch under Criteria 1 or Criteria 4.</u>

In describing the Pahrump Metapatch, the FSA states various unsupported assumptions about its prehistoric use, including:

> The Pahrump Metapatch "is the result of a dynamic interaction among the natural elements of the landscape and the Native American cultures that have evolved there." (FSA, p. 4.3-65), and contains
>
> ….. mesquite groves which aboriginal cultures have used and quite probably tended for millennia ….. (FSA, p. 4.3-64)

However, there is no archeological data for that area, and certainly none to support these assertions. The FSA acknowledges as much: "Representative archeological data for the landscape are presently unavailable." (FSA, p. 4.3-65). Nor are there other studies cited which support these statements. Therefore, the assertion that Native Americans have "quite probably" tended these resources for millennia is merely an unsupported assumption. The fact that Native Americans lived in or used a location is not evidence that significant events occurred there. There is no evidence to support the FSA's finding of eligibility under CRHR Criterion 1 (associated with events that have made a significant contribution to the broad patterns of our history).

Additionally, there is no information to support Staff's finding of eligibility under Criteria 4 (has yielded, or may be likely to yield, information important to history or prehistory). With respect to its likelihood to yield information important to prehistory, there is no evidence that this archeological landscape resource is unique and could yield information different from other similar features in the Mojave Desert. As pointed out by the first archaeologists to investigate this type of resource in the Las Vegas Valley, while this landscape is can appear extraordinary in the context of the arid, stony desert that surrounds it, dunes and mesquite occurred in the bottoms of most of the larger valleys in the northeastern Mojave Desert when, historically, groundwater levels were much higher. The Applicant provided Staff with the following summary and list as a follow-up to a workshop in December 2011 that supports the fact that this landscape is common in the larger valleys in the northeastern Mojave Desert (Applicant's Data Response, Set 1D, dated January 6, 2012):

> Provided below is a summary list of the major coppice dune and shallow groundwater systems in the northeastern Mojave Desert, defined as lying between the Muddy River in the east, and the Mojave Sink in the west, and north of the I-15 corridor (spring systems such as those of the Death Valley and Tecopa Basin are considered in the central Mojave Desert). Some, such as the Las Vegas and Amargosa Desert systems, were extensive and covered square miles of area prior to twentieth century groundwater draw-down. Others, such as Coyote Valley and Shadow Valley, may have supported shallow groundwater areas of a few acres during years of high groundwater recharge but, during normally dry years, were the site of a very few perennial springs and shallow wells. Sandy Valley is included because of its extensive coppice dunes and mesquite thickets; at this level of analysis no named springs have been identified in this valley. This listing references pre-1950 conditions.
>
> **1. Muddy River Valley** (ca. 114°40' W, 36°46'N)
> Representative riparian and shallow groundwater areas: Warm Springs, Muddy Spring
>
> **2. Coyote Springs Valley** (ca. 114°58' W, 36°50'N)
> Representative riparian and shallow groundwater areas: Coyote Springs
>
> **3. Pahranagat Valley** (ca. 115°08' W, 37°18'N)
> Representative riparian and shallow groundwater areas: Pahranagat Lakes
>
> **4. Las Vegas Valley** (ca. 115°10' W, 36°10'N)
> Representative riparian and shallow groundwater areas: Duck Creek, "The Meadows", Tule Springs, Corn Creek Springs
>
> **5. Indian Springs Valley** (ca. 115°40' W, 36°35'N)
> Representative riparian and shallow groundwater areas: Indian Springs, Cactus Spring
>
> **6. Amargosa Desert** (ca. 116°20' W, 36°30'N)
> Representative riparian and shallow groundwater areas: Point of Rocks Spring, Longstreet Spring, Devils Hole, Ash Meadows

7. Oasis Valley (ca. 116°43' W, 37°00'N)
Representative riparian and shallow groundwater areas: Oasis Hot Springs, Goss Spring, Springdale

8. Pahrump Valley (ca. 116°00' W, 36°15'N)
Representative riparian and shallow groundwater areas: Manse Spring, Mound Spring, Stump Spring

9. Sandy Valley (ca. 115°35' W, 35°45N)
Representative riparian and shallow groundwater areas: Unnamed but extensive mesquite thickets and coppice dunes.

10. Shadow Valley (ca. 115°42' W, 35°28'N)
Representative riparian and shallow groundwater areas: Valley Wells, Cottonwood Springs

Impacts

- Even if the Pahrump Metapatch were eligible for the CRHR, the project would not significantly impact it in a manner that would alter its historical significance.

Even assuming the Pahrump Metapatch were eligible for the CRHR, the question is whether addition of the project would diminish the setting such that the Pahrump Metapatch can no longer convey its reasons for significance. Staff states the elements that convey its significance are the "associative values" and historical significance conveyed by some undefined aspect of the shaping or form of the dunes and mesquite coppices that reflect aboriginal use (FSA, p. 4.3-64 to -65). The project will not directly affect the dunes or mesquites, as there will be no direct ground disturbance in the Pahrump Metapatch. Further, although Staff concluded that the views of the project will adversely affect the resource, since the towers will interrupt the relatively undeveloped setting in the immediate area, the appropriate question, as acknowledged by Staff, is whether the physical and visual context would still "be able to convey the values for which the resource has been found to be significant" (FSA, p. 4.3-51). Here, while the setting would be impacted, the project would not affect the shape or presence of the mesquite -sand dune complex (which is the context important to conveying the significance). To the extent groundwater use could be an indirect effect of the project, BIO- 23 and WATER SUPPLY-4 address that concern and protect the resource from project-related groundwater effects in the unlikely event that they would extend off site. Therefore, to the extent that the Pahrump Metapatch is actually a historical resource, it will still be able to convey the features that make it historically significant after the project is built.

Cumulative Impacts

- The FSA cumulative impact analysis conclusion related to the Pahrump Metapatch is not supported, as the boundaries of the landscape are not defensible and the boundaries of the cumulative effects area were not described, nor were cumulative projects identified.

The FSA determined that cumulative impacts to the Pahrump Metapatch would occur and be significant and unavoidable, but this conclusion is not supported by facts in the record. Neither the cumulative area boundary nor the cumulative projects considered were described. As discussed above, Cultural Resources Figure 6 indicates that a non-representative and improperly expansive geographic definition of the Pahrump Metapatch was employed. The FSA also states, without evidence, that the modifications to the ancillary infrastructure will induce growth in the future (p. 4.3-124 to -125) and concludes that since the project itself will be significant any additional growth will similarly be significant. However, the infrastructure proposed is sized to fit this project and there

is no evidence that it will be growth inducing. Regardless, to show that additional growth would have significant adverse impacts, the FSA would need to show that the specific projects would either directly impact or degrade the integrity of the resource such that it can no longer convey its significance. There simply is no evidence in the record to support the FSA determination.

Mitigation

- The FSA is flawed because it requires the Applicant to develop the facts to determine whether the Pahrump Metapatch is of historical significance as mitigation.

The FSA proposes CUL-11, which would require the Applicant to "design and implement a program of primary research on the geology, geomorphology, hydrology, ecology and archaeology" of the Pahrump Metapatch (p. 4.3-148). As discussed in the comments above, Staff does not have substantial evidence to support its finding of "assumed eligibility". In essence, therefore, Staff asks the Commission to require as mitigation that the Applicant develop the research to investigate whether the resource is, in fact, eligible. The FSA implicitly acknowledges that the proposed mitigation sounds a lot like the research needed to make an eligibility finding when it states without any supporting legal justification: "The overarching purpose for gathering and interpreting information on the associative values of the Pahrump Metapatch Landscape is not to provide further support to staff's assumption of historical significance of the subject landscape. Once assumed significant by the lead agency, the resource is considered significant under CEQA and treated accordingly" (p.4.3-83). This veneer is not sufficient to make the mitigation constitutionally permissible. Since CEQA determinations must be supported by substantial evidence in the record, such evidence does not, and cannot include conjecture or assumptions. This mitigation approach is not legal, since the mitigation is intended to prove an impact that the FSA does not have the facts to support.

2. Issues Regarding the Old Spanish Trail/Mormon Road Northern Corridor

As explained below, the FSA creates a historical resource identified as the Old Spanish Trail - Mormon Road (OST-MR) Northern Corridor without identifying the boundaries and scope of the resource. It does not consider the integrity of the resource or evaluate the potentially contributing or non-contributing elements of the resource. The FSA's conclusions that certain road and trail segments on the project site contain data potential does not take into account the evidence and data that Applicant has submitted to date (particularly Data Response, Set 1D-5), which demonstrates that road and trail segments on site lack any integrity or any further data potential. In addition, the FSA assumes, without any evidentiary support, that all road and trail segments on the project site are contributors to the OST-MR Northern Corridor. The Commission should find that the OST-MR Northern Corridor does not constitute a significant cultural resource under CEQA, as there is no defined scope or definition of what constitutes this resource. The Commission should also find that the roads and trails segments on the project site are not significant cultural resources, as the data demonstrate that these resources are not eligible for listing in the CRHR. Additionally, according to the criteria listed in the National Register nomination form for the OST/MR District, no trail within the project site would meet the requirements listed therein to be considered part of the OST/MR District. In fact, under the following requirements, none of the roads or trails in the project site would even be considered, and notably, no road or trail in the project site meets the very first requirement:

> "Following Myhrer et al. (1990), in order to evaluate the Old Spanish Trail/Mormon Road, the following criteria should be met:

1) The Old Spanish Trail/Mormon Road must be part of the mapped route by Fremont and other early cartographers.

2) Evaluated sections must be part of the entire road route.

3) Road segments that have been totally or partially disturbed are not eligible because they have lost integrity in workmanship, design, feeling, association, and materials.

4) Very short, pristine segments (shorter than 0.125 mile) have lost integrity due to close proximity to disturbed portions (in the qualities of association and feeling), are considered non-contributing elements, and are not eligible.

5) Long sections (more than 0.125 mile) of the road showing wagon traces and at times associated artifacts, are considered to be eligible, contributing elements of the property."

General Issues

- The FSA fails to adequately identify the proposed historical resource - the Old Spanish Trail–Mormon Road Northern Corridor. It offers insufficient factual justification to include the full project site in such a corridor.

The FSA correctly identifies the OST described in the Old Spanish Trail Recognition Act of 2002 ("OST Act"). The FSA also correctly identified the Old Spanish Trail-Mormon Road ("OST-MR") District, which lies in Nevada and which was determined eligible for the NRHP by BLM in 2001.

Notwithstanding the more narrow designation provided in the OST Act of specific tracks, the FSA concluded "there is a high probability that these tracks and traces [on the project site] although not formally included in the OST Act, would be CRHR eligible" (p. 4.3-111). Yet no corridor is actually identified in the FSA for this assumed OST-MR Northern Corridor. Rather, the FSA simply asserts that "the OST and the Mormon Road are discussed together here and referred to as the Old Spanish Trail-Mormon Road Northern Corridor (OST-MRNC)" (p. 4.3-111) and proceeds to evaluate every possible trail on the project site as inside the corridor. The so-called Northern Corridor apparently includes the project site and the FSA suggests that it may include the full Pahrump Valley. This approach is not supported by substantial evidence, particularly here, where each trail on site was ground-truthed and specifically evaluated (as further discussed below).

- The FSA's conclusions that all tracks and trails on the project site are eligible or contributing resources are based on assumptions, lack of data and unsupported hypotheses. Staff thus failed to use best science available and reached unsupportable conclusions.

The FSA improperly assumes all tracks/trails on the project site are part of the OST-MR Northern Corridor. This is not true, as discussed here and for each track individually below.

CH2M HILL identified two tracks on or near the project site that were considered for their possible association with the OST-MR: Track 4 and Site S-24. Both were evaluated in detail (Applicant's Data Response, Set 1D-5, response to Data Request 125 [Exhibit 26]), and both were found to lack integrity or further data recovery potential, as further discussed individually below. In addition, the FSA asserts that additional tracks may be eligible, stating that: "It is also possible, although not identified by the Applicant, that Site S-25, Site S-26, Track 1, and/or Track 5 are associated with the OST-MR. In particular Site S-25 and Track 4 appear to line up with the study done by the OSTA."(4.3-111). This statement, in fact, misrepresents findings presented to Staff (Data Response, Set 1D-5).

In reaching its conclusion that the tracks/trails on the project site are eligible for CRHR and are contributors to the OST-MR Northern Corridor, the FSA incorrectly (1) assumes that the tracks/trails on the project have not been ground- truthed, stating multiple times that not all of the traces on the project site have been ground-truthed, (e.g., p. 4.3-111 and p. 4.3-115); (2) relies on a conjectural study from the Old Spanish Trail Association (OSTA); and (3) inexplicably (in light of Data Response, Set 1D-5 and other works referenced therein) points to the fact that "the history of the OST-MR is incomplete" (4.3-113) to justify the possibility that the trails "may be" important.

- The FSA disregards Applicant's surveys.

All traces and tracks on the project site were in fact ground-truthed. The studies conducted included a pedestrian survey of the entire HHSEGS project, as well as a 200-foot buffer (AFC, Section 5.3). These surveys, in combination with the subsurface geoarcheology, are adequate to identify any potentially significant deposits with a surface manifestation. Additionally, the roads and trails that were identified by the archival research and remote sensing exercise were ground-checked by professional archaeologists within the HHSEGS project and buffer area (Data Response Set 1D-5; Attachment DR125-1).

The historic roads located within the HHSEGS project were completely surveyed, completely recorded, and exhaustively researched.

The following maps were consulted, as noted in the AFC, Section 5.3:

- 1919 Road Map of the State of Nevada, State of Nevada, Department of Highways
- 1952 Clark County, Nevada, State of Nevada, Department of Highways, Sheet 1
- 1968 Clark County, Nevada, State of Nevada, Department of Highways, Sheet 1
- 1963/1968 Nevada State Highway Department, Planning Survey Division Quadrangle 12-4, Clark and Nye Counties
- 1956 Horse Thief Springs, California and Nevada 15’ USGS quadrangle topographic map
- 1960 Kingman, Arizona 1:250,000 USGS quadrangle topographic map
- 1969 Las Vegas, Nevada 1:250,000 USGS quadrangle topographic map
- February 1954 Aerial
- September 1968 Aerial

Additional maps consulted for the Roads and Trails Study, Attachment DR125-1:

- 1908 General Map Showing Approximate Location of Better Known Springs and Wells in the Mohave and Adjacent Deserts Southeastern California and Southwestern Nevada
- 1910 *Ivanpah, California and Nevada* 30’ U.S. Geological Survey (USGS) quadrangle topographic map

The following archival sources were consulted (referenced in Attachment DR 125-1):

- Bureau of Land Management (BLM). 2011. Old Spanish National Historic Trail. Electronic document, http://www.blm.gov/az/st/en/prog/blm_special_areas/hist_trails/old_span_tr.html. Accessed March 12, 2012.

- Dames and Moore. 1997. Site Record for 26CK3848. Ms. on file, Harry Reid Center, Las Vegas, Nevada.
- Frémont, J. C. 1845. Report of the Exploring Expedition to the Rocky Mountains in the Year 1842 and to Oregon and Northern California in the Years 1843-1844. Originally published, Miller, Orton, & Mulligan, 1856. Digitized by Google ebooks, January 24, 2008.
- Hafen, L. R., and A. W. Hafen, editors. 1954. *Journals of Forty Niners, Salt Lake to Los Angeles.* University of Nebraska Press, Lincoln and London.
- Hafen, L. R., and A. W. Hafen. 1993. *The Old Spanish Trail: Santa Fe to Los Angeles,* with extracts from contemporary records including diaries of Antonio Armijo and Orville Pratt. University of Nebraska Press. Originally published in 1954 by Arthur H. Clarke Company.
- Heizer, Robert F. 1978 Trade and Trails. In *California*, edited by Robert F. Heizer, pp. 690-693. Handbook of North American Indians, Vol. 8, Smithsonian Institution, Washington, D.C.
- McCracken, R. D. 1992. *A History of Pahrump, Nevada.* Nye County Press. Tonopah, Nevada.
- Myhrer, K., W. G. White, S. D. Rolf. 1990. Archaeology of the Old Spanish Trail/Mormon Road, From Las Vegas, Nevada to the California Border. BLM Technical Report 17, February 1990.
- National Park Service. 2001. National Historic Trail Feasibility Study and Environmental Assessment: Old Spanish Trail (Draft).
- Padon, B., and D. S. McIntosh. 2009. Focused Phase I Archaeological Study for Old Spanish Trail Association-Tecopa Chapter, Inyo County, California. Ms. on file, Eastern Information Center, Riverside, California.
- Steiner, H. A. 1999. *The Old Spanish Trail Across the Mojave Desert.* The Haldor Company, Las Vegas, Nevada.
- Warren, Elizabeth von Till. 1974. Armijo's Trace Revisited: A New Interpretation of the Impact of the Antonio Armijo Route of 1829-1830 on the Development of the Old Spanish Trail. Unpublished Master's Thesis, University of Nevada, Las Vegas, May 1974. Copy on file at UNLV Special Collections.

The Applicant surveyed each trail segment within the HHSEGS project area (AFC, Section 5.3). All roads and trails identified from the remote sensing exercise were revisited during the Roads and Trails study (Attachment DR 125-1). The Applicant examined the map provided by the OSTA, which was included as Figure 5 in Attachment DR125-1. The corridors identified by the OSTA within the project area were field-checked during the Roads and Trails Study. Not all were confirmed; comprehensive field work showed that at least one does not exist. Site forms for S-24, S-25, S-26 (a prehistoric trail, but included here), and Track 1 were prepared for the Roads and Trails Study and provided to Staff (Applicant's Data Response, Set 1D-5 [Exhibit 25]). The roads and trails located within the HHSEGS project have been completely recorded, site forms submitted, and any data potential to be realized from these resources has been exhausted by the recordings.

Despite this exhaustive effort, the FSA continues to fall back on the OSTA conjectures and the claim that the history of the OST-MR is incomplete.

- <u>The FSA relies on discredited hypotheses.</u>

The FSA employs the descriptive text provided to staff (Applicant's Data Response Set 1D-5, Attachment DR125-1) to describe the individual segments. For analysis and significance determination however, the FSA appears to rely only on a report produced by members of the Old Spanish Trail Association (OSTA), which offers unfounded conjectures on the location of trails within the project site (Prichett, 2012, *The Old Spanish National Historic Trail: A Report on Cultural and Visual Resources in the Near Vicinity of the Proposed Hidden Hills Solar Energy System Plant, Inyo County, California)*. For example, on page 4.3-111, the FSA states: "The OSTA has documented approximately seven miles of the mule trace defining the OST from Emigrant Pass east to the community of Charleston View." There are actually no credible cultural survey reports that support this statement. Reliance on the OSTA study is misplaced given the subsequent professional research presented in Lawson and Spaulding (2012; Applicant's Data Response Set 1D-5. Documentation obtained from the EIC includes a cultural survey report, prepared by cultural resource consultants retained by the OSTA, that identifies approximately two miles of trail leading from Emigrant Pass into the California Valley (Padon and McIntosh, 2009), many miles to the west. This report, which extends an historic track, a likely component of the OST-MR, to a point approximately 3.8 miles northeast of Emigrant Pass, has been examined by the Applicant's cultural resources specialists. In particular, the track discussed terminates in California Valley, well before Pahrump Valley is reached, and many miles west of Charleston View. Therefore, it has been documented that there is no credible data supporting the OSTA assertion that there is seven miles of mule trace documented from Emigrant Pass east to the community of Charleston View.

In the same paragraph on page 4.3-111 as that cited above, the FSA further notes:

> "Based on the locations of the springs just over the border in Nevada, OSTA has hypothesized that branches of the route are located on the HHSEGS project site. Other traces or segments of the OST-MR have been proposed, based on travel accounts, from just south of present-day Pahrump, to the north of the project site, and to the south of the project site … (see CULTURAL RESOURCES Figure 8)."

While OSTA may hypothesize that there are branches of the OST-MR on the HHSEGS site, the hypothesis was not based on any data. Additionally, the Applicant's specialists researched this issue and documented all identifiable segments in the project area (Data Response Set 1D-5; Attachment DR125-1).The report presented research results which were based on remote imagery interpretation followed by ground-truthing of not only the project site, but also the area within a 1-mile radius around the project site. The research was structured to address the hypothesis, based on energetics and critical resource scarcity (water) in a hyper-arid environment, that during early historic and prehistoric times, interbasin travel routes would describe the shortest distances (essentially straight lines) from mountain passes to basin springs. As explained in the report, and in this testimony, there are only two segments on the project site which may be a part of the OST-MR-S-24 and Track 4. However, both lack integrity as they are severely degraded, and have no further data potential beyond recordation accomplished (Applicant's Data Response Set 1D-5; Attachment DR125-1).

It is important to recognize that the speculative locations of historic tracks in the project area provided by OSTA (Prichett, 2012, p. 44, Fig. 13) were tested *in the field* by Lawson and Spaulding (2012). In particular a "mule trace" bisecting the project area from east to west was found not to exist (ibid. p. 4-3). Although reported to Staff, this fact is overlooked in the FSA. A thorough study (including field survey) of the entire project area revealed no evidence for additional potential

historic trails and roads beyond those enumerated by Lawson and Spaulding (2012) and listed in the FSA). Therefore, by employing the map provided by the OSTA (Cultural Resources Figure 7), the FSA misrepresents the current status of understanding of historic routes comprising the OST-MR in the project area, and improperly disregards the best available science addressing the resources of concern.

Finally, as discussed further below, lack of information (i.e., the fact that the history of the OST is incomplete) does not justify the significance of findings for all the tracks/trails made in the FSA.

- Even if there were a defined "Northern Corridor" and all tracks were assumed to be related to the OST-MR, the trails that cross the project site are not eligible individually or as contributors, since they (a) lack integrity and/or (b) do not have further data potential.

On page 4.3-128, the FSA states, “Staff has identified a historic trail corridor, within which the HHSEGS project site is located, containing various converging and intermingled tracks and traces that comprise a portion of the Old Spanish Trail-Mormon Road. Staff recommends that this trail corridor be assumed to be a historical resource under CEQA, for the purpose of the present siting case, eligible for the CRHR under Criteria 1 and 4.”

The National Register Bulletin, “How to Apply the National Register Criteria for Evaluation” published by U.S. Department of the Interior, National Park Service, contains a discussion of historic districts, such as the trail corridor discussed above. This bulletin is used to assist in evaluating districts under the CRHR, as well as the NRHP (OHP, Technical Assistance Series #6). According to the National Register bulletin, “A component of a district cannot contribute to the significance if, it has been *substantially altered* since the period of the district's significance or it does not share the historic associations of the district” (emphasis added).

When applying these principles to the trails on the project site, it is clear that none of the trails on site are contributors to the OST-MR Northern Corridor. Tracks 4 and 5 are off-site, and Sites S-25, S-26, and Track 1 do not share the historic associations of the OST-MR. Furthermore, it is indisputable that S-24 has been extensively graded and altered, as further discussed individually below, such that any original trail or track along with any associated track-side debris in the "pitch zone", if any, is long gone. With respect to Site S-26, the best available science shows that this single, ephemeral trail is prehistoric. This resource lacks integrity due to its extreme ephemeral nature. It was really only able to be identified briefly on desert pavement and the remaining portions are extrapolated from remote imagery. This trail is so intermittent as to lack integrity. Therefore, none of these sites, which are located on the HHSEGS project, can be considered contributing elements to the overall OST-MR. Furthermore, as explained below, none of these segments are eligible individually for the CRHR.

Eligibility of the Individual Tracks Under CRHR

- The FSA’s determination that Site S-24 contains data potential and is therefore potentially eligible for the CRHR under Criteria 4 is factually flawed.

Site S-24 consists of a historic road segment connecting the old Nevada State Route 16 to the Tecopa Pass Road. On page 4.3-112, the FSA states that there are ungraded parts of Site S-24 on the project site, and that therefore, “subsurface artifacts associated with the road may be present on either side of the ungraded segment, in the “pitch zone.” Based on this conclusion, the FSA finds on page 4.3-112:

> The history of the OST-MR is incomplete; therefore, any traces and tracks that are discovered are potentially eligible under Criterion D (and CRHR Criterion 4) for data potential.

However, this finding is based on incorrect facts. First, the entire segment of this road located within the HHSEGS project site has been graded in the modern era. This graded segment is approximately 20 feet wide. The far southern segment of this road visited during the reconnaissance survey was also graded in the modern era. The segment of Site S-24 described in the FSA as "ungraded and in fair condition" is not, in fact, located on the project site, but is a small section located south of Tecopa Road, and within the Charleston View development. This segment of older road is situated within an area of desert pavement and is bounded by two modern roads, and will not be directly impacted by grading on the HHSEGS. Therefore, there is no data potential from ungraded segments located on the project site.

Second, the segment of Site S-24 located within the HHSEGS project was completely surveyed during the original pedestrian survey (AFC, Section 5.3) and revisited during the Roads and Trails study (Attachment DR125-1). Additionally, since the road within the HHSEGS project is completely graded to several feet on either side of the original road, the likelihood that items will be identified within the toss zone of this road is highly unlikely. The toss zone of the original road has been graded to several inches below the original surface (Lawson and Spaulding, 2012; Applicant's Data Response, Set 1D-5, Attachment DR-125) and the road has lost any potential to yield significant scientific or historical information or specific data. The segment of this road located within the HHSEGS project has been completely recorded, and any data potential to be realized from this segment has been exhausted by this recording. Therefore, Site S-24 is not individually eligible for listing under Criteria 4 of the CRHR.

- <u>The FSA's determination that Site S-24 retains integrity is incorrect.</u>

On page 4.3-112, the FSA states that "Despite the fact that some segments have been maintained or upgraded, they still retain integrity of location, feeling, and association." However, according to the California Office of Historic Preservation, Technical Assistance Series #6, California Register and National Register: A Comparison (for purposes of determining eligibility for the California Register), published by the California OHP, integrity "is the authenticity of a historical resource's physical identity evidenced by the survival of characteristics that existed during the resource's period of significance. Historical resources eligible for listing in the California Register must meet one of the criteria of significance described above and retain enough of their historic character or appearance to be recognizable as historical resources and to convey the reasons for their significance." Within the HHSEGS project, Site S-24 appears to be a completely modern dirt road. No historic aspects of this road remain. Had this road not been identified through archival research as a historic road, there is nothing remaining on the HHSEGS project to indicate this road is historic. The small segment which contains the wagon tracks was only located off site through remote sensing and archival research. Therefore, the segment of Site S-24 located on the project site completely lacks any characteristics that make it recognizable as a historical resource or that conveys the reasons for its significance, and thus lacks integrity.

- <u>The FSA's determination that Site S-25 is eligible for the CRHR is factually flawed.</u>

Site S-25 is a modern graded road used by the former landowner, Roland Wiley, to access his Hidden Hills Ranch. On page 4.3-113, the FSA states, "evidence suggests that portions of this road are associated with the OST." This is completely incorrect. The OST served as a major trade route between 1829 and 1849. Based on reviews of USGS maps, an appropriate construction date range

for this segment is 1954 to 1956, because this road is visible on the 1956 USGS 15-minute Horse Thief Springs quadrangle map but does not appear on the 1910, 1912, or 1942 USGS Ivanpah 30-minute quadrangle map. It is likely that Wiley graded this road, as it connects to a previous older road on his property. Therefore, because the data shows that this road was likely constructed in 1954, and not before that time, Site S-25 cannot be associated with a trade route from the 1800's. Moreover, because Site S-25 is not associated with the OST, it does not have the potential to provide data that would lend to an understanding of the OST. Therefore, Site S-25 is not eligible for the CRHR.

On page 4.3-113, the FSA states "As is the case with S-24, the fact that some portions have been maintained or upgraded does not change the fact that it still retains integrity of location, feeling, and association which can add to the historical knowledge of the route(s) of the OST-MR." Again, there is no evidence indicating this road is a part of the OST-MR. Archival research conducted for the original pedestrian survey included a literature search of the EIC. Nothing regarding Site S-25 was found during this search (AFC, Section 5.3). Review of historic maps only identified the road on a 1956 map. Previous maps, including maps dating from 1910, 1911, and 1942, do not show this road. Review of diary entries, additional review of historic maps, research among Pahrump Valley specific literature, and remote sensing did not provide evidence that this road is a part of the OST-MR. Several roads criss-cross the Pahrump Valley. Some of these roads are indeed portions of the OST-MR. Some of these roads are a part of a well-known mid valley road system which connected settlements in Pahrump to settlements in Sandy Valley and mining operations in local mountains. Some roads are more modern roads which were created by local ranchers and residents to access property. All points of evidence searched indicate that Site S-25 is one of the latter, a road which was created late in the historic era (1950's) by a local rancher to access his property. This road segment, which is located within the HHSEGS project, was completely surveyed during the original pedestrian survey (AFC, Section 5.3) and revisited during the Roads and Trails study (Attachment DR125-1). The segment of this road located within the HHSEGS project has been completely recorded and any data potential to be realized from this segment has been exhausted by this recording. Therefore, the FSA's conclusion that Site S-25 is eligible for the CRHR is completely without any evidentiary basis.

- <u>The FSA's determination that Site S-26 is potentially associated with the OST-MR is factually flawed.</u>

Site S-26 is a single, ephemeral trail or footpath that measures approximately 35 to 40 cm wide, which runs northeast-southwest within the project site. On page 4.3-111, the FSA states:

Known elements and features within the OST-MRNC to date include the Northern Route of the Old Spanish Trail National Historic Trail (as designated by the Old Spanish Trail Recognition Act of 2002), Track 4 (CH2MHill DR125), Steiner's Apx Trace (OSTA 2012), S-24 (CH2MHill DR125), S-26 (CH2MHill DR125), Track 5 (CH2MHill DR125), Central trace (OSTA 2012), and Northern trace (OSTA 2012).

The inclusion of Site S-26 as a "known element[ ] and feature[ ]" of the OST-MR is repeated elsewhere in the FSA, for example, on page 4.3-111:

> The Applicant's consultant identified two traces of the OST-MR …, which were given temporary site numbers, Track 4 and S-24. It is also possible, although not identified by the Applicant, that S-25, S-26, Track 1, and/or Track 5 are associated with the OST-MR. In particular S-25 and Track 4 appear to line up with the study done by the OSTA.

However, the inclusion of this trail as a component of the OST-MR and as a historic resource is incorrect. First, this trail is appropriately classified as prehistoric for the following reasons:

- The trail was not found any historic maps reviewed.
- Ethnographic data indicates the area was a crossroads between water sources and prehistoric settlements in the Pahrump Valley. Archaeological sites identified in the HHSEGS further indicate the transitory nature of the area.
- On the northeastern end of the trail, a small number of isolated finds, all single flakes and Temporary Site S-23, a small lithic scatter, were recorded within 100 meters of this trail. No historic artifacts were found along this trail.
- Remote imagery of the alluvial fan toe surfaces to the west and leading up to Formidable Pass were scanned carefully to determine if a trace of the pathway of S-26 could be detected, but none could. This indicates that, assuming the trail did not turn aside in the valley bottom, the erosional events that led to the deposition of these land forms are younger than the trail itself, in turn, suggesting that the trail is of prehistoric age and therefore not associated with the OST-MR.

Therefore, evidence related to the age of this trail strongly indicates that it is an ancient trail, rather than an historic trail. The trail is not considered significant under Criteria 1, 2, or 3, as the trail cannot be associated with events or people important to prehistory. The trail is not an outstanding example of engineering. The trail was not considered eligible under Criterion 4, as it lacks data potential primarily due to the disturbance to the trail. Erosion has obliterated substantial segments of Site S-26, both in the valley bottom as well on the alluvial fans leading down to the valley from the west. The trail is visible on the ground in two *fragmented* segments within the HHSEGS project. The northeast segment is approximately 1.2 km long and the southwest segment is approximately 0.7 km long. Within each defined segment, however, the trail is not continuous. For example, the northeastern segment has been largely impacted by OHV use (dirt bikes), as well as erosion. It is, however, *occasionally* visible in fair condition.

The southwest segment is located in an area within a large, very shallow wash and small, higher areas with desert pavement. The portions of the trail situated on this desert pavement are relatively intact. The trail is not visible between the northeast and southwest segments likely due to erosion of the intervening segment. Overall, the trail is also very heavily impacted anywhere it crosses any of the dirt roads which were graded in the late 1960s when the property was subdivided. At each point where the trail crosses these roads, the trail is obliterated and is not visible again for 3 to 4 meters on either side of the road. On the northern end of the trail at the California-Nevada border, this trail runs into a well maintained dirt road which connects to another well maintained dirt road that parallels the border and is no longer visible due to this grading (Lawson and Spaulding, 2012).

In addition, the pedestrian survey of the HHSEGS did not locate any CRHR eligible sites along the trail, thus limiting the trail's potential to contribute data important to the prehistory of the area. Finally, this site is located in an area that was completely surveyed during the original pedestrian survey (AFC, Section 5.3). The trail was revisited during the Roads and Trails study (Attachment DR125-1). Therefore, the FSA's conclusion that Site S-26 is potentially eligible in the CRHR under Criteria 1 as associated with the OST-MR is not supported by the data. Furthermore, this trail has been completely recorded, and any data potential to be realized from this site has been exhausted by this recording. Therefore, the FSA's conclusion that Site S-26 is potentially eligible in the CRHR under Criteria 4 as possessing data potential is incorrect.

- The FSA's determination that Track-1 contains data potential and therefore eligible for the CRHR is factually flawed.

On page 4.3-113, the FSA states:

> There is evidence that [Track 1] may be associated with the OST and later early surveys of the California-Nevada border. Staff agrees that Track 1 would not be eligible under NRHP Criterion A (equivalent to CRHR Criterion 1) due to the alterations that have occurred during maintenance, which included being graded with modern equipment. However, the history of the OST-MR is incomplete; therefore, any traces and tracks that are discovered are potentially eligible under Criterion D (and CRHR Criterion 4) for data potential. Despite the fact that some segments have been maintained or upgraded, they still retain integrity of location, feeling, and association which can add to the historical knowledge of the route(s) of the OST-MR. Staff recommends that Track 1 is potentially eligible as a feature or element of the OST.

Based on extensive research and surveys conducted on behalf of the Applicant, there is no evidence indicating that Track 1 is a part of the OST-MR. Archival research conducted for the original pedestrian survey included a literature search of the EIC. Nothing regarding this road was found during this search (AFC, Section 5.3). This road was not identified any maps reviewed. Review of diary entries, additional review of historic maps, research among Pahrump Valley specific literature, and remote sensing did not provide evidence that this road is a part of the OST-MR. Upon field inspection, this track was found to have been made by a single pass of a grader and individual wheel ruts were not visible, suggesting little use of this road. The road is approximately 6 feet wide and nearly at ground level. Associated artifacts include two one-quart oil cans, which date into the early half of the twentieth century (Rock, 1987), and a single 2-inch lathe stake with the top significantly eroded by blasting with wind-driven sand. This road is disturbed intermittently by newer graded roads within the project site. All points of evidence searched, including the identification of oil cans along this road, indicate that Track 1 was likely a part of the mid valley road system, which connected settlements in Pahrump to settlements in Sandy Valley and mining operations in local mountains. Therefore, there is no evidence to support the FSA's assertion that Track 1 is associated with the OST. As a result, Track 1 is not eligible for the CRHR under Criteria 1, because it is not associated with the OST.

In addition, this segment of road was completely surveyed within the HHSEGS project during the original pedestrian survey (AFC, Section 5.3) and revisited during the Roads and Trails study (Attachment DR125-1). This site has been completely recorded and any data potential to be realized from this resource has been exhausted by this recording. Therefore, Track 1 is not eligible for the CRHR under Criteria 4, because there is no further data potential from this site.

- Track-4 is located off-site, and will not be physically impacted by the project.

Track 4 was initially discerned as a single route during remote imagery analysis, and is located outside of and south of the project site, on the south side of Tecopa Road. At its closest point to the HHSEGS project, Track 4 is about 0.56 mile south-southwest of the project, and south of Tecopa Road. Its west-southwesterly trace is disrupted by, but can still be followed through, the Charleston View development. The position of Track 4 approximates the digitized file providing the general location of the OST-MR by the NPS (2001). It also appears to follow some of the old routes shown in historic maps including 1908 *General Map Showing Approximate Location of Better Known Springs and Wells in the Mohave and Adjacent Deserts Southeastern California and Southwestern Nevada* and the 1910 *Ivanpah, California and Nevada* 30' USGS quadrangle topographic map.

However, in its description of Track-4, while the FSA notes that Track 4 is a segment of the OST-MR (p. 4.3-114), the FSA fails to note that the west-southwesterly trace of Track 4 is disrupted by the Charleston View development, and that Track 4 actually runs through the development. Therefore, the FSA's assertion that "existing views of the OST are unobstructed for several miles" is not correct.

- Track-5 is located off-site and will not be physically impacted by the project.

Track 5 was discerned through remote imagery analysis, and is located outside of and north of the project site, approximately 0.3 mile away from the HHSEGS project. The FSA does not state how Track 5 will be significantly impacted by the project. It should be noted that Track 5 is located completely off-site, and will not be disturbed by the project.

Mitigation

- The FSA is flawed, because it requires the Applicant to develop the facts to show eligibility/ historical significance of the OST-MR Northern Corridor and tracks/trails on the project site as mitigation (CUL-9).

CUL-9 requires that the Applicant fund a study of the OST-MR Northern Corridor by the OSTA as well as fund a follow up study by a "qualified historian" to "evaluate the eligibility" of all the tracks and traces found in the study (p. 4.3-143 to -144). To the extent the first study is only intended to relate to the project site, as indicated in the discussion on page 4.3-117, then that work has already been done. All tracks and trails on the project site have been identified and ground-truthed. To the extent it is intended to be broader, as the extent of the Northern Corridor is unknown, the requirement is indefensibly vague and lacking nexus to the project impacts (nor is the OSTA a qualified entity to conduct this study). Notwithstanding the evidence to the contrary as provided by the Applicant and discussed above with respect to the eligibility of each track/trail, the FSA seems to essentially rely on the fact that "the history of the OST-MR is incomplete" (4.3-113) to override the facts and justify the finding of significance for all tracks/trails on site and desire for further studies. As with the Pahrump Metapatch, Staff proposes to again require as mitigation that the Applicant develop a study - here two studies - to determine whether any of the tracks or the so-called Northern Corridor is eligible. Basing a potential eligibility determination on lack of information and conjecture is bad science, and requiring the Applicant to develop the actual science after making the finding is impermissible.

Visual Impacts

- Mere visibility of towers from a NRHP-eligible property does not rise to the level of adverse effects that destroy the resource's integrity; the FSA finding of significant visual impact to the OST-MR District is not supported by facts in the record.

The FSA finds that the project towers would be visible from the currently NRHP-eligible OST/MR District in Nevada (p. 4.3-115). The project would also be visible from the off-site Track 4, which likely represents a continuation of that trail in California, and off-site Track 5, which has an unknown origin. However, the mere fact of visibility does not in itself degrade the aspects of integrity that contribute to the District's significance.

The fundamental question regarding potential visual impact to the OST/MR District is: If the project site is merely visible from the trail or more specifically a segment in Nevada that has been determined to be a contributing element to the District, such as the 0.55 mile Stump Spring segment, does the mere visibility of the project site from the trail result in a "substantial adverse change" under CEQA? California Public Resources Code (PRC), Section 5020.1 and CEQA Guidelines Section 15064.5(b)(1) and Section 15064.5(b)(2) define a substantial adverse change to a historical resource as one that "Demolishes or materially alters in an adverse manner those physical

characteristics…" of a historical resource. The HHSEGS project will have no effect whatsoever on any physical characteristic of any portion of the OST/MR District and therefore, does not result in impact to a historical resource.

Further, various other significant elements of the modern landscape are also within the viewshed of the OST/MR. There is insufficient evidence offered by the FSA to support a significant impact finding.

Even if visual impact were to be considered significant, documentation of the route and associated viewshed has been completed, and with the addition of VIS-6 and the interpretive kiosk proposed in CUL-10, as revised by the Applicant, the impacts would be mitigated to a less than significant level. The additional interpretive display requirements of CUL-10 relate to the broader corridor, which is not adequately defined, rather than the NRHP-eligible District, and are not in proportion to the impacts and should be deleted.

Cumulative Impacts

- The FSA cumulative impact analysis related to the OST-MR Northern Corridor is not supported, as the boundaries of the corridor are unclear and similarly, the boundaries of the cumulative effects area were not described.

The FSA determined that cumulative impacts to the OST-MR Northern Corridor could occur from the St. Therese Mission, Pahrump Airport, Element Solar, and Sandy Valley Solar projects (p. 4.3-125). Yet, neither the boundaries of the proposed corridor itself nor the boundaries of the cumulative effects study area were described. The FSA does not support the finding of a significant cumulative impact.

IV. Proposed Findings of Fact

The following findings of fact proposed in the FSA should be deleted or revised as discussed below.

1) The following proposed finding of fact should be deleted because there is no evidence to support the conclusion that the Pahrump Metapatch is a significant cultural resource, and the FSA's conclusions that this resource is eligible are all founded on assumption, hypothesis, and speculation.

- ~~Staff has identified the Pahrump Metapatch Mesquite Woodland-Coppice Dune Archaeological Landscape, located just to the northeast of the HHSEGS facility site, as a historical resource under CEQA and recommends that it be assumed eligible for the California Register of Historical Resources (CRHR), under CRHR Criteria 1 and 4, for the purpose of the present siting case. The resource represents the aboriginal use of a locally significant ecological zone during still undetermined periods over probably at least the last 12,000 years.~~

2) The following proposed finding of fact should be deleted. First, as stated above, there is no evidence to support the conclusion that the Pahrump Metapatch is a cultural resource eligible for the CRHR. Second, the evidence shows that the project will not affect mesquite thickets, and will therefore not affect the ability of the resource to convey the reasons for its historical significance.

- ~~Staff concludes that the visual impact of the proposed HHSEGS project on the Pahrump Metapatch Mesquite Woodland-Coppice Dune Archaeological Landscape would severely degrade the ability of the resource to convey its association with aboriginal lifeways of the Holocene epoch, potentially compromising its CRHR eligibility.~~

3) The following proposed finding of fact should be deleted because there is no evidence establishing what boundaries comprise the proposed historic trail corridor. Because the scope of the resource cannot be established, the potential eligibility of the assumed corridor cannot be determined. Further all tracks and trails within the project site have been researched, ground truthed, and evaluated. The facts show that they lack integrity. Regardless, all data potential has been achieved and documented. Therefore, the tracks are not eligible individually for the CRHR.

- ~~Staff has identified a historic trail corridor, within which the HHSEGS project site is located, containing various converging and intermingled tracks and traces that comprise a portion of the Old Spanish Trail-Mormon Road. Staff recommends that this trail corridor be assumed to be a historical resource under CEQA, for the purpose of the present siting case, eligible for the CRHR under Criteria 1 and 4.~~

4) The following proposed finding of fact should be revised as set forth below. There is no evidence to support the conclusion that an unbounded corridor in the vicinity of the project is a CRHR-eligible historic resource. Regardless, while the project can be seen from the previously determined NRHP historic district, the OST-MR District, no evidence supports the significant impact finding proposed in the FSA.

- ~~Staff concludes that~~ The potential impacts of the HHSEGS project ~~impacts~~ on the Old Spanish Trail-Mormon Road Historic District ~~Northern Corridor~~ would be less than significant ~~and that, even~~ with adoption and full implementation of Conditions of Certification **CUL-~~9~~10** and **VIS-6**.~~and **CUL-10**, project impacts to this resource could not be mitigated to a less than significant level.~~

V. Proposed Licensing Conditions

The FSA for the project proposes 11 Conditions of Certification for this subject matter. We agree with the Conditions of Certification set forth in the FSA pertaining to this subject, except as set forth below. In particular, all conditions of certification have been clarified to state that the scope of the condition is limited only to the facilities located in California, and does not apply to the linear facilities located in Nevada.

CONDITION CUL-1

Paragraph 4 of CUL-1 requires a "Petition to Modify and CPM review and approval of a project-specific protocol for addressing unanticipated discoveries" if "circumstances develop" during operation of the power plant that require ground disturbance. This requirement is vague, and it is unclear as to what ground disturbing activities this requirement would be applicable. In addition, while this condition requires a "Petition to Modify", it is unclear what, exactly, the project owner would be seeking to modify. Therefore, this condition has been modified to remove the requirement for a Petition to Modify. Instead, the process for ground disturbance during operations will be included in the CRMMP as set forth in the proposed modifications to CUL-3. The verification should also be modified to remove the requirement that all ground disturbance on the site be stopped if a cultural resource is discovered. Given the size of the site, it is reasonable to allow ground disturbance to continue in areas away from the find.

Proposed revisions to CUL-1 are as follows.

CUL-1 Prior to the start of construction-related ground disturbance or grading, boring, and trenching, as defined in the General Conditions for this project; surface

grading or subsurface soil work during pre-construction activities or site mobilization; or mowing activities and heavy equipment use in loose or sandy soils, at the project site and for access roads and linear facilities in California, the project owner shall obtain the services of a Cultural Resources Specialist (CRS) and one or more Alternate CRS(s). The project owner shall submit the resumes and qualifications for the CRS, CRS alternates, and all technical specialists to the CPM for review and approval.

The CRS shall manage all cultural resources monitoring, mitigation, curation, and reporting activities, and any pre-construction cultural resources activities (e.g., geoarchaeology or data recovery), unless management of these is otherwise provided for in accordance with the cultural resources conditions of certification (Conditions). The CRS may elect to obtain the services of Cultural Resources Monitors (CRMs), Native American Monitors (NAMs), and other technical specialists, if needed, to assist in monitoring, mitigation, and curation activities. The project owner shall ensure that the CRS makes recommendations regarding the eligibility for listing in the California Register of Historical Resources (CRHR) of any cultural resources that are newly discovered or that may be affected in an unanticipated manner.

No construction-related ground disturbance or grading, boring, and trenching, as defined in the General Conditions for this project; and/or surface grading or subsurface soil work during pre-construction activities or site mobilization, and/or mowing activities and heavy equipment use in loose or sandy soils, at the project site, and/or at access roads and linear facilities in California, shall occur prior to Energy Commission Compliance Project Manager (CPM) approval of the CRS and alternates, unless such activities are specifically approved by the CPM.

~~If, during operation of the power plant, circumstances develop that would require ground disturbance in soils or sediments previously undisturbed during project construction, no surface grading or subsurface soil work shall occur prior to submission of a Petition to Modify and CPM review and approval of a project-specific protocol for addressing unanticipated discoveries, consistent with the approved Cultural Resources Mitigation and Monitoring Plan (CRMMP).~~

CULTURAL RESOURCES SPECIALIST

The resumes for the CRS and alternate(s) shall include information demonstrating ~~to the satisfaction of the CPM~~ that their training and backgrounds conform to the U.S. Secretary of the Interior's Professional Qualifications Standards, as published in Title 36, Code of Federal Regulations, part 61 (36 C.F.R., part 61). In addition, the CRS and alternate(s) shall have the following qualifications:

1. Listing in the Register of Professional Archaeologists;
2. Qualifications appropriate to the needs of the project, including a background in anthropology, archaeology, history, architectural history, or a related field;

3. At least three years of archaeological or historical, as appropriate (per nature of predominant cultural resources on the project site), resources mitigation and field experience in California; and
4. At least one year of experience in a decision-making capacity on cultural resources projects in California and the appropriate training and experience to knowledgably make recommendations regarding the significance of cultural resources. The resumes of the CRS and alternate CRS shall include the names and telephone numbers of contacts familiar with the work of the CRS/alternate CRS on referenced projects and demonstrate to the satisfaction of the CPM that the CRS/alternate CRS has the appropriate training and experience to implement effectively the Conditions.

CULTURAL RESOURCES MONITORS

CRMs shall have the following qualifications:

1. B.S. or B.A. degree in anthropology, archaeology, historical archaeology, or a related field, and one year experience monitoring in California; or
2. A.S. or A.A. degree in anthropology, archaeology, historical archaeology, or a related field, and four years experience monitoring in California; or
3. Enrollment in upper division classes pursuing a degree in the fields of anthropology, archaeology, historical archaeology, or a related field, and two years of monitoring experience in California.

CULTURAL RESOURCES TECHNICAL SPECIALISTS

The resume(s) of any additional technical specialist(s), e.g., historical archaeologist, historian, architectural historian, and/or physical anthropologist, shall be submitted to the CPM for approval.

The historian(s) must meet the U.S. Secretary of Interior's Professional Qualifications Standards, as published in Title 36, Code of Federal Regulations, part 61 (36 CFR, part 61). Resume(s) of the selected historian(s) shall be submitted for review and approval by the CPM and shall include the names and telephone numbers of contacts familiar with their work on referenced projects and demonstrate, to the satisfaction of the CPM, that the historian has the appropriate training and experience to effectively implement all study requirements.

Verification: At least 45 days prior to the start of ground disturbance, the project owner shall submit the resumes for the CRS and alternate(s) to the CPM for review and approval.

At least 10 days prior to a termination or release of the CRS, or within 10 days after the resignation of a CRS, the project owner shall submit the resume of the proposed new CRS, if different from the alternate CRS, to the CPM for review and approval. At the same time, the project owner shall also provide to the proposed new CRS the Application for Certification and all cultural resources documents, field notes, photographs, and other cultural resources materials generated by the project. If no alternate CRS is available to assume the duties of the CRS, the project owner shall designate a CRM to serve in place of a CRS for a maximum of 3 days. If cultural resources are discovered, ground disturbance shall remain halted in the

vicinity of the find, as designated by the CRM, until there is a CRS or alternate CRS to make a recommendation regarding significance.

At least 20 days prior to ground disturbance, the CRS shall provide a letter naming CRMs and attesting that the identified CRMs meet the minimum qualifications for cultural resources monitoring required by this condition.

At least 5 days prior to additional CRMs beginning on-site duties during the project, the CRS shall provide letters to the CPM identifying the new CRMs and attesting to their qualifications.

At least 15 days prior to any technical specialists, other than CRMs, beginning tasks, the resume(s) of the specialists shall be provided to the CPM for review and approval.

At least 10 days prior to the start of ground disturbance, the project owner shall confirm in writing to the CPM that the approved CRS will be available for onsite work and is prepared to implement the cultural resources Conditions.

CONDITION CUL-2

Because the project's Monthly Compliance Reports ("MCR") are easily accessible on-line, and such large files that they cannot be easily emailed, CUL-2 should be revised to eliminate the requirement that the project owner email electronic copies of the MCR to those who have expressed or express an interest in that document. In addition, this requirement is vague, as it is unclear how the project owner would determine those parties "who have expressed or express" an interest in the MCR. Additionally, some of the information in the MCR may be confidential and should be reviewed by the CEC.

The requirement to have the CPM "review map submittals" is unclear and creates an unnecessary CEC review of simple project maps which will be used exclusively by the CRS. The requirement also does not clearly define which maps will be reviewed and approved by the CPM and does not provide a timeframe within which such a review would occur.

Proposed revisions to CUL-2 are as follows.

CUL-2 Prior to the start of construction-related ground disturbance or grading, boring, and trenching, as defined in the General Conditions for this project; and/or surface grading or subsurface soil work during pre-construction activities or site mobilization, and/or mowing activities and heavy equipment use in loose or sandy soils, at the project site and at laydown areas, access roads, and other ancillary areas in California ~~facilities~~, if the CRS has not previously worked on the project, the project owner shall provide the CRS with copies of the Application For Certification (AFC), data responses, confidential cultural resources reports, all supplements, the Energy Commission cultural resources Final Staff Assessment (FSA), and the cultural resources conditions of certification from the Final Decision for the project. The project owner shall also provide the CRS and the CPM with maps and drawings showing the footprints of the power plant, and in California, all linear facility routes, all access roads, and all laydown areas. Maps shall include the appropriate USGS quadrangles and a map at an appropriate scale (e.g., 1:24,000 or 1" = 200') for plotting cultural features or materials. If the CRS requests enlargements or strip maps for linear facility routes, the project owner shall provide copies to the CRS and CPM. ~~The CPM shall review map submittals and, in consultation with the CRS, approve those that are appropriate for use in cultural resources planning activities. No ground~~

~~disturbance shall occur prior to CPM approval of maps and drawings, unless such activities are specifically approved by the CPM.~~

If construction of the project would proceed in phases, maps and drawings not previously provided shall be provided to the CRS and CPM prior to the start of each phase. Written notice identifying the proposed schedule of each project phase shall be provided to the CRS and CPM.

Weekly, until ground disturbance is completed, the project construction manager shall provide to the CRS and CPM a schedule of project activities for the following week, including the identification of area(s) where ground disturbance will occur during that week.

The project owner shall notify the CRS and CPM of any changes to the scheduling of the construction phases.

Verification: At least 40 days prior to the start of ground disturbance, the project owner shall provide the AFC, data responses, confidential cultural resources documents, all supplements, cultural resources conditions of certification, and the FSA to the CRS, if needed, and the subject maps and drawings to the CRS and CPM. ~~The CPM will review submittals in consultation with the CRS and approve maps and drawings suitable for cultural resources planning activities.~~

At least 15 days prior to the start of ground disturbance, if there are changes to any project-related footprint, the project owner shall provide revised maps and drawings for the changes to the CRS and CPM.

At least 15 days prior to the start of each phase of a phased project, the project owner shall submit the appropriate maps and drawings, if not previously provided, to the CRS and CPM. ~~Monthly, during ground disturbance, the project owner shall email an electronic copy of the MCR to Native Americans and other parties who have expressed or express an interest in that document.~~

Within 5 days of changing the scheduling of phases of a phased project, the project owner shall provide written notice of the changes to the CRS and CPM.

CONDITION CUL-3

For ease of implementation, the specifics of the CRMMP should be placed in the verification, rather than the body of the condition of certification. In addition, the condition requires that the project owner agree to pay the curation fees for cultural resources investigations conducted for the project. The verification specifies that curation fees be paid for both archaeological investigations and "as a result of the historical documentation of the Old Spanish Trail-Mormon Road Northern Corridor." The scope of this requirement is not proportional to the potential impacts of the project on cultural resources, and should be clarified to ensure that the project owner is responsible for the curation fees of only those cultural resources found on the project site, rather than the entire Pahrump Valley.

Proposed revisions to CUL-3 are as follows.

CUL-3 Prior to the start of construction-related ground disturbance or grading, boring, and trenching, as defined in the General Conditions for this project; and/or surface grading or subsurface soil work during pre-construction activities or site mobilization, and/or mowing activities and heavy equipment use in loose or sandy soils, at the project site and at laydown areas, roads, and other ancillary

areas in California, the project owner shall submit the Cultural Resources Monitoring and Mitigation Plan (CRMMP), as prepared by, or under the direction of, the CRS, to the CPM for review and approval. The CRMMP shall follow the content and organization of the draft model CRMMP, provided by the CPM, and the authors' name(s) shall appear on the title page of the CRMMP. The CRMMP shall identify measures to minimize potential impacts to sensitive cultural resources. Implementation of the CRMMP shall be the responsibility of the CRS and the project owner. Copies of the CRMMP shall reside with the CRS, alternate CRS, each CRM, and the project owner's on-site construction manager. No ground disturbance shall occur prior to CPM approval of the CRMMP, unless such activities are specifically approved by the CPM.

Verification: After approval of the CRS proposed by the project owner, the CPM will provide to the project owner an electronic copy of the draft model CRMMP for the CRS.

At least 30 days prior to the start of ground disturbance, the project owner shall submit the CRMMP to the CPM for review and approval.

The CRMMP shall include, but not be limited to, the following elements and measures:

1. The following statement included in the Introduction: "Any discussion, summary, or paraphrasing of the conditions of certification in this CRMMP is intended as general guidance and as an aid to the user in understanding the conditions and their implementation. The conditions, as written in the Commission Decision, shall supersede any summarization, description, or interpretation of the conditions in the CRMMP. The Cultural Resources conditions of certification from the Commission Decision are contained in Appendix A."
2. A proposed general research design that includes a discussion of archaeological research questions and testable hypotheses specifically applicable to the project area, and a discussion of artifact collection, retention/disposal, and curation policies as related to the research questions formulated in the research design. The research design will specify that the preferred treatment strategy for any buried archaeological deposits is avoidance. A specific mitigation plan shall be prepared for any unavoidable impacts to any CRHR-eligible (as determined by the CPM) resources. A prescriptive treatment plan may be included in the CRMMP for limited data types.
3. Specification of the implementation sequence and the estimated time frames needed to accomplish all project-related tasks during the ground disturbance and post-ground–disturbance analysis phases of the project.
4. Identification of the person(s) expected to perform each of the tasks, their responsibilities, and the reporting relationships between project construction management and the mitigation and monitoring team.
5. A description of the manner in which Native American observers or monitors will be included, the procedures to be used to select them, and their role and responsibilities and following specific requirements as described in CUL-6. Contact lists of interested Native Americans shall be obtained from the Native American Heritage Commission (NAHC), and the project owner shall, to the extent feasible, adhere to the NAHC's Guidelines for Monitors/Consultants Native American Cultural, Religious, Burial Sites (http://www.nahc.ca.gov/guidelines4mon.html). Preference in selecting a monitor shall

be given to the Pahrump Paiute Tribe, a Native American community with traditional ties to the project area. Should no member or too few members of that community be able to serve as monitors for whatever reason, or should the CPM assess that no member or too few members of that community are qualified under the above guidelines to serve as monitors, then the project owner shall seek and, to the extent feasible, accommodate the preferences of the Pahrump Paiute Tribe as to the Native American community affiliation of any other Native American monitors that are to monitor the construction of the project. If efforts to obtain the services of a qualified Native American monitor are ultimately unsuccessful, the project owner shall immediately inform the CPM. The CPM will either identify potential monitors or will allow ground disturbance to proceed without a Native American monitor.

6. A description of all impact-avoidance measures (such as flagging or fencing) to prohibit or otherwise restrict access to sensitive resource areas that are to be avoided during ground disturbance, construction, and/or operation, and identification of areas where these measures are to be implemented. The description shall address how these measures would be implemented prior to the start of ground disturbance and how long they would be needed to protect the resources from project-related effects.
7. A statement that all encountered cultural resources 50 years old or older shall be recorded on the appropriate Department of Parks and Recreation (DPR) 523 form(s) and mapped and photographed. In addition, all archaeological materials retained as a result of the archaeological investigations (e.g., survey, testing, data recovery) shall be curated in accordance with the California State Historical Resources Commission's Guidelines for the Curation of Archaeological Collections, into a retrievable storage collection in a public repository or museum.
8. As an element of the prescriptive treatment plan, a statement describing that the discovery of isolated artifacts and unexceptional prehistoric artifacts, up to five in number in an area of 25 square meters or less, requires only standard documentation by the CRS, Alternate CRS, or CRM and does not require the approval of the CPM to resume construction once the documentation has been completed. ~~Among the categories of cultural resources subject to prescriptive treatment as a result of discovery during the construction and operation of the project, an explicit category for isolate, unexceptional prehistoric or historic artifacts, or groups of such artifacts, up to five in number in an area of 25 square meters or less, of which the CPM shall be notified and which shall be reported completely in the MCR, but for which the CRS, having fulfilled all requisite documentation requirements, does not need the approval of the CPM to resume construction.~~ This prescriptive treatment category shall specify that the CPM shall have the discretion to nullify this same category upon the CPM's determination that the CRS has inadvertently, or otherwise, misapplied explicit criteria set out in the category for what shall constitute unexceptional prehistoric and historic artifacts.
9. A statement that the project owner will pay all curation fees for artifacts recovered and for related documentation produced during cultural resources investigations conducted for the project on the project site. The project owner shall identify three possible curation facilities that could accept cultural resources materials resulting from project activities.
10. A statement demonstrating when and how the project owner will comply with Health and Human Safety Code 7050.5(b) and Public Resources Code 5097.98(b) and (e),

including the statement that the project owner will notify the CPM and the Native American Heritage Commission (NAHC) of the discovery of human remains.

11. A statement that the CRS has access to equipment and supplies necessary for site mapping, photography, and recovery of any cultural resource materials that are encountered during ground disturbance and cannot be treated prescriptively.

12. A description of the contents, format, and review and approval process of the final Cultural Resource Report (CRR), which shall be prepared according to ARMR guidelines.

13. A description of the process that will occur to reduce impacts to cultural resources if additional ground disturbance occurs within undisturbed soils during operations.

~~Verification:~~ At least 30 days prior to the start of ground disturbance, in a letter to the CPM, the project owner shall agree to pay curation fees for any materials generated or collected as a result of the archaeological investigations (survey, testing, data recovery) on the project site, and which are accepted for curation at a curation facility. ~~and as a result of the historical documentation of the Old Spanish Trail-Mormon Road Northern Corridor.~~

Within 90 days after completion of ground disturbance (including landscaping), if cultural materials requiring curation were generated or collected, the project owner shall provide to the CPM a copy of an agreement with, or other written commitment from, a curation facility that meets the standards stated in the California State Historical Resources Commission's Guidelines for the Curation of Archaeological Collections, to accept the cultural materials from this project. Any agreements concerning curation will be retained and available for audit for the life of the project.

CONDITION CUL-4

No comments.

CONDITION CUL-5

The trigger for this measure should be clarified to be limited to ground disturbance in California. Also, for ease of implementation, the specifics of the training should be placed in the verification, rather than the body of the condition of certification.

Proposed revisions to CUL-5 are as follows.

CUL-5 Prior to, and for the duration of, construction-related ground disturbance, or grading, boring, and trenching, as defined in the General Conditions for this project; and/or surface grading or subsurface soil work during pre-construction activities or site mobilization, and/or mowing activities and heavy equipment use in loose or sandy soils, at the project site and at laydown areas, roads, and other ancillary areas in California, the project owner shall provide Worker Environmental Awareness Program (WEAP) training to all new workers within their first week of employment at the project site and at laydown areas, roads, and other ancillary areas in California. The cultural resources part of this training shall be prepared by the CRS and may be presented in the form of a video. The CRS is encouraged to include a Native American as a presenter in the training to contribute the Native American perspective on archaeological and ethnographic resources. During the training and during construction, the CRS shall be available (by telephone or in person) to answer questions posed by employees. The training may be discontinued when ground disturbance is completed or

suspended, but must be resumed when ground disturbance, as described in detail in CUL-1, resumes.

Verification: At least 30 days prior to the beginning of ground disturbance, the CRS shall provide the cultural resources WEAP training program draft text, including Native American participation, as relevant, graphics, and the informational brochure to the CPM for review and approval.

The training shall include:

1. A discussion of applicable laws and penalties under law;
2. Samples or visuals of artifacts that might be found in the project vicinity;
3. A discussion of what such artifacts may look like when partially buried, or wholly buried and then freshly exposed;
4. A discussion of what prehistoric and historical archaeological deposits look like at the surface and when exposed during construction, and the range of variation in the appearance of such deposits;
5. Instruction that the CRS, alternate CRS, and CRMs have the authority to halt ground disturbance in the area of a discovery to an extent sufficient to ensure that the resource is protected from further impacts, as determined by the CRS;
6. Instruction that employees, if the CRS, alternate CRS, or CRMs are not present, are to halt work on their own in the vicinity of a potential cultural resources discovery, and shall contact their supervisor and the CRS or CRM, and that redirection of work would be determined by the construction supervisor and the CRS;
7. An informational brochure that identifies reporting procedures in the event of a discovery;
8. An acknowledgement form signed by each worker indicating that they have received the training; and
9. A sticker that shall be placed on hard hats indicating that environmental training has been completed. No ground disturbance shall occur prior to implementation of the WEAP program, unless such activities are specifically approved by the CPM.

No ground disturbance shall occur prior to implementation of the WEAP program, unless such activities are specifically approved by the CPM.

~~**Verification:** At least 30 days prior to the beginning of ground disturbance, the CRS shall provide the cultural resources WEAP training program draft text, including Native American participation, graphics, and the informational brochure to the CPM for review and approval.~~

At least 15 days prior to the beginning of ground disturbance, the CPM will provide to the project owner a WEAP Training Acknowledgement form for each WEAP-trained worker to sign.

Monthly, until ground disturbance is completed, the project owner shall provide in the Monthly Compliance Report (MCR) the WEAP Training Acknowledgement forms of workers who have completed the training in the prior month and a running total of all persons who have completed training to date.

CONDITION CUL-6

It has been thoroughly demonstrated after intensive surface inventory and multiple episodes of sub-surface testing, that historical resources are not present at the facility site and are unlikely to be encountered during construction. No artifacts were encountered during geoarchaeological testing -, nor were any indications of subsurface archaeological potential encountered, such as features, anthrosols, or paleosols. Data from separate geotechnical and paleontological investigations of the project area also indicated a low sensitivity for buried archaeological resources to be present within the HHSEGS.

Staff have stated clear agreement in the FSA that none of the archaeological resources found as a result of all these studies meet any of the four criterion to be considered CRHR-eligible resources, nor do they meet criteria to be determined "unique" archaeological resources under CEQA. Staff have also stated on FSA page 4.3-21, their clear agreement that:

> *In consideration of the fact that the archaeological deposits that have been found to date on the surface of the proposed facility site are all relatively sparse scatters of chipped stone, staff would anticipate any buried archaeological deposits to be similar"* (emphasis added)

The geoarcheological testing and the Phase II testing also support this conclusion. Therefore, while one can argue that there is always some remaining theoretical possibility that additional archaeological material could be present within the thin veneer of Holocene soils within the eastern margin of the facility site, the data demonstrates that it is 1) unlikely that such resources are present, and 2) highly unlikely that if found, any such resources would meet the criteria for them to be considered significant, that is to say, historical resources eligible for the CRHR.

On this basis, preparation and implementation of a CRMMP and discovery plan is considered sufficient to mitigate any potential impacts to archaeological resources and is commensurate with the potential for such resources to be found. Cultural resources monitoring as proposed by staff in CUL-6 would be overly burdensome and inappropriate, Additionally, CUL-3 and CUL-7 contain appropriate requirements for the use of Native American monitors. The Commission's policy and practice for Native American monitors should be followed as adequately set forth in CUL-7. Specifically, CUL-7 would apply after discovery of a cultural resource of significance that would be of interest to Native Americans as determined by the CRS, then Native American monitors would be retained in accordance with the CRRMP in CUL-3. In addition, the more specific requirements contained in the FSA CUL-6 have been moved to CUL-3.

Also, for ease of implementation, the following components should be placed in the verification, rather than the body of the condition of certification.

Proposed revisions to CUL-6 are as follows.

CUL-6 Prior to the start of construction-related ground disturbance or grading, boring, and trenching, as defined in the General Conditions for this project; and/or surface grading or subsurface soil work during pre-construction activities or site mobilization, and/or mowing activities and heavy equipment use in loose or sandy soils, at the project site and at laydown areas, roads, and other ancillary areas in California, the project owner shall notify the CPM of the date on which ground disturbance will ensue.

At the direction of the CPM, the project owner shall ensure that the CRS, alternate CRS, or CRMs monitor full time all ground disturbances in the area where a CRHR-eligible (as determined by the CPM) cultural resources discovery

has been made. The level, duration, and spatial extent of monitoring shall be determined by the CPM.

~~The project owner shall ensure that the CRS, alternate CRS, or CRMs monitor, full time, all ground disturbance at the project site, along the linear facilities routes in California, and at laydown areas, roads, and other ancillary areas wherever such ground disturbance occurs on and in Holocene-age alluvial landforms Qa1 and Qa2 (see CH2 2012a, Figure DR101-1), which compose much of the eastern portion of the project site. The purpose of monitoring the physical disturbance of these landforms is to minimize any impacts to previously unknown archaeological resources that are found during the course of project construction and operation, and to ensure that known cultural resources are not impacted in an unanticipated manner.~~

~~Full-time archaeological monitoring for this project shall be the archaeological monitoring of ground-disturbing activities in the areas specified in the previous paragraph, for as long as the activities are ongoing. Where excavation equipment is actively removing dirt and hauling the excavated material farther than fifty feet from the location of active excavation, full-time archaeological monitoring shall require at least two monitors per excavation area. In this circumstance, one monitor shall observe the location of active excavation and a second monitor shall inspect the excavated spoils. The inspection of excavated spoils shall include periodic and systematic screening of five-gallon samples of such spoils through one-quarter-inch hardware cloth. For excavation areas where the excavated material is dumped no farther than fifty feet from the location of active excavation, one monitor shall both observe the location of active excavation and inspect the dumped material.~~

A Native American monitor (NAM) shall be obtained to monitor ground disturbance full time in project areas where the CRS, alternate CRS, or CRMS are monitoring full time. Contact lists of interested Native Americans shall be obtained from the Native American Heritage Commission (NAHC), and the project owner shall, to the extent feasible, adhere to the NAHC's *Guidelines for Monitors/Consultants Native American Cultural, Religious, Burial Sites* (http://www.nahc.ca.gov/guidelines4mon.html). Preference in selecting a monitor shall be given to the Pahrump Paiute Tribe, a Native American community with traditional ties to the project area. Should no member or too few members of that community be able to serve as monitors for whatever reason, or should the CPM assess that no member or too few members of that community are qualified under the above guidelines to serve as monitors, then the project owner shall seek and, to the extent feasible, accommodate the preferences of the Pahrump Paiute Tribe as to the Native American community affiliation of any other Native American monitors that are to monitor the construction of the project. If efforts to obtain the services of a qualified Native American monitor are ultimately unsuccessful, the project owner shall immediately inform the CPM. The CPM will either identify potential monitors or will allow ground disturbance to proceed without a Native American monitor.

Verification: Full-time archaeological monitoring for this project, if deemed necessary, shall be the archaeological monitoring of ground-disturbing activities in the areas specified

in the previous paragraph, for as long as the activities are ongoing. Where excavation equipment is actively removing dirt and hauling the excavated material farther than fifty feet from the location of active excavation, full-time archaeological monitoring shall require at least two monitors per excavation area. In this circumstance, one monitor shall observe the location of active excavation and a second monitor shall inspect the excavated spoils. The inspection of excavated spoils shall include periodic and systematic screening of five-gallon samples of such spoils through one-quarter-inch hardware cloth. For excavation areas where the excavated material is dumped no farther than fifty feet from the location of active excavation, one monitor shall both observe the location of active excavation and inspect the dumped material.

The research design in the CRMMP shall govern the collection, treatment, retention/disposal, and curation of any archaeological materials encountered.

If monitoring should be needed, as determined by the CPM, o~~O~~n forms provided by the CPM, CRMs shall keep a daily log of any monitoring and other cultural resources activities and any instances of non-compliance with the conditions and/or applicable LORS. Copies of the daily monitoring logs shall be provided by the CRS to the CPM, if requested by the CPM. From these logs, the CRS shall compile a monthly monitoring summary report to be included in the MCR. If there are no monitoring activities, the summary report shall specify why monitoring has been suspended.

The CRS or alternate CRS shall report daily to the CPM on the status of the project's cultural resources-related activities, unless reducing or ending daily reporting is requested by the CRS and approved by the CPM.

In the event that the CRS believes that the current level of monitoring is not appropriate in certain locations, a letter or e-mail detailing the justification for changing the level of monitoring shall be provided to the CPM for review and approval prior to any change in the level of monitoring.

The CRS, at his or her discretion, or at the request of the CPM, may informally discuss cultural resources monitoring and mitigation activities with Energy Commission technical staff.

Cultural resources monitoring activities are the responsibility of the CRS. Any interference with monitoring activities, removal of a monitor from duties assigned by the CRS, or direction to a monitor to relocate monitoring activities by anyone other than the CRS shall be considered non-compliance with these conditions.

Upon becoming aware of any incidents of non-compliance with the conditions and/or applicable LORS, the CRS and/or the project owner shall notify the CPM by telephone or e-mail within 24 hours. The CRS shall also recommend corrective action to resolve the problem or achieve compliance with the conditions. When the issue is resolved, the CRS shall write a report describing the issue, the resolution of the issue, and the effectiveness of the resolution measures. This report shall be provided in the next MCR for the review of the CPM.

Verification: At least 30 days prior to the start of ground disturbance, the CPM will notify all Native Americans with whom the Energy Commission communicated during the project review of the date on which the project's ground disturbance will begin.

At least 30 days prior to the start of ground disturbance, the CPM will provide to the CRS an electronic copy of a form to be used as a daily monitoring log.

Monthly, while monitoring is on-going, the project owner shall include in each MCR a copy of the monthly summary report of cultural resources-related monitoring prepared by the CRS and shall attach any new DPR 523A forms completed for finds treated prescriptively, as specified in the CRMMP.

At least 24 hours prior to implementing a proposed change in monitoring level, the project owner shall submit to the CPM, for review and approval, a letter or e-mail (or some other form of communication acceptable to the CPM) detailing the CRS's justification for changing the monitoring level.

~~Daily, as long as no cultural resources are found, the CRS shall provide a statement that "no cultural resources over 50 years of age were discovered" to the CPM as an e-mail or in some other form of communication acceptable to the CPM.~~

~~At least 24 hours prior to reducing or ending daily reporting, the project owner shall submit to the CPM, for review and approval, a letter or e-mail (or some other form of communication acceptable to the CPM) detailing the CRS's justification for reducing or ending daily reporting.~~

CONDITION CUL-7

As stated in response to CUL-1, this condition should be modified to allow ground disturbance to continue in areas away from the site where a cultural resource is discovered. Given the size of the site, it is reasonable to allow ground disturbance to continue in areas away from the find.

In addition, this condition requires that the project owner assume responsibility for offsite "cultural resources beyond the project site boundaries" if flooding occurs that impacts those cultural resources. It is completely unreasonable for the project owner to assume responsibility for the impacts to unspecified off-site cultural resources from an act of nature, where no nexus has been established between the project and an impact. In addition, no sensitive resources have been identified downstream and the measure presents implementability and feasibility problems. This requirement should be deleted.

Proposed revisions to CUL-7 are as follows.

CUL-7 The project owner shall grant authority to halt ground disturbance <u>in the immediate vicinity of a find</u> to the CRS, alternate CRS, and the CRMs in the event of a cultural resources discovery. Redirection of ground disturbance shall be accomplished under the direction of the construction supervisor in accordance with the opinion of the CRS.

In the event that a cultural resource over 50 years of age is found (or if younger, determined exceptionally significant by the <u>CRS</u> ~~CPM~~), or impacts to such a resource can be anticipated, ground disturbance shall be halted or redirected in the immediate vicinity of the discovery sufficient to ensure that the resource is protected from further impacts. If the discovery includes human remains, the project owner shall comply with the requirements of Health and Human Safety Code § 7050.5(b) and shall additionally notify the CPM and the NAHC of the discovery of human remains. No action with respect to the disposition of human remains of Native American origin shall be initiated without direction from the CPM. Monitoring, including Native American monitoring, and daily reporting, as provided in other conditions, shall continue during the project's ground-

disturbing activities elsewhere, while the halting or redirection of ground disturbance in the vicinity of the discovery shall remain in effect until the CRS has visited the discovery, and all of the following have occurred:

1. The CRS has notified the project owner, and the CPM has been notified within 24 hours of the discovery, or by Monday morning if the cultural resources discovery occurs between 8:00 AM on Friday and 8:00 AM on Sunday morning. Notification shall include a description of the discovery (or changes in character or attributes), the action taken (i.e., work stoppage or redirection), reasoned recommendations of CRHR eligibility, and recommendations for appropriate regulatory treatment, whether or not, in any given case, a determination of CRHR eligibility has been made.
2. If the discovery would be of interest to Native Americans, the CRS has notified all Native American groups that have requested to be notified in the event of such a discovery within 24 hours of the discovery.
3. The CRS has completed field notes, measurements, and photography for a DPR 523 "Primary" form. Unless the find can be treated prescriptively, as specified in the CRMMP, the "Description" entry of the DPR 523 "Primary" form shall include a recommendation on the CRHR eligibility of the discovery. The project owner shall submit completed forms to the CPM.
4. The CRS, the project owner, and the CPM have conferred, and the CPM has concurred with any recommendations of eligibility made in relation to the discovery and approved the CRS's proposed treatment, if any, including the curation of the artifacts, or other appropriate treatment; and any necessary treatment has been completed. Ground disturbance may resume only with the approval of the CPM.

~~In the event that heavy rain should coincide with an incomplete or compromised project drainage system during construction, and flooding occurs that impacts cultural resources beyond the project site boundaries, the project owner shall treat such impacted cultural resources as discoveries under this condition of certification, and all provisions of this condition shall apply, with the exception of the requirement to halt construction in the vicinity of the discoveries.~~

Verification: At least 30 days prior to the start of ground disturbance, the project owner shall provide the CPM and CRS with a letter confirming that the CRS, alternate CRS, and CRMs have the authority to halt ground disturbance in the vicinity of a cultural resources discovery, and that the project owner shall ensure that the CRS notifies the CPM within 24 hours of a discovery, or by Monday morning if the cultural resources discovery occurs between 8:00 AM on Friday and 8:00 AM on Sunday morning.

Unless the discovery can be treated prescriptively, as specified in the CRMMP, completed DPR 523 forms for resources newly discovered during ground disturbance shall be submitted to the CPM for review and approval no later than 24 hours following the notification of the CPM, or 48 hours following the completion of data recordation/recovery, whichever the CRS decides is more appropriate for the subject cultural resource.

Within 48 hours of the discovery of a resource of interest to Native Americans, the project owner shall ensure that the CRS notifies all Native American groups that expressed a desire to be notified in the event of such a discovery, and the CRS must inform the CPM when the notifications are complete.

No later than 30 days following the discovery of any Native American cultural materials, the project owner shall submit to the CPM copies of the information transmittal letters sent to the chairpersons of the Native American tribes or groups who requested the information. Additionally, the project owner shall submit to the CPM copies of letters of transmittal for all subsequent responses to Native American requests for notification, consultation, and reports and records.

Within 15 days of receiving them, the project owner shall submit to the CPM copies of any comments or information provided by Native Americans in response to the project owner's transmittals of information.

CONDITION CUL-8

Changes to this condition were made to reflect CEC's jurisdiction in California and to clarify the survey requirements.

Proposed revisions to CUL-8 are as follows.

CUL-8 If fill soils necessary to the construction or operation of the California components of the project must be acquired from any non-commercial borrow site or disposed of at any non-commercial disposal site~~,~~ in California ~~or elsewhere~~, the project owner shall have the ~~CRS~~ a survey performed under the direction of the CRS of any such borrow or disposal site for cultural resources, including ethnographic and built-environment resources, and record on DPR 523 series forms, any resources found, unless the project owner is able to submit reports of the results of intensive-level pedestrian surveys completed less than five years prior to the anticipated use of any subject borrow or disposal site, which surveys cover the area to be impacted. ~~that document 100 percent coverage of the subject site.~~ The adequacy of the documentation of any prior survey is subject to the approval of the CPM.

Upon the completion of any new requisite survey, the project owner shall convey the results and the CRS's recommendations for further action to the CPM. The CPM, in consultation with the project owner, shall determine what, if any, further action may be required. If the CPM determines that significant archaeological resources that the project cannot avoid are present at the borrow or disposal site, other conditions, which may include the elimination of a proposed non-commercial borrow or disposal site from consideration, shall apply. The project owner shall have the CRS report on the methods and results of these surveys in the final CRR.

Verification: As soon as the project owner knows that a non-commercial borrow site or disposal site will be used, the owner shall notify the CRS and CPM, and provide documentation, for the approval of the CPM, of any relevant previous archaeological surveys completed less than five years prior to the anticipated use of any subject borrow or disposal site.

In the absence of documentation for any cultural resource surveys completed less than five years prior to the anticipated use of any subject borrow or disposal site, the CRS shall survey

any such borrow or disposal site for archaeological resources. Said survey shall occur at least 30 days prior to the disturbance of the ground on any such site. The project owner shall report the results of any cultural resources survey to the CPM, with recommendations for further action. The CPM, in consultation with the project owner and CRS, shall determine what subsequent action is warranted.

CONDITION CUL-9

CUL-9 requires that the Applicant fund a study of the OST-MR Northern Corridor by the OSTA as well as fund a follow up study by a "qualified historian" to "evaluate the eligibility" of all the tracks and traces found in the study (p. 4.3-143 to -144). To the extent the first study is only intended to relate to the project site, as indicated in the discussion on FSA page 4.3-117, that work has already been completed (Attachment DR 125-1). All tracks and trails on the project site have been identified, evaluated, ground-truthed and documented. To the extent it is intended to be broader, the requirement is indefensibly vague and lacking nexus to the project impacts. Nor is the OSTA an entity professionally qualified to conduct this type of study. As written, this mitigation measure would require ground-truthing, investigation, analysis, and documentation of a study that examines all potential tracks and traces of the entire Pahrump Valley. Such a study could take several years and cost several million dollars, and to delay ground disturbance until the study has been completed is unnecessarily burdensome on the project owner. Moreover, even if the Applicant were to agree to this type of study, it is completely unreasonable for this condition to not allow ground disturbance to occur prior to any such study, as all tracks/trails on site have been thoroughly evaluated and documented (Attachment DR 125-1).

As discussed above, basing a potential eligibility determination on lack of information and conjecture, as was done in the FSA, is bad science and poor cultural resources management, and requiring the Applicant to develop the actual science after making the finding is impermissible.

Therefore, CUL-9 should be deleted in its entirety.

CONDITION CUL-10

CUL-10 should be replaced in its entirety with the following text because:

1. The Pahrump Mesquite Metapatch Woodland Coppice Dune Archeological Landscape is not a CRHR-eligible resource and therefore no mitigation is necessary.
2. The construction of a complex interpretive center as mitigation is not commensurate with the level of the impact the project has on the OST-MR. This said, the Applicant agrees that the construction of kiosks is consistent with the objectives set forth in the Nevada OST-MR Historic District NRHP nomination form, which states:

   > *"The Old Spanish Trail/Mormon Road Historic District is an ideal resource for interpretation. Because of its linear nature, pedestrians and bicyclists would greatly benefit from appropriately-placed information kiosks, interpretive signage, historical markers, etc."*

3. There are no CHRH-eligible ethnographic landscapes identified; even if the Salt Song Trail were to be considered as a landscape, there is no evidence that the project has a significant adverse impact. (See Testimony from Lynne Sebastian, PhD.)Nonetheless, the Applicant supports providing additional information on the Piaute culture and, notwithstanding the lack of nexus, agrees to provide a kiosk interpreting the Native American use of the landscape and the Salt Song practices.
4. The verification measures are proposed to align with those in VIS-6 for consistency

Proposed revisions to CUL-10 are as follows.

CUL-10 The project owner agrees to ~~shall negotiate,~~ design, plan, and cause to be built two interpretive kiosks, ~~staff, and maintain the infrastructure, and architectural and interior improvements necessary to~~ implementing interpretive and preservation objectives, as follows: ~~that will reduce the project's significant and feasibly unmitigable effects to the Pahrump Metapatch Mesquite Woodland-Coppice Dune Archaeological Landscape, the Pahrump Paiute Home Landscape, the Ma-hav Landscape, and the Old Spanish Trail-Mormon Road Northern Corridor in Pahrump Valley. The interpretive and preservation objectives that the project owner shall implement include, at a minimum:~~

- Kiosk 1: The construction ~~and maintenance~~ of an interpretive kiosk ~~within one hundred yards of the facility site~~ that presents broad overviews of the ~~Pahrump Metapatch Mesquite Woodland-Coppice Dune Archaeological Landscape, the Pahrump Paiute Home Landscape, the Ma-hav Landscape, and the~~ Old Spanish Trail/Mormon Road Historic District. ~~Northern Corridor along with information on the nearby interpretive facilities where the public shall be able to access more in-depth interpretive programs for each resource.~~ The presentation of the overviews and the delivery of information ~~on nearby interpretive facilities~~ could occur in conjunction with the implementation of **VIS-6.**~~, as long as the implementation of that condition occurred within the specified distance from the facility site.~~

- Kiosk 2: The construction of an interpretive kiosk that facilitates interpretation of the Native American use of the local landscape in the prehistoric and ethnographic periods, including the Salt Song trail practices.

  ~~The delivery of passive museum displays and multi-media presentations, *and* hands-on, interactive exhibits, at extant interpretive facilities in Pahrump or adjacent valleys, the primary purposes of which shall be to facilitate the interpretation of the cultural landscapes and corridor, and visual resources. The specific interpretive modes shall include, at a minimum, the development and delivery of accessible[1], separate displays, presentations, *and* exhibits, of museum quality[2], for the following topics:~~

  - ~~the genesis, paleoecology, and archaeology of the Pahrump Metapatch Mesquite Woodland-Coppice Dune Archaeological Landscape,~~
  - ~~the seasonal subsistence cycle of the Pahrump Paiute Tribe, and~~
  - ~~the Old Spanish Trail-Mormon Road Northern Corridor.~~

~~The interpretation of each of the above topic and subtopic areas shall facilitate separate consideration of the chronologic phases and sociocultural themes relevant to each such area. The planning, development, maintenance, and~~

~~[1] "accessible" shall be herein defined as comporting with the *Smithsonian Guidelines for Accessible Exhibition Design* (http://accessible.si.edu/pdf/Smithsonian%20Guidelines%20for%20accessible%20design.pdf)~~

~~[2] "museum quality" shall be herein defined as comporting with the *Standards for Museum Exhibitions and Indicators of Excellence* as developed by the Standing Professional Committees Council of the American Association of Museums (http://name-aam.org/about/past-winners/standards-for-museum-exhibitions)~~

periodic renewal of these modes shall be done in consultation with stakeholders that actively participated in the consultation process conducted in conjunction with the review of the project owner's application for certification for this project.

- The delivery of ethnographic reconstructions,[3] at an extant interpretive facility in Pahrump or adjacent valleys, the purpose of which shall be to facilitate the interpretation of the Native American use of the local landscape in the prehistoric and ethnographic periods. The specific interpretive modes shall include, at a minimum:
  - Native American installation and maintenance of an aboriginal horticultural garden reliant on natural spring water to the extent feasible, for public interpretation, and
  - the conjunctive Native American installation and maintenance, of an exploratory reconstructed village consisting of a few replica dwellings that allow public access to walk in, about, and through the village and garden area. Providing direct visitor access to a real garden, featuring native garden varietals, such as pumpkins, beans, and corn, set near the interpretive materials provided per item 2, above, will greatly enhance the visitor education experience beyond what passive interpretive materials would solely provide.

The planning, development, maintenance, and periodic renewal of these modes shall be done in consultation with representatives of the Native American communities that actively participated in the consultation process conducted in conjunction with the review of the project owner's application for certification for this project.

The project owner shall conduct each phase of the implementation of this condition in consultation with stakeholders who formally respond to the project owner's formal invitation to participate in such consultation, and shall also be able to provide evidence, to the satisfaction of the CPM, of all resultant consultation. At a minimum, the stakeholders should include, in addition to representatives of the hosting interpretive facilities, the Pahrump Paiute Tribe, the Old Spanish Trail Association, the Armagosa Conservancy, a representative of each municipality or county government in whose jurisdiction a hosting interpretive facility falls.

The CPM, in consultation with the California and Nevada Bureau of Land Management, will provide active and discretionary oversight to ensure that the negotiated venues for the delivery of the mitigation objectives, the design of the delivery modes, the environmental planning for those modes, and actual mode delivery, maintenance, and efforts of periodic renewal are consistent with the intent of this condition.

[3] "museum quality" shall be herein defined as comporting with the *Standards for Museum Exhibitions and Indicators of Excellence* as developed by the Standing Professional Committees Council of the American Association of Museums (http://name-aam.org/about/past-winners/standards-for-museum-exhibitions)

Verification: At least 120 days prior to the start of commercial operations, the project owner will provide a draft conceptual plan for the interpretive kiosk to the Old Spanish Trail Association with respect to Kiosk 1, and to the Pahrump Paiute with respect to Kiosk 2, for review and comment, and to the CPM for review and approval. Following CPM approval of the conceptual plan, detailed plans for the interpretive kiosk shall be submitted to the CPM for review and approval. The interpretative kiosks will be installed within 90 days after commercial operation of the HHSEGS or in conjunction with VIS-6 if located on the project site. The project owner shall notify the CPM within seven days after completing installation of the interpretive kiosks that the site is ready for inspection. ~~No later than 12 months after the CPM's issuance of the notice to proceed for the project, the project owner shall conclude negotiations with the facilities that will host the delivery of the mitigation objectives for **CUL-10**. The project owner shall submit, for CPM for review and approval, a report of these negotiations and their respective outcomes, and shall further include, as appendices, formal correspondence from each host facility that specifies precisely what mitigation objectives that the facility has agreed to host, the period of time for which the facility has agreed to host them, and any conditions that the host facility has placed on their agreement with the project owner.~~

~~No later than 6 months after the CPM's issuance of the notice to proceed for the project, the project owner shall submit, for CPM for review and approval, a draft consultation protocol that sets out the precise manner in which the project owner intends to interact with the stakeholders whose input the project owner shall seek as the project owner negotiates, designs, plans, constructs, and maintains the delivery modes for the mitigation objectives of this condition. The minimum stakeholder group shall include, to the extent feasible, representatives of the hosting interpretive facilities, the Pahrump Paiute Tribe, the Old Spanish Trail Association, the Armagosa Conservancy, a representative of each municipality or county government in whose jurisdiction a hosting interpretive facility falls. The draft protocol shall include, as appendices, proofs of contact for each of the above members of the minimum stakeholders group and any additional potential stakeholders with whom the project owner has made contact, and an initial stakeholder list.~~

~~No later than 18 months after the CPM's issuance of the notice to proceed for the project, the project owner shall submit, for CPM for review and approval, a draft, host facility-approved, initial design proposal for each delivery venue for each mitigation objective in this condition.~~

~~No later than 24 months after the CPM's issuance of the notice to proceed for the project, the project owner shall submit, for CPM for review and approval, the host facility-approved, final design for each delivery venue for each mitigation objective in this condition.~~

~~No later than 30 months after the CPM's issuance of the notice to proceed for the project, the project owner shall initiate construction or installation of each delivery venue for each mitigation objective in the approved final designs.~~

~~No later than 36 months after the CPM's issuance of the notice to proceed for the project, the project owner shall ensure, and provide the CPM evidence, that each delivery venue for each mitigation objective in the approved final designs is in full operation.~~

~~For the operational life of the project, through project decommissioning, the project owner shall provide evidence in the annual compliance report for the project that each delivery~~

~~venue for each mitigation objective in the approved final designs continues to be maintained.~~

CONDITION CUL-11

CUL-11 would require the Applicant to "design and implement a program of primary research on the geology, geomorphology, hydrology, ecology and archaeology" of the Pahrump Metapatch (p. 4.3-148). As discussed in the comments above, Staff does not have substantial evidence to support its finding of "assumed eligibility", and appears to have disregarded what information that has been provided on this resource (e.g. Data Response Set 1D-7, May 17, 2012. Data Response 105 [Exhibit 27]). In essence, therefore, Staff asks the Commission to require as mitigation that the Applicant develop the research to investigate whether the resource is in fact eligible. CEQA determinations must be supported by substantial evidence in the record and such evidence cannot be conjecture or assumptions. Mitigation intended to prove an impact that the FSA does not have the facts to support is not constitutional; therefore CUL-11 has been deleted.

Therefore, CUL-11 should be deleted in its entirety.

Cultural Resources–Ethnographic Landscapes

I. Introduction

A. Names: Lynne Sebastian, Ph.D., RPA

B. Qualifications: The witness' qualifications are as noted in the resume contained in Appendix A.

C. Attachments:

- Salt Song Trail Map (Enth-1)
- Approximate Extent of Pahrump Paiute Home Landscape (Enth-2)
- Ma-hav Landscape (Enth-3)

To the best of my knowledge, all of the facts contained in this testimony (including all referenced documents) are true and correct. To the extent this testimony contains opinions, such opinions are my own. I make these statements, and render these opinions freely and under oath for the purpose of constituting sworn testimony in this proceeding.

II. Summary of Testimony

Ethnographic Landscapes and the Hidden Hills Solar Electric Generating System

Subject of Report

I have been asked to provide background on the topic of "ethnographic landscapes" as historic properties potentially eligible to the California Register of Historic Resources (referred to here as the "CRHR" or "California Register") and the National Register of Historic Places (referred to here as the "NRHP" or "National Register"). I have further been asked to form opinions as to the significance and integrity of three such landscapes that have been identified as potentially affected by BrightSource Energy's proposed Hidden Hills Solar Electric Generating System (HHSEGS) project. Finally, I have been asked to offer opinions about the California Energy Commission Final Staff Assessment ("FSA") concerning effects of the HHSEGS project on the three ethnographic landscapes and the appropriateness of the mitigation measures that the staff has proposed.

In preparing this report I have relied upon the *Hidden Hills Solar Generating System Ethnographic Report* by Thomas Gates (Gates 2012; Docket Number 11-AFC-2), the Cultural Resources section of the FSA for HHSEGS (FSA 2012; Docket Number 11-AFC-02), and various guidance documents for the CRHR and NRHP. See **References Cited** section below for full references for all examined and cited materials.

Statement of Qualifications

I hold a Ph.D. in Anthropology from the University of New Mexico and have, since 1990, been an adjunct member of the Department of Anthropology, currently holding the rank of Adjunct Associate Professor. I have been employed in the field of cultural resource management for nearly 35 years: 8 years as an archaeological consultant, 10 years as the Deputy State Historic Preservation Officer for New Mexico (holding the joint title of State Archaeologist for 6 of those years), 2 years as New Mexico State Historic Preservation Officer, and 14 years as a private sector historic

preservation consultant. Since 2002 I have been Director of Historic Preservation Programs at the SRI Foundation.

I am a nationally recognized expert on compliance with historic preservation laws. I teach continuing professional education workshops on Section 106 of the National Historic Preservation Act for federal and state agencies, private industry clients, and Indian tribes. I am a contract instructor for the National Highway Institute (NHI) Beyond Compliance course, a 3-day intensive workshop on integrating NEPA, Section 106, and Section 4(f). I have taught historic preservation and cultural resource management at the university level, and I advise agency and private industry clients on historic preservation issues. I have served as an expert witness on cultural resource and historic preservation issues for numerous legal proceedings. My California experience includes teaching the NHI course on compliance with federal historic preservation laws for the California Department of Transportation, serving as an expert on National Register eligibility and effects on historic properties for permit hearings for a proposed gravel quarrying project in Riverside County, and a current project on modeling archaeological site significance for the U.S. Navy at San Clemente Island.

I am a past president of the Society for American Archaeology and currently serve as President of the Register of Professional Archaeologists. I have published widely on archaeology, historic preservation, preservation laws, Section 106, and traditional cultural properties. A copy of my curriculum vitae appears as Appendix A of this report.

Ethnographic Landscapes as Historic Properties

The following discussion focuses on concepts and guidance from the National Register of Historic Places even though the relevant authority in this case is the California Register of Historic Resources. The California Register was modeled very closely on the National Register, using virtually identical concepts and language. The major difference between the two registers is that the CRHR covers properties physically located in California. Other differences between the two Registers are so minor that the California Office of Historic Preservation (n.d.) Technical Assistance Series document that provides users with a comparison and assessment of the differences (TAS #6) is only 6 pages long. Moreover, there is no guidance for evaluating historic landscapes, ethnographic or otherwise, for listing on the CRHR. The only California-specific guidance of which I am aware is General Guidelines for Identifying and Evaluating Historic Landscapes (Clement 1999) which was prepared by the California Department of Transportation. The CALTRALNS document, like the following discussion, is entirely based on NRHP guidance.

In the 1980s and 1990s, on the national front there was a growing interest among land managers and preservationists in preserving historic landscapes (or cultural landscapes – the two terms are use somewhat interchangeably). In response to this interest, the National Park Service (NPS) produced a number of guidance documents in the late 1980s and 1990s on identifying, evaluating, registering, and managing these properties. The first of these (Keller and Keller 1987) was Bulletin 18, *How to Evaluate and Nominate Designed Historic Landscapes,* which addresses consciously designed properties such as parks, gardens, estates, plazas, village greens, and campuses. Two years later, the NRHP published Bulletin 30, *Guidelines for Evaluating and Documenting Rural Historic Landscapes* (McClelland et al. 1989).

Bulletin 30 defines a rural historic landscape as a historic site or district that is a geographical area historically "used by people or shaped or modified by human activities, occupancy, or intervention, and that possesses a significant concentration, linkage, or continuity of areas of land use, vegetation, buildings and structures, roads and waterways, and natural features" (McClelland et al. 1989:1-2). The NRHP defines and identifies rural historic landscapes largely in terms of evidence of

human modifications or "landscape characteristics." These landscape characteristics are defined as "the tangible evidence of the activities and habits of the people who occupied, developed, used, and shaped the land to serve human needs" (1989:3).

After noting the characteristics that distinguish rural historic landscapes from designed historic landscapes, the bulletin says:

> The properties discussed in this bulletin possess tangible features, called landscape characteristics, that have resulted from historic human use. In this way, they also differ from natural areas that embody important cultural values but have experienced little modification, such as sites having religious meaning for Native American groups. (1989:2)

The bulletin then refers the reader to NRHP Bulletin 38 (discussed below) for guidance on such properties.

The first use of the term "ethnographic landscape" that I have come across is in a 1991 issue of the NPS publication CRM, devoted entirely to the topic of cultural landscapes. This publication includes an article entitled "Canyon de Chelly – An Ethnographic Landscape" by NPS landscape architect Jill Cowley. Cowley writes "An ethnographic landscape can be thought of as a landscape as seen through the eyes of a specific culture, or the combination of several specific cultures" (1991:10). She goes on to describe such landscapes using language taken almost verbatim from NRHP Bulletin 38 (Parker and King 1990) Guidelines for Evaluating and Documenting Traditional Cultural Properties:

> The ethnographic landscape is associated with cultural practices or beliefs of a living community that are rooted in the history of the community, and that are important in maintaining the continuing cultural identity of the community. (Cowley1991:10)

Subsequent guidance from the NPS Preservation Assistance Division – Preservation Brief 36 Protecting Cultural Landscapes: Planning, Treatment and Management of Historic Landscapes (Birnbaum 1994) – and its successor the Heritage Preservation Services Division – Guidelines for the Treatment of Cultural Landscapes (Birnbaum 1996) – introduces the concept of "ethnographic landscapes" as a specific type of historic property. Both documents describe "cultural landscapes" as a category of historic sites and districts comprising four subcategories: historic designed landscapes, historic vernacular landscapes, historic sites, and ethnographic landscapes. Both documents provide the following definition of an ethnographic landscape:

> a landscape containing a variety of natural and cultural resources that associated people define as heritage resources. Examples are contemporary settlements, sacred religious sites, and massive geological structures. Small plant communities, animals, subsistence and ceremonial grounds are often components. (Birnbaum 1994:2; 1996:4)

Beyond these definitions and examples there is no discussion or guidance concerning ethnographic landscapes available from either the NRHP or the NPS Heritage Preservation Services.

The references to NRHP Bulletin 38 in both the Crowley (1991) article and in Bulletin 30 would lead one to expect that Bulletin 38, the NRHP guidance on traditional cultural properties, would provide guidance on identifying and evaluating ethnographic landscapes in the same way that Bulletins 18

and 30 provide guidance on designed and vernacular historic landscapes, but that is not the case. In fact, Bulletin 38 only uses the word "landscape" four times. The first instance simply notes that landscapes are type of property that may be included in the NRHP. The second instance notes that a culturally significant natural landscape may be classified as a "site" for NRHP purposes "as long as it was the location of a significant event or activity, regardless of whether the event or activity left any evidence of its occurrence" (Parker and King 1990:16). The other two instances simply use the word "landscape" in the ordinary sense of meaning the local terrain or surround countryside.

In the 20-plus years since the publication of Bulletin 38, many traditional cultural properties have been evaluated for eligibility to the NRHP as part of federal agency compliance with Section 106 of the National Historic Preservation Act, and a few such properties have been actually listed on the National Register. Some of the properties evaluated have been large – the Zuni Salt Lake Sanctuary District, found eligible by the Keeper of the National Register in a formal determination, encompasses more than 200 square miles. Others, like El Tiradito, the wishing shrine in Tucson, Arizona, are very small. Some, like systems of taro fields in Hawaii or Etowah Mound in Georgia are human-constructed features, but many are unmodified natural features. Of these, some, like Tecate Peak in San Diego County California or Tomé Hill in New Mexico, have religious associations. Others, like wild rice-gathering areas in Minnesota or tule-gathering areas in northern California, have subsistence and economic associations.

Regardless of their size or nature, regardless of their cultural affiliation, however, *all* of the evaluated and listed properties that I know about are specific locations and have specific and important historical associations, usually with important events or persons. In recent years, there have been a number of cases where the entire traditional territories of Indian tribes, areas encompassing thousands of square miles, have been proposed as "ethnographic landscapes," historic sites or districts eligible to the NRHP. While it is unquestionably true that events important in the history of the tribe happened and people important in the history of the tribe lived and filled important roles in the history of the tribe within these regions, it is questionable whether the NRHP ever intended to recognize entire regions or traditional homelands as historic properties under the rubric of "ethnographic landscapes."

If this were the case, the entire state of Utah plus portions of southern Idaho, northern Arizona, eastern Nevada, and western Colorado could be listed on the National Register as a historic site associated with the establishment and growth of the Church of Jesus Christ of Latter Day Saints. While technically true, this approach to recognizing the social, cultural, religious, and economic history of the Mormon culture would not be particularly useful either in the NRHP's role as "the nation's official list of historic places worthy of preservation" or in its role as a planning tool for federal agencies and state and local governments trying to find a balance between historic preservation concerns and the needs of modern life and development.

The federal Advisory Council on Historic Preservation has put forward an action plan (ACHP 2011) for addressing concerns about these large-scale properties. In this plan, the ACHP states:

> NPS should issue additional guidance on how to apply the National Register criteria to these historic properties. The guidance should define "traditional cultural landscapes" as they relate to Indian tribes or Native Hawaiian organizations. It should also address what constitutes adequate documentation; how to protect sensitive and confidential Native American cultural knowledge and information;

> and the role of traditional cultural knowledge in making determinations of eligibility.
>
> NPS should update National Register Bulletin 38: *Guidelines for Evaluating and Documenting Traditional Cultural Properties* to clarify how this guidance applies to historic properties of religious and cultural significance to Indian tribes and Native Hawaiian organizations. NPS should also explore how guidance regarding Native American traditional cultural landscapes might inform the treatment of large historic properties or landscapes of significance to non-Native communities.

Although the NRHP is now in the process of revising Bulletin 38, there is currently no available guidance on the subject of ethnographic landscapes beyond what has been reviewed above.

In the absence of guidance specific to ethnographic landscapes, the following evaluation of the arguments for CRHR eligibility for the three ethnographic landscapes identified as potentially affected by the HHSEGS depends on the historic rural landscapes bulletin (NRHP Bulletin 30), the current version of Bulletin 38, and the general NRHP Bulletin 15: How to Apply the National Register Criteria for Evaluation (National Park Service 1997).

Assessing the Identified Ethnographic Landscapes

In order for a place to be eligible to the NRHP or CRHR, it must meet several requirements. First, it must be a property, that is, it must be a physical, specifically identifiable location. Activities, beliefs, performances, ceremonies, artistic expressions, and so forth are very important parts of our various and shared cultures, but they cannot be eligible for or listed on either register.

Second, to be eligible for listing a property must meet one or more of four criteria:

- it must have a specific and important association with an important historic event or pattern of events or
- have a specific and important association with a historically important personage or
- be an strong example of particular intrinsic qualities of style or time period or construction or aesthetics or
- have the potential to yield important information about the past

Third, generally though not always, a property must be at least 50 years old. All three of the proposed ethnographic landscapes would more than meet that requirement.

Finally, a property must have sufficient integrity to convey its historical significance. The qualities of integrity of an historic property, as described by the California and National Registers, are location, design, setting, materials, workmanship, feeling and association. The first five are qualities of the property and its location; the final two are subjective qualities that depend on the perceptions of an observer.

In the following sections I will assess each of the identified ethnographic landscapes in terms of the NRHP and CRHR requirements and then evaluate the FSA of the impact of the HHSEGS on these three proposed historic properties.

Salt Song Landscape

The Salt Song Landscape, as identified in the ethnographic report (Gates 2012), comprises the places named in the Salt Trail songs, a shared tradition among Southern Paiute bands. Gates quotes a tribal consultant as saying, "the song is about travel from place to place, naming everything that they saw [redaction] Each place they stopped has its own story and named as you go along [redaction] This song describes where to go and then how to get there and what to do. Paiute people travel on these trails physically across the land, mentally in a dream state, and spiritually after death" (Gates 2012:70).

The Salt Song ceremony is performed as part of mourning rituals. During the ceremony, singers sing a multisong cycle, which lasts from sunset to sunrise, and which is intended to assist the deceased in completing his or her sacred journey. As the singers name and sing the stories of the various places on this large landscape, the spirit of the deceased is able to move through those places, arriving at *Nuva Kiav* (Mt. Charleston northwest of Las Vegas) and crossing over into the afterlife (Gates 2012:74).

Is It a Property?

The Salt Song names actual places that are identifiable on the ground. According to the map provided in the ethnographic report (Figure 7; a more readable version shown as Figure 2 in FSA [2012] is attached here for reference as Appendix B), these named places occur throughout a region stretching from the Chocolate Mountains near Yuma, Arizona on the south to near Richfield, Utah on the north and from near Tuba City, Arizona on the east to the Tehachapi Mountains on the western edge of the Mojave Desert on the west.

The ethnographic report describes the Salt Song Landscape as if it were a single vast historic site or district encompassing large parts of four states. The argument is made that all of the culturally significant plants and animals, all of the water sources, all of the trails, indeed, all physical places within this immense area are part of its significance. One of the tribal consultants says, "Various places and geographic features are covered, but that does not mean that a song has less significance for a particular area because a place is not mentioned in a song" (Gates 2012:72). While this is undoubtedly a clear reflection of the world view of the tribes, it is overbroad and not supportable as a way of defining a property that may be eligible for listing on the NRHP or the CRHR. Neither is this generalized approach useful for agencies that are dependent on register eligibility as a planning tool for assessing the effects of specific projects on specific nearby historic places.

Given the importance of the Salt Songs in Southern Paiute beliefs and cultural practices and the strong link between those beliefs and practices and physical places in Nevada, Arizona, Utah, and California, it would certainly be possible to identify and document a NRHP eligible historic property comprising the specific places associated with the Salt Song ceremony. Because of the vast distances between the named Salt Song places and the relatively defined and compact scale of the named places that would be contributing features to such a historic property, some sort of thematic or multiple property format would probably be the most appropriate approach. In order to be useful as a planning tool, however, any approach to recognizing the historical significance of the Salt Song Trail must include the identification of specific places with definable boundaries so that effects can reasonably be assessed.

Does This Property Meet Any of the Significance Criteria?

The ethnographic report concludes in a very generalized manner that the Salt Song Landscape is eligible under CRHR Criterion 1 (NRHP Criterion A) for:

> its broad contributions to the unique historic events that shape Southern Paiute understanding of the landscape, its mapping through song and movement and the conveyance of the deep oral tradition through the generations for the unborn, living and deceased. (Gates 2012:84)

Without question, performance of the Salt Song ceremony constitutes an important long-term pattern of events for Paiute people, and the physical places actually named in the songs and visited, in a metaphysical sense, by the singers and the spirits of deceased Paiute people during the ceremony have a specific and important association with that long-term pattern of events. Only places named in the Salt Song cycle, however, would constitute a historic property or set of properties eligible to the CRHR under Criterion 1 (Criterion A for the NRHP). As discussed further below, the ethnographic report (Gates 2012) does not identify any such individual, specific places on or near the HHSEGS site (Gates 2012). The vast expanses of territory between the named places do not have a *specific* association with this long-term pattern of ceremonial activities. Likewise, the plants and animals named in the Salt Songs, though important, occur widely throughout the arid West, and cannot be considered contributing properties unless they are specifically related to definable properties.

The argument is made in the ethnographic report that the landscape is eligible not only under Criterion 1, but under Criterion 3 (NRHP Criterion C) as well, "for its contributions to the production of the salt songs for which, without the salt songs, the high artistic value of the songs would fall flat" (Gates 2012:84). This is an interesting attempted use of one aspect of NRHP Criterion C – a property that possesses high artistic values – but ultimately it does not match the concept articulated in NRHP Bulletin 15: "A property is eligible for its high artistic values if it so fully articulates a particular concept of design that it expresses an aesthetic ideal" (National Park Service1997:20). This aspect of Criterion 3 (Criterion C) applies to the design qualities of physical places.

Does This Property Have Sufficient Integrity to Convey Its Significance?

National Register Bulletin 38, *Guidelines for Evaluating and Documenting Traditional Cultural Properties,* makes it clear that integrity for traditional cultural properties has to do with maintaining the integral relationship between the place and the traditional cultural practices or beliefs as these are recognized by the traditional community (Parker and King 1990:10). The ethnographic report for HHSEGS notes, "The Salt Song Landscape has been visually and physically compromised by significant modern developments such as the presence of numerous large cities, towns, military installations, energy generating facilities, mining infrastructure, and other infrastructure such as transportation and transmission corridors" (Gates 2012:85). Despite all of this modern intrusion, however, the report goes on to say that in the view of the Southern Paiute traditional practitioners, "The Salt Song Landscapes maintain integrity of Association, Feeling, Setting, and Location" (Gates 2012:85).

This assessment of the integrity of the Salt Song Landscape illustrates one of the problems with identifying the whole multistate region containing places named in the Salt Songs as a single "ethnographic landscape." The scale of this proposed landscape is so great that, according to the ethnographic study, the integrity of setting, feeling, and association are intact, despite huge amounts of modern development. For this reason, classifying the whole multistate region as an "historic property" renders this construct largely useless as a historic preservation planning tool.

The planning function of identifying and evaluating properties for NRHP or CRHR eligibility is, ultimately, to determine whether a proposed development project will "adversely affect," that is

substantially diminish the integrity of, any eligible or listed historic properties. If even something as massively intrusive as Las Vegas has not substantially impaired the proposed Salt Song Landscape's integrity, how could it be argued that ***any*** planned development project, even a large one, would cause a substantial diminishment to the integrity of this property? And more to the point here, it is difficult to image how a project the size and scale of HHSEGS could *significantly* impact a property of the proposed size and scale of the Salt Song Landscape, especially given that this "property's" integrity is considered intact despite enormously more massive intrusions.

Will the HHSEGS Substantially Diminish the Integrity of this Property?

The map provided as Figure 7 in the ethnographic report is difficult to read, but it does not appear that any of the named places identified on the map are within or adjacent to the project area. The map notes that from *Nuva Kiav* (Mt. Charleston) the Salt Song trail goes west "through mountain passes to the Pacific Ocean." The text of the report does not indicate that any of the named landmarks shown on the map are within or adjacent to the project area, although it says that "the Salt Songs cross, reverberate and provide passage for deceased Southern Paiute in the vicinity of Pahrump Valley including the project site" (Gates 2012:74).

The FSA (FSA 2012:4.3-100), however, says specifically that the Salt Song Landscape is a linear corridor that totally encompasses the project area. There is no indication as to the basis for this statement. The ethnographic report describes trails as "a path on the ground, a corridor on and above the ground, and an auditory soundscape" (Gates 2012:Table 8) and says of the Salt Song Landscape that its "boundaries permeate the Pahrump Valley, and surrounding mountain ranges that collectively form the Pahrump Valley," adding that "the Salt Song landscape is ubiquitous throughout, saturates and exceeds the Project Area" (Gates 2012:81). It is difficult to interpret what "permeate" and "saturate" are intended to convey, but the ethnographic report does not refer in any way to a Salt Song "trail corridor" passing through the project area.

Since we are given no indication as to the basis for the FSA statement concerning a Salt Song "trail corridor" much less any information about the location or scale of this corridor, it is impossible to assess either the integrity of this feature or the potential effects of the HHSEGS on it. The Salt Song Landscape is simply described as "encompassing" the project area. Thus, as noted above, if the Salt Song Landscape is viewed as a single enormous, multistate entity, apparently no impact would be great enough to diminish the overall integrity of this "historic property," and therefore there would be no significant impact from HHSEGS on the Salt Song Landscape *as a whole*. If we were to define, instead, an actual corridor, rather than an "imbued" landscape, then we could assess the effect of the project on that specific historic property. It is impossible, however, to say what the outcome would be in the absence of any information about the reputed trail corridor. Without knowing at least its location, boundaries, and scale, it is impossible to assess the nature of the effects on this reported Salt Song associated "corridor" feature.

A number of metaphysical and spiritual concerns are expressed in the ethnographic report and should be considered, but these are not issues having to do with the historical integrity of this property. As noted earlier, the California and National Registers are intended to address the identification and evaluation of physical places. When register eligibility is used as a planning tool to assess impacts on historic places, those impacts have to do with alterations in the physical integrity of these places.

Pahrump Paiute Home Landscape

The ethnographic report (Gates 2012:77) says that the Pahrump Paiute Home Landscape "ensues from and radiates out from and around the Spring Mountains" and suggests that it covers an area

"slightly larger than the area encircled by Chief Tecopa's 1873 homeland journey," a map of which is provided as Figure 4 of the ethnographic report. The report says that the contributing attributes or elements of the landscape are water, plants, animals, horticultural gardens, trails, landforms and religious practices and provides list of these in Table 9 of the report.

The report notes that no attempt was made to define specific boundaries for this proposed historic property, stating that it is not necessary to do so (Gates 2012:77). The report concludes, however, that "the boundaries permeate the Pahrump Valley, and surrounding mountain ranges that collectively form the Pahrump Valley. The Pahrump Paiute Home Landscape is ubiquitous throughout, saturates and exceeds the Project Area" (Gates 2012:81).

The Pahrump Paiute Home Landscape is described as consisting of numerous component landscape areas with multiple contributing attributes, but the report notes that no attempt will be made to describe or delineate these components. The report goes on to say that "one component landscape, the Ma-hav Landscape is fully described and delineated" elsewhere in the report (Gates 2012:77).

Is It a Property?

Despite the lack of defined boundaries, the proposed Pahrump Paiute Home Landscape is clearly a physical place. It is described in the ethnographic report as "extending from the western side of the Spring Mountain Range and including Pahrump Valley, Last Chance Range, No Pah Range and the Kingston Mountains and areas further to the north, west and south" (2112:81). The author again refers the reader to Figure 4 of the report (attached here as Appendix C for reference) for "a general sense of some of the area mentioned" (2112:81).

Does This Property Meet any of the Significance Criteria?

The ethnographic report says "the period of significance for the Pahrump Paiute Home Landscape spans from the time of Coyote's creation of Southern Paiute up to the Present. From an archaeological perspective the earliest dates would liberally be sometime between 10,000 Before Present to the ethnographic present" (Gates 2012:83). It goes on to say,

> This landscape is eligible under criteria 1 at the regional level for the broad contributions to the unique historic events that shape Pahrump understanding of their homeland and their ongoing traditions and history that have allowed them to survive, and during particular periods of their existence, flourish in a place that many non-Pahrump would consider harsh, inhospitable, or vastly in need of improvements. (Gates 2012:84)

What the ethnographic report proposes is, in essence, that the entire traditional territory of the Pahrump Paiute is eligible to the CRHR and NRHP because all of the things that Pahrump Paiute people have done and experienced since the beginning of time have happened in this geographical area.

While it may be true that the entire history of the Pahrump Paiute people has played out within the described geographical area, that does not qualify the entire traditional territory for eligibility to the CRHR or the NRHP. CRHR Criterion 1 (NRHP Criterion A) requires association with a *specific* and *important* event or pattern of events, ***and*** it requires that the association with the event or pattern of events be both *important* and *specific*. The logical extreme of the argument presented in the ethnographic report would be that all lands within the boundaries of the United States constitute an enormous register-eligible historic property because the whole history of the country has taken

place within this portion of the surface of the earth. This is unarguably true while being completely without utility, either as a way of identifying "places from our past worthy of preservation" or as a mechanism for making planning decisions about the potential effects of development projects.

The ethnographic report also says that the Pahrump Paiute Home Landscape is eligible to the CRHR under Criterion 2 (NRHP Criterion B) "for its association with the life and times of Chief Tecopa the first Pahrump Paiute chief that withstood, translated and guided his people through the pressures of a rapidly changing world brought on by the intrusions of other cultures" (Gates 2012:84). Certainly Chief Tecopa meets the requirement of Criterion 2/Criterion B that an eligible historic property must be associated with an individual whose specific contributions to history can be identified and documented. And undoubtedly there are a number of identifiable places within the Pahrump Paiute traditional territory that have important and specific associations with Chief Tecopa. But the entire traditional territory cannot be demonstrated to have the requisite specific and important association.

Does This Property Have Sufficient Integrity to Convey Its Significance?

As NRHP Bulletin 15, *How to Apply the National Register Criteria for Evaluation*, makes clear, the decision about integrity of a historic property has to come after and be based upon the decisions about its significance relative to the criteria of eligibility. As the Section on evaluating integrity says, "Integrity is based on significance: why, where, and when a property is important. Only after significance is fully established can you proceed to the issue of integrity" (National Park Service 1997:45).

It is very likely that a number of historic properties significant under some or all of the criteria of eligibility for the CRHR and NRHP exist within the Pahrump Paiute traditional territory, and these properties could be identified, evaluated, nominated, and listed, if the tribe so wished. General statements that the history of the Pahrump people took place within this large landscape or that Chief Tecopa lived and carried out activities that contributed to history within this large landscape do not establish the significance of a specific historic property or provide sufficient information to permit an assessment of integrity.

Will the HHSEGS Substantially Diminish the Integrity of this Property?

In the absence of a defined, bounded historic property with specific historical associations and identified qualities of integrity, no assessment of impact is possible.

Ma-hav Landscape

According to the ethnographic report, *Ma-hav* is the Paiute name for the area commonly called Hidden Hills, and the term *Ma-hav Ethnographic Landscape* refers to the part of the broader Pahrump Paiute traditional territory that immediately surrounds the HHSEGS project area. Figure 7 in the ethnographic report (attached here as Appendix D for reference) shows the relationship between the ethnographic landscape, as defined, and the project area. The report states that, "the Ma-have Landscape specifically refers to several springs, an intermittent set of creeks that, flowing all of the way from the flanks of Mount Charleston, cut through a coppice dune mesquite bosque zone and includes the valley floor and the edge of a dry lake bed" (Gates 2012:58).

Is It a Property?

The ethnographic report clearly delineates a physical location:

> Ma-hav is an area of approximately 35 square miles that takes in the southeastern margins of the Pahrump Dry Lake bed, the washes

> that extend from the alluvial toes of Mt. Charleston down to the Pahrump Dry Lake bed, the spring areas in between that include Browns Spring, Hidden Hills Ranch Spring, Stump Spring, several unnamed spring discharge areas (including Weeping Rock Seep). (Gates 2012:58)

According to the report, this boundary delineation is based on the presence of a unique geological surface, the presence of two watersheds that drain the southwestern slopes of Mt. Charleston, traditional land use by a specific set of closely related Pahrump Paiute families, and a history of non-Indian settlement that occurred later than non-Indian settlement in the rest of the Pahrump Valley, though the report also states that "this landscape and the Pahrump Paiute people that occupied it during the Spanish Trail and Mormon road periods were subjected to the some of the first contacts and related hostilities ensuing from trail side encounters." (Gates 2012:82). The report concludes, however, "Given that the land is a contiguous whole, this delineation is conservative. The *Ma-hav* Landscape boundaries could be drawn up to the crest of Mount Charleston by including the Trout Canyon and Pahrump Valley Creeks" (Gates 2012:82), so it would appear that the boundaries are considered tentative or fluid.

Does This Property Meet Any of the Significance Criteria?

The ethnographic report provides is a good deal of information about this area, on a wide variety of topics. In general it is described as "a place where Pahrump Paiute lived, hunted, gathered, worshipped, were born, gardened, died, and were buried" and as an area that is "rich in prehistoric archaeology, historic archaeology, includes a historic ranch complex and is replete with historic events involving local Pahrump Paiute and later newcomers" (Gates 2012:58).

In some more specific examples, one Pahrump Paiute consultant is quoted as saying,

> Many types of clay for pottery come from the Hidden Hills area. Hidden Hills was a caching area. This entire area is extremely important and was the site where Indian families lived. The entire area is a known desert tortoise habitat that was, and is, currently used for the traditional collection/preparation of medicines and foods. This particular location is considered unique and is the home of these resources that can only come from this special area. (Gates 2012:58)

No other information is provided, however, about the locations or significance of these gathering activities. The discussion of *Ma-hav* contains a long story (Gates 2012:59-60) about Queho, the son of a Cocopah mother and white father, who grew up among the Moapa Southern Paiute. Apparently he was considered a renegade both by the white people and by the Paiutes, among whom he committed several serious crimes. After he died, his remains were treated scandalously by some white residents of the area – not an uncommon occurrence at the time, but no less reprehensible for that reason. It is unclear whether Queho is suggested to be a historically significant individual or what relationship the Queho story bears to *Ma-hav* as a historic property.

The report states that "there are several burials located throughout Ma-hav, some marked and some no longer locatable due to shifting sand. One such cemetery has some evidence of grave looting" (Gates 2012:59). It also states that "Formal Traditional Ceremonies and burials are held at Hidden Hills. They may continue to be held here in the future. The cemetery and the ceremonial areas are still visited by members of the Pahrump Paiute Tribe" and goes on to note that "Two Pahrump elders recalled an 'Indian Powwow' or religious ceremony held at Hidden Hills Ranch in

1933 for Susie Yount, (Wa-sid-ai) a Pahrump Paiute woman who had passed away in 1932" (Gates 2012:61). There is even one source, according to the report, that "suggests that Chief Tecopa's cry ceremony was held in 1905 somewhere at *Ma-hav"* (Gates 2012:61). Again, no specific information is provided regarding locations or significance of these places or activities.

The report states that "specific esoteric cultural and religious knowledge was formulated, instructed and practiced within this delineated landscape and nowhere else in the Paiute landscape" (Gates 2012:82). The report also indicates the following:

> Ma-hav is particularly where females become woman, learn of menstruation, birthing and menopause. Set in the time just after creation when animals were anthropomorphic, it relates the connection between mountains, valleys, springs, creeks, travel and procreation and the role of the creator in teaching humans how to be. While some of the exact course of events and specific meanings are lost to translation and because of gender specific descriptions that are taboo for mixed audiences, the story attempts to convey that Hidden Hills is a place designated by the creator (coyote) as a place where girls learn to become women. (Gates 2012:58)

Although some of these specific examples *could* potentially indicate important historical associations between particular Pahrump Paiute cultural beliefs and practices and particular locations in the vicinity of the project area, there is not enough information about the historical associations or the locations of the practices to support an evaluation of any of them as historic properties or to evaluate potential project effects. First menses sites, for example, are very important locations of rite of passage rituals for young Paiute women. A 2004 cultural landscape study for the Spring Mountains noted the following locational requirements for First Menses sites:

> These sites are very different from the vision quest places, occurring down in canyons, near water, and having both abundant supplies of medicine and food plants nearby. Unlike the vision quest sites, there is no evidence that the place logic of First Menses places involves vistas, volcanoes, obsidian, or basalt flows. (Stoffle et al. 2004:31)

Given this description it is unlikely that such a site would be located within the actual project area, but absence of specific information makes it impossible to evaluate this suggested function for *Ma-hav*.

The suggested period of significance for the proposed *Ma-hav* Landscape is provided as a 5-page table (Table 7 of the report) that lists everything from "The Beginning of Time" through 2011. This table is, in essence, a capsule summary of the history of the region and not a defined period of significance for a historic property. The report notes that:

> Archaeological evidence that provides dates for material remains (including dating of artifacts from sites within the Ma-hav landscape) has not been conducted. A historic time period that can be documented in the literature, including oral histories collected for this ethnographic study, starts with John "Stomper" Pete's occupation of Stump Springs, circa 1840 -1890, up to the present. (Gates 2012:83)

The wide range of topics presented in this discussion of *Ma-hav* and the amount of detail relative to some of those topics reflect a pattern that frequently occurs with ethnographic studies of areas slated for some type of development. The location of the proposed development is taken as the center point, and then knowledgeable people are questioned about the significance of the proposed development area and its surroundings. The more people who are questioned and the more intensively they are interviewed, the greater the amount of information that is brought to light about historical events, places, and particular associations within the proposed development area and its surroundings.

This wealth of information about a fairly small area may make it appear to have very special significance. But if another area of a similar size were to be delineated elsewhere within the traditional territory of the Pahrump Paiute, and people were interviewed about it with similar techniques and intensity, it is likely that a similarly broad set of events, memories, and associations would be collected.

The ethnographic report says that the *Ma-hav* Ethnographic Landscape:

> is eligible under Criteria 1 at the local level for the broad contributions to the unique historic events that this landscape provides to the Pahrump Paiute Home landscape in that it provides a unique marginal cultural milieu that spanned the interaction of the first contacts between Pahrump Paiute and non-Pahrump Paiute foreigners such as the Mexican traders, American explores, trappers, and traders; the American and Mormon miners, homesteaders and later American ranchers and business men that came to call the Pahrump Valley either a wayside curiosity or new home. (Gates 2012:84)

This says, in effect, that the area is eligible under the criterion "associated with events that have made a significant contribution to the broad pattern of our history" because the area was the location of a broad pattern of events. As noted in the discussion of the Pahrump Paiute Home Landscape, the fact that the history of a people took place within a region or a part of a region is not sufficient for eligibility under CRHR Criterion 1 (NRHP Criterion A). This criterion requires an *important* and *specific* association between the place and an important event or specific pattern of events.

The ethnographic report also says the *Ma-hav* Ethnographic Landscape is eligible "under Criteria 4 at the local level of significance for the potential to yield ethnographic information important to the prehistory and history of the *Ma-hav* area and specifically the prehistoric archaeological potential that lays beneath and on the surface of the *Ma-hav* area including the archaeological remains known to exists or that potentially exist in the *Ma-hav* Landscape" (Gates 2012:86). The same could be said of the entire state of California, the state of Nevada, virtually all places. The mere fact that things *could be learned* about an area through research, whether historical, ethnographic, or archaeological, does not make that area eligible to the CRHR or NRHP under Criterion 4 (Criterion D).

In terms of archaeological sites, Criterion 4 or D would apply only to the sites themselves, not to the broad area in which they are located. Further, the assessment of a site's data potential requires that the site's location be actually known and that enough information be available about the site's content and condition to indicate whether it is likely to yield information with a significant bearing on *specific* and *important* research questions. The nature of the archaeological record within the

HHSEGS project area would seem indicate that, at least for the central portion of *Ma-hav*, the answer would be no.

Does This Property Have Sufficient Integrity to Convey Its Significance?

As noted previously, NRHP Bulletin 15, *How to Apply the National Register Criteria for Evaluation*, makes it clear that decisions about integrity of a historic property have to come after and be based upon the decisions about its significance relative to the criteria of eligibility. As the Bulletin 15 Section on evaluating integrity says, "Integrity is based on significance: why, where, and when a property is important. Only after significance is fully established can you proceed to the issue of integrity" (National Park Service 1997:45).

Based on the information provided, there could be any number of potential historic properties within the area called *Ma-hav* in Paiute. Traditional gathering areas for clay and other resources are mentioned; several historical figures are mentioned as being associated in some way with this general area. Information is mention on general ritual associations and one specific association. None of these potential historic associations is developed in sufficient detail to permit *Ma-hav* or portions of *Ma-hav* to be evaluated as a historic property eligible to the CRHR or the NRHP, or to provide an adequate basis for a finding that the area is an eligible ethnographic landscape.

General statements that a lot of history took place here and therefore this place is a historic property eligible to the CRHR are not consistent either with the role of the state and national registers as official lists of places worthy of preservation or with their role as a historic preservation planning tool for evaluating the effects of proposed development projects. Such general statements do not establish the significance of a specific historic property or provide sufficient information to permit an assessment of integrity.

Will the HHSEGS Substantially Diminish the Integrity of this Property?

In the absence of specific historical associations and identified qualities of integrity, no assessment of impact is possible.

Conclusions: Eligibility and Effect

To summarize, then, the ethnographic report for HHSEGS (Gates 2012) identifies three ethnographic landscapes eligible to the CRHR that will potentially be impacted by the HHSEGS. The FSA (FSA 2012:4.3-90 through 91) simply adopts and incorporates the ethnographic report's conclusions about the identification and evaluation of significance, integrity, and eligibility for these three landscapes. Thus the Salt Song Landscape is judged to be eligible under Criteria 1 and 3; the Pahrump Paiute Home Landscape is judged to be eligible under Criteria 1 and 2; and the *Ma-hav* Landscape is judged to be eligible under Criteria 1 and 4.

As discussed above, while a criteria-based argument could be made that individual *places* named in the Salt Song ceremony are historic properties eligible to the NRHP (and to the CRHR, in the case of properties located in California) under Criterion A (or Criterion 1) for their specific and important association with the long-term pattern of this culturally important ceremony, neither the FSA nor the ethnographic report upon which it relies develops this claim or supports such criteria. The claim of eligibility under Criterion 3 as a property possessing high artistic values ignores the NRHP bulletin guidance that makes it clear that this criterion applies to the *design* qualities of a physical property itself.

A "property" that stretches across four states and includes enormous swaths of land not demonstrably associated with the Salt Song cycle in any way is incompatible with both the NRHP's role as the nation's inventory of historic places worthy of preservation and its role as a preservation

planning tool. In regard to the latter role of the register, the vast scale of the proposed "property" and the existing presence within it of large cities, towns, military installations, roads, highways, power lines, and all the other detritus of modern life makes it difficult to imagine that any kind of development project could have a significant impact on it. As described and documented in the ethnography report (Gates 2012), the Salt Song Landscape does not appear to qualify as an eligible historic property.

As discussed above, the Pahrump Paiute Home Landscape, as defined in Gates (2012), appears to be simply the traditional territory of this Paiute band; since boundaries are dismissed in the report as being unimportant, it is difficult to be certain. The information provided is largely a recounting of bits and pieces of the history of Paiute people in this area. No specific and important associations between specific physical places and important events (Criterion 1 or A) or between places and the important contributions to history of Chief Tecopa (Criterion 2 or B) are ever proposed. There are almost certainly many specific places with specific historical associations within this large region that could be found eligible to the CRHR (for those areas within the state of California) or the NRHP. The approach taken, however – that the whole region is a historic property because a particular people's history happened there – is not consistent with the role or intent of either historic register.

The FSA goes on to say that "The Pahrump Paiute feel that their lifeways have been trodden upon, stolen, lost, forgotten, rejected, belittled, infringed upon, and otherwise dismissed" (FSA 2012:4.3-91). I think most people would agree that the Pahrump Paiute have considerable reason to feel this way, but labeling their entire traditional territory as a historic property eligible to the CRHR while ignoring the requirements of the criteria of eligibility does nothing to remedy this unfairness. What is worse, this approach deprives the agency of specific and usable planning information. As described and documented in the ethnographic report (Gates 2012), the Pahrump Paiute Home Landscape does not qualify as an eligible historic property.

The *Ma-hav* Landscape is recognized in both the ethnographic report and the FSA as being one of an undefined number of component parts of the Pahrump Paiute Home Landscape, in fact, the FSA says that the historical significance of the *Ma-hav* derives from "its broad contributions to the unique historic events of the Pahrump Paiute Home Landscape" (FSA 2012:4.3-91). Yet no explanation is ever offered as to why this single component of another historic property was defined as a separate landscape and evaluated as a separate historic property.

A number of potential specific historical associations with *Ma-hav* (or more likely with specific places within it) are mentioned in passing in the ethnographic report. These range from the resource-based (collecting areas for clay and other materials), to specific historical events (cry ceremonies for Susie Yount and possibly even for Chief Tecopa), to aspects of the Pahrump belief system (an area for teaching girls the requirements of womanhood). But none of these is developed in any detail or set specifically on the broader landscape of the general project area, so there is no way to assess significance or integrity for any property or properties with these specific associations.

As with the Pahrump Paiute Home Landscape, what we have in the proposed *Ma-hav* landscape a defined area in which a variety of things that were part of the local history occurred. What we do ***not*** have is a historic property meeting the CRHR or NRHP requirements for specific and important associations with specific and important events. Given the requirements for eligibility under Criterion 4 or D – that archaeological properties must have demonstrated their potential to yield information through testing or research – we also do not have a property eligible for its information potential.

The FSA notes that "the regulatory threshold for whether a proposed project would have a significant effect with respect to cultural resources is a finding that the project would materially impair the significance of one or more historical resources" (FSA 2012:4.3-51). It then cites the CEQA Guidelines as defining "material impairment," in the case of historic properties, as "any project action that 'demolishes or materially alters in an adverse manner those physical characteristics of a historical resource that convey its historical significance and that justify its eligibility for inclusion in the California Register of Historical Resources" (FSA 2012:4.3-51).

Using these definitions and guidelines, the FSA finds that all three ethnographic landscapes will experience significant impacts (FSA 2012:4.3:99). For the purpose of exploring this question of impacts, let us, for the moment, take the FSA conclusions about eligibility of these landscapes at face value, and say that all three landscapes could be considered eligible to the NRHP under Criterion A, and that the Pahrump Paiute Home Landscape could be considered eligible under Criterion B as well. Because at least half of each of these landscapes, as defined in the ethnographic report, lies outside California, CRHR eligibility is more problematic, and the arguments for NRHP eligibility under Criteria C and D are entirely untenable. All of the ethnographic landscapes are described as having integrity of location, setting, feeling, and association, from the perspective of traditional practitioners.

Looking at the maps provided here as Appendix B (Salt Song Landscape) and Appendix C (Pahrump Paiute Home Landscape), and considering both the scale of these properties and the current assessment of integrity for these landscapes, despite the presence of truly substantial modern developments, what would be the rationale for saying that HHSEGS would "demolish or materially alter" the integrity of location, setting, feeling, or association for either the Salt Song Landscape or the Pahrump Paiute Home Landscape? No adequate rationale is provided to justify the impact finding on these large landscapes. The impact is only found by unjustifiably segmenting the Salt Song and Pahrump Paiute Home landscapes and considering only the portions of the large landscapes in the vicinity of the project.

The potential impacts on the *Ma-hav* Landscape (map in Appendix D) are more difficult to assess. We are told that its significance under Criterion 1 or A is "for the broad contributions to the unique historic events that this landscape provides to the Pahrump Paiute Home landscape," but we have no idea what event or pattern events constitutes the area's historical associations, nor do we know where within the area these events took place. The FSA speaks of loss of habitat for animal species, possible impacts to springs, and visual intrusion on the conduct of ceremonies as indirect effects (FSA 2012:4.3-103) and refers the reader to the discussion of the Pahrump Paiute Home Landscape for direct effect, but no discussion of direct effects occurs in that section of the report. In the absence of better information, it is impossible to assess the nature and severity of any effects on the integrity of the *Ma-hav* landscape. No adequate rationale is provided for finding the *Ma-hav* landscape is impacted by HHSEGS.

Mitigation Proposed in the FSA

The cultural resource mitigation measure specific to the ethnographic landscapes, CUL-10, is focused on public interpretation of various aspects of traditional Paiute lifeways. It includes development of an on-site kiosk, off-site museum exhibits, and ethnographic reconstructions. Interpretative materials and installations are a fairly common means of mitigation for cultural resources, and all three of the interpretive modes proposed here are appropriate. It is uncommon to see a requirement for multiple interpretive modes on a single project unless the effects are unusually broad and severe. Generally one or another interpretive mode is required or the project owner is given the choice of several interpretive modes. In addition, the detailed, prescriptive

nature of the requirements in CUL-10 is unusual. More commonly, the mitigation requirements specify the interpretive mode and the general outcome desired, and leave the details to interpretive designers and consultation with the stakeholders of the project. Finally, the measures laid out in CUL-10 appear to require the project owner to accept responsibility for the long-term suitability and viability of host facilities receiving exhibits, displays, etc. This should be clarified to indicate that with delivery and installation of the interpretive exhibits, if such exhibits are the chosen form of interpretive mitigation, the project owner has completed this requirement.

References Cited

Advisory Council on Historic Preservation

2012 Native American Traditional Cultural Landscapes Action Plan. (http://www.achp.gov/pdfs/native-american-traditional-cultural-landscapes-action-plan-11-23-2011.pdf).

Birnbaum, Charles A.

1994 *Protecting Cultural Landscapes: Planning, Treatment and Management of Historic Landscapes.* **Preservation Briefs** Number 36. National Park Service Preservation Assistance, Washington D.C.

1996 *The Secretary of the Interior's Standards for the Treatment of Historic Properties with Guidelines for the Treatment of Cultural Landscapes.* National Park Service Heritage Preservation Services, Washington D.C.

California Office of Historic Preservation

n.d. *California Register and National Register: A Comparison* (for purposes of determining eligibility for the California Register). **Technical Assistance Series** #6. http://ohp.parks.ca.gov/pages/1069/files/technical%20assistance%20bulletin%206%202011%20update.pdf

Clement, Dorene

1999 *General Guidelines for Identifying and Evaluating Historic Landscapes*. Environmental Program, California Department of Transportation, Sacramento. http://www.dot.ca.gov/hq/env/cultural/landscape/indxfram.htm

Cowley, Jill

1991 *Canyon De Chelly – An Ethnographic Landscape.* **CRM** 14(6):10-11.

FSA

2012 *Final Staff Assessment for the Hidden Hills Solar Energy Generating System*. California Energy Commission, Sacramento.

Gates, Thomas

2012 *Hidden Hills Solar Energy Generating System Ethnographic Report*. California Energy Commission, Sacramento.

Keller, J. Timothy, and Genevieve P. Keller

1987 **National Register Bulletin 18:** *How to Evaluate and Nominate Designed Historic Landscapes*. National Park Service, Interagency Resources Division, Washington D.C.

McClelland, Linda Flint, J. Timothy Keller, Genevieve P. Keller, and Robert Z. Melnick

1989 **National Register Bulletin 30:** *Guidelines for Evaluating and Documenting Rural Historic Landscapes*. National Park Service, Interagency Resources Division, Washington D.C.

National Park Service

1997 **National Register Bulletin 15:** *How to Apply the National Register Criteria for Evaluation.* NPS Interagency Resources Division, Washington D.C.

Parker, Patricia L., and Thomas F. King

1990 **National Register Bulletin 38:** *Guidelines for Evaluating and Documenting Traditional Cultural Properties.* National Park Service, Interagency Resources Division, Washington D.C.

Stoffle, Richard W., Fletcher P. Chmara-Huff, Kathleen A. Van Vlack, and Rebecca S. Toupal

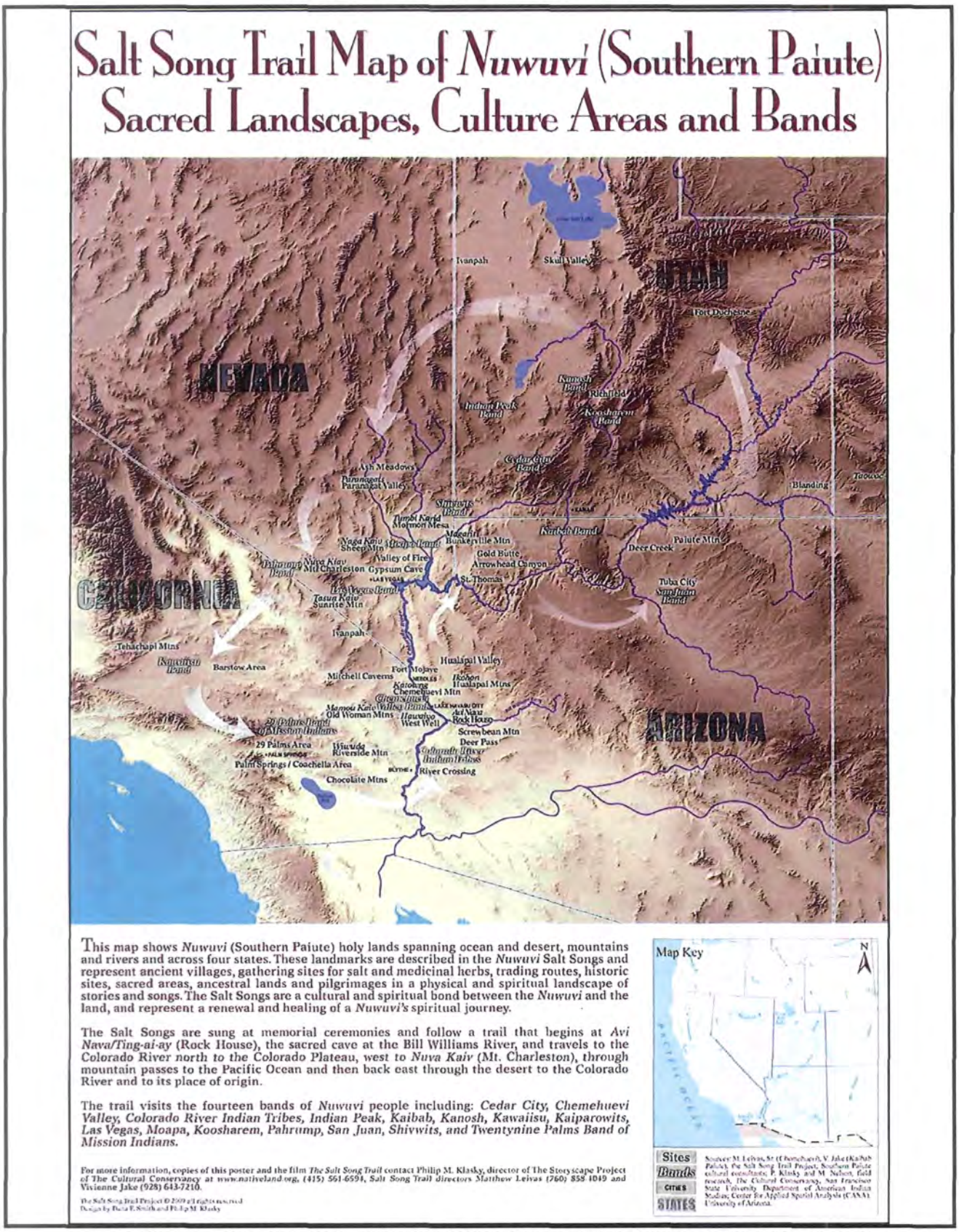
2004 *Puha Flows from It: The Cultural Landscape Study of the Spring Mountains.* Bureau of Applied Research in Anthropology, The University of Arizona, Tuscon.

Attachment Enth-1

Salt Song Trail Map

FSA 2012: Figure 2

CULTURAL RESOURCES - FIGURE 2
Hidden Hills Solar Generating System (HHSEGS) - Salt Song Trail Map of Nuwuvi (Southern Paiute)
Sacred Landscapes, Culture Areas and Bands



This map shows *Nuwuvi* (Southern Paiute) holy lands spanning ocean and desert, mountains and rivers and across four states. These landmarks are described in the *Nuwuvi* Salt Songs and represent ancient villages, gathering sites for salt and medicinal herbs, trading routes, historic sites, sacred areas, ancestral lands and pilgrimages in a physical and spiritual landscape of stories and songs. The Salt Songs are a cultural and spiritual bond between the *Nuwuvi* and the land, and represent a renewal and healing of a *Nuwuvi's* spiritual journey.

The Salt Songs are sung at memorial ceremonies and follow a trail that begins at *Avi Nava/Ting-ai-ay* (Rock House), the sacred cave at the Bill Williams River, and travels to the Colorado River north to the Colorado Plateau, west to *Nuva Kaiv* (Mt. Charleston), through mountain passes to the Pacific Ocean and then back east through the desert to the Colorado River and to its place of origin.

The trail visits the fourteen bands of *Nuwuvi* people including: *Cedar City, Chemehuevi Valley, Colorado River Indian Tribes, Indian Peak, Kaibab, Kanosh, Kawaiisu, Kaiparowits, Las Vegas, Moapa, Koosharem, Pahrump, San Juan, Shivwits, and Twentynine Palms Band of Mission Indians.*

For more information, copies of this poster and the film *The Salt Song Trail* contact Philip M. Klasky, director of The Storyscape Project of The Cultural Conservancy at www.nativeland.org, (415) 561-6594, *Salt Song Trail* directors Matthew Leivas (760) 858-1049 and Vivienne Jake (928) 643-7210.

Source: M. Leivas, Sr. (Chemehuevi), V. Jake (Kaibab Paiute), the Salt Song Trail Project, Southern Paiute cultural consultants; P. Klasky and M. Nelson, field research, The Cultural Conservancy, San Francisco State University Department of American Indian Studies; Center for Applied Spatial Analysis (CASA), University of Arizona.

CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION
SOURCE: The Salt Song Trail Project (c) 2009 all rights reserved. Design by Dana F. Smith and Philip M. Klasky

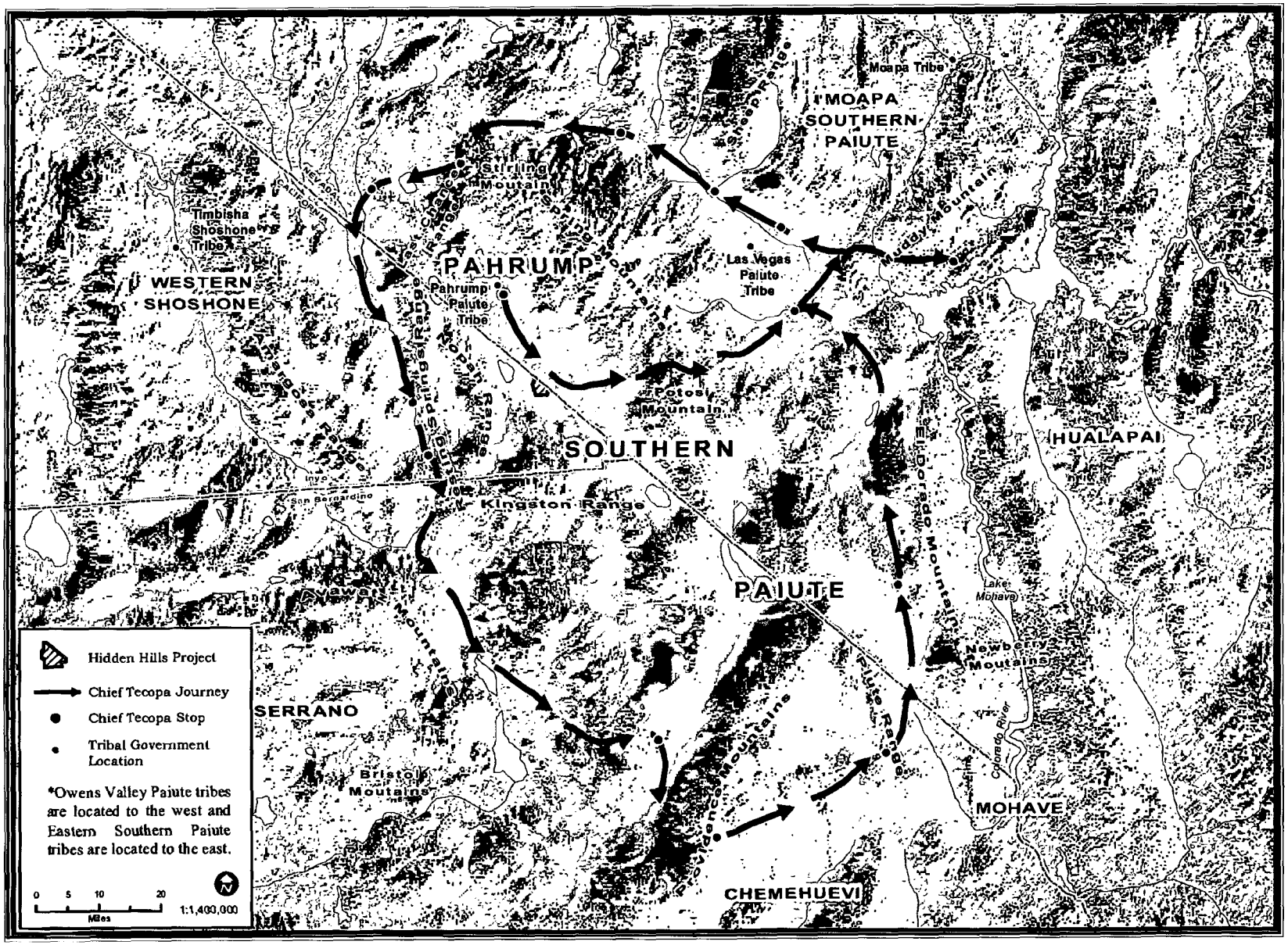
Attachment Enth-2

Approximate Extent of Pahrump Paiute Home Landscape

Gates 2012: Figure 4

CULTURAL RESOUCES - FIGURE 4

Hidden Hills Solar Electric Generating System (HHSEGS) - Tribal Ancestral Territories and Tribal Government Locations in and around Pahrump Valley



CULTURAL RESOUCES

CALIFORNIA ENERGY COMMISSION, SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION

SOURCE: Adapted from *Handbook of North American Indian* Volumes 8 and 11, and *Chief Tecopa and The Hikos* by Celeste Lowe.

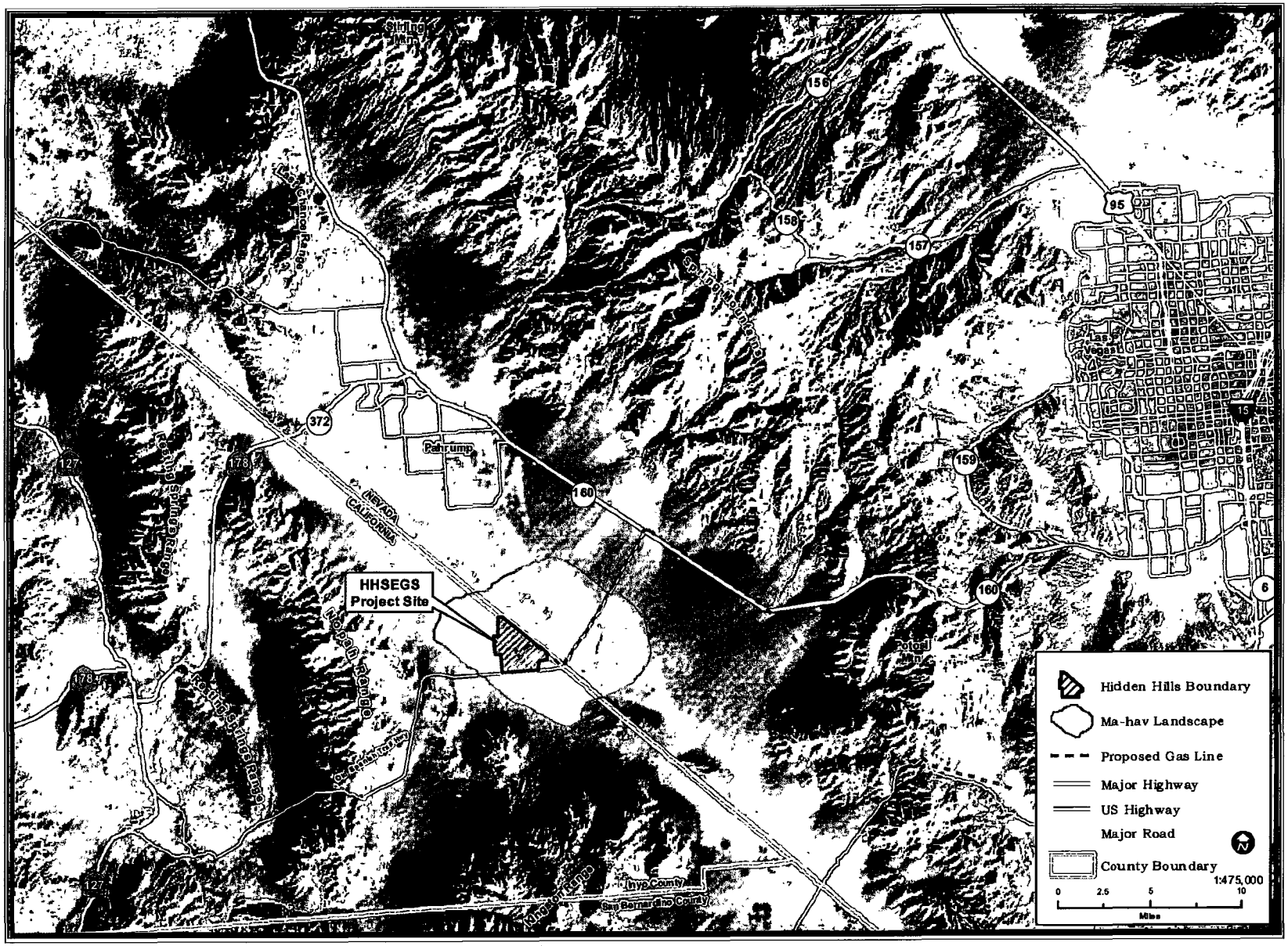
Attachment Enth-3

Ma-hav Landscape

Gates 2012: Figure 7

CULTURAL RESOUCES - FIGURE 7

Hidden Hills Solar Electric Generating System (HHSEGS) - Ma-hav Landscape Vicinity Map



CULTURAL RESOUCES

CALIFORNIA ENERGY COMMISSION, SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION

SOURCE: Landsat - NASA (2002), SRTM Shaded Relief - USGS (2005), US Major Highway - Tele Atlas North America, Inc (2010).

Executive Summary

I. Introduction

A. Name: Joseph Desmond, Sr. VP

B. Qualifications: Mr. Desmond's qualifications are as noted in his resumes contained in Appendix A.

C. Prior Filings: In addition to the statements herein, this testimony includes by reference the following documents submitted in this proceeding:

- Application for Certification, Volume 1 & Volume 2, dated August 5, 2011 [Exhibit 1]

D. Documents Prepared By Others

- Applicant's QC3 and QC4 Phase II Interconnection Study Report. November 5, 2012. Submitted to dockets on Posted December 10, 2012 for the Rio Mesa Solar SEGS case (11-AFC-04) available online at: http://www.energy.ca.gov/sitingcases/riomesa/documents/index.html

E. Attachments

- Integrating a Proprietary Technology with Conventional Components to Deliver Highly Reliable, Renewable Power (ES-1)
- Summary of Selected Documents in Support of Hidden Hills SEGS (ES-2)
- Resolution E-4522 (ES-3)
- Economic and Reliability Benefits of CSP with Thermal Energy Storage: Recent Studies and Research Needs. PowerPoint by Udi Helman, Ph.D., dated December 19, 2012 (ES-4)
- Economic and Reliability Benefits of CSP with Thermal Energy Storage: Recent Studies and Research Needs. PowerPoint by Udi Helman, Ph.D. and Marcus Evans, dated January 9, 2013 (ES-5)

To the best of my knowledge, all of the facts contained in this testimony (including all referenced documents) are true and correct. To the extent this testimony contains opinions, such opinions are my own. I make these statements, and render these opinions freely and under oath for the purpose of constituting sworn testimony in this proceeding.

II. Summary of Testimony

I, Joseph Desmond, serve as Senior Vice President at BrightSource Energy (BrightSource). I oversee communications, marketing, legislative, government and regulatory affairs. I am currently a member of the Board of Directors for the American Council on Renewable Energy ("ACORE") and on the Advisory Council of the Precourt Energy Efficiency Center at Stanford University. Prior to joining BrightSource, I was Executive Vice President and Chief Marketing & Business Development Officer at Ice Energy, Inc. I also served as Senior Vice President of External Affairs at NorthernStar Natural Gas. Under California Governor Arnold Schwarzenegger, I served as Chairman of the California Energy Commission and in other executive roles including Deputy Secretary of Energy for the State Resources Agency and Undersecretary for Energy Affairs.

BrightSource designs, develops and deploys concentrating solar thermal technology to produce high-value electricity and steam for power, petroleum and industrial-process markets worldwide. Headquartered in Oakland, California, BrightSource is a privately-held company with operations in the United States, Israel, China and South Africa.

Hidden Hills Solar I, LLC and Hidden Hills Solar II, LLC (wholly owned subsidiaries of BrightSource) seek the Commission's approval of the Hidden Hills Solar Electric Generating System ("HHSEGS"). HHSEGS is a 500 MW concentrating solar thermal project located on privately owned land in Inyo County, at the California-Nevada border. HHSEGS will interconnect to the California Independent System Operator ("CAISO") transmission system through the Valley Electric Association ("VEA"), a nonprofit electric utility headquartered in Pahrump, Nevada.

The HHSEGS facility consists of two, 250 MW towers surrounded by thousands of tracking mirrors, known as heliostats, controlled by BrightSource's proprietary software to directly concentrate sunlight onto a boiler filled with water that sits atop a tower. When the sunlight hits the boiler, the water inside is heated and creates high temperature steam. Once produced, the steam is used in a conventional turbine to produce electricity. An air-cooled condenser converts the steam back into water where it is re-circulated to the boiler to be heated into steam, continuing the closed-loop cycle. The dry-cooling method consumes 90 percent less water than a solar thermal plant using wet-cooling (see Attachment ES-1). Our systems also use a small amount of natural gas for quicker morning startup and to ensure steady, reliable power output when transient clouds pass over the plant.

BrightSource's Ivanpah Solar Electric Generating Station ("Ivanpah") project, which was approved by this Commission in 2010, made important strides for the future of solar thermal power. HHSEGS represents the second generation of the BrightSource technology, and when operational, will surpass Ivanpah as the world's largest solar thermal complex. BrightSource is advancing its technology further at HHSEGS to drive costs down, increase electric system value and reduce environmental impacts. The project will achieve economies of scale, in part from a taller tower and larger power block, as well as attain higher solar-to-electric efficiencies by reaching higher pressure and temperature steam levels. These effects combined lead to a more efficient land use for solar energy production. HHSEGS will advance the renewable industry by progressing solar thermal technology on a number of fronts:

- First facility with solar thermal tower plants over 200 MW in size
- First solar thermal tower project over 200 MW to obtain a full Engineering Procurement and Construction ("EPC") "wrap" or guarantee
- First solar receiver with over 600 MW thermal capacity
- First advanced solar steam cycle beyond 560° / 160 bar
- First to implement a new low-cost heliostat design and in-field assembly system

Today, the market for financing renewable energy projects is much different than a few years ago. In the absence of loan guarantees and other federal incentives, developers must seek private financing for 100 percent of their project costs. Approval of this project, with a reasonable set of mitigation measures, will contribute to enabling its successful financing and also signals to developers and the investment community, that California is a favorable location for siting and financing utility-scale renewable energy projects.

In addition to advancing solar technologies and signaling California's continued desire to have renewable projects constructed in-state, this project provides significant benefits to both California's grid and the Western Interconnect. BrightSource's proprietary technology helps utilities and grid operators address integration challenges by delivering a more firm, reliable and controllable renewable power source compared to other variable generation resources. Because of the plant's synchronous steam turbine generator, the project provides important reliability benefits, such as reactive power support, dynamic voltage support, voltage control and some degree of inertia response. BrightSource's technology compensates for solar resource variability through the ability to increase or decrease the number of mirrors focusing on the receiver. This capability adds stability to the generation profile by allowing facility operators to shape the profile as system needs change. The project's operational attributes can also reduce the need for back-up fossil-fuel generation to meet grid reliability requirements.

Recently, the CAISO recognized the value of solar thermal generation when it released the Queue Cluster 3 and 4 Phase II Report. "The system capacity will be lowered if solar thermal projects in the Eastern Bulk System are not dispatched" (*See* QC3 and QC4 Phase II Interconnection Study Report, Group Report in SCE's Eastern Bulk System, Final Report, November 5, 2012). In this instance, the transfer capability of the specific transmission area will be 20 percent to 30 percent greater with the siting of solar thermal generators due to improved transient stability performance.

HHSEGS will also make significant contributions to the state's clean energy, climate, and economic development goals. By 2020, the State's utilities must achieve a 33 percent renewable portfolio standard ("RPS"), expressed as an energy goal (MWh), not capacity (MW). HHSEGS will deliver over 1,400,000 MWh annually of in-state renewable generation, and make a significant contribution to achieving the 33 percent RPS. This equates to over 2 percent of the RPS mandated energy production for the California investor owned utilities, combined. Similarly, HHSEGS will help the State reduce GHG emissions to 1990 levels by 2020 (as required by AB 32). HHSEGS will provide 500 MW of clean generation capacity that can be used to displace high GHG emitting resources.

HHSEGS will also provide a significant economic boost to the region. The project will create high paying construction jobs, providing about $305.3 million in construction payroll, at an average salary of $50 per hour (including benefits). The project will employ a peak construction work force of approximately 2,293 workers, and will generate approximately $81.375 million in state and local sales taxes over the life of the project. Once operational, the project will generate approximately $3.51 million in annual property taxes and require an operational staff of at least 100 people. For Inyo County, the annual property tax increase would constitute an approximate 21 percent increase in total county taxes compared to the County's revenue in the 2010 fiscal year. BrightSource's experience with Ivanpah confirms the economic boost. At peak of construction, Ivanpah employed more than 2,100 workers on site and it will require 90 long-term operations and maintenance jobs. The total employee earnings (based on 30 years of operation) are estimated to be $650 million. Ivanpah will also generate nearly $300 million in state and local tax benefits.

Until this point in the AFC process, the majority of the analysis has focused on studying narrow, specific impacts. However, as the ultimate decision makers in the Application for Certification process, the Commissioners play a crucial role by bringing balance to the process. The Commissioners will not only weigh criticisms of the project by certain parties, but also evaluate the project's specific impacts in light of larger policy issues and project benefits. As the leaders of the state's primary agency for the creation of energy policy, the Commissioners are uniquely situated to evaluate a project's overall beneficial contribution to the State's energy, economic, and environmental goals.

A robust, but balanced, environmental review for projects in California is critical to the state fulfilling its role as a leader in environmental stewardship *and* renewable energy development. We are appreciative of the Commission Staff's hard work in preparing the FSA and we commend the Staff for their objective evaluation in many resource areas. For example, Staff was thoughtful, balanced and prudent in analyzing the reasonableness of cost projections and other economic information submitted by Inyo County during discovery for this project. Staff has also been approachable and courteous in working through many of the proposed conditions. However, in some areas, the FSA contains analysis and proposed conditions that remain unbalanced and imposes significant, unnecessary costs for the project.

One example of our concern is in the Alternatives analysis. The FSA concludes that a photovoltaic (PV) solar technology alternative would be environmentally superior to the proposed project due to allegedly lower impacts on biological, visual and cultural resources. We strongly disagree with this conclusion based on the fact that the FSA fails to consider the significant environmental impacts associated with the PV alternative, including extensive grading and pouring of, concrete foundations, as well as requiring a 25 percent larger footprint to generate the same amount of energy.

We also are concerned by many of the costly conditions proposed in the FSA. Some of the conditions are novel in nature and application, or appear disproportionate, unbounded and unprecedented. There are alleged environmental impacts that are unsupported by *any* substantial evidence that the impact would even occur. To "mitigate" these speculative impacts, the FSA imposes extremely costly mitigation measures that may be difficult to implement and threaten the project's ability to secure commercial financing.

Consider just two examples: First, Condition Water Supply-4 would require the project to undertake a complex and costly groundwater monitoring and reporting plan. This condition simply does not make sense for a project that would: (1) use minimal amounts of water – just 140 acre feet per year (equivalent to the water use of 140 residences) and (2) fully offset this use by retiring water rights in the basin. The cost associated with monitoring this nominal amount of water use is unprecedented. But of even more concern is that in the event that the onsite monitoring wells identify a *projected* 6-inch decline in water levels, the entire project could be required to stop pumping. This could trigger a total shut down of the project. Water Supply Condition 4 is based on a speculative assumption that the project's impact on the local groundwater aquifer could affect offsite resources and wells. The Condition also fails to recognize that the Applicant is committed to offsetting 100 percent of its groundwater use. Such a condition could render the project un-financeable.

In the other example, the FSA's proposed Cultural Resources Condition of Certification 10 (CUL-10) would require the Applicant to effectively build, staff and maintain a cultural museum in the vicinity of the project. This condition would require much more than construction of a passive display. Rather, it calls for construction of "museum quality" multi-media presentations, including: (1) hands-on, interactive exhibits, (2) an "ethnographic reconstruction," including a reconstructed Native American village, and (3) a horticulture garden reliant on natural spring water. Despite the fact that there is virtually no nearby population center to use these facilities, the Applicant would nevertheless bear considerable expenses associated with the construction, maintenance and staffing of these displays into perpetuity. Nowhere before, that I am aware of, in the history of the Commission or for any other project subject to CEQA, has an applicant been required to build a cultural museum to mitigate the alleged impact on a landscape.

As the Commission evaluates these and other conditions, as well as the FSA's supporting analysis, we hope the Commission will bear in mind that financing and constructing the renewable energy

projects California needs are neither easy nor simple tasks. Due to the absence of loan guarantees and the need to secure private financing, these challenges have grown materially. To secure commercial financing, a developer must demonstrate that there is a reasonable balance between risk and performance. There is a perception by some that because of the cost and scale of most renewable projects, the project owners have an unlimited deep pocket to finance massive research projects and monitoring of minor impacts. Nothing could be further from the truth. Competition for power purchase agreements is extreme and every dollar that is added to a project for excessive mitigation is a dollar that, at best, drives up the cost of electricity to California ratepayers, and, at worst, impedes the State's ability to achieve its economic, renewable and climate change goals.

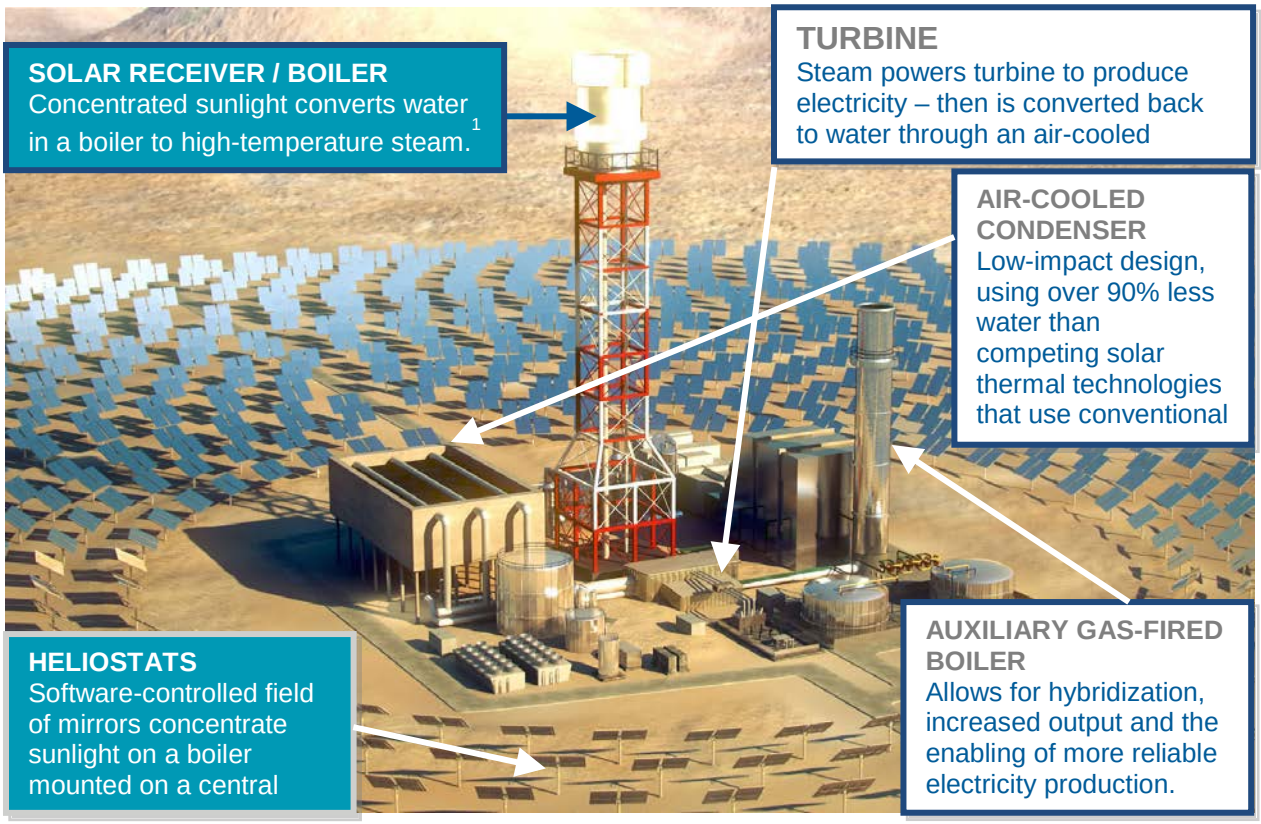
As you examine the 2,181-page FSA submitted by the Staff, including the 201 conditions, and more than $25 million in proposed mitigation measures, I urge you to ask critical questions with regard to each proposed condition of certification – is this a condition that has been imposed on similarly situated projects licensed by the Commission or by local agencies? Is this a condition that proposes mitigation commensurate with the impact? Does the analysis objectively apply CEQA to justify the proposed condition? If the answer to any of these questions is "No," then it is unreasonable that this project *alone* bear the new and extraordinary burden.

It is imperative for this project, and other future projects, that the Commission's final decision redress the excesses that will be discussed in our testimony, and provide appropriately balanced conditions for to the certification of the HHSEGS project.

Attachment ES-1

ATTACHMENT ES-1

Integrating a Proprietary Technology with Conventional Components to Deliver Highly Reliable, Renewable Power (Note: depiction is sample rendering, not HHSEGS)



Attachment ES-2
Summary of Selected Documents in Support of Hidden Hills SEGS

Attachment ES-2

Summary of Selected Documents in Support of Hidden Hills SEGS

1. An Evaluation of Solar Valuation Methods Used in Utility Planning and Procurement Processes

Andrew Mills and Ryan Wiser, Environmental Energy Technologies Division, December 2012

LBNL-5933E

Abstract

As renewable technologies mature, recognizing and evaluating their economic value will become increasingly important for justifying their expanded use. This report reviews a recent sample of U.S. load-serving entity (LSE) planning studies and procurement processes to identify how current practices reflect the drivers of solar's economic value. In particular, we analyze the LSEs' treatment of the capacity value, energy value, and integration costs of solar energy; the LSEs' treatment of other factors including the risk reduction value of solar, impacts to the transmission and distribution system, and options that might mitigate solar variability and uncertainty; the methods LSEs use to design candidate portfolios of resources for evaluation within the studies; and the approaches LSEs use to evaluate the economic attractiveness of bids during procurement.

We found that many LSEs have a framework to capture and evaluate solar's value, but approaches varied widely: only a few studies appeared to complement the framework with detailed analysis of key factors such as capacity credits, integration costs, and tradeoffs between distributed and utility-scale photovoltaics. Full evaluation of the costs and benefits of solar requires that a variety of solar options are included in a diverse set of candidate portfolios. The design of candidate portfolios evaluated in the studies, particularly regarding the methods used to rank potential resource options, can be improved.

We found that studies account for the capacity value of solar, though capacity credit estimates with increasing penetration can be improved. Furthermore, while most LSEs have the right approach and tools to evaluate the energy value of solar, improvements remain possible, particularly in estimating solar integration costs used to adjust energy value. Transmission and distribution benefits, or costs, related to solar are rarely included in studies. Similarly, few LSE planning studies can reflect the full range of potential benefits from adding thermal storage and/or natural gas augmentation to concentrating solar power plants. Finally, the level of detail provided in requests for proposals used in procurement is not always sufficient for bidders to identify the most valuable technology or configurations to the LSE.

Sample Table:

Table 4. Capacity credits applied by LSEs in planning studies

Technology	Sub-category	Capacity credit range	LSEs within range
PV	Excluding Pacific Northwest	27% –77%	APS, CA IOU process, Duke Energy, LADWP, NV Energy, PNM, PSCo, TEP
	In Pacific Northwest	5% –36%	Idaho Power, PGE
	With lead-acid battery	100%	PNM
CSP	Without thermal storage or natural gas augmentation	55%–87%	APS, CA IOU process, PNM, TEP
	With thermal storage or natural gas augmentation	87%–100%	APS, CA IOU process, Idaho Power, PSCo, TEP

Avialable online at:
http://emp.lbl.gov/publications/evaluation-solar-valuation-methods-used-utility-planning-and-procurement-processes

2. Application of the California Energy Commission for Approval of Electric Program Investment Charge Proposed 2012 Through 2014 Triennial Investment Plan

CALIFORNIA ENERGY COMMISSION

Dated: November 1, 2012

THE ELECTRIC PROGRAM INVESTMENT CHARGE PROPOSED 2012-14 TRIENNIAL INVESTMENT PLAN

Chapter 3: Applied Research and Development

S4 Strategic Objective: Develop Emerging Utility-Scale Renewable Energy Generation Technologies and Strategies to Improve Power Plant Performance, Reduce Costs, and Expand the Resource Base.
pp 79 - 83

Available online at:
http://www.energy.ca.gov/research/epic/documents/final_documents_submitted_to_CPUC/2012-11-01_EPIC_Application_to_CPUC.pdf

3. Resolution E-4522 (document provided as Attachment ES-3)

All Parties Conference on BrightSource Contracts
October 22, 2012
Comments by Michael Picker, Senior Advisor to the Governor for Renewable Energy

Excerpt:
We appreciate the hard work of the California Public Utilities Commission (CPUC) and its staff to promote a reliable and clean energy future. The projects under discussion today implement a

technology roadmap to deploy dispatchable solar thermal storage. These grid needs have been demonstrated by a growing body of evidence, recognized by the California Energy Commission and the California Independent Systems Operator.

Resource diversity was a driving force behind the Renewable Portfolio Standard (RPS) when it was first adopted. Only a few of the technologies incorporated into the RPS have had widespread application and experience in California, and all of these technologies are seeing rapid advances. Only three years ago, when I first stepped into my position in the Governor's Office, many analysts in the field argued that solar thermal technologies would be predominant in solar developments. Instead, largely because of advances in production and the ease of installation, several photovoltaic technologies lead in the market place. But the solar thermal technologies coupled with storage offer values that may compete over time – if we preserve the opportunities for these technologies to reach the market place. California has always led the world in innovating in ways that benefit both our economy, and our lives.

The CPUC has always recognized that future needs are often uncertain, and that subjective judgment is a necessary part of the RPS resource selection process. "Least cost-best fit" requires that the Commission and the utilities must exercise judgment and not simply rely on quantified benefits or narrow assumptions.

4. The Economic and Reliability Benefits of CSP with Thermal Energy Storage: Recent Studies and Research Needs

The Concentrating Solar Power Alliance (CSPA)

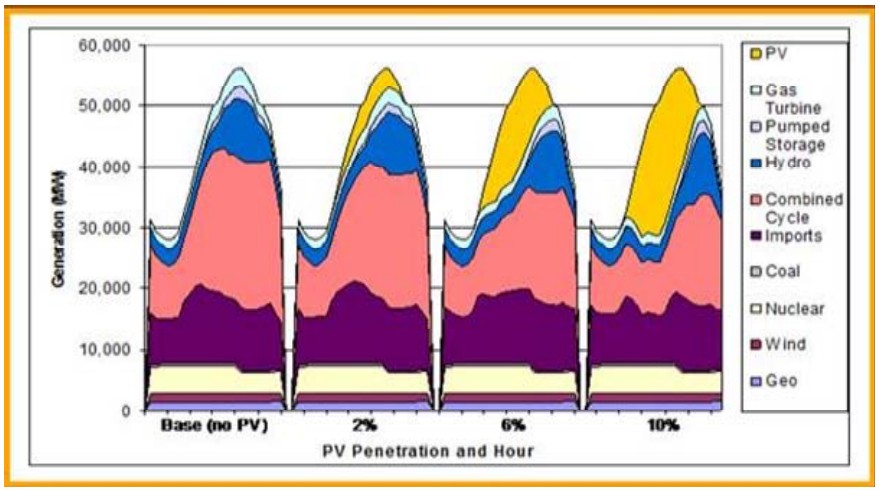
The Report is available online at:
http://www.csp-alliance.org/cspa-report/

5. The Economic and Reliability Benefits of CSP with Thermal Energy Storage: Recent Studies and Research Needs (document provided as Attachment ES-4)

PowerPoint Presentation by Dr. Udi Helman, Brightsource's Managing Director of Economic and Pricing Analysis. December 19, 2012

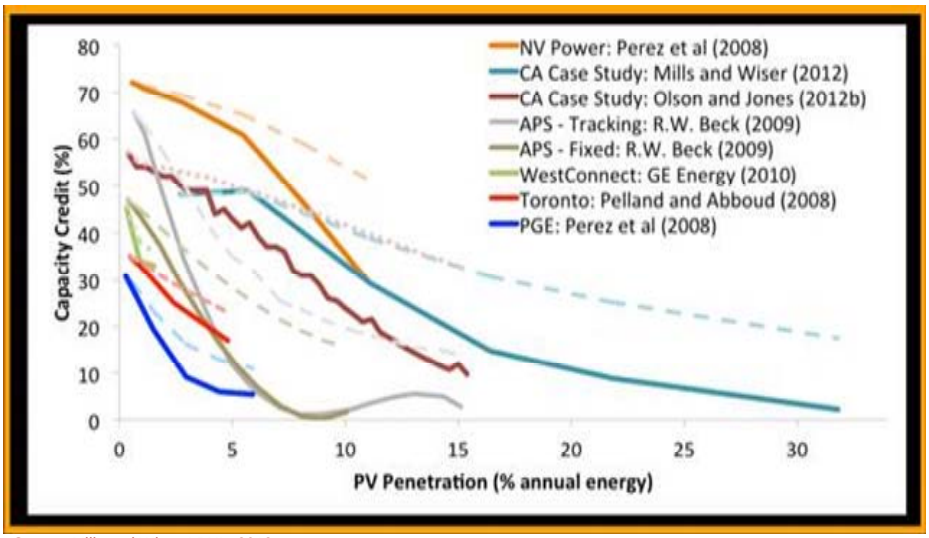
The next two slides are graphs taken from the report which explain why the value of PV decreases as the penetration level of PV on the grid increases.

Capacity value will change as solar penetration increases: Illustration using dispatch of generation in California at different penetrations of PV – simulated summer da



Source: Denholm and Mehos, NREL, 2011, pg. 3.

Solar PV capacity value as penetration increases



Source: Mills and Wiser, LBNL, 2012

6. The Economic and Reliability Benefits of CSP with Thermal Energy Storage: Recent Studies and Research Needs (document provided as Attachment ES-5)

PowerPoint Presentation by Dr. Udi Helman, Brightsource's Managing Director of Economic and Pricing Analysis and Marcus Evans. 3rdAnnual Electric Energy Storage. Phoenix, AZ. January 9-10, 2013.

7. Select presentations from CEC's storage workshop on Aug. 22, 2012

Paul Denholm / NREL-
http://www.energy.ca.gov/research/notices/2012-08-23_workshop/presentations/1-3_Paul%20Denholm_csp%20project%20update_1.pdf

Udi's /BrightSource Energy presentation:
http://www.energy.ca.gov/research/notices/2012-08-23_workshop/presentations/1-1_Udi%20Helman%20presentation%20FINAL.pdf

Andrew Mills / LBNL- this cuts both ways, showing value of CSP w/ storage but saying CSP w/o storage is similar to PV in marginal economic value
http://www.energy.ca.gov/research/notices/2012-08-23_workshop/presentations/1-4_Andrew%20Mills_LBNL_CSP_economic_value.pdf

Shucheng Liu, Ph.D./ CAISO- describes challenge to the future grid, notes dispatchable wind /solar and storage can contribute to solution set:
http://www.energy.ca.gov/research/notices/2012-08-23_workshop/presentations/2-2_Shucheng%20Liu_CAISO%20Presentation%20for%20CEC-KEMA%20Workshop.pdf

Tex Wilkins' presentation (general, but helpful):
http://www.energy.ca.gov/research/notices/2012-08-23_workshop/presentations/0-2_Tex_Wilkins_CEC_Storage_Workshop.pdf

Adam Green / Solar Reserve: (see pp. 5-6- nothing really new but echoes what is said elsewhere):
http://www.energy.ca.gov/research/notices/2012-08-23_workshop/presentations/1-2_Adam%20Green_SolarReserve%20Intro%20for%20KEMA-CEC%20Study%20Workshop.pdf/

Attachment ES-3
Resolution E-4522

Resolution E-4522
All Parties Conference on BrightSource Contracts
October 22, 2012

Comments by Michael Picker, Senior Advisor to the Governor for Renewable Energy

We appreciate the hard work of the California Public Utilities Commission (CPUC) and its staff to promote a reliable and clean energy future. The projects under discussion today implement a technology roadmap to deploy dispatchable solar thermal storage. These grid needs have been demonstrated by a growing body of evidence, recognized by the California Energy Commission and the California Independent Systems Operator.

Resource diversity was a driving force behind the Renewable Portfolio Standard (RPS) when it was first adopted. Only a few of the technologies incorporated into the RPS have had widespread application and experience in California, and all of these technologies are seeing rapid advances. Only three years ago, when I first stepped into my position in the Governor's Office, many analysts in the field argued that solar thermal technologies would be predominant in solar developments. Instead, largely because of advances in production and the ease of installation, several photovoltaic technologies lead in the market place. But the solar thermal technologies coupled with storage offer values that may compete over time – if we preserve the opportunities for these technologies to reach the market place. California has always led the world in innovating in ways that benefit both our economy, and our lives.

The CPUC has always recognized that future needs are often uncertain, and that subjective judgment is a necessary part of the RPS resource selection process. "Least cost-best fit" requires that the Commission and the utilities must exercise judgment and not simply rely on quantified benefits or narrow assumptions.

But also very important are the thousands of family wage jobs, billions of dollars of investment in California's energy infrastructure, and the hundreds of millions of dollars in state and local tax benefits that come with these projects.

I'd also like to comment on two specific issues posed in the staff analyses: the role of land use in guesstimating viability of projects, and the need to account for integration as a value for awarding contracts.

<u>Land Use</u>:

The staff Resolution (at pages 16 to 18) identifies a number of viability risks to the Siberia 1 and Siberia 2 projects "which go beyond the typical scope of the Commission's Advice Letter process." On page 24, the staff Resolution further notes that, "environmental permitting for the PPAs is the jurisdiction of the California Energy Commission." This is an important reminder that land use permitting and environmental review should not be prejudged, and must undergo the normal processes of permit application, scoping, information gathering, analysis, review, mitigation, and forcing of alternatives by

the legally empowered land use decision-making bodies. The Commission is wise not to open that door. Similarly, the Commission should be cautious about judging viability from such premature arguments.

Integration value of solar thermal:

The staff Resolution says (at page 15) that "(i)t is true that the Commission assumes zero value for avoided integration costs for comparison purposes," and argues that integration value is excluded in renewable premium calculations for all solar thermal projects and further that, "the Rio Mesa 1 and Rio Mesa 2 PPAs were compared against other executed contracted (sic) recently approved by the Commission which do not include any solar thermal PPAs."

The lack of any clear, consistent and transparent means for valuing integration value is important to the credibility of "least cost-best fit" as a tool. This issue is widely noted.

For example, the California Energy Commission held a workshop for the Desert Renewable Energy Conservation Plan (DRECP) on July 13, 2012, entitled "Energy Roundtable Discussion: Infrastructure Planning, Cost, & Market Implications of the Desert Renewable Energy Conservation Plan.[1]" Andrew Mills of the Lawrence Berkeley National Laboratory presented a report on "Changes in the Economic Value of Variable Generation with Increasing Penetration Levels: A Pilot Study of California." Among the many findings reported were:

> The value of CSP with six hours of storage started off at the same level as other solar technologies, but did not drop to the same extent with higher penetration because the capacity value of the generation was preserved.

(and)

> Increasing the penetration levels in one variable technology does not adversely impact the value of a different variable technology. Therefore it is easier to get to a higher penetration of renewable with a mix of technologies rather than a single technology.

Similarly, the Draft Lead Commissioner Report for the "2012 Integrated Energy Policy Report" (IEPR) states on page 50 that

> Currently, valuation of renewable resources does not include integration costs such as incremental ancilliary service needs or capacity-related services provided by renewable resources. This prevents the procurement of even a "least direct costs" portfolio.

One concern with the staff proposal is that, by somewhat arbitrarily (at least without a clear policy and consistent guidance for staff analysts and independent evaluators) limiting the mix of technologies, and treating projects as isolated events, we may be setting ourselves up for future costs from additional ramping generation required to integrate large amounts of photovoltaic, or solar thermal projects with less capacity.

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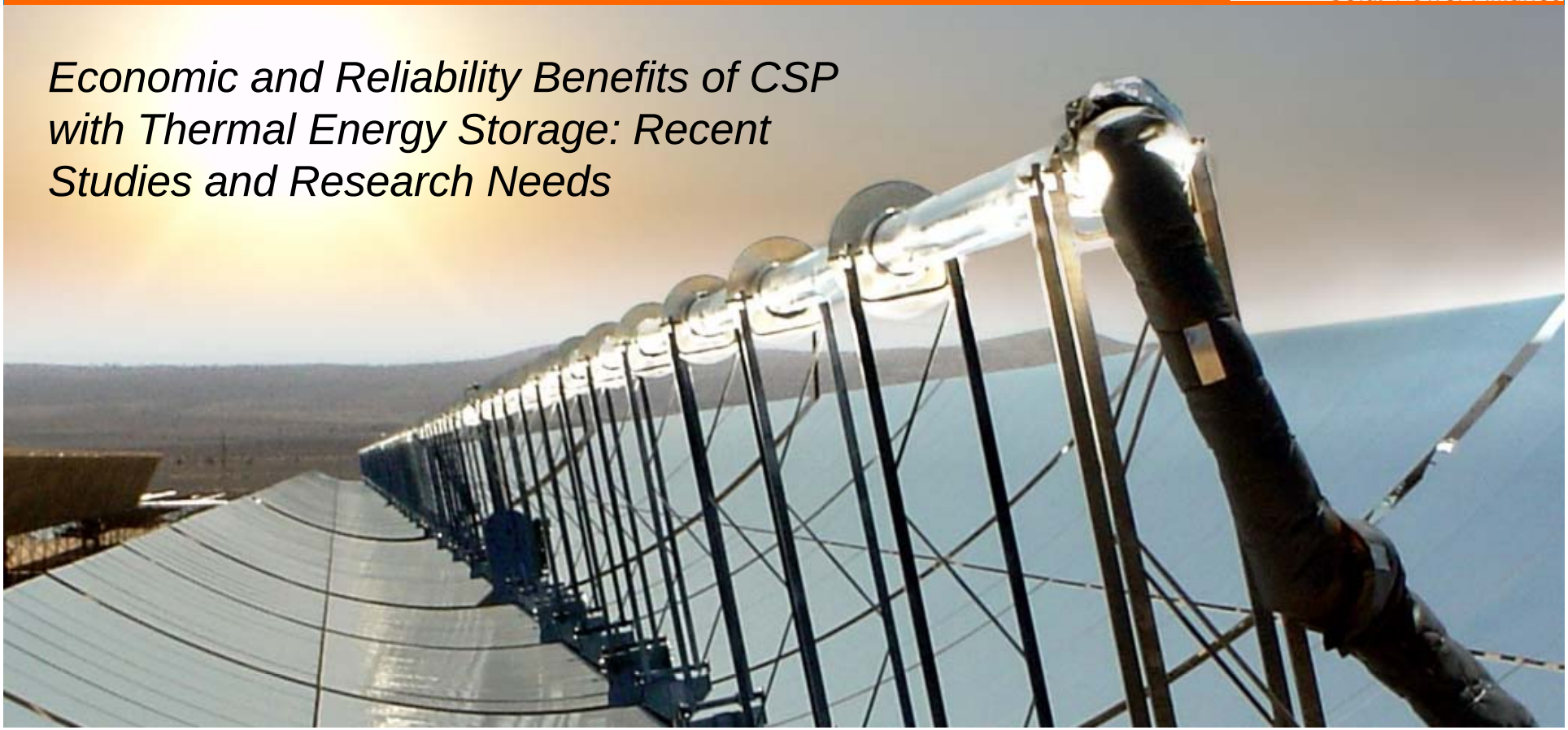
[1] Posted at www.drecp.org

Attachment ES-4
PowerPoint Presentation December 19, 2012

Concentrating Solar Power Alliance



Economic and Reliability Benefits of CSP with Thermal Energy Storage: Recent Studies and Research Needs

Udi Helman
Managing Director, Economic and Pricing Analysis
BrightSource Energy

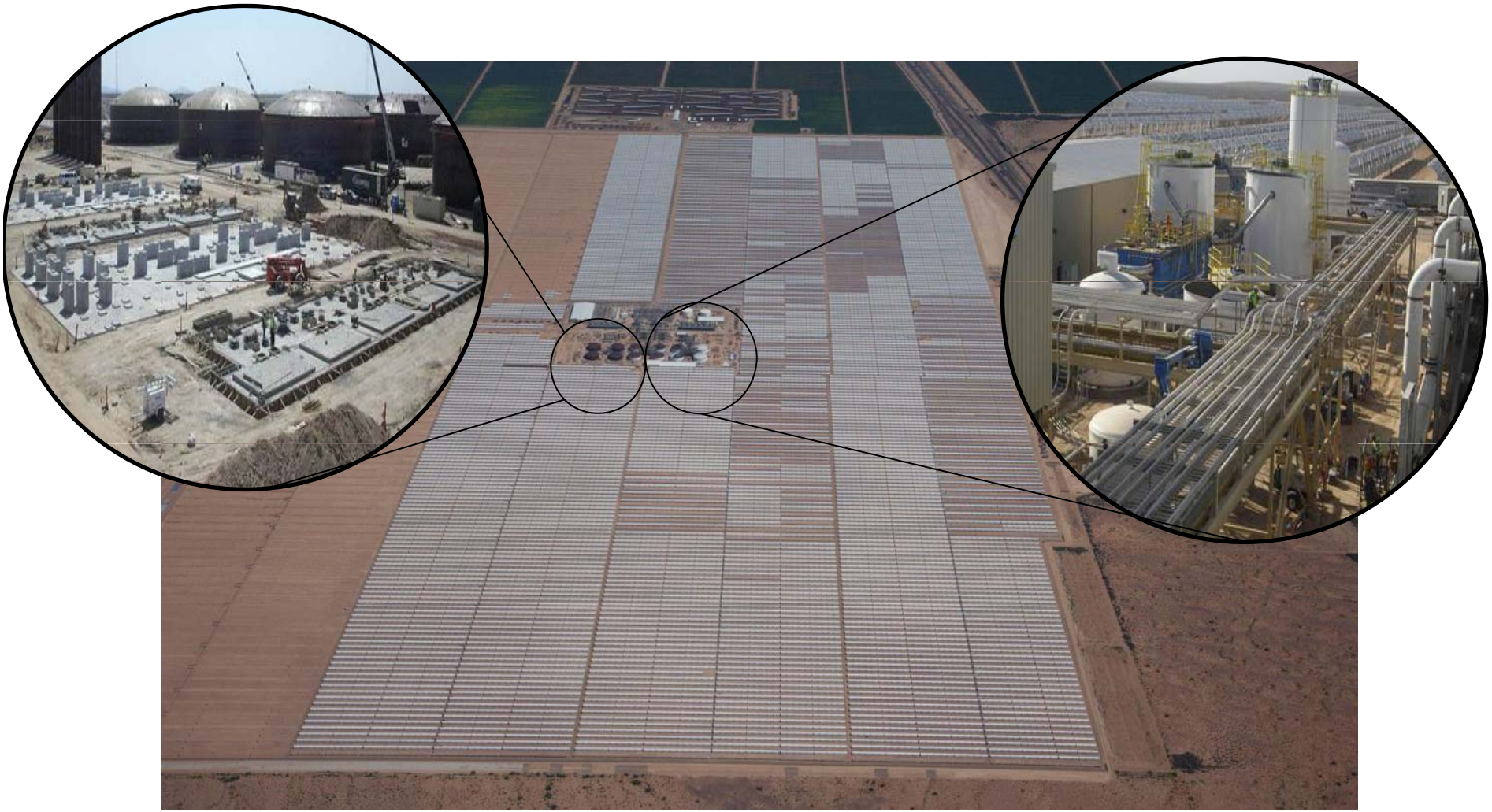
DOE
December 19, 2012

Concentrating Solar Power Alliance

- What is the CSP Alliance?
  - An advocacy group formed in March 2012 whose goal is to increase the deployment of CSP
- What is the CSP Alliance's mission?
  - Inform utilities, grid operators, and regulators of the benefits of CSP with its ability to store thermal energy and provide dispatchable power
- Who are the members?
  - Membership includes Abengoa, BrightSource, Torresol Energy, Lointek, and Cone Drive
  - Others are in the process of joining

The Next Phase of CSP technology: BrightSource Ivanpah Project

The Next Phase of CSP technology: Abengoa Solana project



Forthcoming CSPA Report Objectives

- Recent research studies have helped to clarify several aspects of solar valuation, but there was no literature survey available
  - Some methodological differences between studies need to be explained
  - Additional research needs have been identified
- Utilities and regulators need to adopt new approaches to economic and reliability valuation based on “net system costs” to incent more operationally flexible and reliable renewable resources

What are the general findings?

- CSP with thermal storage is a dispatchable thermal power plant, which offers additional economic and reliability benefits when compared to wind and other solar technologies
- There are several categories of these benefits – energy, ancillary services, capacity and power quality – as well as some avoided system costs of integration
- The additional benefits can be significant at higher renewable penetration, in the range of $30-40/MWh in recent studies

Overview of Report

Background sections on technology and valuation

- Section 2 – Design and operational attributes of CSP with thermal energy storage
- Section 3 – Valuation methods and definition of net system cost
- Section 4 – Valuation in different market and regulatory regimes
- Section 5 – Simulating high renewable power systems

Overview of Report (cont.)

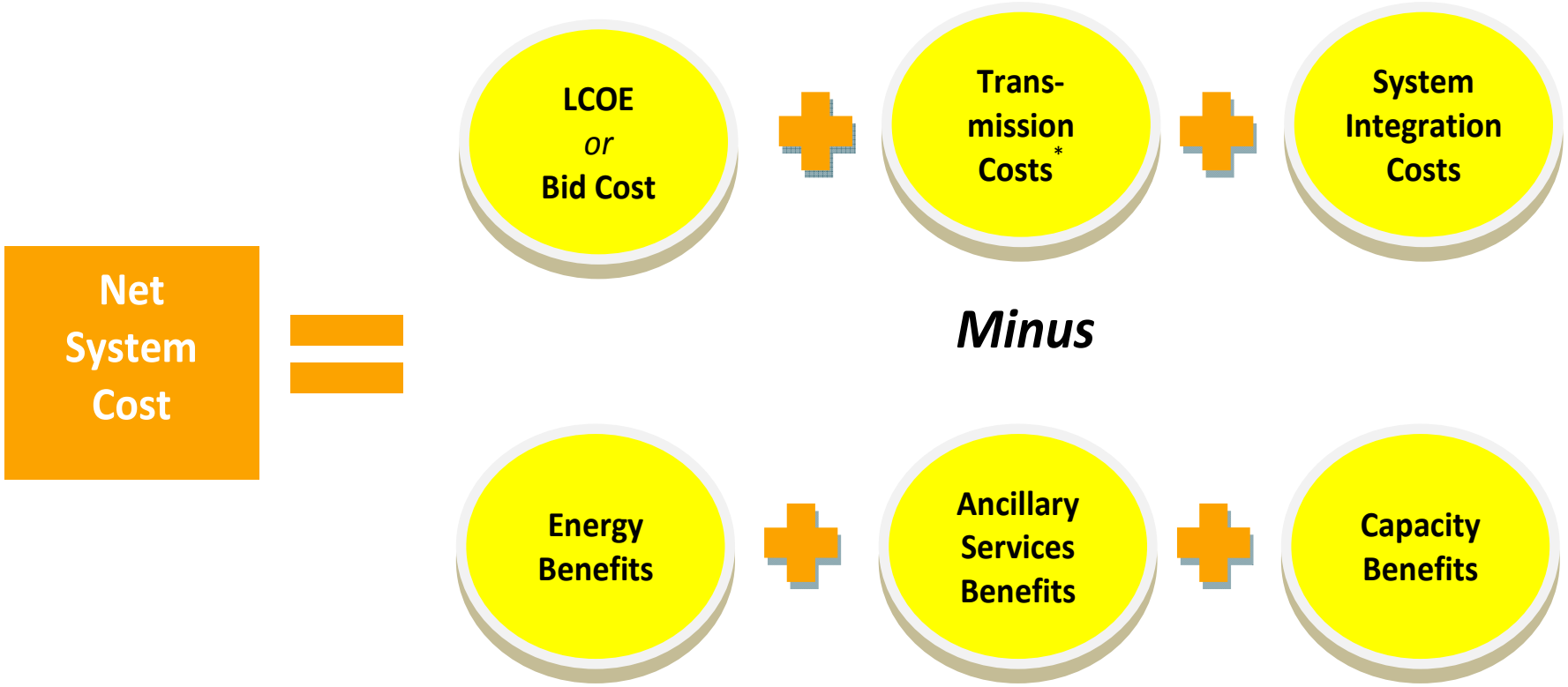
Analysis of economic and reliability benefits by category

- Section 6 – Energy and ancillary services
- Section 7 – Resource adequacy
- Section 8 – Integration and curtailment costs
- Section 9 – Greenhouse gas emissions
- Section 10 – Power quality and other reliability attributes

Categories of value

Energy	✓ *Hourly optimization of energy schedules* ✓ *Subhourly energy dispatch* ✓ *Ramping reserves*
Ancillary services (for secondary frequency control)	✓ *Regulation* ✓ *10-minute spinning reserves* ✓ *10-min non-spinning reserves* ✓ *Operating reserves on greater than 10 minute time-frames*
Power quality and other ancillary services	✓ *Voltage control* ✓ *Frequency response* ✓ *Blackstart*
Capacity	✓ *Generic MW shifted to meet evolving system needs* ✓ *Operational attributes*
Integration and curtailment costs compared to solar PV and wind	✓ *Reduced production forecast error and associated reserve requirements* ✓ *Reduced curtailment due to greater dispatch flexibility without production losses* ✓ *Ramp mitigation*

Net System Cost



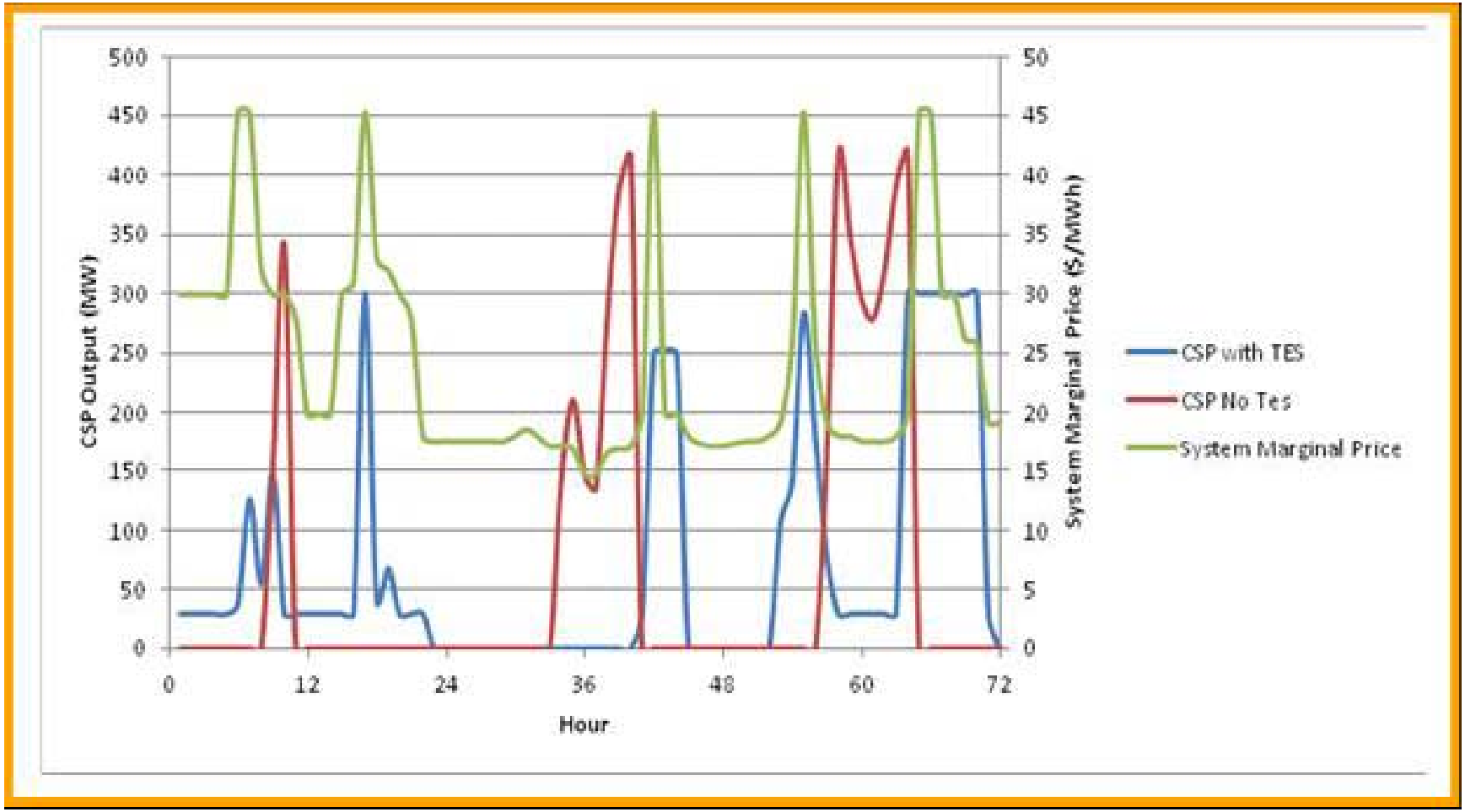
*Transmission costs may be difficult to dis-aggregate for many projects that jointly utilize a set of transmission upgrades, but exist regardless.

Energy and ancillary services

- Several studies of different systems, and varying system conditions
  - Plant level optimization to maximize revenues against historical or simulated prices
  - Different types of power system models, typically to minimize fuel costs
    - E.g., production simulation models; variants on capacity expansion models

- Solar plant revenues vary from year to year, but added value of thermal storage is fairly consistent across study scenarios

CSP with thermal energy storage dispatched against simulated energy prices



Source: Denholm and Hummon, NREL (2012), Figure 10, pg. 19.

Energy and ancillary services – study results

Study	Location and Date	Technology	Methodology/Metric	Baseline Solar	Renewable penetration	Added Market Value
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Sioshansi and Denholm, 2010	ERCOT (Texas), western zone, 2005	Trough with 6 Hrs storage, SM 2.0	Plant revenue optimization against exogenous fixed market prices	Trough with no storage, SM 1.5	N/A, but assume existing renewables in 2010	$9.00/MWh [Energy]
Helman and Sioshansi, 2012 (unpublished)	California ISO, Dagget, CA, 2011 prices	Trough with 6 Hrs storage, SM 2.0	Plant revenue optimization against exogenous fixed market prices	Trough with no storage, SM 1.5	Existing renewables in 2011	$8.50/MWh [Energy + Spinning Reserves]
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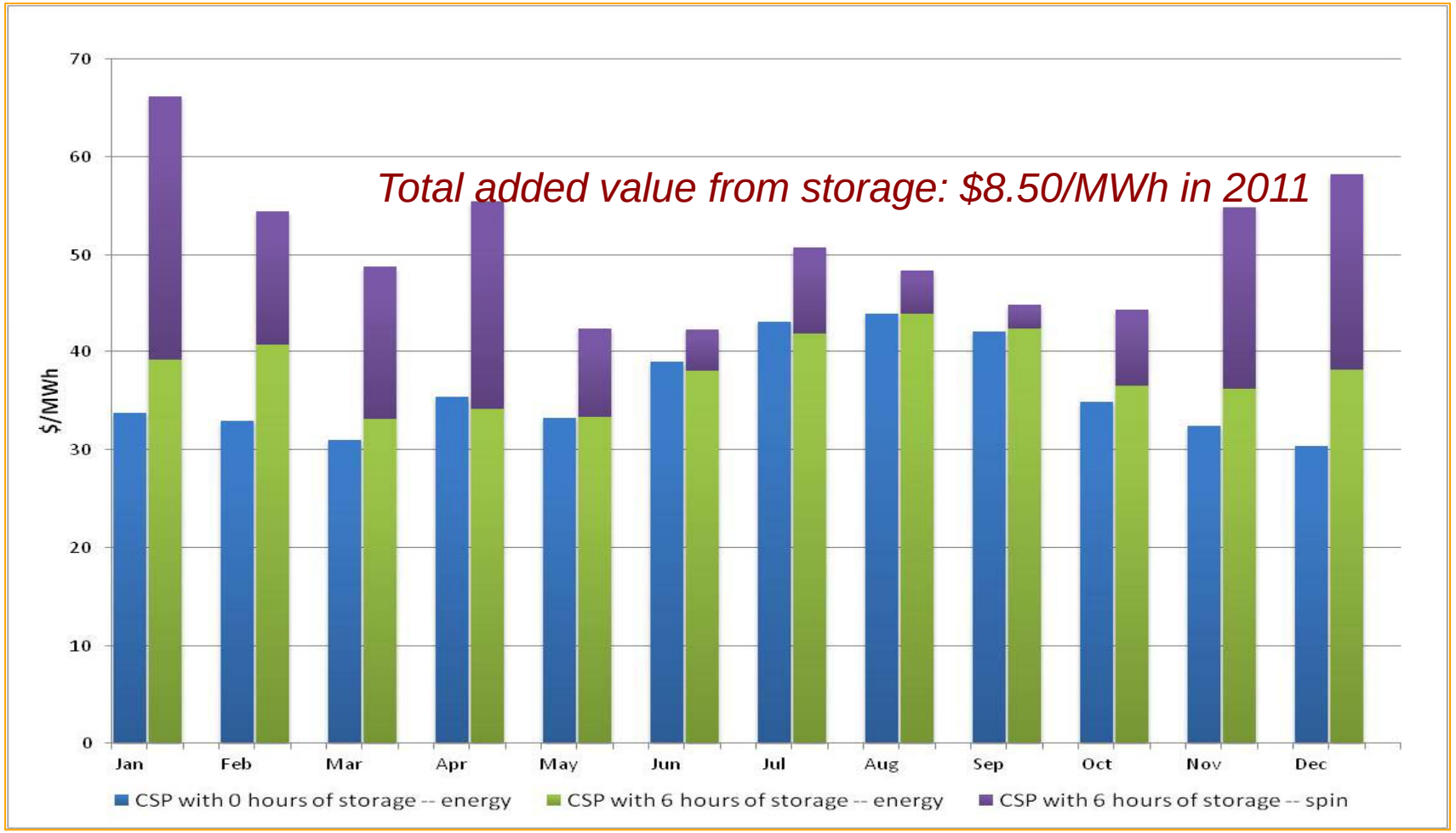
Energy and ancillary services: Results from California ISO market prices, 2011

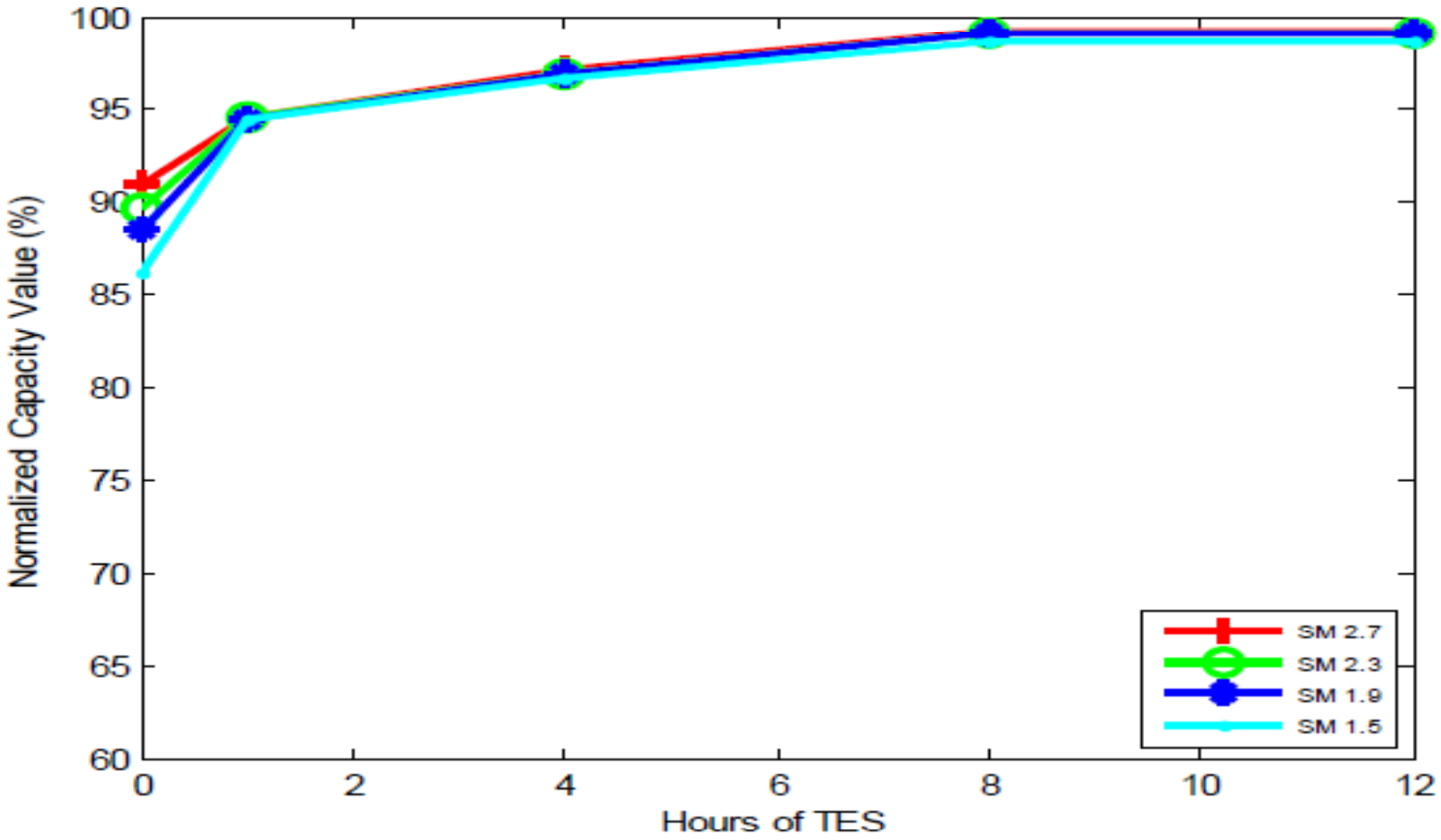


Source: Helman and Sioshansi using exogenous fixed price model (2012, unpublished); these values are expressed in $/MWh of energy production each month, which slightly skews the calculation of spin $/MWh during months with lower energy production and higher spin revenues.

Resource adequacy and capacity value

- In some regions, such as California, load-serving entities must fulfill resource adequacy requirements
  - In California, secure operable capacity to meet next year's monthly peak loads + reserve margin
- Capacity credits awarded to wind and solar resources are typically based on either (i) forecast production during annual capacity counting hours or (ii) on probabilistic models based on loss-of-load probability (LOLP) under different scenarios
- Capacity credits valued against existing capacity prices or future avoided costs of new generation capacity ($/kW-year, or converted to $/MWh of CSP energy production)

CSP with thermal storage capacity value as a function of solar multiple and hours of storage



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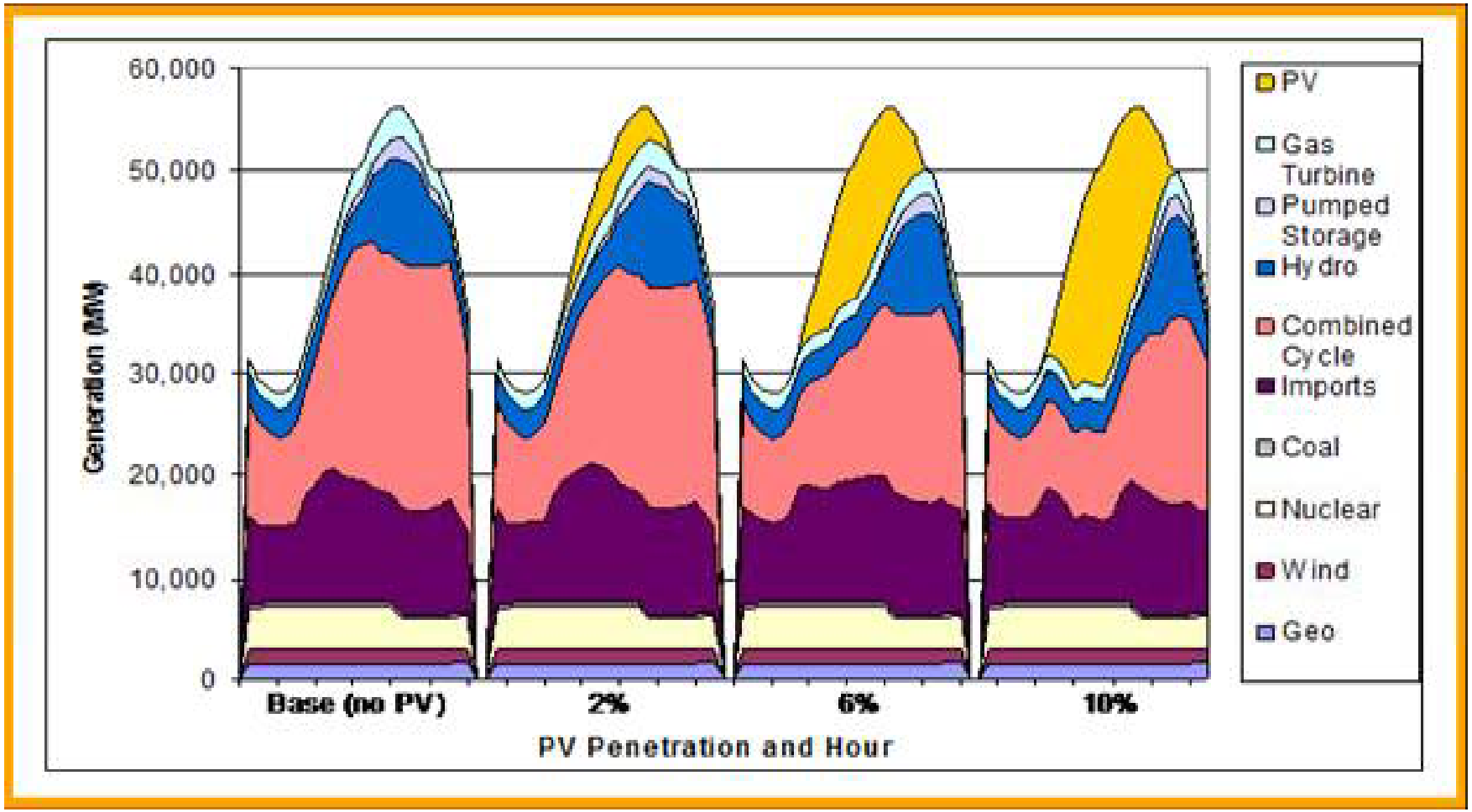
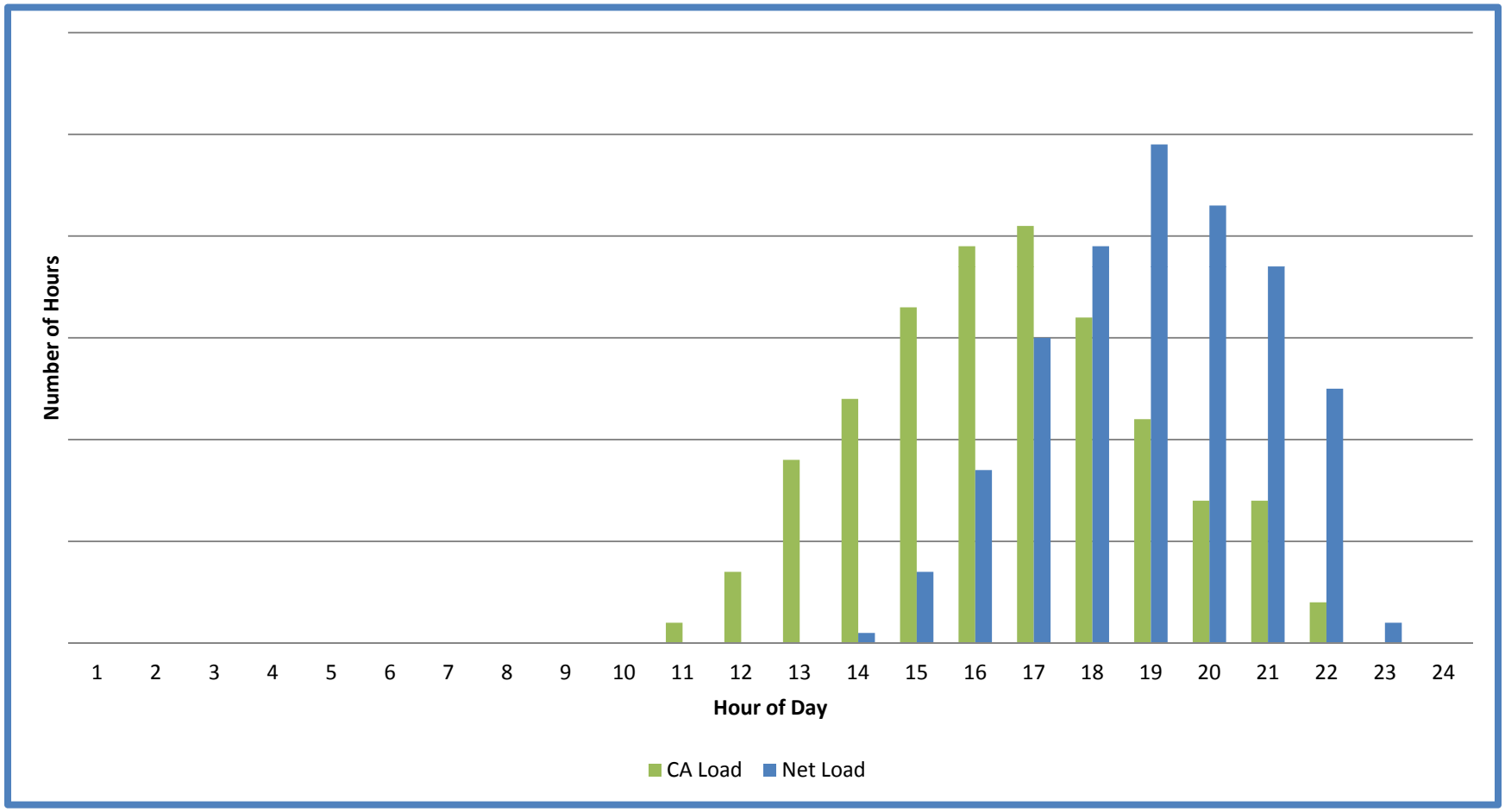
Capacity value will change as solar penetration increases: Illustration using dispatch of generation in California at different penetrations of PV – simulated summer da



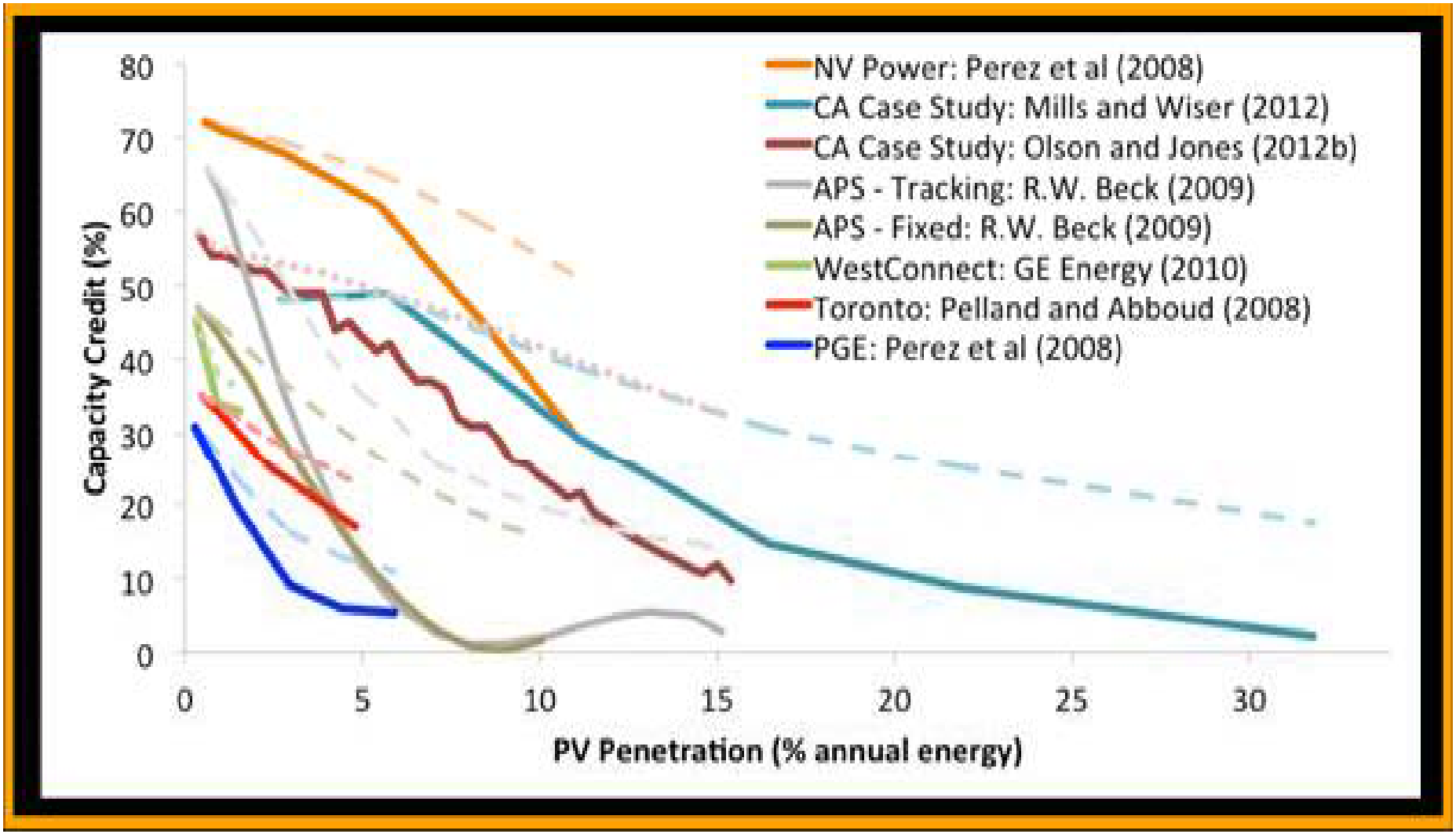
Source: Denholm and Mehos, NREL, 2011, pg. 3.

Shifting capacity needs in California: Top 250 load and "net load" hours in the CPUC 33% RPS "Environmental" Scenario (2010 vintage)



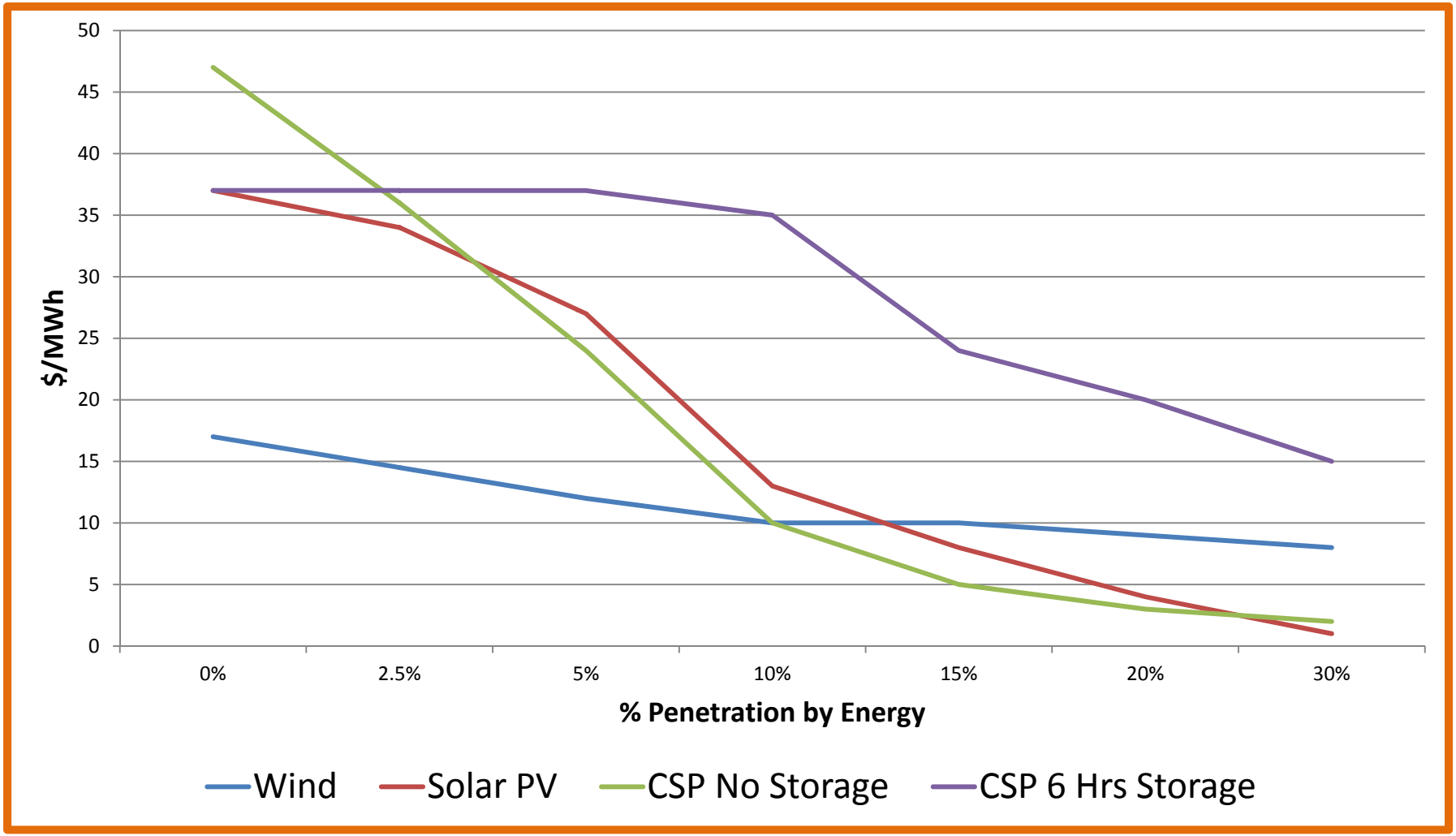
Source: CAISO 33% RPS data sets with BrightSource assumptions about net load

Solar PV capacity value as penetration increases



Source: Mills and Wiser, LBNL, 2012

Marginal capacity value ($/MWh) of incremental renewables in California at different penetrations



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Capacity value difference between CSP and PV at higher penetrations

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Mills and Wiser, 2012	California	Trough with 6 hours of storage, SM 2.0	Modified capacity expansion model with simplified dispatch	Single axis tracking PV	15% PV (no other renewable energy)	$16/MWh

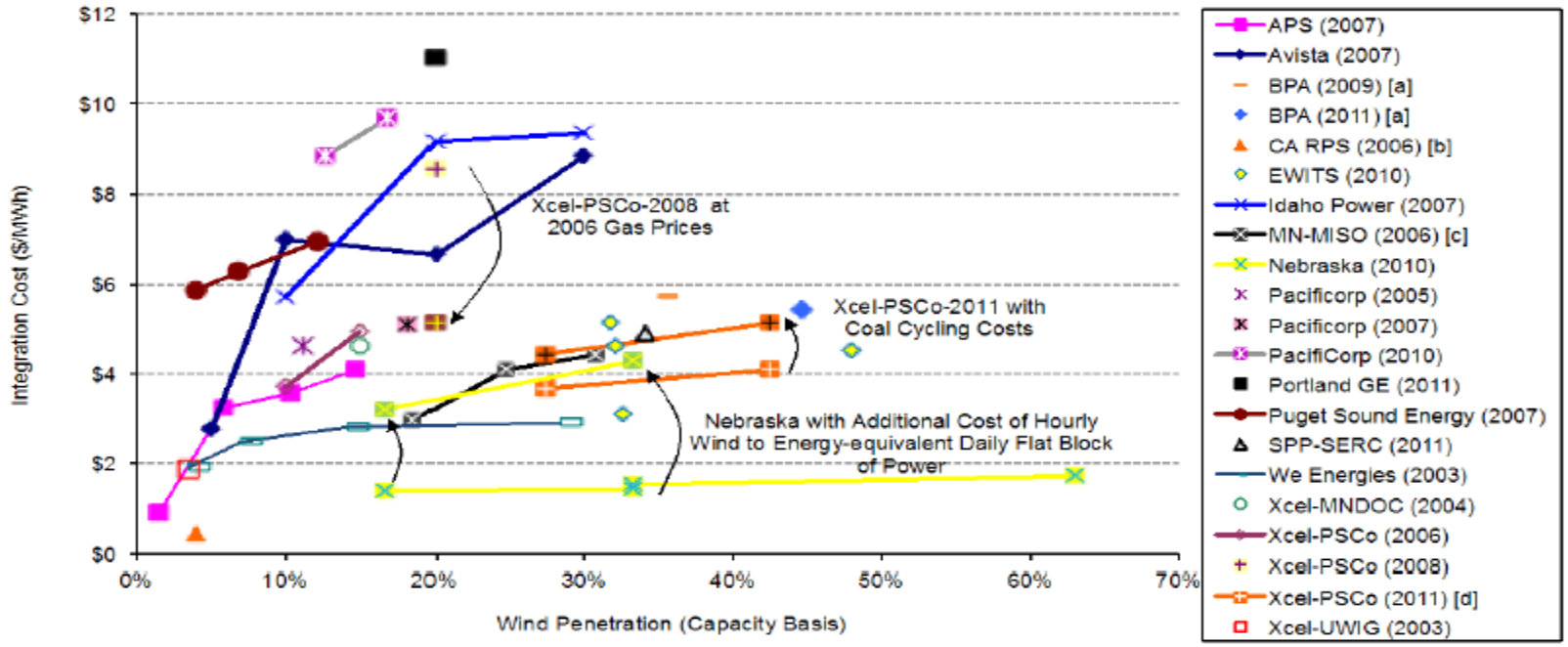
Renewable integration costs

- Additional procurement of existing and new ancillary service products
- Additional start-up and no-load costs
- Additional O&M costs
- Retrofits to existing generation or upgrades to transmission to improve operational flexibility
- Costs of new resources – flexible generation, storage, demand response – needed for operational flexibility

Avoided integration costs of CSP with thermal storage

- Lower production forecast error than other variable energy
- Smoothing of intra-hour production variability
- Potential to slow rate of morning net load ramp
- Potential to slow rate of late afternoon net load ramp
- Solar dispatchability could offset the need for new integration resources (beyond the capability of the planned generation fleet)

Wind integration cost studies

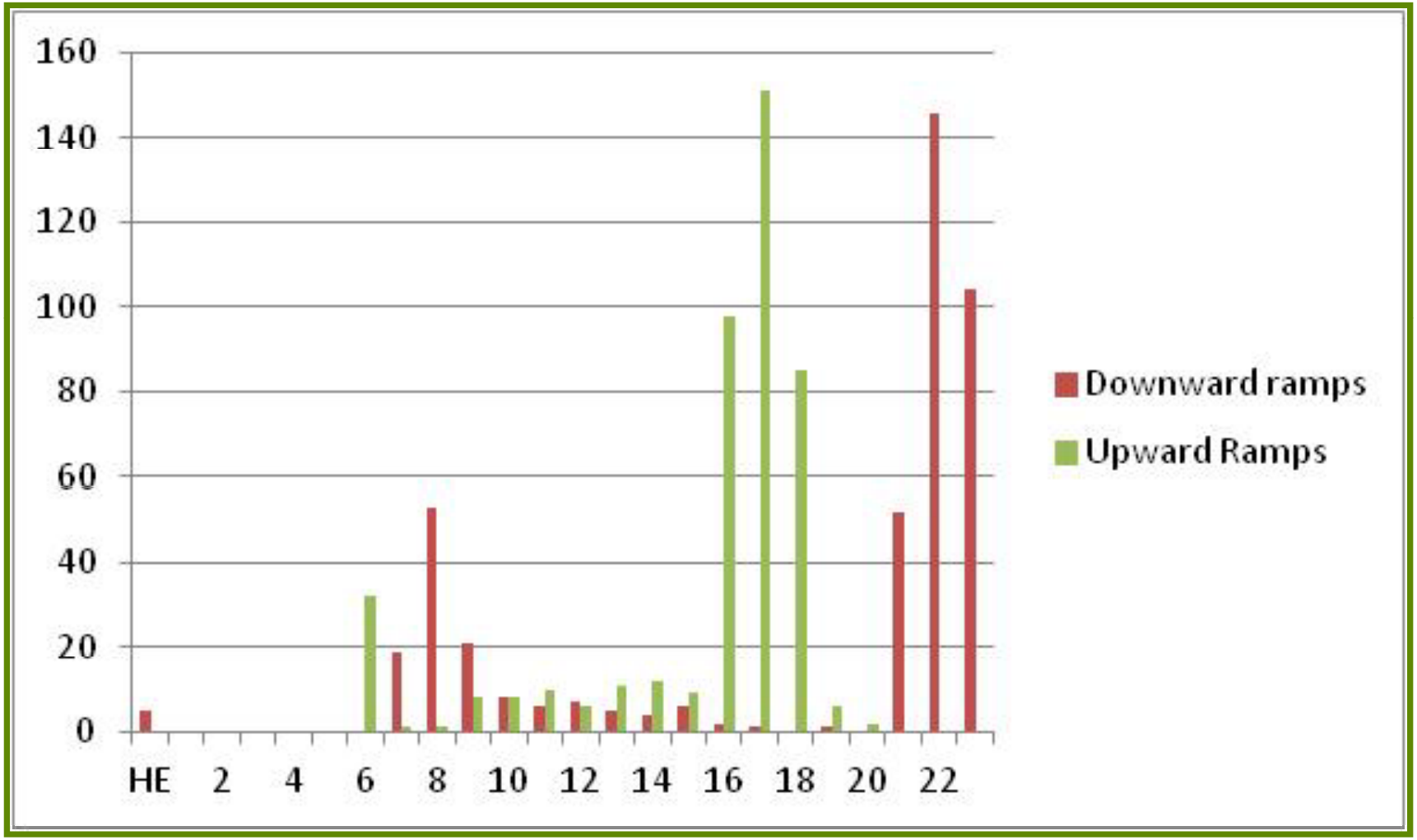


[a] Costs in $/MWh assume 31% capacity factor.
[b] Costs represent 3-year average.
[c] Highest over 3-year evaluation period.
[d] Higher cost line adds the coal cycling costs found in Xcel Energy (2011).

Sources: Acker (2007) [APS (2007)]; EnerNex Corp. (2007) [Avista (2007)]; BPA (2009); BPA (2011c); Shiu et al. (2006) [CA RPS (2006)]; EnerNex Corp (2010) [EWITS (2010)]; EnerNex Corp. and Idaho Power Co. (2007) [Idaho Power (2007)]; EnerNex Corp. and WindLogics Inc. (2006) [MN-MISO (2006)]; EnerNex et al. (2010) [Nebraska (2010)]; PacifiCorp (2005); PacifiCorp (2007); PacifiCorp (2010); PGE and EnerNex Corp.(2011) [Portland GE (2011)]; Puget Sound Energy (2007); EPRI (2011) [SPP-SERC (2011)]; Electrotek Concepts, Inc. (2003) [We Energies (2003)]; EnerNex Corp. and WindLogics, Inc. (2004) [Xcel-MNDOC (2004)]; EnerNex Corp. (2006) [Xcel-PSCo (2006)]; EnerNex Corp. (2008) [Xcel-PSCo (2008)]; Xcel Energy and EnerNex Corp. (2011) [Xcel-PSCo (2011)]; Brooks et al. (2003) [Xcel-UWIG (2003)]

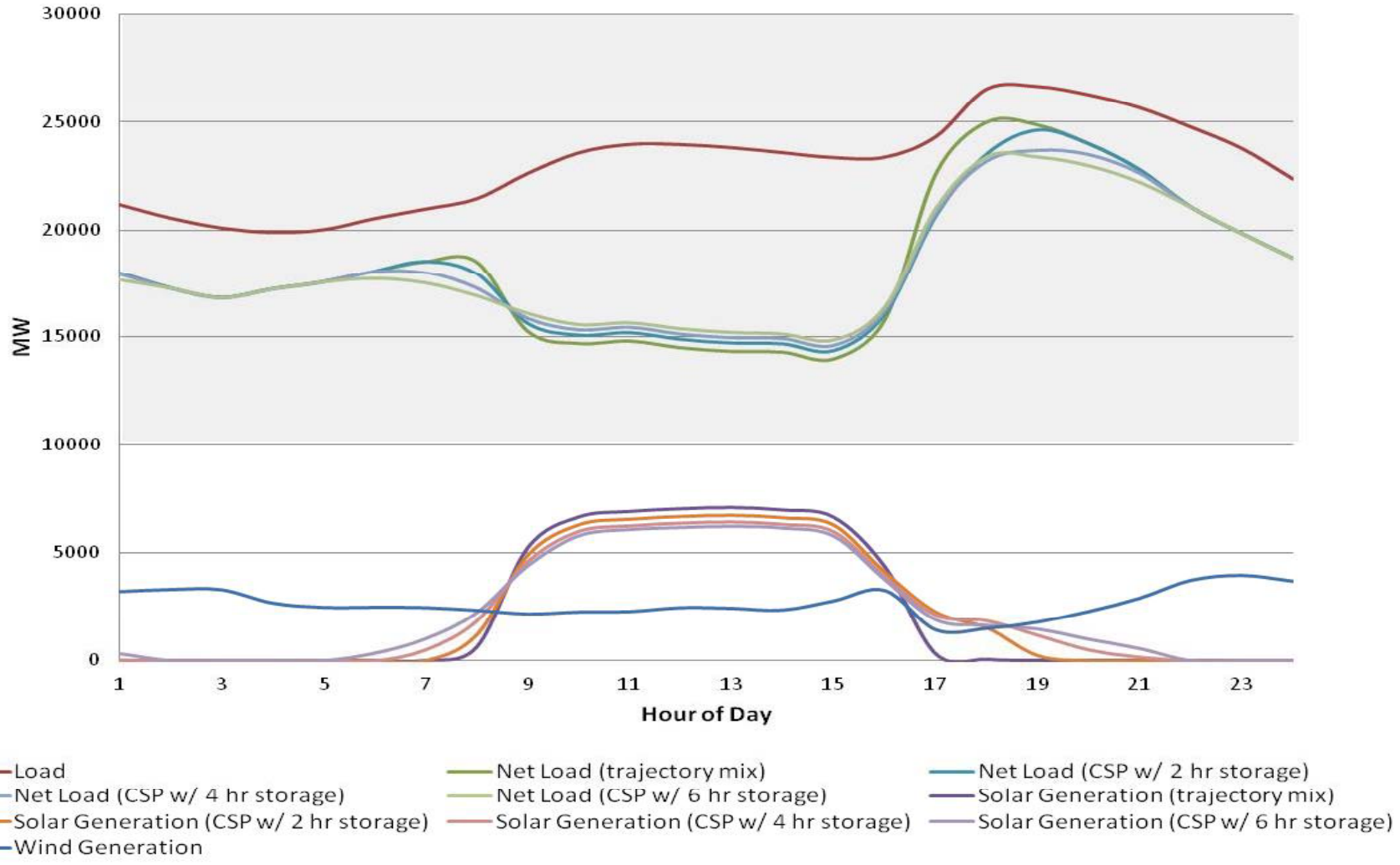
Source: DOE Wind technologies market report, 2012

Top 10% of upward and downward net loa hours in California under 33% RPS, by hou

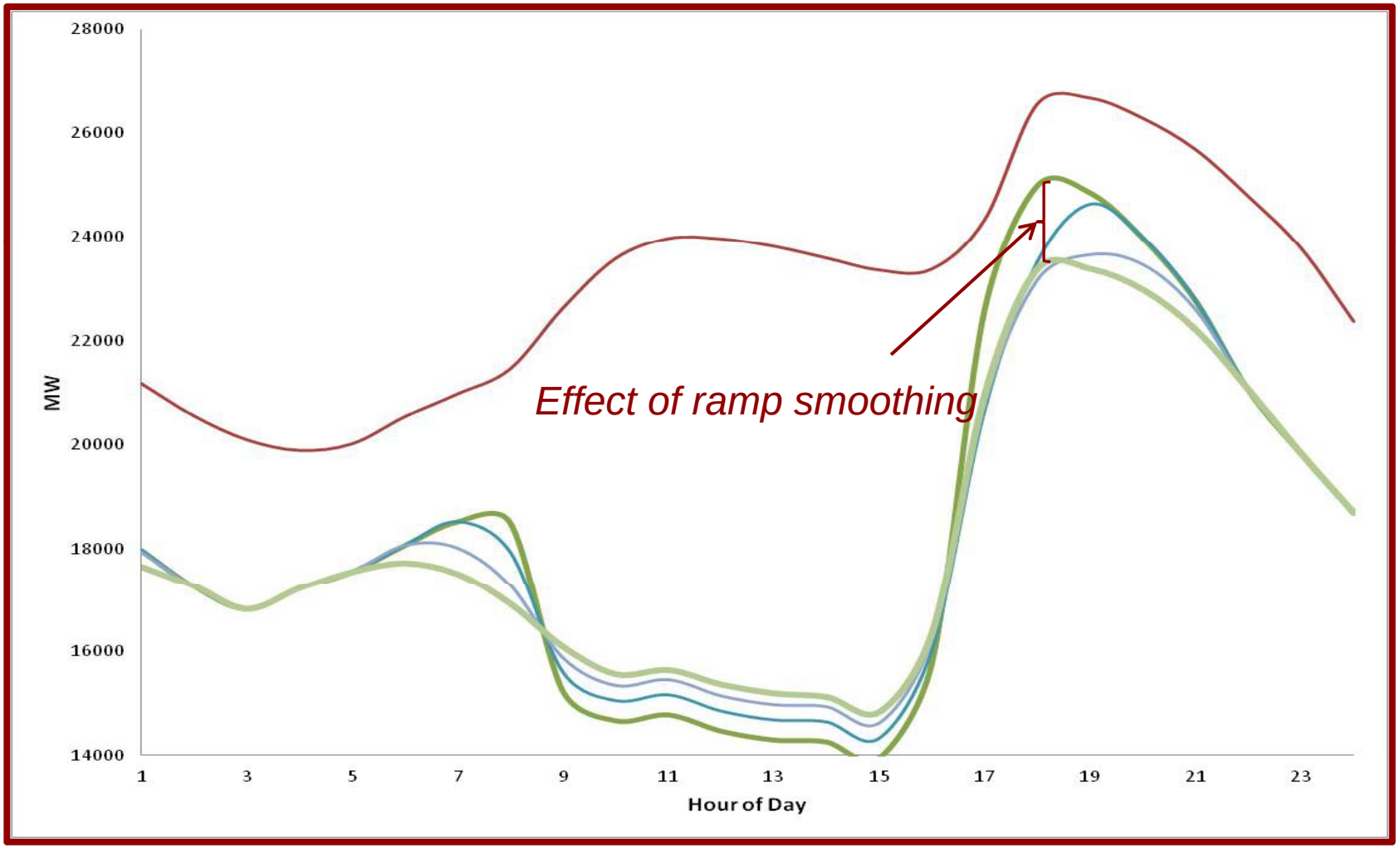


Source: CAISO 33% RPS simulation data-sets, 2011

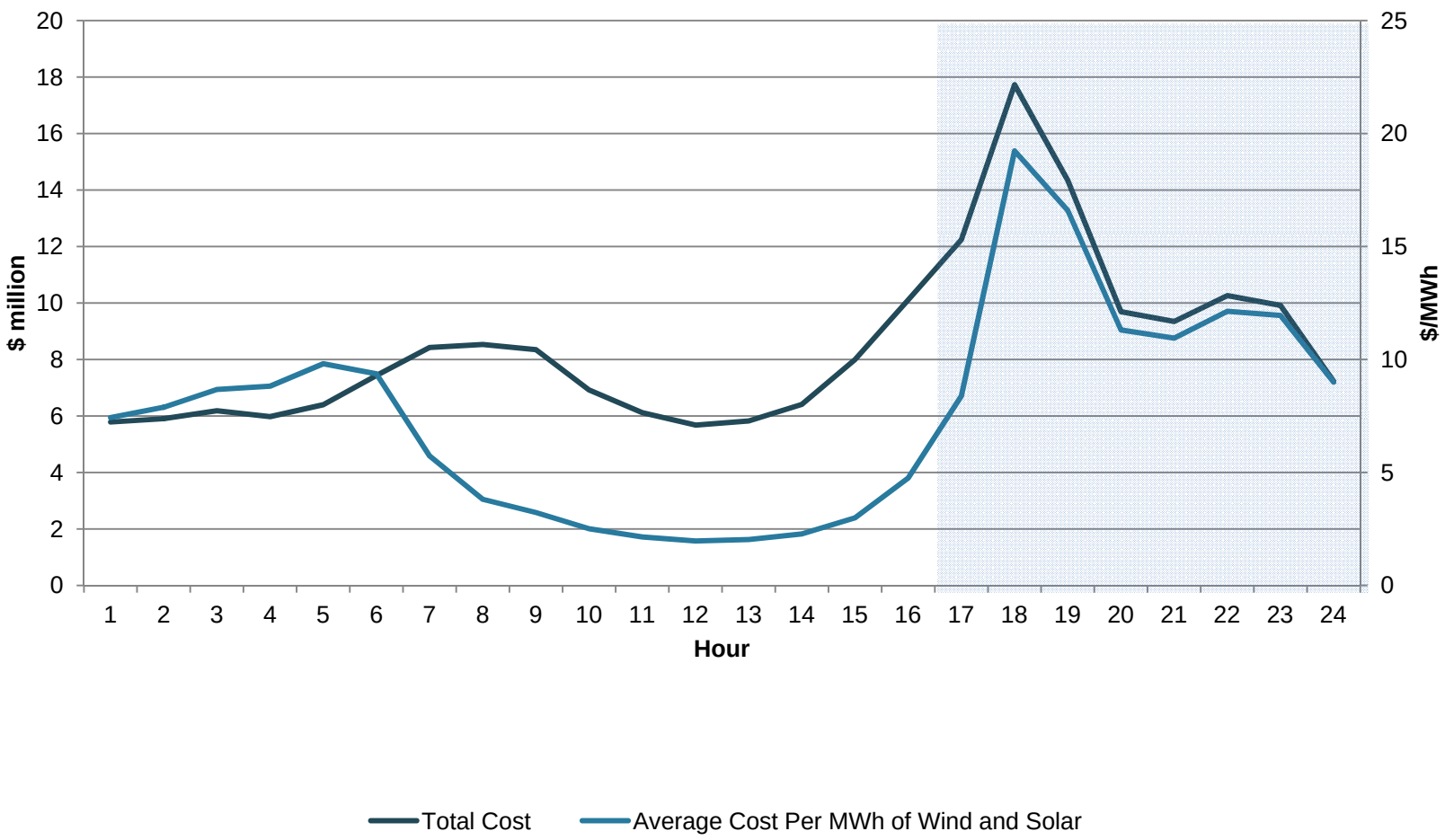
CSP mitigating high net load afternoon ramp – Winter day in California at 33% RPS



High net load afternoon ramp – winter day with more detail



Distribution of integration costs over the operating day at 33% RPS

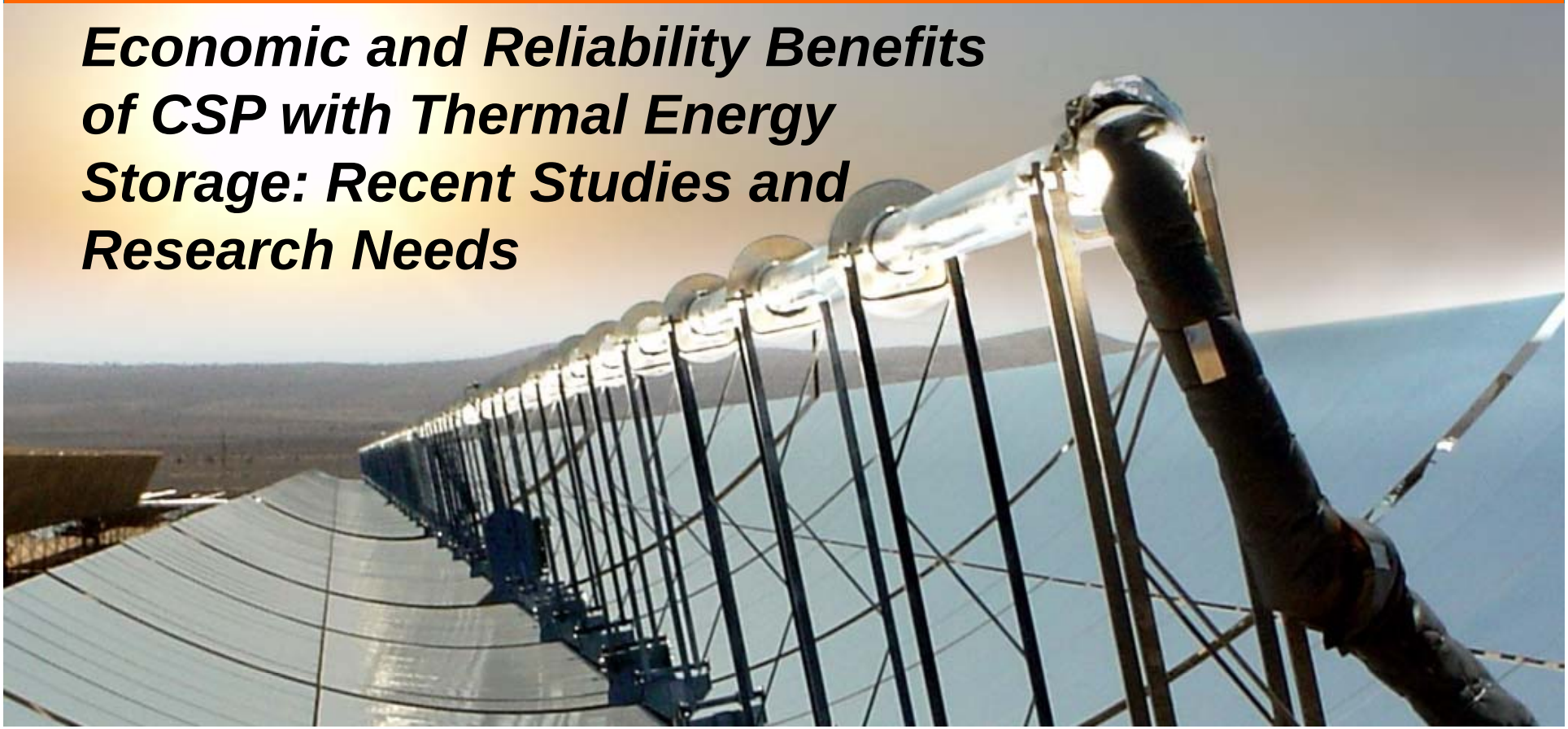


Summary of findings

- Different studies are generally showing similar ranges of thermal storage benefits for energy, ancillary services, capacity and avoided integration costs
  - More research is needed on some areas, such as solar integration costs
- Regulators and utilities should expand valuation of solar resources to consider a more comprehensive approach to net system cost that reflects these considerations

Attachment ES-5
PowerPoint Presentation January 9-10, 2013

Economic and Reliability Benefits of CSP with Thermal Energy Storage: Recent Studies and Research Needs



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Marcus Evans
3rd Annual Electric Energy Storage
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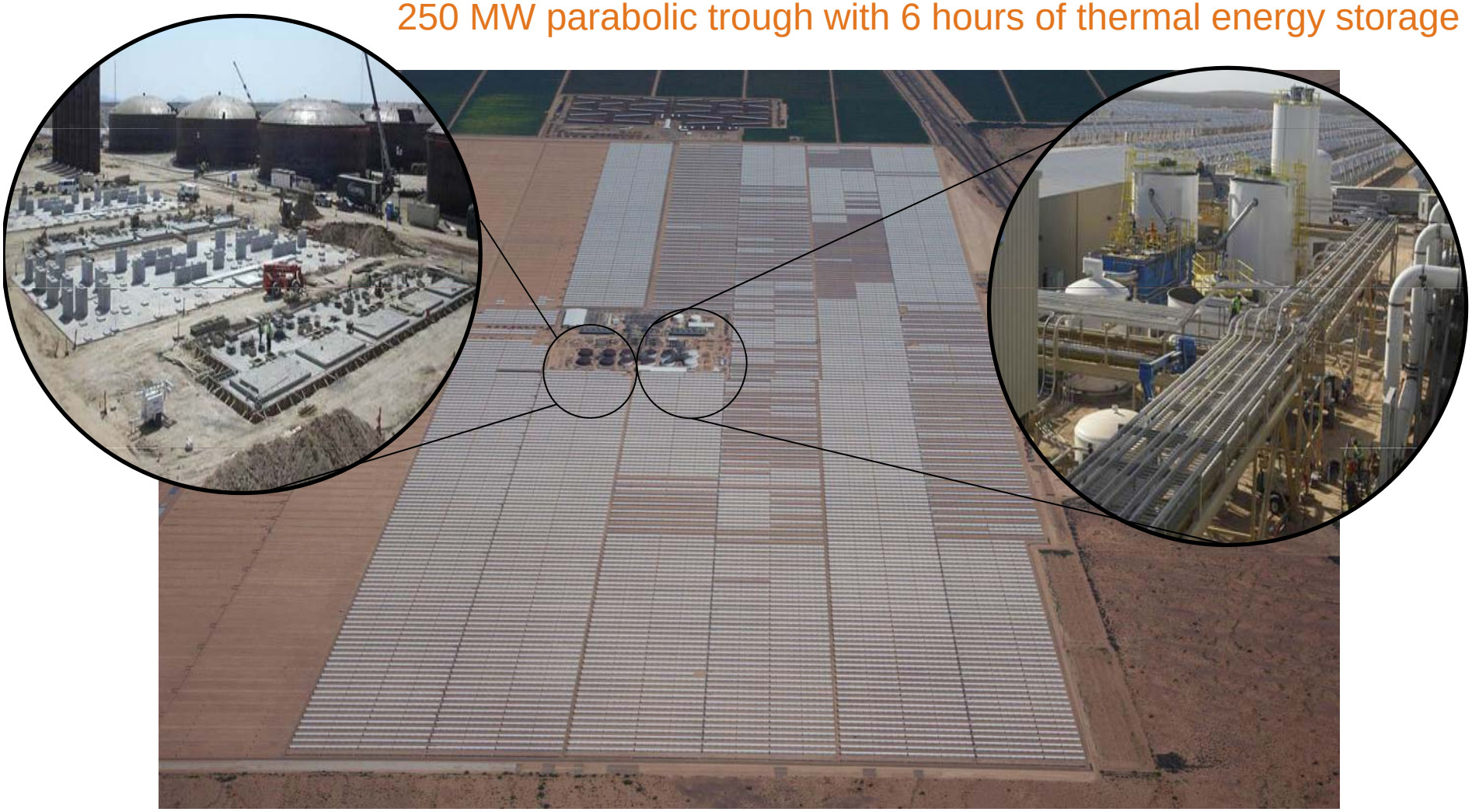
The Next Phase of CSP technology: BrightSource Ivanpah Project

377 MW complex with 3 power towers without thermal storage; other tower designs can include thermal storage

The Next Phase of CSP technology: Abengoa Solana project

250 MW parabolic trough with 6 hours of thermal energy storage



CSPA Report on valuation of CSP with thermal storage

- Available at

http://www.csp-alliance.org/cspa-report/

CSPA Concentrating Solar Power Alliance csp-alliance.org

CSPA Report Objectives

- Recent research studies have helped to clarify several aspects of solar valuation, but there was no literature survey available
  - Some studies focus on a single solar technology, such as CSP with thermal storage, while others compare different technologies
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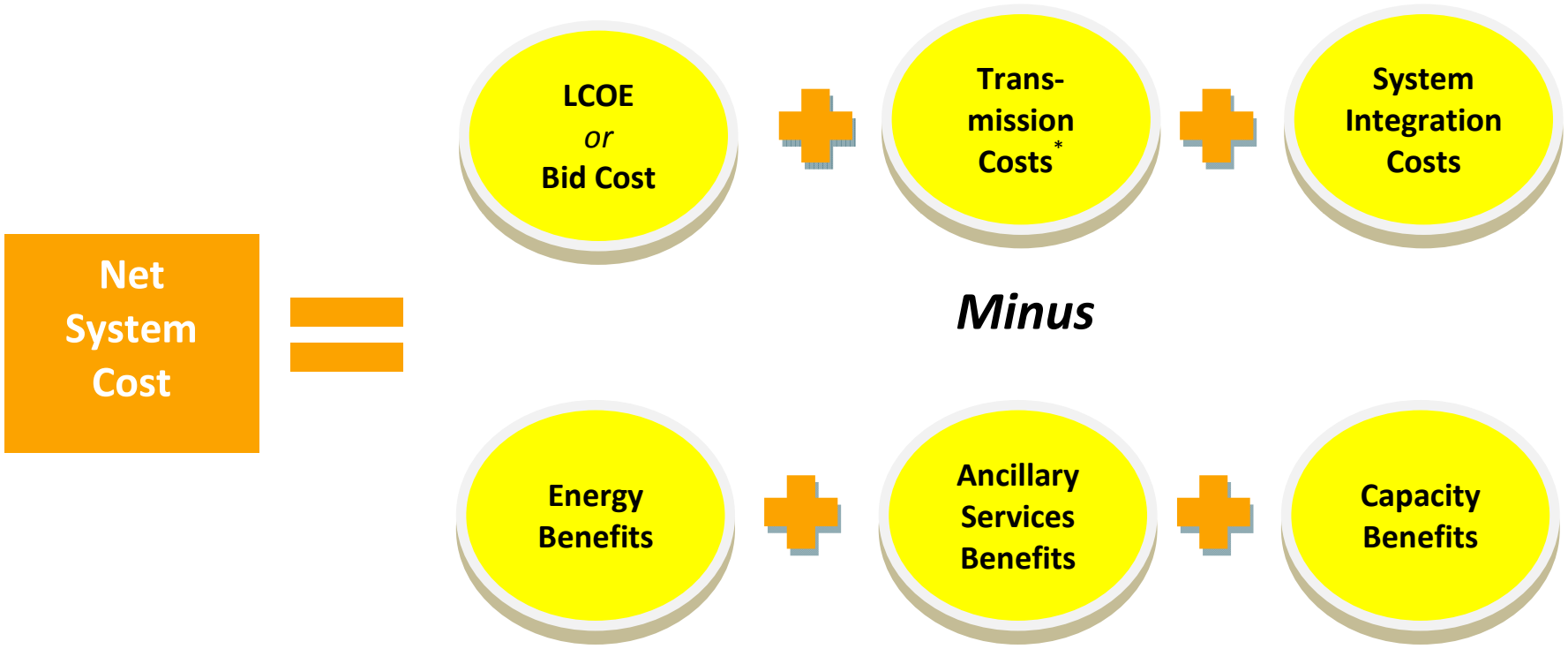
Net System Cost



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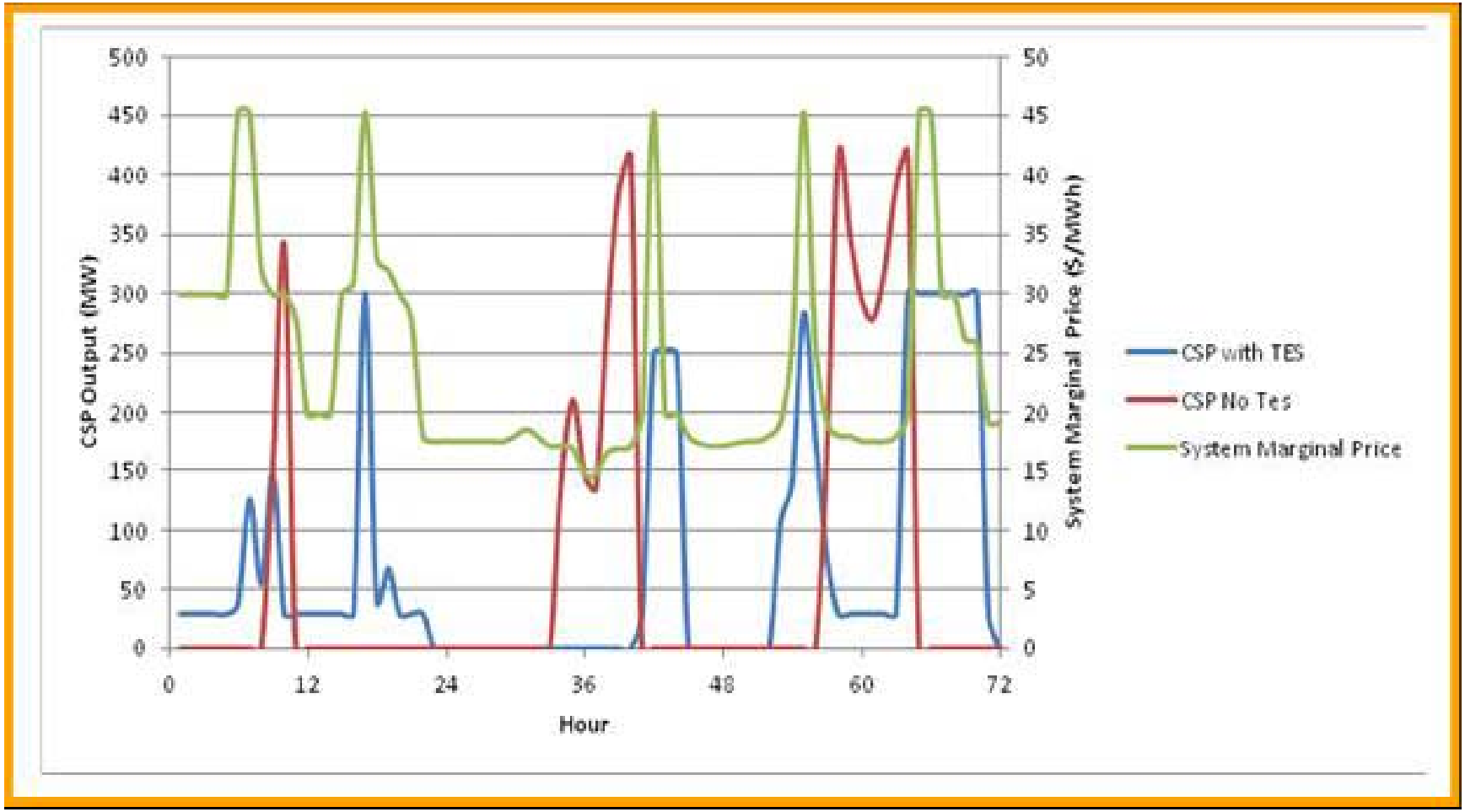

***Source*: Denholm and Hummon, NREL (2012), Figure 10, pg. 19.**

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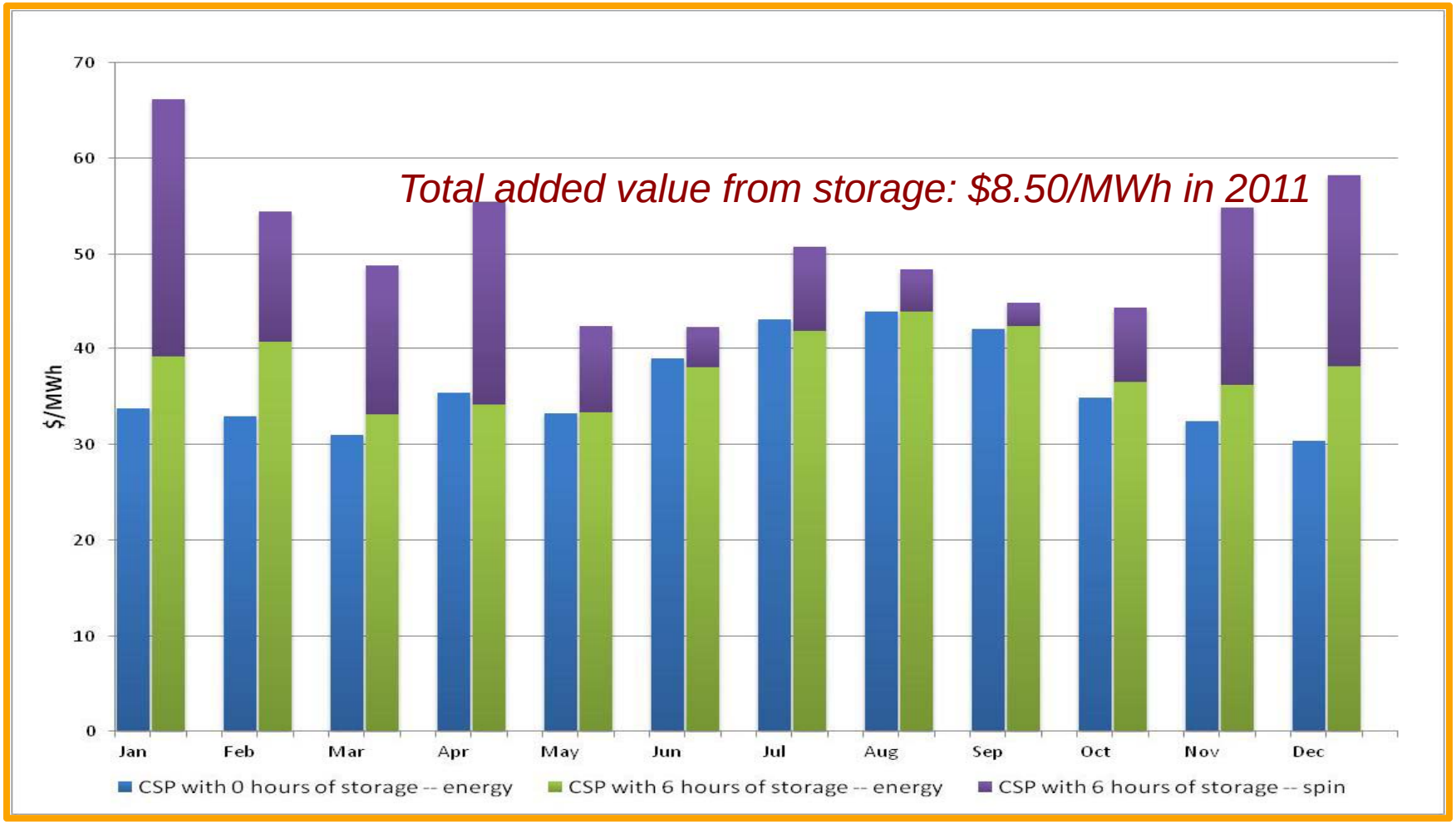
Energy and ancillary services: Results from California ISO market prices, 2011



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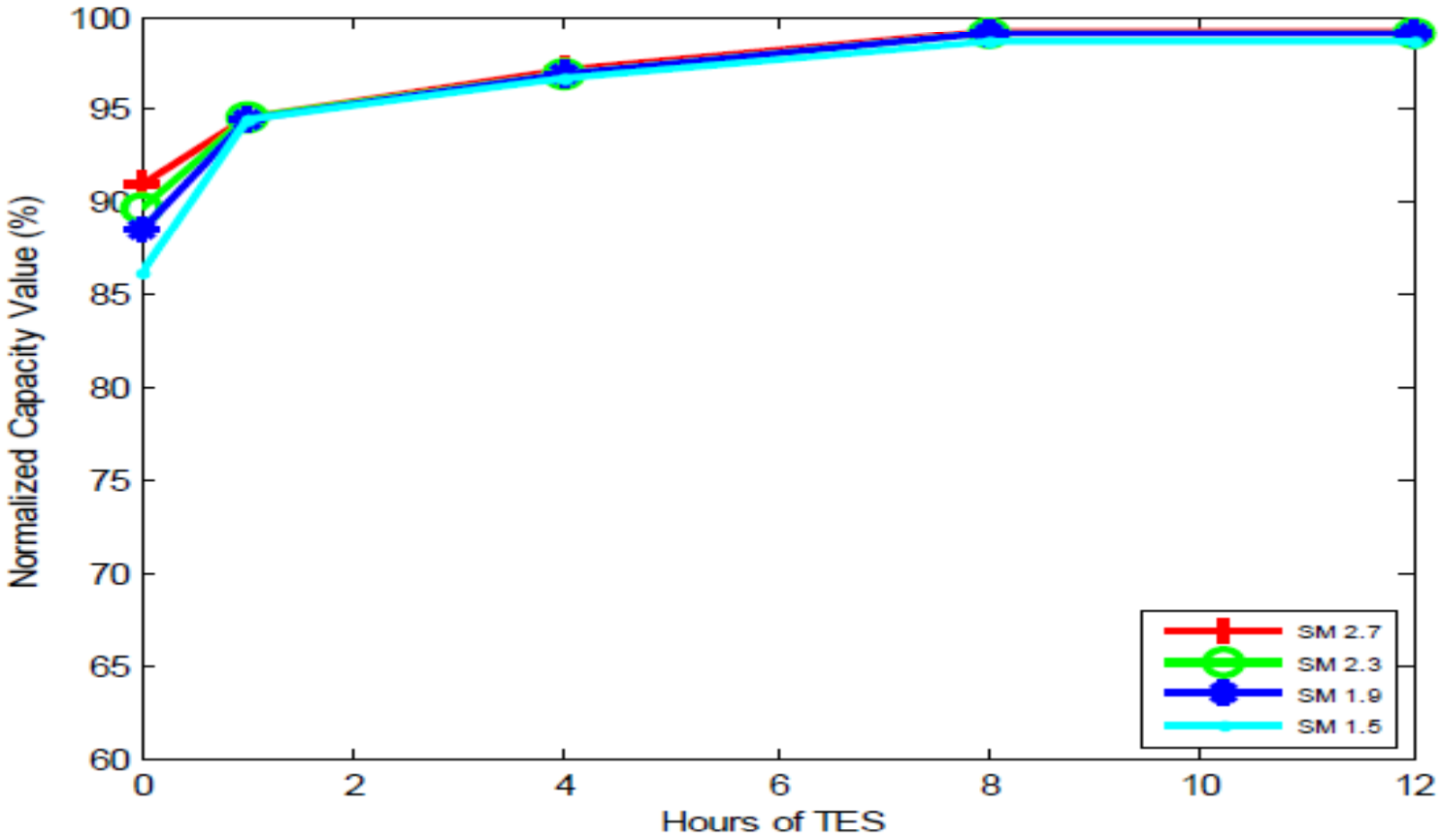
Capacity value of CSP with thermal storage – low solar penetration

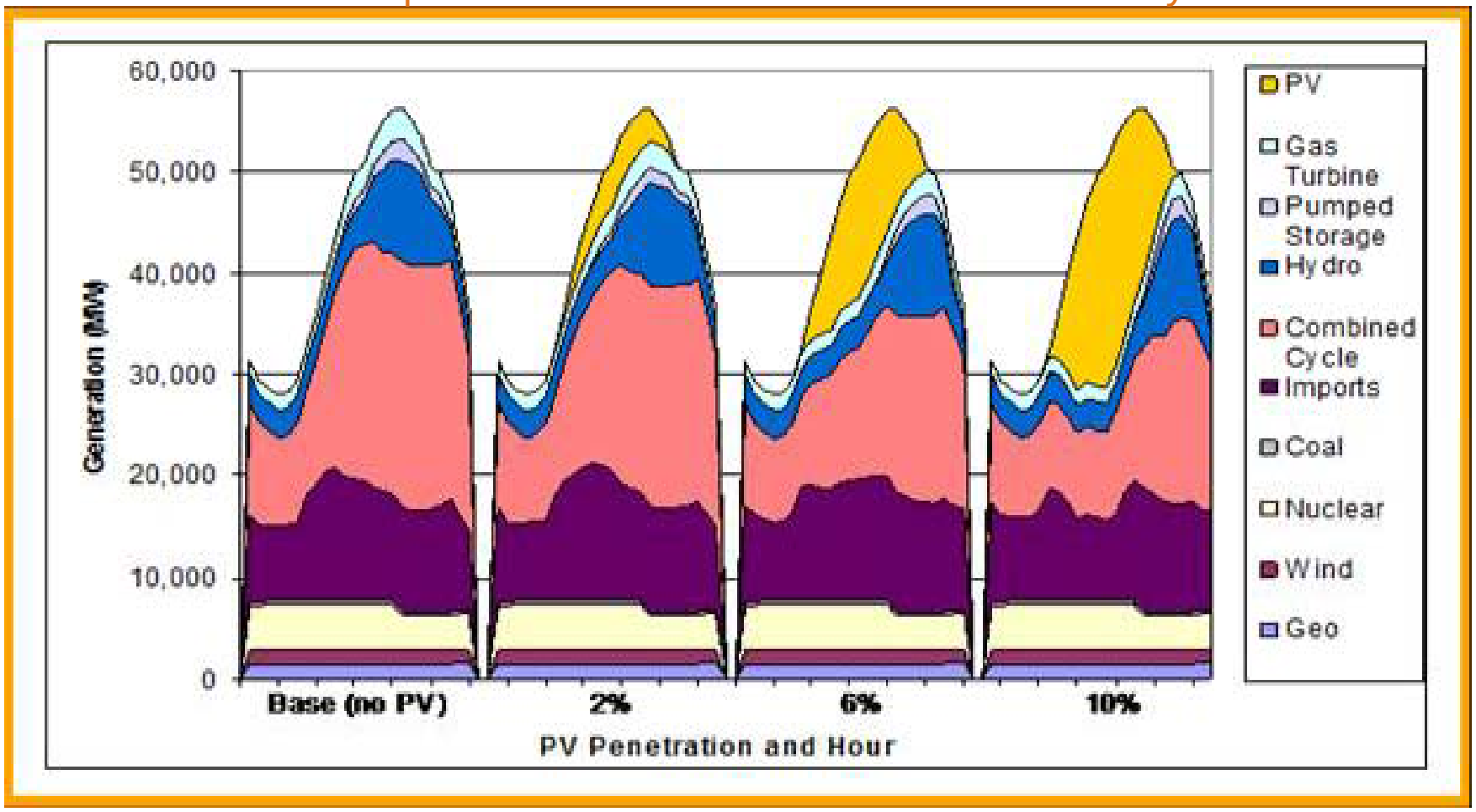
Capacity value as a function of the solar multiple and number of hours of storage



Source: NREL research based on Death Valley location; assumes energy and capacity payments

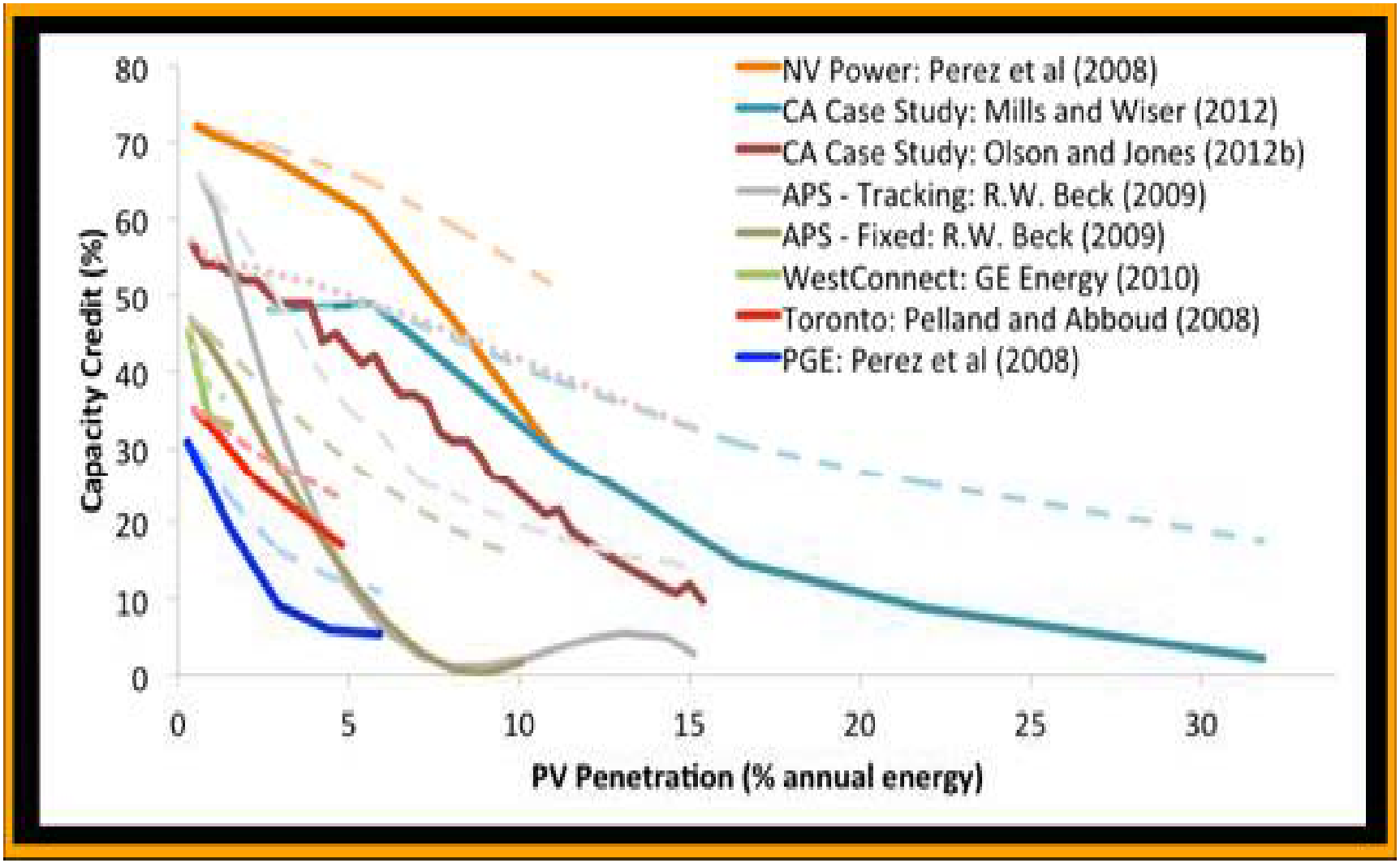
Solar capacity value will change as solar penetration increases

Illustration using dispatch of generation in
California at different penetrations of PV – simulated summer day



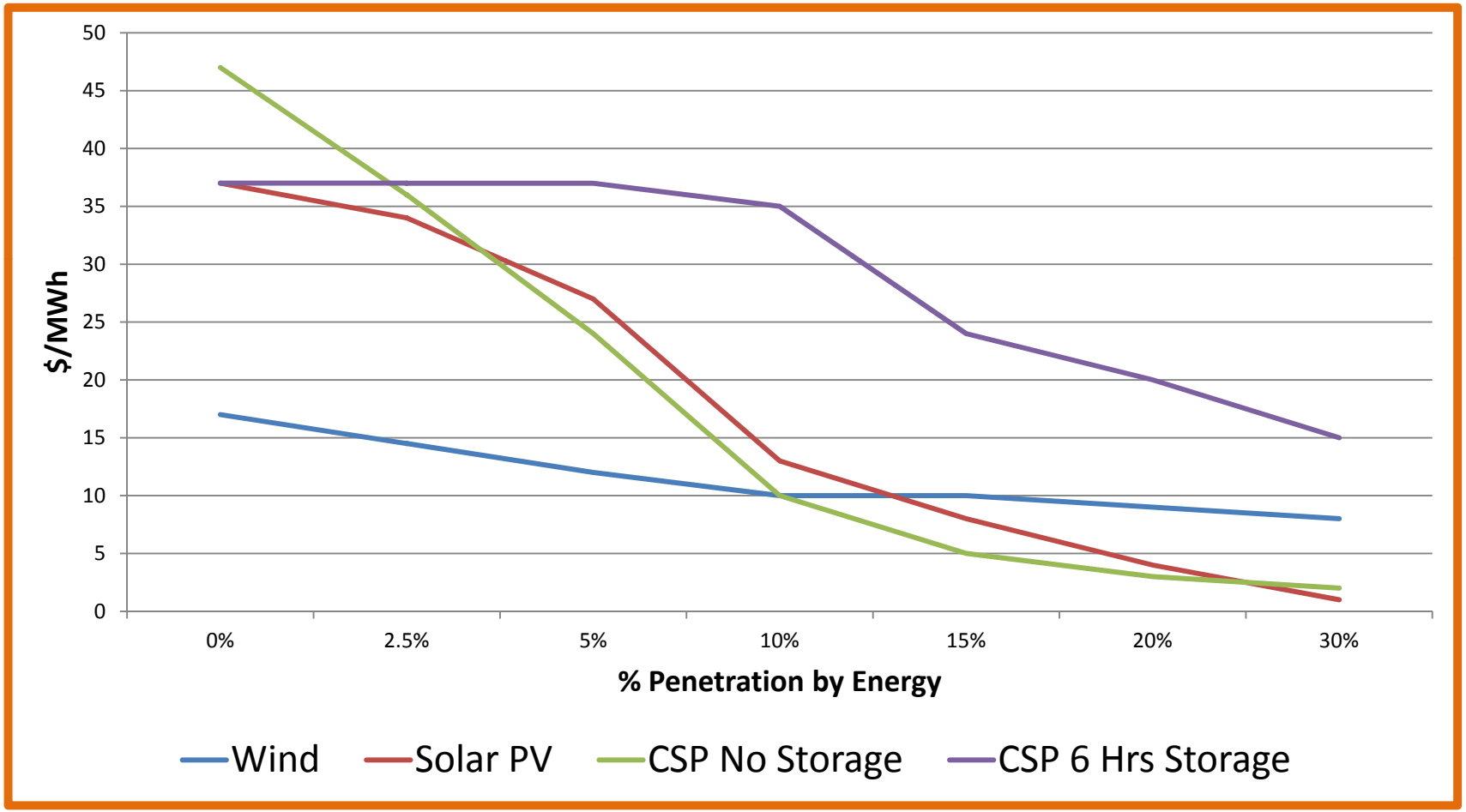
Source: Denholm and Mehos, NREL, 2011, pg. 3.

Solar PV capacity value as penetration increases



Source: Mills and Wiser, LBNL, 2012

Marginal capacity value of incremental renewables in California, at different penetrations (of individual technologies)



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Mills and Wiser, 2012	California	Trough with 6 hours of storage, SM 2.0	Modified capacity expansion model with simplified dispatch	Single axis tracking PV	5% PV (no other renewable energy)	$10/MWh
Mills and Wiser, 2012	California	Trough with 6 hours of storage, SM 2.0	Modified capacity expansion model with simplified dispatch	Single axis tracking PV	10% PV (no other renewable energy)	$22/MWh
Mills and Wiser, 2012	California	Trough with 6 hours of storage, SM 2.0	Modified capacity expansion model with simplified dispatch	Single axis tracking PV	15% PV (no other renewable energy)	$16/MWh

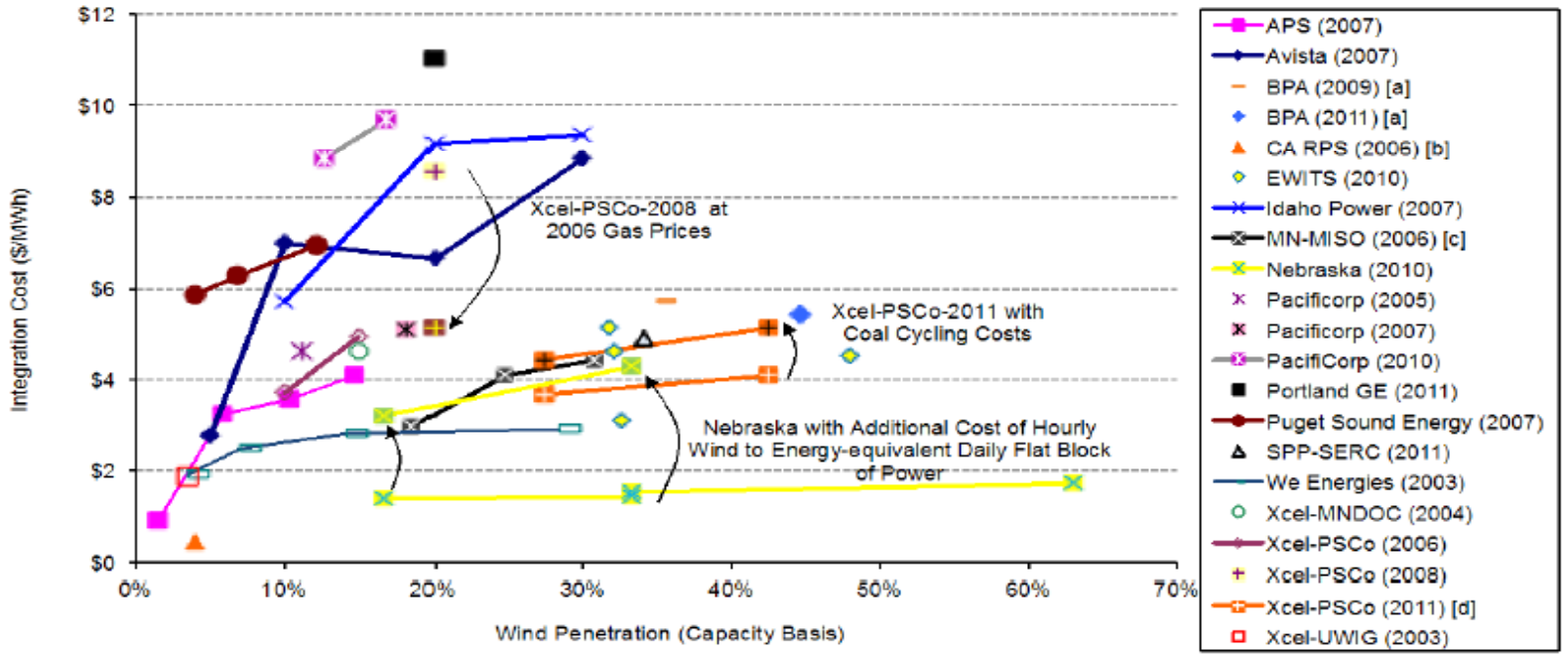
Renewable integration costs

- Additional procurement of existing and new ancillary service products
- Additional start-up and no-load costs
- Additional O&M costs
- Retrofits to existing generation or upgrades to transmission to improve operational flexibility
- Costs of new resources – flexible generation, storage, demand response – needed for operational flexibility

Avoided integration costs of CSP with thermal storage

- Lower production forecast error than other variable energy
- Smoothing of intra-hour production variability
- Potential to slow rate of morning net load ramp
- Potential to slow rate of late afternoon net load ramp
- Solar dispatchability could offset the need for new integration resources (beyond the capability of the planned generation fleet)

Wind integration cost studies

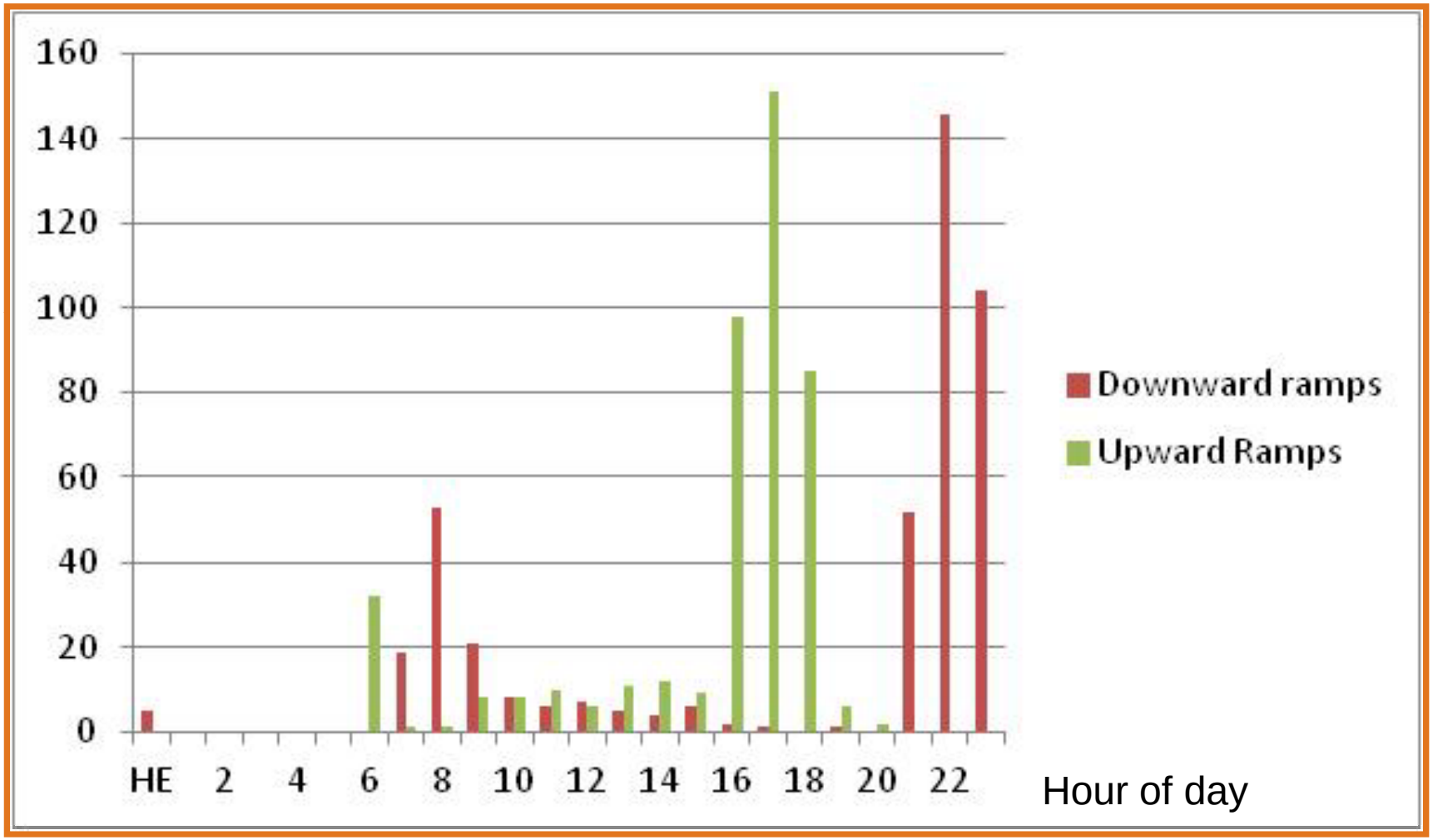


[a] Costs in $/MWh assume 31% capacity factor.
[b] Costs represent 3-year average.
[c] Highest over 3-year evaluation period.
[d] Higher cost line adds the coal cycling costs found in Xcel Energy (2011).

Sources: Acker (2007) [APS (2007)]; EnerNex Corp. (2007) [Avista (2007)]; BPA (2009); BPA (2011c); Shiu et al. (2006) [CA RPS (2006)]; EnerNex Corp (2010) [EWITS (2010)]; EnerNex Corp. and Idaho Power Co. (2007) [Idaho Power (2007)]; EnerNex Corp. and WindLogics Inc. (2006) [MN-MISO (2006)]; EnerNex et al. (2010) [Nebraska (2010)]; PacifiCorp (2005); PacifiCorp (2007); PacifiCorp (2010); PGE and EnerNex Corp.(2011) [Portland GE (2011)]; Puget Sound Energy (2007); EPRI (2011) [SPP-SERC (2011)]; Electrotek Concepts, Inc. (2003) [We Energies (2003)]; EnerNex Corp. and WindLogics, Inc. (2004) [Xcel-MNDOC (2004)]; EnerNex Corp. (2006) [Xcel-PSCo (2006)]; EnerNex Corp. (2008) [Xcel-PSCo (2008)]; Xcel Energy and EnerNex Corp. (2011) [Xcel-PSCo (2011)]; Brooks et al. (2003) [Xcel-UWIG (2003)]

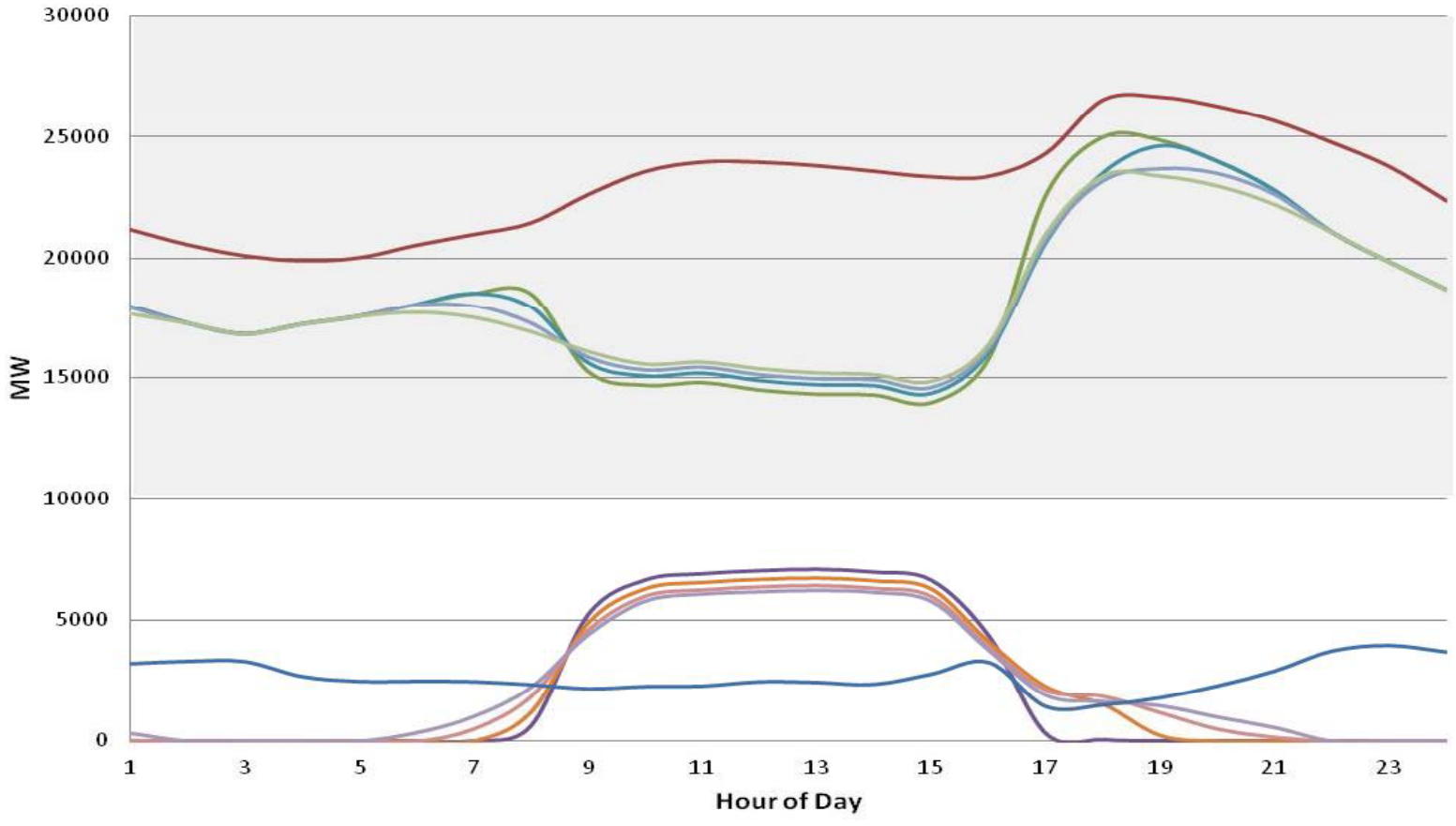
Source: DOE Wind technologies market report, 2012

Top 10% of upward and downward net load ramp hours in California under 33% RPS – by hour of day

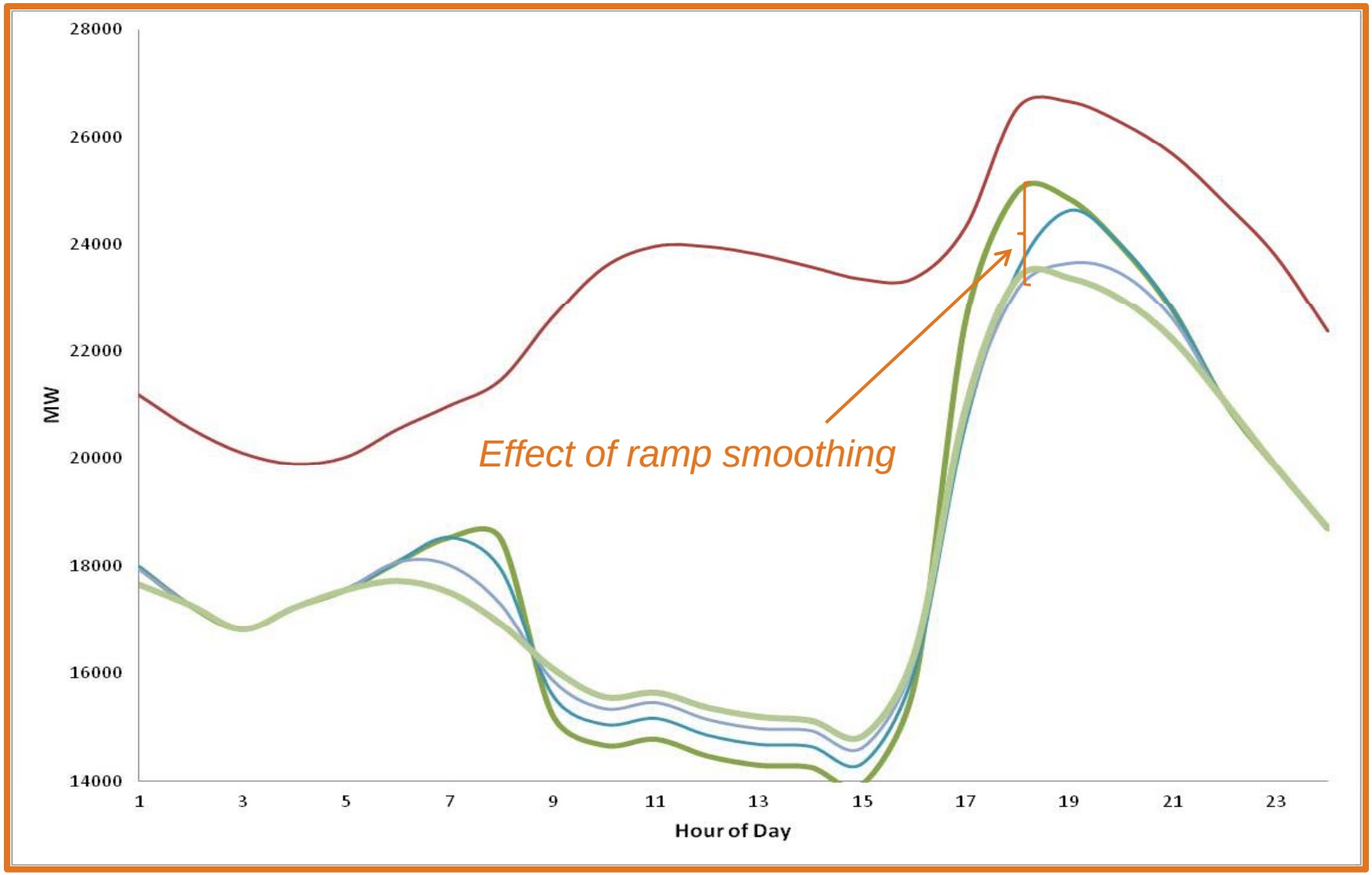


***Source*: CAISO 33% RPS simulation data-sets, 2011**

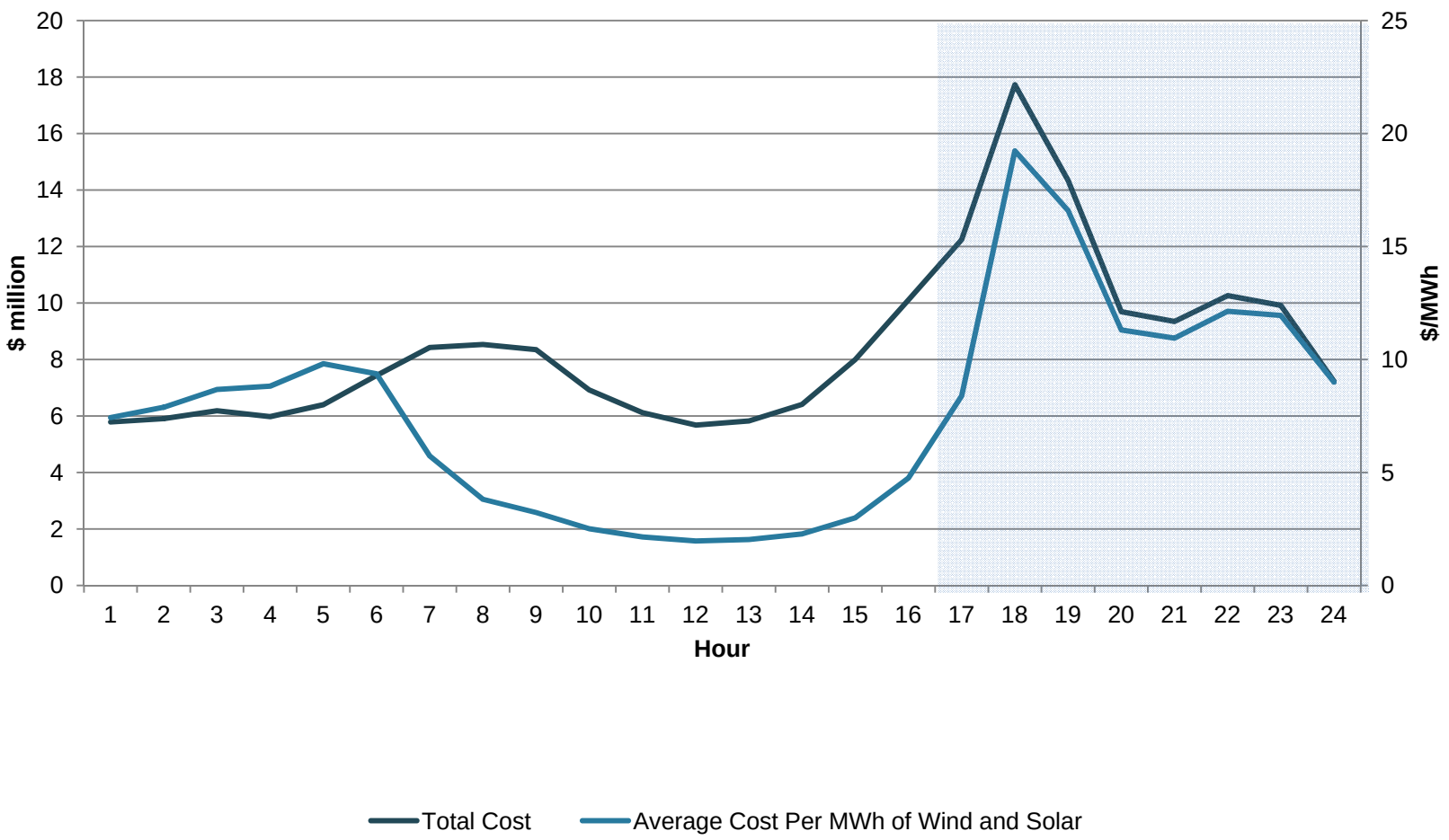
CSP mitigating high net load afternoon ramp – Winter day in California at 33% RPS



High net load afternoon ramp – winter day with more detail



Distribution of integration costs over the operating day at 33% RPS



Summary of CSPA report findings

- Different studies are generally showing similar ranges of thermal storage benefits for energy, ancillary services, capacity and avoided integration costs
  - More research is needed on some areas, such as solar integration costs
- Regulators and utilities should expand valuation of solar resources to consider a more comprehensive approach to net system cost that reflects these considerations

Facility Design, Power Plant Efficiency, and Power Plant Reliability

I. Introduction

A. Names: Channing Haskell, P.E.; Michael Rojansky, Ph.D., P.E.; Susan Walzer, and Susan Strachan

B. Qualifications: The panel's qualifications are as noted in their resumes contained in Appendix A.

C. Prior Filings: In addition to the statements herein, this testimony includes by reference the following documents submitted in this proceeding:

- Application for Certification, Volume 1 & Volume 2, dated August 5, 2011 [Exhibit 1]
- Applicant's Data Adequacy Supplement, dated September 7, 2011 [Exhibit 2]
- Applicant's Supplemental Data Response Set 2, Boiler Optimization, dated April 2, 2012 [Exhibit 46]
- Applicant's Preliminary Staff Assessment Comments, Set 2, dated July 23, 2012. [Exhibit 70]

To the best of our knowledge, all of the facts contained in this testimony (including all referenced documents) are true and correct. To the extent this testimony contains opinions, such opinions are our own. We make these statements, and render these opinions freely and under oath for the purpose of constituting sworn testimony in this proceeding.

II. Summary of Testimony

A. Affected Environment

The Applicant proposes to build and operate HHSEGS, a solar thermal power plant producing a total nominal output of 500 MW. The project would consist of two solar fields (Solar Plant 1 and Solar Plant 2) using concentrating solar thermal tower technology, and would be located in Inyo County, California. Each solar field would consist of a large circular field of heliostats (mirrors) that reflect the sun's energy onto a central receiver tower to produce electrical power using a steam turbine generator fed from solar steam generators. The land that would be occupied by this project would be approximately 3,096 acres. Each solar field would consist of arrays of parabolic mirrors, one solar receiver steam generator (SRSG), one steam turbine generator, and an air-cooled condenser.

The project's power cycle would be based on a steam cycle (also known as the Rankine cycle). Solar energy is reflected by the heliostats onto the SRSG where the energy heats water into superheated steam. The steam is then routed via the main steam pipe to the steam turbine generator where the steam's energy is converted to electrical energy by the expansion of steam through the turbine. Each solar plant would use two natural gas-fired boilers; one for overnight preservation (to maintain system temperatures overnight); and one to reduce startup time and to augment power production when solar energy diminishes or during transient cloudy conditions. On an annual basis, heat from natural gas would be limited by fuel use and other conditions to roughly 5 percent of the heat from the sun.

Power Plant Efficiency

HHSEGS would consume some fossil fuel for power generation. It would consume natural gas to reduce startup time, for overnight preservation, and to augment power production when solar energy diminishes or during transient cloudy conditions. The annual natural gas consumption would be limited to approximately 757,500 million British thermal units (MMBtu); equal to roughly 5 percent of the heat input from the sun. Thus, most of the project's produced electricity would come from the sun (a renewable source of energy).

Compared to a typical fossil fuel-fired power plant of equal capacity (500 MW net), and compared to the relatively considerable resources of fossil fuel in California, this rate of natural gas consumption is not significant. Natural gas is a relatively efficient form of fossil fuel.

Facility Availability

It is anticipated that the facility will normally operate at high average annual capacity factors during periods of sunlight. HHSEGS will be designed for an operating life of 25 to 30 years. Reliability and availability projections are based on this operating life. Operation and maintenance procedures will be consistent with industry standard practices to maintain the useful life status of plant components.

The percent of time that the solar plants are projected to be operated is defined as the service factor. The service factor considers the amount of time that a unit is operating and generating power, whether at full or partial load. The projected service factor for the power block, which considers projected percent of time of operation, differs from the equivalent availability factor (EAF), which considers the projected percent of energy production capacity achievable.

The EAF, which is a weighted average of the percent of energy production capacity achievable, differs from the availability of a unit, which is the percent of time that a unit is available for operation, whether at full load, partial load, or standby. The projected equivalent availability factor for the project is estimated to be approximately 92 to 98 percent.

Redundancy of Critical Components

A generating facility called on to operate in base-load service for long periods of time must be capable of being maintained while operating. A typical approach for achieving this is to provide redundant pieces of equipment most likely to require service or repair. The following subsection identifies equipment redundancy as it applies to project availability. A summary of equipment redundancy is shown in Table PPR-1. Final design could differ.

TABLE PPR-1
Major Equipment Redundancy

Description	Number	Note
Solar Receiver Steam Generators	One per plant	
SRSG Superheater	One per plant	
SRSG Circulating Pumps	Four – 25 percent capacity per plant	Two spares per plant in warehouse
Steam Turbine Generator	One per plant	
Boiler feedwater pump – Turbine Driven	One – 100 percent capacity per plant	One spare per plant in warehouse (consisting of a spare pump cartridge and key spare parts for turbine drive)

TABLE PPR-1
Major Equipment Redundancy

Description	Number	Note
Boiler feedwater pump – Motor Driven	One – 100 percent capacity per plant	One spare in warehouse
Condensate pumps	Two – 50 percent capacity per plant	One spare in warehouse
Condenser	One per plant	
Demineralization trailer	Two – 100 percent capacity per plant	

The HHSEGS project would be able to operate when the sun is shining. Maintenance or repairs can be done when the plant is shut down at night. This helps to enhance the project's reliability. The nature of solar thermal generating technology also provides inherent redundancy; the series arrangement of solar collector assemblies allows for reduced output generation if one (or possible several) rows of solar collectors were to require service or repair. This redundancy allows service or repair to be done during sunny days when the plant is in operation, if required. Furthermore, all plant ancillary systems are designed with adequate redundancy to ensure continued operation in the face of equipment failure. The balance of plant equipment would be provided with redundancy; examples include spare circulating pumps, feed water pumps, and condensate pumps as shown in Table PPR-1.

Maintenance Program

The Applicant proposes to establish a preventive plant maintenance program typical of the industry. Equipment manufacturers provide maintenance recommendations with their products; the Applicant would base its maintenance program on these recommendations. The program will encompass preventive and predictive maintenance techniques. Maintenance outages would be planned for periods of low electricity demand.

Fuel Availability

Natural gas would be used in natural gas boilers for startup and overnight freeze protection. A 12-inch natural gas supply pipeline for HHSEGS would connect to the Kern River Gas Transmission (KRGT) mainline approximately 32.4 miles southeast of the project site. A tap station on the main KRGT transmission pipeline would be installed at that interconnection point. A gas metering station would be required at the interconnection point to measure and record gas volumes from the KRGT metering station. KRGT's natural gas supply system draws from extensive supplies originating in the Rocky Mountains. It draws from the oil and gas producing fields of southwestern Wyoming through Utah and Nevada to the project site, and is capable of delivering the required amount of gas for this project.

Water Supply Reliability

The project would use groundwater from six onsite wells with a pair of wells (a primary and backup well) located at each power block and the administration complex. Wells will provide water for plant service needs, steam boiler makeup, heliostat washing, and fire protection. To save water in the site's desert environment, each solar plant would use a dry-cooled condenser. Turbine cooling would be provided by air-cooled condensers, supplemented by a partial dry-cooling system for auxiliary equipment cooling.

B. Summary of Compliance with Applicable LORS

No federal, state, or local/county laws, ordinances, regulations, and standards (LORS) apply to the reliability and efficiency of this project.

III. Response to Certain Issues Raised in the FSA

None.

IV. Proposed Licensing Conditions

The FSA for the project proposes 20 Conditions of Certification for this subject matter: GEN-1 through GEN-8, CIVIL-1 through CIVIL-4, STRUC-1 through STRUC-4, MECH -1 through MECH-3, and ELEC-1. We agree with the Conditions of Certification set forth in the FSA pertaining to this subject, except as set forth below.

A. Proposed Revisions to Conditions GEN-1 Through GEN-8, CIVIL-1 Through CIVIL-4, STRUC-1 Through STRUC-4, MECH-1 Through MECH-3, AND ELEC-1

The CEC has the responsibility to enforce provisions of the California Building Code and serves as the building official for projects under its jurisdiction. The CEC appoints a delegate Chief Building Official (CBO) to act on the CEC's behalf in reviewing engineering drawings, calculations, and specifications, and conducting inspections, such as those required by the Facility Design Conditions of Certification. The delegate CBO is also required by the CEC to create and maintain a project website for posting project documents. An example of this requirement between the CEC and the delegate CBO is listed below:

> "The CBO shall create and maintain a password-protected project website for the posting of weekly reports and other project documents. Documents on the website will be posted in a Microsoft Word-compatible format or as a portable document format (pdf). The project website shall include the following information in an easily navigable format: all components of the [CBO's] weekly status report; a minimum of ten dated project photographs of current construction activities; list and status of submitted plans; status of field inspections; new subcontractors or key CBO personnel; and documents submitted for CPM review and/or approval. *The CPM will be notified of new documents posted to the project website by email with an active link to the document."* (Emphasis added)[1]

The project website is funded by the Applicant as part of the fees paid to the CBO.

The majority of the Facility Design conditions require the applicant to submit documents to the CBO and the CPM. Many conditions also have the requirement that the applicant submit CBO documents to the CPM. Given that all of the documents are required to be uploaded to the project website to which the CPM (and other CEC staff, if requested) has access, it is redundant and burdensome to require the applicant to also provide Facility Design related documentation to the CPM. The proposed language modifications to the conditions below remove this duplicative effort. Additional modifications to the conditions are as indicated below.

[1] Memorandum of Understanding between the California Energy Commission and TRB+Associates for Design Review, Plan Check, and Construction Inspection of the Almond II Power Plant Project 09-AFC-2C, April 2010.

CONDITION GEN-1

In addition to removing the requirement to submit duplicative information to the CPM that would be available on the delegate CBO's project website, Condition GEN-1 should be revised to reflect that the CEC only has jurisdiction of the onsite transmission facilities since they are located in California. Also, the requirement that project owner notify the CPM of repair and maintenance activities should be removed since it is an onerous and unnecessary requirement.

GEN-1 The project owner shall design, construct, and inspect the project in accordance with the 2010 California Building Standards Code (CBSC), also known as Title 24, California Code of Regulations, which encompasses the California Building Code (CBC), California Building Standards Administrative Code, California Electrical Code, California Mechanical Code, California Plumbing Code, California Energy Code, California Fire Code, California Code for Building Conservation, California Reference Standards Code, and all other applicable engineering LORS in effect at the time initial design plans are submitted to the CBO for review and approval (the CBSC in effect is the edition that has been adopted by the California Building Standards Commission and published at least 180 days previously). The project owner shall ensure that all the provisions of the above applicable codes are enforced during the construction, addition, alteration, moving, demolition, repair, or maintenance of the completed facility. All <u>on-site</u> transmission facilities (lines, switchyards, switching stations and substations) are covered in the conditions of certification in the **TRANSMISSION SYSTEM ENGINEERING** section of this document.

In the event that the initial engineering designs are submitted to the CBO when the successor to the 2010 CBSC is in effect, the 2010 CBSC provisions shall be replaced with the applicable successor provisions. Where, in any specific case, different sections of the code specify different materials, methods of construction or other requirements, the most restrictive shall govern. Where there is a conflict between a general requirement and a specific requirement, the specific requirement shall govern.

The project owner shall ensure that all contracts with contractors, subcontractors, and suppliers clearly specify that all work performed and materials supplied comply with the codes listed above.

<u>Verification:</u> Within 30 days following receipt of the certificate of occupancy, the project owner shall submit to the CPM a statement of verification, signed by the responsible design engineer, attesting that all designs, construction, installation, and inspection requirements of the applicable LORS and the Energy Commission's decision have been met in the area of facility design. ~~The project owner shall provide the CPM a copy of the certificate of occupancy within 30 days of receipt from the CBO.~~

Once the certificate of occupancy has been issued, the project owner shall inform the CPM at least 30 days prior to any construction, addition, alteration, moving, <u>or</u> demolition~~, repair, or maintenance~~ to be performed on any portion(s) of the completed facility that requires CBO approval for compliance with the above codes. The CPM will then determine if the CBO needs to approve the work.

CONDITION GEN-2

The verification language of this condition should be revised to remove the requirement to submit duplicative information to the CPM that would be available on the delegate CBO's project website.

GEN-2 Before submitting the initial engineering designs for CBO review, the project owner shall furnish the CPM and the CBO with a schedule of facility design submittals, and master drawings and master specifications list. The master drawings and master specifications list shall contain a list of proposed submittal packages of designs, calculations, and specifications for major structures, systems, and equipment. Major structures, systems, and equipment are structures and their associated components or equipment that are necessary for power production, costly or time consuming to repair or replace, are used for the storage, containment, or handling of hazardous or toxic materials, or could become potential health and safety hazards if not constructed according to applicable engineering LORS. The schedule shall contain the date of each submittal to the CBO. To facilitate audits by Energy Commission staff, the project owner shall provide specific packages to the CPM upon request.

Verification: At least 60 days (or a project owner- and CBO-approved alternative time frame) prior to the start of rough grading, the project owner shall submit to the CBO ~~and to the CPM~~ the schedule, and the master drawings and master specifications list of documents to be submitted to the CBO for review and approval. These documents shall be the pertinent design documents for the major structures, systems, and equipment defined above in Condition of Certification **GEN-2**. Major structures and equipment shall be added to or deleted from the list only with CPM approval. ~~The project owner shall provide schedule updates in the monthly compliance report~~.

CONDITION GEN-3

The verification language of this condition should be revised to remove the requirement that the project owner submit proof of payment to the CEC's delegate CBO. The condition requires the project owner to make payments to the CBO. If that were not to occur, the CBO would inform the CPM.

GEN-3 The project owner shall make payments to the CBO for design review, plan checks, and construction inspections, based upon a reasonable fee schedule to be negotiated between the project owner and the CBO. These fees may be consistent with the fees listed in the 2010 CBC, adjusted for inflation and other appropriate adjustments; may be based on the value of the facilities reviewed; may be based on hourly rates; or may be otherwise agreed upon by the project owner and the CBO.

Verification: The project owner shall make the required payments to the CBO in accordance with the agreement between the project owner and the CBO. ~~The project owner shall send a copy of the CBO's receipt of payment to the CPM in the next monthly compliance report indicating that applicable fees have been paid.~~

CONDITION GEN-4

In addition to removing the requirement to submit duplicative information to the CPM that would be available on the delegate CBO's project website, Condition GEN-4 should also be revised to

reflect that the CEC only has jurisdiction of the onsite transmission facilities since they are the only portion that is located in California.

GEN-4 Prior to the start of rough grading, the project owner shall assign a California-registered architect, or a structural or civil engineer, as the resident engineer (RE) in charge of the project. All onsite transmission facilities (lines, switchyards, switching stations, and substations) are addressed in the conditions of certification in the **TRANSMISSION SYSTEM ENGINEERING** section of this document.

The RE may delegate responsibility for portions of the project to other registered engineers. Registered mechanical and electrical engineers may be delegated responsibility for mechanical and electrical portions of the project, respectively. A project may be divided into parts, provided that each part is clearly defined as a distinct unit. Separate assignments of general responsibility may be made for each designated part.

The RE shall:

1. Monitor progress of construction work requiring CBO design review and inspection to ensure compliance with LORS;
2. Ensure that construction of all facilities subject to CBO design review and inspection conforms in every material respect to applicable LORS, these conditions of certification, approved plans, and specifications;
3. Prepare documents to initiate changes in approved drawings and specifications when either directed by the project owner or as required by the conditions of the project;
4. Be responsible for providing project inspectors and testing agencies with complete and up-to-date sets of stamped drawings, plans, specifications, and any other required documents;
5. Be responsible for the timely submittal of construction progress reports to the CBO from the project inspectors, the contractor, and other engineers who have been delegated responsibility for portions of the project; and
6. Be responsible for notifying the CBO of corrective action or the disposition of items noted on laboratory reports or other tests when they do not conform to approved plans and specifications.

The resident engineer (or his delegate) must be located at the project site, or be available at the project site within a reasonable period of time, during any hours in which construction takes place.

The RE shall have the authority to halt construction and to require changes or remedial work if the work does not meet requirements.

If the RE or the delegated engineers are reassigned or replaced, the project owner shall submit the name, qualifications and registration number of the newly assigned engineer to the CBO for review and approval. ~~The project owner shall notify the CPM of the CBO's approval of the new engineer.~~

Verification: At least 30 days (or project owner- and CBO-approved alternative time frame) prior to the start of rough grading, the project owner shall submit to the CBO for review and approval, the resume and registration number of the RE and any other delegated engineers assigned to the project. ~~The project owner shall notify the CPM of the CBO's approvals of the RE and other delegated engineer(s) within five days of the approval.~~

If the RE or the delegated engineer(s) is subsequently reassigned or replaced, the project owner has five days to submit the resume and registration number of the newly assigned engineer to the CBO for review and approval. ~~The project owner shall notify the CPM of the CBO's approval of the new engineer within five days of the approval.~~

CONDITION GEN-5

This condition should be revised to remove the requirement to submit duplicative information to the CPM that would be available on the delegate CBO's project website. Condition GEN-5 should be revised to reflect that the CEC only has jurisdiction of the onsite transmission facilities since they are located in California.

GEN-5 Prior to the start of rough grading, the project owner shall assign at least one of each of the following California registered engineers to the project: a civil engineer; a soils, geotechnical, or civil engineer experienced and knowledgeable in the practice of soils engineering; and an engineering geologist. Prior to the start of construction, the project owner shall assign at least one of each of the following California registered engineers to the project: a design engineer who is either a structural engineer or a civil engineer fully competent and proficient in the design of power plant structures and equipment supports; a mechanical engineer; and an electrical engineer. (California Business and Professions Code section 6704 et seq., and sections 6730, 6731 and 6736 require state registration to practice as a civil engineer or structural engineer in California). All on-site transmission facilities (lines, switchyards, switching stations, and substations) are handled in the conditions of certification in the **TRANSMISSION SYSTEM ENGINEERING** section of this document.

The tasks performed by the civil, mechanical, electrical, or design engineers may be divided between two or more engineers, as long as each engineer is responsible for a particular segment of the project (for example, proposed earthwork, civil structures, power plant structures, equipment support). No segment of the project shall have more than one responsible engineer. The on-site transmission line may be the responsibility of a separate California registered electrical engineer.

The project owner shall submit, to the CBO for review and approval, the names, qualifications, and registration numbers of all responsible engineers assigned to the project.

If any one of the designated responsible engineers is subsequently reassigned or replaced, the project owner shall submit the name, qualifications and registration number of the newly assigned responsible engineer to the CBO for review and approval. The project owner shall notify the CPM of the CBO's approval of the new engineer.

A. The civil engineer shall:

1. Review the foundation investigations, geotechnical, or soils reports prepared by the soils engineer, the geotechnical engineer, or by a civil engineer experienced and knowledgeable in the practice of soils engineering;

2. Design (or be responsible for the design of), stamp, and sign all plans, calculations, and specifications for proposed site work, civil works, and related facilities requiring design review and inspection by the CBO. At a minimum, these include: grading, site preparation, excavation, compaction, construction of secondary containment, foundations, erosion and sedimentation control structures, drainage facilities, underground utilities, culverts, site access roads and sanitary sewer systems; and

3. Provide consultation to the RE during the construction phase of the project and recommend changes in the design of the civil works facilities and changes to the construction procedures.

B. The soils engineer, geotechnical engineer, or civil engineer experienced and knowledgeable in the practice of soils engineering, shall:

1. Review all the engineering geology reports;

2. Prepare the foundation investigations, geotechnical, or soils reports containing field exploration reports, laboratory tests, and engineering analysis detailing the nature and extent of the soils that could be susceptible to liquefaction, rapid settlement or collapse when saturated under load;

3. Be present, as required, during site grading and earthwork to provide consultation and monitor compliance with requirements set forth in the 2010 CBC (depending on the site conditions, this may be the responsibility of either the soils engineer, the engineering geologist, or both); and

4. Recommend field changes to the civil engineer and RE.

This engineer shall be authorized to halt earthwork and to require changes if site conditions are unsafe or do not conform to the predicted conditions used as the basis for design of earthwork or foundations.

C. The engineering geologist shall:

1. Review all the engineering geology reports and prepare a final soils grading report; and

2. Be present, as required, during site grading and earthwork to provide consultation and monitor compliance with the requirements set forth in the 2010 CBC (depending on the site conditions, this may be the responsibility of either the soils engineer, the engineering geologist, or both).

D. The design engineer shall:

1. Be directly responsible for the design of the proposed structures and equipment supports;
2. Provide consultation to the RE during design and construction of the project;
3. Monitor construction progress to ensure compliance with engineering LORS;
4. Evaluate and recommend necessary changes in design; and
5. Prepare and sign all major building plans, specifications, and calculations.

E. The mechanical engineer shall be responsible for, and sign and stamp a statement with, each mechanical submittal to the CBO, stating that the proposed final design plans, specifications, and calculations conform to all of the mechanical engineering design requirements set forth in the Energy Commission's decision.

F. The electrical engineer shall:

1. Be responsible for the electrical design of the project; and
2. Sign and stamp electrical design drawings, plans, specifications, and calculations.

Verification: At least 30 days (or project owner- and CBO-approved alternative time frame) prior to the start of rough grading, the project owner shall submit to the CBO for review and approval, resumes and registration numbers of the responsible civil engineer, soils (geotechnical) engineer and engineering geologist assigned to the project.

At least 30 days (or project owner- and CBO-approved alternative time frame) prior to the start of construction, the project owner shall submit to the CBO for review and approval, resumes and registration numbers of the responsible design engineer, mechanical engineer, and electrical engineer assigned to the project.

~~The project owner shall notify the CPM of the CBO's approvals of the responsible engineers within five days of the approval.~~

If the designated responsible engineer is subsequently reassigned or replaced, the project owner has five days in which to submit the resume and registration number of the newly assigned engineer to the CBO for review and approval. ~~The project owner shall notify the CPM of the CBO's approval of the new engineer within five days of the approval.~~

CONDITION GEN-6

This condition should be revised to remove the requirement to submit duplicative information to the CPM that would be available on the delegate CBO's project website. Condition GEN-6 should also be revised to reflect that the CEC only has jurisdiction of the on-site transmission facilities since they are the only portion located in California.

GEN-6 Prior to the start of an activity requiring special inspection, including prefabricated assemblies, the project owner shall assign to the project, qualified and certified special inspector(s) who shall be responsible for the special

inspections required by the 2010 CBC. All onsite transmission facilities (lines, switchyards, switching stations, and substations) are handled in conditions of certification in the **Transmission System Engineering** section of this document.

A certified weld inspector, certified by the American Welding Society (AWS), and/or American Society of Mechanical Engineers (ASME) as applicable, shall inspect welding performed on-site requiring special inspection (including structural, piping, tanks and pressure vessels).

The special inspector shall:

1. Be a qualified person who shall demonstrate competence, to the satisfaction of the CBO, for inspection of the particular type of construction requiring special or continuous inspection;
2. Inspect the work assigned for conformance with the approved design drawings and specifications;
3. Furnish inspection reports to the CBO and RE. All discrepancies shall be brought to the immediate attention of the RE for correction, then, if uncorrected, to the CBO ~~and the CPM~~ for corrective action; and
4. Submit a final signed report to the RE~~,~~ and CBO ~~and CPM~~, stating whether the work requiring special inspection was, to the best of the inspector's knowledge, in conformance with the approved plans, specifications, and other provisions of the applicable edition of the CBC.

Verification: At least 15 days (or project owner- and CBO-approved alternative time frame) prior to the start of an activity requiring special inspection, the project owner shall submit to the CBO for review and approval, ~~with a copy to the CPM,~~ the name(s) and qualifications of the certified weld inspector(s), or other certified special inspector(s) assigned to the project to perform one or more of the duties set forth above. ~~The project owner shall also submit to the CPM a copy of the CBO's approval of the qualifications of all special inspectors in the next monthly compliance report.~~

If the special inspector is subsequently reassigned or replaced, the project owner has five days in which to submit the name and qualifications of the newly assigned special inspector to the CBO for approval. ~~The project owner shall notify the CPM of the CBO's approval of the newly assigned inspector within five days of the approval.~~

CONDITION GEN-7

The verification language of this condition should be revised to remove the requirement to submit duplicative information to the CPM that would be available on the delegate CBO's project website.

GEN-7 If any discrepancy in design and/or construction is discovered in any engineering work that has undergone CBO design review and approval, the project owner shall document the discrepancy and recommend required corrective actions. The discrepancy documentation shall be submitted to the CBO for review and approval. The discrepancy documentation shall reference this condition of certification and, if appropriate, applicable sections of the CBC and/or other LORS.

Verification: The project owner shall transmit a copy of the CBO's approval of any corrective action taken to resolve a discrepancy to the CPM in the next monthly compliance report. ~~If any corrective action is disapproved, the project owner shall advise the CPM, within five days, of the reason for disapproval and the revised corrective action to obtain CBO's approval.~~

CONDITION GEN-8

This condition should be revised to remove the requirement to submit duplicative information to the CPM that would be available on the delegate CBO's project website.

GEN-8 The project owner shall obtain the CBO's final approval of all completed work that has undergone CBO design review and approval. The project owner shall request the CBO to inspect the completed structure and review the submitted documents. ~~The project owner shall notify the CPM after obtaining the CBO's final approval.~~ The project owner shall retain one set of approved engineering plans, specifications, and calculations (including all approved changes) at the project site or at another accessible location during the operating life of the project. Electronic copies of the approved plans, specifications, calculations, and marked-up as-builts shall be provided to the CBO for retention by the CPM.

Verification: Within 15 days of the completion of any work, the project owner shall submit to the CBO, with a copy to the CPM, in the next monthly compliance report, (a) a written notice that the completed work is ready for final inspection, and (b) a signed statement that the work conforms to the final approved plans. After storing the final approved engineering plans, specifications, and calculations described above, the project owner shall submit to the CPM a letter stating both that the above documents have been stored and the storage location of those documents.

Within 90 days of the completion of construction, the project owner shall provide to the CBO three sets of electronic copies of the above documents at the project owner's expense. These are to be provided in the form of "read only" (Adobe .pdf 6.0 or newer version) files, with restricted (password-protected) printing privileges, on archive quality compact discs.

CONDITION CIVIL-1

This condition should be revised to remove the requirement to submit duplicative information to the CPM that would be available on the delegate CBO's project website. In addition, Item 3 should be removed because the Stormwater Pollution Prevention Plan (SWPPP) is a State Water Resources Control Board/Regional Water Quality Control Board (SWRCB/RWQCB) document, which is in response to a federal law.

CIVIL-1 The project owner shall submit to the CBO for review and approval the following:

1. Design of the proposed drainage structures and the grading plan;
2. An erosion and sedimentation control plan;
3. ~~A construction storm water pollution prevention plan (SWPPP);~~
4. Related calculations and specifications, signed and stamped by the responsible civil engineer; and

5. Soils, geotechnical, or foundation investigations reports required by the 2010 CBC.

Verification: At least 15 days (or project owner- and CBO-approved alternative time frame) prior to the start of site grading the project owner shall submit the documents described above to the CBO for design review and approval. ~~In the next monthly compliance report following the CBO's approval, the project owner shall submit a written statement certifying that the documents have been approved by the CBO.~~

CONDITION CIVIL-2

The verification language of this condition should be revised to remove the requirement to submit duplicative information to the CPM that would be available on the delegate CBO's project website.

CIVIL-2 The resident engineer shall, if appropriate, stop all earthwork and construction in the affected areas when the responsible soils engineer, geotechnical engineer, or the civil engineer experienced and knowledgeable in the practice of soils engineering identifies unforeseen adverse soil or geologic conditions. The project owner shall submit modified plans, specifications, and calculations to the CBO based on these new conditions. The project owner shall obtain approval from the CBO before resuming earthwork and construction in the affected area.

Verification: The project owner shall notify the CPM within 24 hours, when earthwork and construction is stopped as a result of unforeseen adverse geologic/soil conditions. ~~Within 24 hours of the CBO's approval to resume earthwork and construction in the affected areas, the project owner shall provide to the CPM a copy of the CBO's approval.~~

CONDITION CIVIL-3

This condition should be revised to remove the requirement to submit duplicative information to the CPM that would be available on the delegate CBO's project website.

CIVIL-3: The project owner shall perform inspections in accordance with the 2010 CBC. All plant site-grading operations, for which a grading permit is required, shall be subject to inspection by the CBO.

If, in the course of inspection, it is discovered that the work is not being performed in accordance with the approved plans, the discrepancies shall be reported immediately to the resident engineer~~,~~ and the CBO~~, and the CPM~~. The project owner shall prepare a written report, with copies to the CBO ~~and the CPM~~, detailing all discrepancies, non-compliance items, and the proposed corrective action.

Verification: Within five days of the discovery of any discrepancies, the resident engineer shall transmit to the CBO ~~and the CPM~~ a non-conformance report (NCR), and the proposed corrective action for review and approval. Within five days of resolution of the NCR, the project owner shall submit the details of the corrective action to the CBO ~~and the CPM~~. A list of NCRs, for the reporting month, shall also be included in the following monthly compliance report.

CONDITION CIVIL-4

The verification language of this condition should be revised to remove the requirement to submit duplicative information to the CPM that would be available on the delegate CBO's project website.

CIVIL-4 After completion of finished grading and erosion and sedimentation control and drainage work, the project owner shall obtain the CBO's approval of the final grading plans (including final changes) for the erosion and sedimentation control work. The civil engineer shall state that the work within his/her area of responsibility was done in accordance with the final approved plans.

Verification: Within 30 days (or project owner- and CBO-approved alternative time frame) of the completion of the erosion and sediment control mitigation and drainage work, the project owner shall submit to the CBO, for review and approval, the final grading plans (including final changes) and the responsible civil engineer's signed statement that the installation of the facilities and all erosion control measures were completed in accordance with the final approved combined grading plans, and that the facilities are adequate for their intended purposes~~, along with a copy of the transmittal letter to the CPM. The project owner shall submit a copy of the CBO's approval to the CPM in the next monthly compliance report.~~

CONDITION STRUC-1

The verification language of this condition should be revised to remove the requirement to submit duplicative information to the CPM that would be available on the delegate CBO's project website.

STRUC-1 Prior to the start of any increment of construction, the project owner shall submit plans, calculations and other supporting documentation to the CBO for design review and acceptance for all project structures and equipment identified in the CBO-approved master drawing and master specifications lists. The design plans and calculations shall include the lateral force procedures and details as well as vertical calculations.

Construction of any structure or component shall not begin until the CBO has approved the lateral force procedures to be employed in designing that structure or component.

The project owner shall:

1. Obtain approval from the CBO of lateral force procedures proposed for project structures;
2. Obtain approval from the CBO for the final design plans, specifications, calculations, soils reports, and applicable quality control procedures. If there are conflicting requirements, the more stringent shall govern (for example, highest loads, or lowest allowable stresses shall govern). All plans, calculations, and specifications for foundations that support structures shall be filed concurrently with the structure plans, calculations, and specifications;
3. Submit to the CBO the required number of copies of the structural plans, specifications, calculations, and other required documents of the designated major structures prior to the start of on-site fabrication and installation of each structure, equipment support, or foundation;

4. Ensure that the final plans, calculations, and specifications clearly reflect the inclusion of approved criteria, assumptions, and methods used to develop the design. The final designs, plans, calculations, and specifications shall be signed and stamped by the responsible design engineer; and
5. Submit to the CBO the responsible design engineer's signed statement that the final design plans conform to applicable LORS.

Verification: At least 60 days (or project owner- and CBO-approved alternative time frame) prior to the start of any increment of construction of any structure or component listed in the CBO-approved master drawing and master specifications list, the project owner shall submit to the CBO the above final design plans, specifications and calculations~~, with a copy of the transmittal letter to the CPM.~~

~~The project owner shall submit to the CPM, in the next monthly compliance report, a copy of a statement from the CBO that the proposed structural plans, specifications, and calculations have been approved and comply with the requirements set forth in applicable engineering LORS.~~

CONDITION STRUC-2

The verification language of this condition should be revised to remove the requirement to submit duplicative information to the CPM that would be available on the delegate CBO's project website.

STRUC-2 The project owner shall submit to the CBO the required number of sets of the following documents related to work that has undergone CBO design review and approval:

1. Concrete cylinder strength test reports (including date of testing, date sample taken, design concrete strength, tested cylinder strength, age of test, type and size of sample, location and quantity of concrete placement from which sample was taken, and mix design designation and parameters);
2. Concrete pour sign-off sheets;
3. Bolt torque inspection reports (including location of test, date, bolt size, and recorded torques);
4. Field weld inspection reports (including type of weld, location of weld, inspection of non-destructive testing (NDT) procedure and results, welder qualifications, certifications, qualified procedure description or number (ref: AWS); and
5. Reports covering other structural activities requiring special inspections shall be in accordance with the 2010 CBC.

Verification: If a discrepancy is discovered in any of the above data, the project owner shall, within five days, prepare and submit an NCR describing the nature of the discrepancies and the proposed corrective action to the CBO.~~, with a copy of the transmittal letter to the CPM.~~ The NCR shall reference the condition(s) of certification and the applicable CBC chapter and section. Within five days of resolution of the NCR, the project owner shall submit a copy of the corrective action to the CBO~~ and the CPM~~.

The project owner shall transmit a copy of the CBO's approval or disapproval of the corrective action to the CPM within 15 days. If disapproved, the project owner shall advise

the CPM, within five days, the reason for disapproval, and the revised corrective action to obtain CBO's approval.

CONDITION STRUC-3

The verification language of this condition should be revised to remove the requirement to submit duplicative information to the CPM that would be available on the delegate CBO's project website.

STRUC-3 The project owner shall submit to the CBO design changes to the final plans required by the 2010 CBC, including the revised drawings, specifications, calculations, and a complete description of, and supporting rationale for, the proposed changes, and shall give to the CBO prior notice of the intended filing.

Verification: On a schedule suitable to the CBO, the project owner shall notify the CBO of the intended filing of design changes, and shall submit the required number of sets of revised drawings and the required number of copies of the other above-mentioned documents to the CBO~~, with a copy of the transmittal letter to the CPM. The project owner shall notify the CPM, via the monthly compliance report, when the CBO has approved the revised plans.~~

CONDITION STRUC-4

The verification language of this condition should be revised to remove the requirement to submit duplicative information to the CPM that would be available on the delegate CBO's project website.

STRUC-4 Tanks and vessels containing quantities of toxic or hazardous materials exceeding amounts specified in the 2010 CBC shall, at a minimum, be designed to comply with the requirements of that chapter.

Verification: At least 30 days (or project owner- and CBO-approved alternate time frame) prior to the start of installation of the tanks or vessels containing the above specified quantities of toxic or hazardous materials, the project owner shall submit to the CBO for design review and approval final design plans, specifications, and calculations, including a copy of the signed and stamped engineer's certification.

~~The project owner shall send copies of the CBO approvals of plan checks to the CPM in the following monthly compliance report. The project owner shall also transmit a copy of the CBO's inspection approvals to the CPM in the monthly compliance report following completion of any inspection.~~

CONDITION MECH-1

The verification language of this condition should be revised to remove the requirement to submit duplicative information to the CPM that would be available on the delegate CBO's project website.

MECH-1 The project owner shall submit, for CBO design review and approval, the proposed final design, specifications and calculations for each plant major piping and plumbing system listed in the CBO-approved master drawing and master specifications list. The submittal shall also include the applicable QA/QC procedures. Upon completion of construction of any such major piping or plumbing system, the project owner shall request the CBO's inspection approval of that construction.

The responsible mechanical engineer shall stamp and sign all plans, drawings, and calculations for the major piping and plumbing systems, subject to CBO

design review and approval, and submit a signed statement to the CBO when the proposed piping and plumbing systems have been designed, fabricated, and installed in accordance with all of the applicable laws, ordinances, regulations and industry standards, which may include, but are not limited to:

- American National Standards Institute (ANSI) B31.1 (Power Piping Code);
- ANSI B31.2 (Fuel Gas Piping Code);
- ANSI B31.3 (Chemical Plant and Petroleum Refinery Piping Code);
- ANSI B31.8 (Gas Transmission and Distribution Piping Code);
- NACE R.P. 0169-83;
- NACE R.P. 0187-87;
- NFPA 56;
- Title 24, California Code of Regulations, Part 5 (California Plumbing Code);
- Title 24, California Code of Regulations, Part 6 (California Energy Code, for building energy conservation systems and temperature control and ventilation systems);
- Title 24, California Code of Regulations, Part 2 (California Building Code); and
- Inyo County codes (including Title 21).

The CBO may deputize inspectors to carry out the functions of the code enforcement agency.

Verification: At least 30 days (or project owner- and CBO-approved alternative time frame) prior to the start of any increment of major piping or plumbing construction listed in the CBO-approved master drawing and master specifications list, the project owner shall submit to the CBO for design review and approval the final plans, specifications, and calculations, including a copy of the signed and stamped statement from the responsible mechanical engineer certifying compliance with applicable LORS~~, and shall send the CPM a copy of the transmittal letter in the next monthly compliance report.~~

~~The project owner shall transmit to the CPM, in the monthly compliance report following completion of any inspection, a copy of the transmittal letter conveying the CBO's inspection approvals.~~

CONDITION MECH-2

The verification language of this condition should be revised to remove the requirement to submit duplicative information to the CPM that would be available on the delegate CBO's project website,

MECH-2 For all pressure vessels installed in the plant, the project owner shall submit to the CBO and California Occupational Safety and Health Administration (Cal-OSHA), prior to operation, the code certification papers and other documents required by applicable LORS. Upon completion of the installation of any pressure vessel, the project owner shall request the appropriate CBO and/or Cal-OSHA inspection of that installation.

The project owner shall:

1. Ensure that all boilers and fired and unfired pressure vessels are designed, fabricated, and installed in accordance with the appropriate section of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code, or other applicable code. Vendor certification, with identification of applicable code, shall be submitted for prefabricated vessels and tanks; and
2. Have the responsible design engineer submit a statement to the CBO that the proposed final design plans, specifications, and calculations conform to all of the requirements set forth in the appropriate ASME Boiler and Pressure Vessel Code or other applicable codes.

Verification: At least 30 days (or project owner- and CBO-approved alternative time frame) prior to the start of on-site fabrication or installation of any pressure vessel, the project owner shall submit to the CBO for design review and approval, the above listed documents, including a copy of the signed and stamped engineer's certification~~, with a copy of the transmittal letter to the CPM~~.

~~The project owner shall transmit to the CPM, in the monthly compliance report following completion of any inspection, a copy of the transmittal letter conveying the CBO's and/or Cal-OSHA inspection approvals.~~

CONDITION MECH-3

The verification language of this condition should be revised to remove the requirement to submit duplicative information to the CPM that would be available on the delegate CBO's project website.

MECH-3 The project owner shall submit to the CBO for design review and approval the design plans, specifications, calculations, and quality control procedures for any heating, ventilating, air conditioning (HVAC) or refrigeration system. Packaged HVAC systems, where used, shall be identified with the appropriate manufacturer's data sheets.

The project owner shall design and install all HVAC and refrigeration systems within buildings and related structures in accordance with the CBC and other applicable codes. Upon completion of any increment of construction, the project owner shall request the CBO's inspection and approval of that construction. The final plans, specifications and calculations shall include approved criteria, assumptions, and methods used to develop the design. In addition, the responsible mechanical engineer shall sign and stamp all plans, drawings and calculations and submit a signed statement to the CBO that the proposed final design plans, specifications and calculations conform with the applicable LORS.

Verification: At least 30 days (or project owner- and CBO-approved alternative time frame) prior to the start of construction of any HVAC or refrigeration system, the project owner shall submit to the CBO the required HVAC and refrigeration calculations, plans, and specifications, including a copy of the signed and stamped statement from the responsible mechanical engineer certifying compliance with the CBC and other applicable codes.~~, with a copy of the transmittal letter to the CPM.~~

CONDITION ELEC-1

This condition should be revised to remove the requirement to submit duplicative information to the CPM that would be available on the delegate CBO's project website. Condition ELEC-1 should be revised to reflect that the CEC only has jurisdiction of the onsite transmission facilities since they are located in California. Item B.6. should be deleted because it is duplicative with Item B.4.

ELEC-1 Prior to the start of any increment of electrical construction for all electrical equipment and systems 110 volts or higher (see a representative list, below) the project owner shall submit, for CBO design review and approval, the proposed final design, specifications, and calculations. Upon approval, the above listed plans, together with design changes and design change notices, shall remain on the site or at another accessible location for the operating life of the project. The project owner shall request that the CBO inspect the installation to ensure compliance with the requirements of applicable LORS. All <u>on-site</u> transmission facilities (lines, switchyards, switching stations, and substations) are handled in conditions of certification in the Transmission System Engineering section of this document.

A. Final plant design plans shall include:

1. one-line diagram for the 13.8 kV, 4.16 kV and 480 V systems;
2. system grounding drawings;
3. lightning protection system; and
4. hazard area classification plan.

B. Final plant calculations must establish:

1. short-circuit ratings of plant equipment;
2. ampacity of feeder cables;
3. voltage drop in feeder cables;
4. system grounding requirements;
5. coordination study calculations for fuses, circuit breakers and protective relay settings for the 13.8 kV, 4.16 kV and 480 V systems;

~~6. system grounding requirements;~~

7. lighting energy calculations; and
8. 110 volt system design calculations and submittals showing feeder sizing, transformer and panel load confirmation, fixture schedules and layout plans.

C. The following activities shall be reported to the CPM in the monthly compliance report:

1. Receipt or delay of major electrical equipment;
2. Testing or energization of major electrical equipment; and

3. A signed statement by the registered electrical engineer certifying that the proposed final design plans and specifications conform to requirements set forth in the Energy Commission decision.

Verification: At least 30 days (or project owner- and CBO-approved alternative time frame) prior to the start of each increment of electrical construction, the project owner shall submit to the CBO for design review and approval the above listed documents. The project owner shall include in this submittal a copy of the signed and stamped statement from the responsible electrical engineer attesting compliance with the applicable LORS. ~~and shall send the CPM a copy of the transmittal letter in the next monthly compliance report~~.

Geologic Hazards & Resources

I. Introduction

A. Names: Michael Rojansky, Ph.D., P.E. and Thomas A. Lae, P.G.

B. Qualifications: The panel's qualifications are as noted in their respective resumes contained in Appendix A.

C. Prior Filings: In addition to the statements herein, this testimony includes by reference the following documents submitted in this proceeding:

- Application for Certification, Volume 1 & Volume 2, dated August 5, 2011 [Exhibit 1]
- Applicant's Response to CEC Staff Requests, Supplemental Data Response Set 2, dated April 2, 2012, Response to Data Request PD-1 [Exhibit 46]
- Applicant's Preliminary Staff Assessment Comments, Set 2, dated July 23, 2012. [Exhibit 70]

To the best of our knowledge, all of the facts contained in this testimony (including all referenced documents) are true and correct. To the extent this testimony contains opinions, such opinions are our own. We make these statements, and render these opinions freely and under oath for the purpose of constituting sworn testimony in this proceeding.

II. Summary of Testimony

A. Affected Environment

The proposed Hidden Hills Solar Electric Generating System (HHSEGS) site is a 3,096-acre parcel within the eastern part of California's Mojave Desert physiographic province in Inyo County, California. HHSEGS is located in the Pahrump Valley at the California-Nevada border in an elongated north-south trending alluvial valley. The proposed generating facility site is gently sloping (approximate elevation ranges between 2,590 and 2,680 feet). This area is underlain by Quaternary age alluvial sediment deposits from accumulation of fine-grained basin fill and is not within a highly active seismic region.

The most significant geologic hazard at the HHSEGS site is seismic ground shaking. An earthquake event could produce peak ground gravity (g) acceleration of up to 0.11g in the vicinity of the site, according to the 2008 USGS deaggradation tool.

No geologic resources of recreational or scientific value were identified in the vicinity of the project site.

B. Potential Construction Related Impacts; Avoidance and Minimization Measures

Construction of the HHSEGS will require minor grading and excavation, thereby minimizing alteration of the terrain of the project site. Potential construction-related impacts to the geologic setting involve dust generation, changes in drainage, cuts, and fills. Since the site is generally level, any site grading is not expected to adversely impact the geologic environment. The generating facility and all of the associated linear facilities will be designed and constructed in accordance with the requirements of all applicable federal, state, regional, and local laws, ordinances, regulations, and standards.

C. Potential Operational Related Impacts; Avoidance and Minimization Measures

No operational related impacts to geological hazards and resources have been identified.

D. Summary of Compliance with Applicable LORS

The project will be designed and constructed in accordance with the requirements of all applicable federal, state, regional and local laws, ordinances, regulations, and standards. This will minimize any operational impacts to a level of insignificance.

E. Summary of the Potential Cumulative Impacts

The construction and operation of the HHSEGS will not produce any significant negative cumulative impacts to geologic resources.

III. Response to Certain Issues Raised in the FSA

FSA page 5.2-12, 5th paragraph, 3rd sentence, Geological Hazards, Faulting and Seismicity: The reference cited "Stateline Fault System: A New Component of the Miocene-Quaternary Eastern California Shear Zone" (Guest 2007), states that approximately 30 Km of dextral offset has occurred over the last 13.1 Ma (million years), rather than the last 13 thousand years as presented in the FSA. Therefore, this section of the FSA should be corrected as follow:

> The Stateline Fault forms the eastern boundary of the ECSZ and marks the transition from stable North America to its mobile western margin (Guest 2007, Hislop, 2011). This 200 km long fault system lies just east of the project site (**Geological Resources - Figure 1**). Recent geologic mapping has documented approximately 30 km of dextral offset along the fault over approximately the last 13 ~~thousand~~ million years, which translates to a minimum long-term geologic slip rate of approximately 2.5 mm/year (Guest 2007). Understanding the spatial and temporal evolution of the Stateline Fault is important for seismic hazard assessment in the region and for use in models describing the development of the ECSZ.

IV. Proposed Licensing Conditions

The FSA for the project does not propose any Conditions of Certification for this specific subject matter.

Hazardous Materials

I. Introduction

A. Names: Channing Haskell and Karen Parker

B. Qualifications: The panel's qualifications are as noted in their resumes contained in Appendix A.

C. Prior Filings: In addition to the statements herein, this testimony includes by reference the following documents submitted in this proceeding:

- Application for Certification, Volume 1 & Volume 2, dated August 5, 2011 [Exhibit 1]
- Applicant's Response to CEC Staff Requests, Supplemental Data Response Set 2 (Boiler Optimization), dated April 2, 2012, Response to Data Request PD-1 [Exhibit 46]
- Applicant's Preliminary Staff Assessment Comments, Set 2, dated July 23, 2012. [Exhibit 70]

D. Attachments

- Applicant's Report of Conversation with Geoff Lesh and Karen Parker, consultant for Applicant, regarding Haz Mat Issue Clarification, dated October 18, 2012

To the best of our knowledge, all of the facts contained in this testimony (including all referenced documents) are true and correct. To the extent this testimony contains opinions, such opinions are our own. We make these statements, and render these opinions freely and under oath for the purpose of constituting sworn testimony in this proceeding.

II. Summary of Testimony

A. Affected Environment

The project site will be located in southern California, directly on the Nevada border, south of the city of Pahrump, Nevada. The project will be located on private land in unincorporated Inyo County. The transmission and natural gas pipeline alignments will be located in Nevada, primarily on federal land managed by the U.S. Bureau of Land Management (BLM). There are no schools, hospitals, day-care facilities, emergency response facilities, or long-term health care facilities within the area potentially affected by any release of hazardous materials.

B. Potential Construction Related Impacts; Avoidance and Minimization Measures

Hazardous materials to be used during construction of the project and its associated linear facilities will include gasoline, diesel fuel, motor oil, hydraulic fluid, solvents, cleaners, sealants, welding flux, various lubricants, paint, and paint thinner. There are no feasible alternatives to motor fuels and oils for operating construction equipment. The types of paint required are dictated by the types of equipment and structures that must be coated and by the manufacturers' requirements for coating.

The quantities of hazardous materials that will be onsite during construction are small. Construction personnel will be trained to handle the materials properly. There will be centralized storage for hazardous materials in each of the main work areas, such as the common area and power blocks. This storage may take the form of storage containers (shipping containers), or individual secondary

portable storage containers and centralized material/construction buildings or trailers. The most likely possible incidents will involve the potential for fuels, oil, and grease dripping from construction equipment. The small quantities of fuel, oil, and grease that might drip from construction equipment will be cleaned up by removal of contaminated soil for offsite disposal as hazardous waste. Therefore, the expected environmental impact is minimal.

Small fuel spills may also occur during onsite refueling. The potential environmental effects from fueling operations are expected to be limited to small areas of contaminated soil. If a fuel spill occurs on soil, the contaminated soil will be placed into barrels or trucks for offsite disposal as a solid or hazardous waste (depending on soil/fuel ratio). To minimize fuel spills, preventive measures such as the standard operating procedures described in AFC section 5.5.6.1 will be implemented during construction.

Personnel working on the project during the construction phase will be trained in handling of and the dangers associated with hazardous materials. Therefore, the potential for environmental effects is expected to be small. The worst-case scenario for a chemical release from fueling operations would be a vehicle accident involving a service or refueling truck.

During construction of the project, regulated substances, as defined in California's Health and Safety Code, Section 25531, will not be used.

C. Potential Operational Related Impacts; Avoidance and Minimization Measures

Hazardous materials to be used at HHSEGS during operation were evaluated for hazardous characteristics. During operation, some of these materials will be stored at the project site continuously. Others will be brought onsite for the initial startup and maintenance. Some materials will be used only during startup.

Storage locations are described in Table 5.5-2R1 of Supplemental Data Response Set 2 [Exhibit 46]. Revised hazardous materials tables (Table 5.5-2R1 and 5.5-3R1) were provided in Attachment B of Exhibit 46 (Supplemental Data Response Set 2). A second revision to the HHSEGS Chemical Inventory table (Table 5.5-3R2) was provided via email in October 2012 to correct the maximum quantity of sulfur hexafluoride that will be contained in onsite circuit breakers to 880.4 pounds. (A copy of the email is attached).

All containers used to store hazardous materials will be inspected regularly for signs of leaking or failure. Incompatible materials will be stored in separate storage and containment areas. Areas susceptible to potential leaks and/or spills will be paved and bermed. Containment areas may drain to a collection area, such as an oil/water separator or a waste collection tank. Piping and tanks will be protected from potential traffic hazards by concrete or pipe-type traffic bollards and barriers. A worker safety plan, in compliance with applicable regulations, will be prepared and implemented. It will include training for contractors and operations personnel.

The California Accidental Release Prevention ("CalARP") program requires that a facility that has more than a threshold quantity of a regulated substance in a process prepare a Risk Management Plan ("RMP"). During the HHSEGS operation, two substances identified as a potentially regulated substance under the CalARP program will be stored onsite: sulfuric acid and aqueous ammonia. However, due to the low concentrations and methods of use, neither of these substances will be regulated under CalARP. Sulfuric acid, is identified as a regulated substance under the CalARP program under the following conditions: (1) if it is concentrated with greater than 100 pounds of sulfur trioxide; (2), if it meets the definition of oleum; (3) or if it is stored in a container with

flammable hydrocarbons. The sulfuric acid that will be used at the HHSEGS facility does not meet any of these conditions. Therefore, the Project's use of sulfuric acid is not subject to the RMP requirements under CalARP.

Ammonia is identified as a regulated substance under the CalARP program if the quantity stored meets or exceeds the threshold amount of 500 pounds, and is subject to the federal Risk Management Program if the threshold amount of 20,000 pounds of a 20 percent solution is met. For the HHSEGS project, aqueous ammonia (19% concentration) will be used for boiler water chemistry control, and will be stored in 300-gallon totes at the power blocks in secondary containment. Thus, the quantity stored will not meet either CalARP's or the Federal Risk Management Plan (RMP) program's thresholds. Due to a combination of the ammonia's concentration, the storage volume onsite, and the location of storage at the power blocks, which are over 0.5 mile from the nearest residence, the amount of ammonia will not have a significant impact, and poses a low risk to the public. Therefore, the project's use of ammonia is not subject to the RMP requirements under CalARP.

Annual natural gas use in the boilers under the optimized design [Exhibit 46] will be reduced by about half compared with the original design.

D. Summary of Compliance with Applicable LORS

All hazardous materials stored onsite during HHSEGS operation will be handled and stored in accordance with applicable codes and regulations. The applicable LORS were identified in the AFC [Exhibit 1]. If a spill involves hazardous materials equal to or greater than the specific reportable quantity, all federal, state, and local reporting requirements will be followed.

E. Summary of the Potential Cumulative Impacts

The only past, present, or reasonably foreseeable future project in the vicinity is the St. Therese Mission located about 0.5 mile east of the project site. HHSEGS will not store any hazardous material that could migrate offsite. Therefore, hazardous materials at the project site would not combine with any hazardous materials at the Mission to create a cumulative impact.

III. Response to Certain Issues Raised in the FSA

The following issues are raised by the FSA:

Page 4.4-8, 4th paragraph (Natural Gas). The boiler ratings described in the FSA are for the original boilers as described in the AFC, not the boilers described in the Boiler Optimization submitted on April 2, 2012 (Applicant's Response to CEC Staff Requests, Supplemental Data Response Set 2, Response to Data Request PD-1 [Exhibit 46]). Applicant suggests that the information provided in the filing be incorporated into this paragraph as described below:

> "Each solar plant will include two types of gas-fired boilers: the auxiliary boiler and the nighttime preservation boiler (described previously). The auxiliary boiler will have a capacity of ~~350,000~~174,000 pounds per hour (lb/hr) at ~~950~~770° F and ~~1,450~~655 psia. The night preservation boiler will provide superheated steam to the STG and boiler feedwater pump gland systems overnight and during other shutdown periods when steam is not available from the SRSG. The night preservation boiler will produce ~~8,000~~10,000 lb/hour at 680° F and 145 psia."

IV. Proposed Licensing Conditions

The FSA for the project proposes six Conditions of Certification for this subject matter. We agree with the Conditions of Certification set forth in the FSA pertaining to this subject, except as set forth below.

CONDITION HAZ-2

If the intent of this condition is to provide the HMBP to both the Southern Inyo Fire Protection District (SIFPD) and Inyo County Environmental Health Services Department (ICEHSD), Applicant suggests the text be revised as follows.

HAZ-2 The project owner shall concurrently provide a Hazardous Materials Business Plan to the Southern Inyo Fire Protection District (SIFPD) and Inyo County Environmental Health Services Department (ICEHSD) for review and comment, and the CPM for review and approval. After receiving comments from SIFPD, ICEHSD, and the CPM, the project owner shall ~~reflect all~~ address comments received ~~recommendations~~ in the final documents. If no comments are received from the county or SIFPD within 30 days of submittal, the project owner may proceed with preparation of final documents upon receiving comments from the CPM. Copies of the final Hazardous Materials Business Plan shall then be provided to the ICEHSD and the Southern Inyo Fire Protection District for information, and to the CPM for approval.

Verification: At least 60 days prior to receiving any hazardous material on the site for commissioning or operations, the project owner shall provide a copy of a final Hazardous Materials Business Plan to the CPM for approval.

CONDITION HAZ-3

A Safety Management Plan should only be required for hazardous materials that are delivered in large quantities, not for smaller containers of materials such as totes or paints. Staff concurred with this comment in the Response to Comments, but failed to make changes to this condition.

HAZ-3 The project owner shall develop and implement a Safety Management Plan for delivery of liquid hazardous materials by tanker truck. The plan shall include procedures, protective equipment requirements, training and a checklist. It shall also include a section describing all measures to be implemented to prevent mixing of incompatible hazardous materials. This plan shall be applicable during construction, commissioning, and operation of the power plant.

Verification: At least sixty (60) days prior to the delivery of ~~any~~ bulk liquid hazardous material to the facility, the project owner shall provide a Safety Management Plan as described above to the CPM for review and approval.

CONDITION HAZ-5

To provide some flexibility in developing the Operational Security Plan, the Applicant recommends that the verification language be moved earlier in the condition. Therefore, please revise Condition HAZ-5 as follows.

HAZ-5 The project owner shall prepare a site-specific Operation Security Plan for the operational phase that shall be made available to the CPM for review and

approval. The project owner shall implement site security measures addressing physical site security and hazardous materials storage.

Verification: At least 30 days prior to the initial receipt of hazardous materials on-site for operations, the project owner shall notify the CPM that a site-specific Operations Site Security Plan is available for review and approval. In the Annual Compliance Report, the project owner shall include a statement that all current project employee and appropriate contractor background investigations have been performed, and updated certification statements are appended to the Operations Security Plan. In the Annual Compliance Report, the project owner shall include a statement that the Operations Security Plan includes all current hazardous materials transport vendor certifications for security plans and employee background investigations.

The level of security to be implemented shall not be less than that described below (as per NERC 2002[1]).

The Operation Security Plan shall include the following:

1. Permanent full perimeter fence or wall, at least eight feet high around the Power Block and Solar Field;
2. Main entrance security gate, either hand operable or motorized;
3. Evacuation procedures;
4. Protocol for contacting law enforcement~~,~~ and the CPM in the event of suspicious activity or emergency;
5. Written standard procedures for employees, contractors and vendors when encountering suspicious objects or packages on-site or off-site;
6. a. A statement (refer to sample, attachment "A") signed by the project owner certifying that background investigations have been conducted on all project personnel. Background investigations shall be restricted to ascertain the accuracy of employee identity and employment history, and shall be conducted in accordance with state and federal law regarding security and privacy;

   b. A statement(s) (refer to sample, attachment "B") signed by the contractor or authorized representative(s) for any permanent contractors or other technical contractors (as determined by the CPM after consultation with the project owner) that are present at any time on the site to repair, maintain, investigate, or conduct any other technical duties involving critical components (as determined by the CPM after consultation with the project owner) certifying that background investigations have been conducted on contractor personnel that visit the project site. Background investigations shall be restricted to ascertaining the accuracy of employee identity and employment history, and shall be conducted in accordance with state and federal law regarding security and privacy.
7. Site access controls for employees, contractors, vendors, and visitors;

[1] North American Electric Reliability Council, www.nerc.com/files/V1-Communications.pdf

8. Closed Circuit TV (CCTV) monitoring system, recordable, and viewable in the power plant control room and security station (if separate from the control room) capable of viewing, at a minimum, the main entrance gate~~;~~ and

9. Additional measures to ensure adequate perimeter security consisting of either:

    a. Security guard present 24 hours per day, seven days per week, **OR**

    b. Power plant personnel on-site 24 hours per day, seven days per week and **one** of the following:

        1) The CCTV monitoring system required in number 8 above shall include cameras that are able to pan, tilt, and zoom (PTZ), have low-light capability, are recordable, and are able to view 100% of the perimeter fence to the power block, the outside entrance to the control room, and the front gate from a monitor in the power plant control room; **OR**

        2) Perimeter breach detectors **or** on-site motion detectors for the power block.

The project owner shall fully implement the security plans and obtain CPM approval of any substantive modifications to the security plans. The CPM may authorize modifications to these measures, or may require additional measures, such as protective barriers for critical power plant components (e.g., transformers, gas lines, compressors, etc.) depending on circumstances unique to the facility or in response to industry-related standards, security concerns, or additional guidance provided by the U.S. Department of Homeland Security, the U.S. Department of Energy, or the North American Electrical Reliability Council, after consultation with appropriate law enforcement agencies and the ~~applicant~~ project owner.

~~**Verification:** At least 30 days prior to the initial receipt of hazardous materials on-site, the project owner shall notify the CPM that a site-specific Operations Site Security Plan is available for review and approval. In the Annual Compliance Report, the project owner shall include a statement that all current project employee and appropriate contractor background investigations have been performed, and updated certification statements are appended to the Operations Security Plan. In the Annual Compliance Report, the project owner shall include a statement that the Operations Security Plan includes all current hazardous materials transport vendor certifications for security plans and employee background investigations.~~

Attachment

Carrier, John/SAC

From: Parker, Karen/SAC
Sent: Thursday, October 18, 2012 4:21 PM
To: Geoffrey Lesh (glesh@energy.ca.gov)
Cc: Monasmith, Mike@Energy; Susan Strachan; Carrier, John/SAC
Subject: HHSEGS: Haz Mat Quantity Clarification for SF6
Attachments: HHSEGS Haz Mat Table 5 5-3_Rev 2_10-16-12.docx

Geoff,

In response to your question regarding the maximum quantity of sulfur hexafluoride that will be stored on the Hidden Hills Solar Electric Generating System project site, there will be a total of 880.4 pounds. The material will be contained in circuit breakers and no storage of additional sulfur hexafluoride on site will occur during either project construction or operation.

A revised hazardous materials table (Table 5.5-3R2) is attached. The only revision to the table is the correction of the quantity of sulfur hexafluoride from 1,300 pounds to 880.4 pounds, and the addition of a parenthetical comment that the material is contained within the circuit breakers. These changes are underlined in the table.

Please feel free to contact me if you have further questions.

Karen

Karen Parker
Senior Project Manager
CH2M HILL
2485 Natomas Park Drive #600
Sacramento, California 95833

Direct Phone: 916-286-0298
Direct Fax: 916-614-3498
Mobile: 916-468-8384
Office Phone: 916-920-0212 x.34298

TABLE 5.5-3R2
HHSEGS Chemical Inventory

Trade Name	Chemical Name	CAS Number	Maximum Quantity Onsite	CERCLA SARA RQ[a]	RQ of Material as Used Onsite[b]	EHS TPQ[c]	Regulated Substance TQ[d]	Prop 65
Nalco Elimin-OX (or similar oxygen scavenger)	Carbohydrazide	497-18-7	1,200 gallons	[e]	[e]	[e]	[e]	No
Aqueous Ammonia (19% concentration)	Ammonium hydroxide	1336-21-6	1,200 gallons	1000 lb	1000 lb	500 lb	[e]	No
Acid	Sulfuric acid (93% - 66° Baumé)	7664-93-9	1,200 gallons	1000 lb	1075 lb	1000 lb	[e]	No
Lead Acid Batteries	Composed of the following: Lead (45-60% of battery) Sulfuric Acid (10-30% of battery)	 7439-92-1 7664-93-9	420,000 lbm	10 lb	16 lb	[e]	[e]	Yes (lead)
Caustic	Sodium hydroxide 50%	1310-73-2	1,200 gallons	1000 lb	2000 lb	[e]	[e]	No
Diesel Fuel (No. 2)	Diesel Fuel	None	34,000 gallons	42 gal[f]	42 gal[f]	[e]	[e]	Yes
Cleaning Chemicals and Detergents	Various	None	2,500 gallons	[e]	[e]	[e]	[e]	No
Wastewater Treatment System Anti-scalant	Nalco 5200M or similar	Proprietary	1,200 gallons	[e]	[e]	[e]	[e]	No
Wastewater Treatment System Anti-foaming Agent	Nalco 7468 or similar	Proprietary	1,200 gallons	[e]	[e]	[e]	[e]	Yes
WSAC Corrosion Inhibitor	Nalco 3DT-187 or similar (Phosphoric acid 5%)	7664-38-2	1,200 gallons	5000 lb	100,000 lb	[e]	[e]	No
WSAC Dispersant	Nalco 73801WR or similar	Proprietary	1,200 gallons	[e]	[e]	[e]	[e]	No
Closed Cooling Water Corrosion Inhibitor	Nalco TRAC107 or similar	1310-73-2 & 1330-43-4	500 gallons	1000 lb	2000 lb	[e]	[e]	No
Bisulfite	Sodium bisulfite 30%	7631-90-5	1,500 gallons	5000 lb	16,667 lb	[e]	[e]	No
Sodium hypochlorite	Sodium hypochlorite 12% (trade)	7681-52-9	1,500 gallons	100 lb	800 lb	[e]	[e]	No
Lubricating Oil	Oil	None	40,000 gallons	42 gal[f]	42 gal[f]	[e]	[e]	Yes

TABLE 5.5-3R2
HHSEGS Chemical Inventory

Trade Name	Chemical Name	CAS Number	Maximum Quantity Onsite	CERCLA SARA RQ[a]	RQ of Material as Used Onsite[b]	EHS TPQ[c]	Regulated Substance TQ[d]	Prop 65
			(does not include oil contained within individual equipment and reservoirs)					
Mineral Transformer Insulating Oil	Oil	8012-95-1	100,000 gallons	42 gal[f]	42 gal[f]	[e]	[e]	Yes
Hydraulic Oil	Various Oil	None	5,000 gallons (does not include oil contained within individual equipment and reservoirs)	42 gal[f]	42 gal[f]	[e]	[e]	No
Sulfur hexafluoride	Sulfur hexafluoride	2551-62-4	880.4 lb (contained in circuit breakers)	[e]	[e]	[e]	[e]	No

[a] Reportable quantity for a pure chemical, per CERCLA [Ref. 40 CFR 302, Table 302.4]. Release equal to or greater than RQ must be reported. Under California law, any amount that has a realistic potential to adversely affect the environment or human health or safety must be reported.

[b] Reportable quantity for materials as used onsite. Since some of the hazardous materials are mixtures that contain only a percentage of a reportable chemical, the reportable quantity of the mixture can be different than for a pure chemical. For example, if a material only contains 10% of a reportable chemical and the RQ is 100 lb., the reportable quantity for that material would be (100 lb.)/(10%) = 1,000 lb.

[c] Threshold Planning Quantity [Ref. 40 CFR Part 355, Appendix A]. If quantities of extremely hazardous materials equal to or greater than TPQ are handled or stored, they must be registered with the local Administering Agency.

[d] TQ is Threshold Quantity from 19 CCR 2770.5 (state) or 40 CFR 68.130 (federal)

[e] No reporting requirement. Chemical has no listed threshold under this requirement.

[f] State reportable quantity for oil spills that will reach California state waters [Ref. CA Water Code Section 13272(f)]

Land Use

I. Introduction

A. Names: Jennifer Scholl and Clay Jensen, P.E.

B. Qualifications: The panel's qualifications are as noted in their resumes contained in Appendix A.

C. Prior Filings: In addition to the statements herein, this testimony includes by reference the following documents submitted in this proceeding:

- Application for Certification, Volume 1 & Volume 2, dated August 5, 2011 [Exhibit 1]
- Applicant's Data Adequacy Supplement, dated September 7, 2011 [Exhibit 2]
- Applicant's Data Response, Set 1B, dated December 5, 2011. Responses to Data Requests 74 and 75 [Exhibit 7]
- Applicant's Data Response, Set 1C, dated December 19, 2011. Responses to Data Requests 93 and 94 [Exhibit 17]
- Applicant's Data Response, Set 2E, dated May 4, 2012. Responses to Data Requests 178 through 184 [Exhibit 42]
- Applicant's Preliminary Staff Assessment Comments, Set 2, dated July 23, 2012. [Exhibit 70]

D. Attachments:

- HHSEGS Application for General Plan Amendment and Zoning Solar Overlay (Attachment LU-1)
- Affidavit of Brian Karn (Attachment LU-2)
- Affidavit of Mary J. McMonigle (Attachment LU-3)

To the best of our knowledge, all of the facts contained in this testimony (including all referenced documents) are true and correct. To the extent this testimony contains opinions, such opinions are our own. We make these statements, and render these opinions freely and under oath for the purpose of constituting sworn testimony in this proceeding.

II. Summary of Testimony

HHSEGS is consistent with applicable land use LORS. The HHSEGS project is consistent with the Rural Protection ("RP") land use designation in the Inyo County General Plan because "the managed production of resources," includes renewable energy resources such as solar, as a use provided for in the RP designation. Further, for those portions of the HHSEGS site that are part of the Recreational/Resort ("REC") land use designation, as a public/quasi-public use, HHSEGS is consistent with the REC designation. In addition, even assuming for the sake of argument that the HHSEGS site remained in the Open Space and Recreation ("OSR") General Plan designation, the HHSEGS would nevertheless be consistent with an OSR designation, given the existing General Plan Goals and Polices applicable to the HHSEGS site. As a renewable energy facility, HHSEGS is consistent with the

OS-40 zoning designation because a renewable energy generating facility, which is the managed production of a solar resource, constitutes a conditionally permitted use in an OS-40 district.

As measured under the criteria of Appendix G of the CEQA Guidelines, the project will not have significant adverse effect to land use. HHSEGS will not divide an existing community, will not conflict with an applicable habitat conservation plan (HCP) or a natural community conservation plan (NCCP) and achieves Inyo County's goals of renewable energy development in the Charleston View area. In addition, although HHSEGS is not located on Bureau of Land Management (BLM) land, it is consistent with the Solar Preliminary Environmental Impact Statement (PEIS) goals/policies for the BLM lands surrounding the project site. Further, there are no impacts to agricultural resources or Williamson Act contract lands associated with implementation of the HHSEGS.

A. Affected Environment

The HHSEGS site is located on approximately 3,097 acres (5.12 square miles) of privately owned land in southeastern Inyo County, California immediately adjacent to the Nevada border. The project site contains unimproved dirt roads for a previously approved 170-parcel subdivision. Currently, there are no agricultural uses on the proposed HHSEGS site. However, approximately 12 acres within the HHSEGS site had previously been used as an orchard. Immediately south of the HHSEGS site there is a sparsely populated residential area called Charleston View. Charleston View contains parcels ranging in size from 2 to 40 acres. Land uses adjacent to the western and northern sides of the HHSEGS site are predominately undeveloped ranging in privately owned 20-acre parcels to larger tracts of land managed by BLM. Lands adjacent to the project on the eastern boundary within Nevada are also undeveloped with a large portion of this area managed by BLM. Lands to the southeast of the site are currently under development for the St. Therese Mission.

The current HHSEGS site General Plan land use designations are Rural Protection and Recreation/Resort and the zoning is OS-40. The HHSEGS site is in an area that Inyo County has consistently identified as suitable for renewable energy development and is surrounded by lands identified in the BLM/Department of Energy's (DOE) Solar PEIS proceeding as a variance area suitable for solar development.

B. Project Benefits

There are many land use benefits associated with the HHSEGS project. First, HHSEGS will put the existing land to its highest and best use. Second, HHSEGS conforms to the County's renewable energy policies, including the siting of renewable energy development in Charleston View area, promoting renewable energy in the County, diversifying income sources for the County through renewable energy development, and generating reliable energy for Inyo County residents. Third, increased property, sale, and use taxes from construction and operations will benefit the Inyo County General Fund, the Southern Inyo Fire Protection District, schools, and the state of California.

Environmental

HHSEGS will employ advanced, high-efficiency solar power tower technology. This renewable energy source will provide 500 MW (net) of dependable power to the grid, generally during the hours of peak power consumption using interconnecting utilities. Because natural gas will only be used for supplemental heat, air emissions will be minimal and greenhouse gas (GHG) emissions will be substantially less than gas-fired power plants.

Employment

HHSEGS will provide for a peak of approximately 2,293 construction jobs at the site, with an average of 1,087 construction jobs over the 29-month construction period. In addition, it will provide approximately 100 full-time, living-wage jobs throughout the life of the project.

Renewable Energy

HHSEGS will assist California in repositioning its generation asset portfolio to use more renewable energy and reduce GHG emissions in conformance with state policies as set forth in SB 1078, AB 32, and SBX 1-2. It will also help diversify the state's energy portfolio, including the diversification of sources of renewable energy, and reducing its dependence on natural gas-fired power plants.

C. Summary of Compliance with Applicable LORS

When the AFC for the HHSEGS project was filed in August 2011, the general plan designation for the HHSEGS project site included a renewable energy zone overlay, which specifically allowed renewable energy development as an allowable use. The HHSEGS project was consistent with this general plan overlay. Although the renewable energy zone designation was later rescinded by the County in September 2011, in response to a legal challenge, the adoption of the renewable energy overlay in the Charleston View area—efforts which began in 2009—demonstrates that the County has long viewed the project site as suitable for renewable energy development as a matter of public policy. The chronology of County land use decisions is outlined in Applicant's comments on the Preliminary Staff Assessment [Exhibit 70].

Although the General Plan and zoning designation for the project site changed after the AFC was filed, the HHSEGS project remains consistent with local land use LORS.

Inyo County General Plan

The site of the HHSEGS project is located in an unincorporated portion of Inyo County. Prior to December 2004, the HHSEGS site was designated predominately as Open Space and Recreation (OSR), with a few parcels (those composing the common area) designated as Resort/ Recreational (REC), as depicted on Inyo County General Plan Land Use Diagram 29. This changed on December 7, 2004, when the Inyo County Board of Supervisors amended the Inyo County General Plan with its adoption of Resolution No. 2004-61, which action is final and unappealable. This General Plan Amendment created a new land use designation, Rural Protection ("RP"), and re-designated privately owned parcels in Inyo County with Natural Resource ("NR") and OSR designations as "RP." Resolution 2004-61 states expressly that "it is intended that *all* privately owned parcels currently designated Natural Resource and Open Space Recreation be designated as Rural Protection." (Emphasis added.) Therefore, those parcels on the HHSEGS site that were designated OSR became designated RP.

Because HHSEGS produces electricity from a renewable energy source, the HHSEGS project is consistent with the RP designation as "the managed production of resources," a use provided for in the RP designation. Specifically, the RP designation provides:

> . . . for the preservation of natural resources, *the managed production of resources*, low-intensity agriculture including grazing, park and other low-intensity recreation, wildlife refuges, hunting and fishing, [and] minimum parcel size is generally 40 acres.

> Residential use is limited to one single family home per 40 acre or larger parcel.[1] (Emphasis added.)

Further, Policy GOV-10.1 of the Inyo County General Plan provides that "renewable energy sources," such as solar, are to be treated as "natural resources" by the County. [2] HHSEGS will provide for the managed production of 500 MW (net) of solar energy, a natural resource of the County pursuant to the General Plan. Therefore, the managed production of renewable energy from HHSEGS on lands designated RP is a use consistent with the General Plan.

A small portion of the HHSEGS site is designated REC by the General Plan. Per General Plan Policy LU-3.4, the REC land use designation allows for "… public and quasi-public uses…"[3] Pursuant to Inyo County General Plan Policy LU-2.16, uses that constitute "public, quasi-public, and supporting uses" include "utility system components." Electric generation is a component of a utility system. Therefore, the HHSEGS project is consistent with the REC designation.

If, for the sake of argument, the Open Space designation were still applicable to the project site, HHSEGS is also consistent with the OSR land use designation. Inyo County General Plan Goal LU-5 sets forth the County's goal to "[p]rovide adequate public facilities and services for the existing and/or future needs of communities and their surrounding environs, and to conserve natural and managed resources." Because HHSEGS will generate electricity, HHSEGS will contribute to the existing and future energy needs of the County, and its surrounding environs. Moreover, HHSEGS is also consistent with this goal because HHSEGS, as a renewable energy resource, will help California achieve the need to procure electricity from renewable energy resources to meet the California Renewable Portfolio Standard, and thereby conserve natural resources.

Further, General Plan Goal LU-5 and Policy LU-5.1 states that the OSR designation allows "for existing and planned public parks, ball fields, horse stables, greenbelts, and similar and compatible uses." The scope of "similar and compatible uses" is not defined by LU-5.1. However, in this case, Section 18.12.040 of the Inyo County Zoning Code provides guidance as to the types of uses that are considered "similar and compatible uses" in the OSR land use designation, given that the purpose of Section 18.12.040 is to implement the General Plan's Open Space designation, and the zoning code

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[1] Resolution No. 2004-61, p. 1, available; Inyo County General Plan LU-2.95; emphasis added.

[2] Specifically, Policy Gov-10.1 provides: "Development of energy resources on both public and private lands be encouraged with the policies of the County to develop these energy resources within the bounds of economic reason and sound environmental health. Therefore, the Board supports the following policies.

a. The sound development of any and all energy resources, including, but not limited to geothermal, wind, biomass, and solar.

b. The use of peer-reviewed science in the assessment of impacts related to energy resource development.

c. The development of adequate utility corridors necessary for the transmission of newly generated energy.

d. Maintain energy opportunities on state and federal lands maintaining and expanding access

e. Treat renewable energy sources as natural resources, subject to County planning and environmental jurisdiction. Consider, account for, and mitigate ecological, cultural, economic, and social impacts, as well as benefits, from development of renewable energy resources. Consider developing environmental and zoning permitting processes to ensure efficient permitting of renewable energy projects while mitigating negative impacts to county services and citizens, with a goal to ensuring that citizens of the County benefit from renewable energy development in the County."

[3] Inyo County General Plan, Policy LU-3.4 provides, "This designation provides for a mixture of residential and recreational commercial uses, such as resorts, recreational facilities, motels, campgrounds, trailer parks, restaurants, general stores, service stations, and similar and compatible uses. This designation is oriented toward tourist use, however, it also permits permanent residential use and public and quasi-public uses. The FAR shall not exceed 0.40. The base residential density shall be 1 du/25 acres. Clustering of residential units is encouraged, with density of developed area allowed up to 24 du/net acre. [New]"

must conform to the General Plan. Currently, the "OS" zoning designation sets forth a list of activities permitted in lands zoned OS, which includes the mining and processing of natural resources. Given that the zoning code must be consistent with the General Plan, the logical conclusion is that the mining and processing of natural resources is permissible on lands with an OS General Plan designation. As described above, General Plan Policy Gov-10.1 considers solar resources to be treated as a natural resource, and therefore, processing of a solar resource using a renewable energy power plant, is considered consistent with the General Plan OS land use designation.

This conclusion is supported by other policies set forth in the Inyo County General Plan. The OSR designation refers to another land use policy, Policy LU-2.16. According to the Inyo County General Plan, reference to another policy in the general plan means that the policy is "closely related."[4] Thus, Policy LU-2.16 provides guidance as to what uses can be deemed "similar and compatible uses" for the OSR designation, including utility system components. Given the specific reference in Policy LU-2.16 to utility system components, Policy LU-5.1 should be read as permitting utility system components as a "similar and compatible use" allowed in the OSR designation. This reading of Policy LU-5.1 is also consistent with the goals set forth in Goal LU-5, which is to provide adequate services to meet the needs of the County and surrounding environs. Therefore, the HHSEGS project, as a generator of renewable energy, is permitted in the OSR designation as a utility system component.

Inyo County Code Title 18

The OS-40 zoning designation applicable to the HHSEGS site is intended to implement the land use goals and policies of the General Plan. Renewable energy facilities such as the HHSEGS are not listed as a permitted or conditional use in any zoning district. Where a specific use is not listed in the Inyo County Zoning Ordinance, County Code Section 18.81.020 provides that the characteristics of the use in question are compared with the listed uses permitted in the relevant zoning district to determine if the use is of the same character as a permitted or conditional use in any zoning district. Therefore, to determine whether the HHSEGS is a use consistent with the OS-40 zoning designation, the Commission must compare the characteristics of the use in question, a renewable energy facility, to the listed uses permitted in the OS-40 designation to determine if the proposed use is of the same character as a permitted or conditional use in that zoning district.

In this case, the OS-40 open space zoning designation applicable to the project site allows the mining and processing of natural resources as a conditionally permitted use. As explained previously, the Inyo County General Plan provides that solar resources are to be treated as natural resources of Inyo County. Use of the HHSEGS project site for the processing of solar resources for the production of renewable energy is of the same character of use as the mining and processing of natural resources permitted in OS-40 districts. Therefore, because the HHSEGS is of the same character as a use permitted in the OS-40 district, HHSEGS is a use consistent with the OS-40 zoning designation applicable to the project site.

Inyo County Code Title 21

But for the Commission's exclusive permitting jurisdiction, Title 21 of the Inyo County Code would apply to the project, and would require that the project apply for Renewable Energy Development Agreement or Renewable Energy Permit from Inyo County. However, given that a Renewable Energy Development Agreement and Renewable Energy Permit are discretionary approvals preempted by

[4] Inyo County General Plan, p. 1-13, available at http://www.inyoplanning.org/general_plan/goals/ch1.pdf

the Warren-Alquist Act, the Applicant is not required to "comply" with Title 21 by obtaining a Renewable Energy Development Agreement or Renewable Energy Permit from the County. Nonetheless, the HHSEGS project is consistent with Title 21 because the significant impacts of the project will be mitigated, the project will have a beneficial economic benefit to the County, and compliance with the Commission's conditions of certification will ensure that the project will be properly decommissioned after closing.

General Plan Amendment and Zoning Overlay

While the Applicant does not believe that either a general plan amendment (GPA) or rezoning of the project site is necessary, shortly after the publication of the Preliminary Staff Assessment, the Applicant filed a General Plan Amendment and Zoning Overlay application requesting that the County apply a Solar Overlay to the HHSEGS site. This application was filed in response to a request from Inyo County, and the Applicant did so in a spirit of good will and cooperation.

The base zoning district and general plan designation would not change as a result of the requested application. The application was deemed complete by the County on July 10, 2012. However, Inyo County later stated that the signatures of all property owners for parcels that comprise the project site were needed to process the application, and subsequently determined that the application package was incomplete. The Applicant expects to obtain signatures from all underlying landowners for the GPA and Zoning Overlay application and submit them to the County prior to a final decision by the Commission.

D. Summary of the Potential Cumulative Impacts

The project, in combination with other reasonably foreseeable projects identified in the AFC, will not result in any significant cumulative impacts on land use. Because the General Plan does not impose any ceiling on development, compliance with the plan by each of the individual projects also ensures that taken together, the projects will not have a significant effect on land use.

III. Response to Certain Issues Raised in the FSA

A. FSA Erroneously Concludes That The Project Is Incompatible With The Inyo County General Plan

As discussed in Section II above, HHSEGS is consistent with the Inyo County General Plan. On page 4.5-14, the Final Staff Assessment (FSA) concludes, that the project site is largely designated as OSR, rather than RP. Staff's statement is contrary to the express language of Inyo County Board of Supervisor Resolution 2004-61, which stated that "it is intended that *all* privately owned parcels currently designated Natural Resource and Open Space Recreation be designated as Rural Protection." As explained above, the correct designation for the project site should be RP.

However, even if the OSR designation were applicable, as the FSA contends, the FSA fails to acknowledge that the policies and goals of the OSR designation, such as Goal LU-5, encourages the County to "[p]rovide adequate public facilities and services for the existing and/or future needs of communities and their surrounding environs, and to conserve natural and managed resources." This goal is served by development of the HHSEGS project in an area designated as OSR, which would help provide adequate public facilities and electricity services for the community and surrounding environ. In addition, other OSR policies support the finding that "public/quasi-public uses," such as the generation of renewable energy for the public benefit, are uses consistent with the OSR designation. Therefore, even if the project site were designated as OSR, the FSA should find that the HHSEGS is a use consistent with that land use designation.

This finding is supported by the zoning designation, OS-40, which is applicable to the project site. The OS-40 zoning designation is intended to implement the land use policies and goals for the Inyo County General Plan open space designation. As explained above in Section II, the OS-40 open space zoning designation applicable to the project site allows the mining and processing of natural resources as a conditionally permitted use. The Inyo County General Plan provides that solar resources are to be treated as natural resources of Inyo County. Use of the HHSEGS project site for the processing of solar resources for the production of renewable energy is of the same character of use as the mining and processing of natural resources permitted in OS-40 districts. Therefore, because the HHSEGS is of the same character as a use permitted in the OS-40 district, HHSEGS is a use consistent with the OS-40 zoning designation applicable to the project site.

On page 4.5-14, the FSA concludes that the project is not consistent with the REC land use designation. In response to comments, the FSA explains the basis for this conclusion, stating "public/quasi-public uses do not allow large renewable solar projects that are privately owned." (FSA, Land Use Appendix 1, p. 6). This is inconsistent with previous Commission decisions, which have explicitly rejected arguments that a privately owned power plant could not constitute a public/quasi-public use. Instead, the Commission has previously found that such a "narrow interpretation" must be rejected when, as here, the facility will sell electricity to a public utility for public consumption and benefit. (See, *Mariposa Energy Project Commission Decision*, 09-AFC-3, Land Use, p. 14)

B. The FSA Erroneously Concludes, and Finding of Fact 3 Wrongly States, That The Project Is Incompatible With The Inyo County Zoning Code.

On page 4.5-12, and in Proposed Finding of Fact 3, the FSA finds that the project will not conform with applicable provisions of the Inyo County zoning code and renewable energy ordinance. However, the FSA's finding that the project site is incompatible with the OS-40 zoning designation is inconsistent with the FSA's assertion that Title 21 of the Inyo County Code (the renewable energy ordinance) applies to the project.

Specifically, Section 21.20.020 of Title 21 of the Inyo County Code, provides:

> In lieu of imposing the standards and procedures set forth in Title 18 concerning: (1) permitted, conditional, and/or accessory uses related to a facility and its accessory uses and structures, (2) distance between buildings, (3) height, density and intensity, (4) light and glare, (5) noise, and (6) wireless communications facilities directly related to the facility, with regard to renewable energy development agreements, the County Board of Supervisors shall incorporate, and with regard to renewable energy permits, the County Planning Commission shall impose, such standards as are deemed appropriate. . .

Therefore, if Title 21 is determined to apply, then pursuant to Section 21.20.020, the permitted, conditional, and/or accessory uses provided for a certain zoning designation in the Inyo County Zoning Code are irrelevant. Instead, the Commission standing in Inyo County's shoes would be responsible for determining the appropriate standards of development for the project, including whether the solar renewable energy facility is a permitted use of the project site. It is an either-or proposition. Either the project is subject to the requirements of the zoning code, Title 18 of the Inyo County Code or the project is subject to Title 21. Analyzing the project under both provisions of the County Code ignores the specific exemptions from Title 18 provided in Title 21.

If the project is analyzed under Title 18, it is compatible with the OS-40 designation as a conditionally permitted use. The FSA recognizes on page 4.5-16 that the "Inyo Zoning Code does not specifically identify large solar projects as an allowed use in any one zoning district," yet concludes, without explanation, on page 4.5-12 that "large renewable energy projects are not allowed in this zone district." As stated in Applicant's PSA comments, the OS-40 zoning designation is intended to implement the land use policies and goals for the open space designation in the Inyo County General Plan. Renewable energy facilities such as the HHSEGS are not listed as a permitted or conditional use in any zoning district. Where a specific use is not listed in the Inyo County Zoning Ordinance, County Code Section 18.81.020 provides that the characteristics of the use in question are compared with the listed uses permitted in the relevant zoning district to determine if the use is of the same character as a permitted or conditional use in any zoning district. Therefore, to determine whether the HHSEGS is a use consistent with the OS-40 zoning designation, the Commission must compare the characteristics of the use in question—a renewable energy facility—to the listed uses permitted in the OS-40 designation to determine if the proposed use is of the same character as a permitted or conditional use in that zoning district.

In this case, the OS-40 open space zoning designation applicable to the project site allows the mining and processing of *natural resources* as a conditionally permitted use. As explained previously, the Inyo County General Plan provides that solar resources are to be treated as natural resources of Inyo County. Use of the HHSEGS project site for the processing of solar resources for the production of renewable energy is of the same character of use as the mining and processing of natural resources permitted in OS-40 districts. Therefore, because the HHSEGS is of the same character as a use permitted in the OS-40 district, HHSEGS is a use consistent with the OS-40 zoning designation applicable to the project site.

If the project is analyzed under Title 21, then the uses permitted in the OS-40 zoning designation are irrelevant to a land use analysis because Section 21.20.020 of the Inyo County Code provides that the standards set forth in Title 18 relating to "permitted, conditional, and/or accessory uses" do not apply. Instead, the Commission will determine whether a solar renewable energy facility is a permitted use of the project site. Given Inyo County's attempts since 2009 to designate Charleston View as an area appropriate and suitable for renewable energy development, this should be an easy determination to make.

In addition, on page 4.5-12, the FSA finds that the project is inconsistent with Title 21 because it is inconsistent with the Inyo County General Plan. As discussed above in Section II, the project is consistent with the Inyo County General Plan. Therefore, the Commission should find that the project is consistent with Title 21, if it determines that Title 21 applies.

C. The Warren-Alquist Act Preempts Title 21 of the Inyo County Code

On page 4.5-22, the FSA states, "In this instance, since the county is not the permitting agency, the applicant would be required to obtain a Renewable Energy Impact Determination from the Planning Commission in accordance with Title 21." This is incorrect. Section 21.16.020 of the Inyo County Code provides:

> Any person who proposes to construct a facility within the County or modify an existing facility within the County who is not subject to a renewable energy permit issued by the County for the facility, shall, prior to the commencement of construction or modification, first apply for and obtain from the County Planning Commission a renewable energy impact determination that identifies

> environmental and other impacts expected to result from such project and mitigation for those impacts.

Thus, pursuant to Title 21, a Renewable Energy Impact Determination is a discretionary approval that must be obtained from the County prior to building certain facilities in the County. Such approvals are specifically preempted by the Warren-Alquist Act. Therefore, the Applicant will not be required to obtain a Renewable Energy Impact Determination from the County, because certification by the Commission is in lieu of any permit, certificate, or similar document required by Inyo County.

D. The FSA Incorrectly Concludes, and Finding of Fact 4 Wrongly States, that the Subdivision Map Act is an Applicable LORS

On pages 4.5-11 and 4.5-12, and in Proposed Finding of Fact 4, the FSA concludes that the Subdivision Map Act and Title 16 of the Inyo County Code, which implements the Subdivision Map Act, are applicable LORS.

This is incorrect. The Subdivision Map Act, and therefore any local ordinances implementing the Act, does not apply to the leasing of parcels in conjunction with a solar electrical generation device, such as the HHSEGS project, pursuant to Government Code section 66412(l). Section 66412(l) provides:

> This division shall be inapplicable to any of the following:
>
> * * *
>
> (l) The leasing of, or the granting of an easement to, a parcel of land, or any portion or portions thereof, in conjunction with the financing, erection, and sale or lease of a solar electrical generation device on the land, if the project is subject to review under other local agency ordinances regulating design and improvement or, if the project is subject to other discretionary action by the advisory agency or legislative body.

Because HHSEGS is leasing the project site for the construction of a solar electrical generation device, a solar power plant, and the project is subject to review by the Commission applying local LORS, the Subdivision Map Act, and any local ordinances enacted to implement the Act, is inapplicable. Therefore, proposed Finding of Fact 4 should be deleted. In addition, because the Subdivision Map Act is not an applicable LORS, the condition of certification proposed to ensure consistency, LAND-1, should be deleted.

E. Proposed Finding of Fact 5 is Incorrect as a Matter of Law

Proposed Finding of Fact 5 states that the Inyo County Board of Supervisors "holds exclusive authority to abandon public roads and land use actions." The FSA states that the County claims "these particular roads" meaning the roads that are alleged to be public roads but which have never been specifically identified as such, "can only be eliminated through a discretionary decision by the Board of Supervisors." This proposed finding of fact is incorrect for many reasons. First, this finding appears to be intended to refer to the Streets and Highway Code section 8300, *et seq*. While there is a process for abandonment in the Streets and Highways Code by which the County may abandon a right of way, it is not exclusive. *(See,* Street and Highway Code § 8311: "The procedures provided in this part are alternative procedures for vacating streets, highways, and public service easements. The authority granted in this part is an alternative to any other authority provided by law to public entities.")

Second, insofar as any process applicable to use of the project site is embodied in a statute, the Warren-Alquist Act provides that the Commission holds exclusive authority to certify *all sites* and related facilities in the state. Use of a site for a power plant is subject to the jurisdiction of the Commission. And while the County may abandon a road, the Commission also has plenary authority to restrict or modify the use of roads on and adjacent to the project site. The provisions for road abandonment are state laws and the Warrant Alquist Act expressly pre-empts all state and local laws applicable to the site and related facilities. The issuance of a certificate by the Commission is in lieu of any permit, certificate, or similar document required by any state, local or regional agency for *such use of the site*, and supersedes *any applicable statute ordinance or regulation* of any state, local, or regional agency. Therefore, any action by a local agency that would otherwise be applicable to the project site is expressly preempted by the Commission in the case of HHSEGS.

The FSA also states that, "The question of whether the roads are in fact public rights-of-way that Inyo County would require the land owner to abandon is a legal one whether common law or statutory law applies. Such a determination is beyond the scope of this analysis." In fact, the question of whether a road is a public road falls squarely within the Commission's jurisdiction. In other proceedings, matters concerning public roads, including rerouting or closing public roads and trails to public access has arisen and addressed in the Staff Assessment for other siting cases, such as the Ridgecrest Solar Power Project (09-AFC-9), Ivanpah Solar Electric Generating System project (07-AFC-5), and Imperial Valley Solar project (08-AFC-5. Unlike in this proceeding, the Staff did not state that the question was beyond the scope of analysis.

Moreover, on page 4.5-21, the FSA notes a statement by Inyo County "that some of the unimproved road dedications on the project site have become public roads…" The County's position on this issue is incorrect for several reasons. First, the statement that some of the unimproved roads on the project site have become public roads" is incorrect. On its face, the assertion is unfounded. The County has not identified any specific road that is alleged to be a public road, nor cited the circumstances for the basis for this assertion. A mere allegation that a road is a public road does not make it so. Instead, there are two circumstances under which a road on private property may become a public road. If there has been an offer of dedication of a public road, then the offer may be accepted (1) by formal acceptance by the County, or (2) by adjudication of a court that the offer of dedication has been accepted by the public.

In this case, there was an offer of dedication made by Roland Wiley in 1974. However, none of the unimproved dirt roads that cross the project site have been formally accepted by the County. There has been no court determination that any of the roads offered for dedication have been accepted by the public.

It is not surprising that no court has found any of these roads to have become public roads through public use, because these offers of dedication (1) have not become effective, or (2) assuming the offers were effective, they have been revoked as to the public. The facts establishing that the offers were not effective or that the offers have been revoked are set forth in the affidavits of Mary Jane McMonigle and Brian Karn. Ms. McMonigle is the co-trustee of the Mary Wiley Trust, which owns the majority of the parcels that comprise the project site, and has visited the project site since she was a young child. As noted in the affidavit, the Mary Wiley Trust considers the entire project site, including the graded dirt roads, to be private property. In addition, Mr. Karn, as set forth in his affidavit, aided Roland Wiley in maintaining the dirt roads as private roads. Therefore, the roads on the project site are not public roads.

The FSA states that, "Staff reviewed the subdivision parcel maps that are applicable to the project site and the maps show private roadway easements along all of the parcels within the project site."

This is true, but not relevant to the discussion about public roads. The right to use a private easement is granted to the holder of the easement. Thus, the holder of the easement (or those that the holder of the easement permits) is the only entity authorized to use the roadway easements. The right is not extended to the public at large.

The FSA further states: “The subdivision maps also contain wording indicating that the roadways were an offer of dedication. If these roadways are in fact public rights-of-way that were recorded as a result of the initial subdivision approval, the Inyo County Board of Supervisors may need to abandon those public rights-of-way prior to the HHSEGS construction.” This statement appears to be confused about offers of dedication. The fact that an offer of dedication is recorded, does not make the road a public right-of-way. As explained above, after the offer is recorded, the offer must be accepted. There has been no formal acceptance, nor acceptance by public use as determined by the court; therefore there is nothing to abandon.

In the alternative, if the Commission does determine that there are public roads on the project site, it should find that it has the authority to vacate such roads pursuant to the statutory authority granted it under the Warren-Alquist Act.

F. Tsiamis Parcel

The FSA includes discussion regarding issues raised by a letter received from Briggs Alexander Law Corporation related to site control of a 20-acre parcel owned by the Tsiamis family included within the project boundary. The Applicant has secured site control of this parcel. The Applicant expects Inyo County to continue processing the General Plan and Zoning overlay applications submitted on July 10, 2012.

G. The FSA Incorrectly Finds and Finding of Fact 6 Incorrectly States That There Area Significant Land Use Impacts Based on Visual Impacts

On pages 4.5-25 and 26, the FSA states, “land use incompatibilities could occur if there are uses that are inconsistent or would pose substantial changes that would impact surrounding land uses,” and that “the visual impacts represent a substantial change in the rural open space character of the area.” Based on these purported visual impacts, the FSA finds that the project will “create a land use incompatibility due to significant and unavoidable visual impacts.” The FSA suffers from the same flaws as the PSA. First, this purported impact should be treated, if anything, as a potential visual impact, not as a land use impact. Moreover, it does not logically follow that a project is incompatible with surrounding land uses simply because it can viewed from the surrounding land. The FSA includes no evidence demonstrating that the mere sight of the project from surrounding lands would result a significant impact on the use of such land. There is no analysis in the FSA of how surrounding land uses would be impacted by the project. For example, the mere sight of the project from recreation areas will not impede the use of those areas for recreational purposes. The FSA’s conclusions regarding these impacts are arbitrary and unsupported by substantial evidence in the record

H. Proposed Findings of Fact

Based upon the explanations provided above, the FSA’s proposed findings of fact should be revised as follows:

1. ~~The HHSEGS project site is designated "Open Space and Recreation" and “Recreation” under the Inyo County General Plan and “Open Space with a 40-acre Minimum” in the Inyo County Zoning Code.~~

2. A solar thermal power plant is ~~not~~ an allowed use in the "Rural Protection," "Open Space and Recreation" and "Recreation" general plan designations and the "Open Space" zone.
3. The HHSEGS facility will ~~not~~ conform with applicable provisions of the Inyo County general plan, zoning code or renewable energy ordinance.

~~4. The HHSEGS project would not be consistent with the Inyo County Subdivision ordinance or California statutes without the proposed conditions of certification.~~

~~5. The Inyo County Board of Supervisors holds exclusive authority to abandon public roads and land use actions, such as merging lots or reverting acreage.~~

~~6. The HHSEGS would create a land use incompatibility due to significant and unavoidable visual impacts.~~

4. The HHSEGS project will not convert any Farmland (as classified by the Farmland Mapping and Monitoring Program) to non-agricultural use, conflict with existing agricultural zoning or Williamson Act contracts or convert forest land to non-forest use.
5. The HHSEGS project will not conflict with existing zoning for agricultural use or a Williamson Act contract.
6. The HHSEGS project will not conflict with existing zoning for, or cause rezoning of, forest land, timberland, or timberland zoned Timberland Production.
7. The HHSEGS project will not result in the loss of forest land or conversion of forest land to non-forest use.
8. The HHSEGS project will not directly or indirectly divide an established community or disrupt an existing or recently approved land use.
9. The HHSEGS project will not conflict with any applicable habitat conservation plan or natural community conservation plan.
10. The HHSEGS project will not result in incremental impacts that, although individually limited, are cumulatively considerable when viewed in connection with other project-related effects or the effects of past projects, other current projects, and probable future projects.
11. The HHSEGS project will not create a land use incompatibility with surrounding land uses.
12. The offers of dedication of roads for the subdivision has not become effective, and therefore cannot be accepted, because the private dirt roads graded by Roland Wiley were never opened for use by the public.
13. Even if the offers of dedication did become effective, the offers have been withdrawn as to the public by the acts of the landowner.
14. No offers of dedication for roads within the project site have been accepted by the County.
15. No court has found that any road within the project site has become a public road because of use by the public.

IV. Proposed Licensing Conditions

The FSA proposes Conditions of Certification, LAND-1 through LAND-4. For the reasons set forth below, Applicant recommends that Conditions LAND-1, LAND-2, and LAND-3 be deleted. The Applicant proposes minor clarifications to LAND-4.

CONDITION LAND-1

Proposed Condition LAND-1 would require the Applicant to obtain a Certificate of Merger from Inyo County prior to construction of the project. The FSA states that LAND-1 is required to comply with the Subdivision Map Act, Title 16 of the Inyo County Code, and to ensure site control. However, as discussed above, the Subdivision Map Act and Title 16 of the Inyo County Code are not applicable to the project. Solar leases for solar electrical generating facilities are specifically exempted from the Subdivision Map Act. Because solar leases are exempted, the project is not required to comply with the Subdivision Map Act, or the County's ordinances that were enacted to implement the Subdivision Map Act.

In addition, the project site consists of 170 leased parcels owned by several different owners. The Commission has determined in previous decisions, such as the in the Imperial Valley Solar proceeding (for example, see *Commission Decision Imperial Valley Solar Energy Project* (08-AFC-5), Land Use pp. 512-515) that lease agreements with private property owners establishes site control, particularly where, as here, the parcels cannot be separately conveyed in a way that would interfere with project operations or ownership. Therefore, as site control is already achieved through the lease option that Applicant holds over the project site, LAND-1 should be deleted.

CONDITION LAND-2

Proposed Condition LAND-2 would require bonds or other financial assurances to be paid to the Energy Commission to ensure restoration of the project site to pre-project conditions. However, there is no relationship between the bonding/financial assurances requirement and a land use impact caused by the project. Therefore, LAND-2 should be deleted. See Applicant's Project Description testimony for additional reasons why LAND-2 should be deleted. As stated in Applicant's PSA Comments on Land Use [Exhibit 70], extensive efforts have been made to address concerns raised since the filing of the AFC. Inyo County's designation of the project site as appropriate for renewable energy development changed during the HHSEGS licensing process.

CONDITION LAND-3

Proposed Condition LAND-3 is redundant with other conditions and should be deleted in its entirety. TRANS-2 requires that a 24-foot-wide right-of-way be dedicated to Inyo County and VIS-2 requires landscaping improvements to the facility boundaries. Therefore, LAND-3 is unnecessary.

CONDITION LAND-4

As proposed in the FSA, Condition LAND-4 is overly burdensome in terms of the reporting and approval requirements for sign use. There might be times during construction or operations that a sign might need to be temporarily placed to direct traffic or other activities, or even moved during the course of construction. It is not logical for the Applicant to have to plan the locations of all potential signs that will be used on the project site, and obtain permission for signs on the project site 30 days before signs can be used. Therefore, the Applicant proposes that this condition apply only to permanent signage that will installed after the facility is fully constructed.

LAND-4 The project owner shall ensure that any ~~proposed~~ permanent signs comply with the Chapter 18.75 Sign section of the Inyo County Zoning Ordinance.

Verification: At least thirty (30) days prior to the installation of any permanent sign(s), the project owner shall submit evidence to the CPM for review and approval that the proposed signs will conform to the guidelines. The submittal shall show the location of all proposed sign(s) and include evidence of review and any comments by the County of Inyo on signage.

Attachments

AFFIDAVIT OF MARY JANE MCMONIGLE

STATE OF NEVADA)
)
COUNTY OF CLARK)

MARY JANE MCMONIGLE, being duly sworn and deposed, states the following:

1. That she is a resident of Las Vegas, Clark County, Nevada, having been a resident of Las Vegas, Clark County, Nevada, since her birth in 1973.

2. That MARY JANE MCMONIGLE associated closely with ROLAND WILEY and MARY WILEY from the time of affiant's birth in 1973. MARY JANE MCMONIGLE bears the name of MARY, having been named after MARY WILEY.

3. The association of MARY JANE MCMONIGLE with ROLAND WILEY and MARY WILEY was close, visiting frequently, sometimes several times per week. Affiant frequently traveled with Roland Wiley and Mary Wiley out to the Hidden Hills Ranch visiting the property on both the Nevada and California sides on practically a weekly basis from the time of her earliest recollection beginning in the late 1970s until the death of ROLAND WILEY in 1994.

4. Because of her frequent visits with ROLAND WILEY and MARY WILEY and to the property known as Hidden Hills Ranch, Affiant declares of her own knowledge that she is familiar with the fact that ROLAND WILEY would cause signs to be posted declaring that the real property was "private property" and that "no trespassing was allowed." Affiant was aware that ROLAND WILEY would cause barricades to be posted at various times on various private roadways, to barricade private dirt roads owned and maintained by ROLAND WILEY traversing north and south from the Old Spanish Trail Highway in Inyo County, California going north between Sections 26, 27, 28, and 29 in Township 10 N Range 22 West SBB&M.

5. Later, as MARY JANE MCMONIGLE was able to drive, Affiant would sometimes run errands for ROLAND WILEY and purchase the signs for posting and barricading, delivering them to ROLAND WILEY and being reimbursed for the costs. Affiant saw the signs and the barricades as posted on numerous occasions.

6. Affiant never personally physically posted a sign or barricade herself.

7. As Co-Trustee of the MARY WILEY TRUST, Affiant continues to reassert that the dirt roads and real property which were posted and barricaded in the past continues to be the private land of the MARY WILEY TRUST and continues to be land and private dirt roads which were solely owned and maintained by ROLAND WILEY during his lifetime, by the estate of ROLAND WILEY and then by the MARY WILEY TRUST following the death of ROLAND WILEY and MARY WILEY.

8. Further Affiant sayeth naught.

DATED this 16 day of January, 2012.

MARY JANE MCMONIGLE

SUBSCRIBED and SWORN TO
before me this 16 day of January, 2012.

NOTARY PUBLIC

NOTARY PUBLIC
DEVON MCKNIGHT
STATE OF NEVADA COUNTY OF CLARK
MY APPOINTMENT EXP. NOV. 14, 2016
No: 12-9591-1

AFFIDAVIT OF BRIAN KARN

STATE OF NEVADA)
)
COUNTY OF CLARK)

BRIAN KARN, being duly sworn, deposes and states the following:

1. I am a resident of Las Vegas, Clark County, Nevada. I have been a resident of Las Vegas, Clark County, Nevada, since 1989. For the period of 1991 to 1995, I was married to MARY JANE MCMONIGLE, who was known as MARY JANE KARN during the time of our marriage.

2. In 1992 and 1993, I performed services for ROLAND WILEY, working on the orchards that existed on the Nevada land and the California land, such as maintenance, pruning and other miscellaneous jobs for Mr. Wiley. Roland Wiley considered that all of the California and Nevada lands were a part of his one "Hidden Hills Ranch" operation.

3. One of my duties was to place sawhorse barricades to block access in Nevada and to dirt roads in California that led away from the paved "Old Spanish Trail Highway". This highway is also sometimes referred to as the road to Tecopa. The barricades were placed directly on the dirt roads at the direction of Mr. Wiley on several different occasions because he considered the roads to be privated in nature and not generally accessible by the public. There were four (4) barricades made in the form of a sawhorse with a metal sign bolted onto it stating "Private Property--Do Not Enter."

4. On the map attached hereto as Exhibit A, I have placed an "X" on each spot which indicates the locations where I placed the barricades in 1992 and 1993.

5. Roland Wiley explained that his purpose was to demonstrate on a continuing basis that the land and access roads were all his privately and that he had been continuously carrying a similar barricading and posting process since he acquired the lands decades before.

6. Further Affiant Sayeth Not.

DATED this 16th day of January, 2013.

BRIAN KARN

SWORN AND SUBSCRIBED before me
this 16 day of January, 2013.

Notary Public in and for Clark County, State of Nevada

NOTARY PUBLIC
DEVON MCKNIGHT
STATE OF NEVADA - COUNTY OF CLARK
MY APPOINTMENT EXP. NOV. 14, 2016
No: 12-9591-1

Jan 16, 2018 Brian Karn Exhibit A

BrightSource

July 3, 2012

Inyo County Planning Department
168 North Edwards Street
Independence, CA 93526

To whom it may concern:

The enclosed application for certain land use approvals is submitted on express condition of the County Board of Supervisors prior approval of the proposed *Agreement between County of Inyo and BrightSource Development, LLC for the Provision of Environmental Review and Processing Services* (the "Agreement"), a partially executed copy of which is enclosed. In the event the Agreement is not approved by the Board of Supervisors at its regular July 10, 2012 meeting, the enclosed application and all applicant and landowner authorizations and signatures included therein shall, for all purposes, be null and void and of no force or effect. The enclosed submittal should not be construed by the County or any other person as a waiver or limitation of applicant's past, current or future rights and protections under the *Warren Alquist State Energy Resources Conservation and Development Act*, Pub. Res. Code §25500 *et seq*. or any other applicable law, which rights and protections are hereby expressly reserved. Nor shall this submittal be construed as a waiver or limitation of the California Energy Commission's exclusive jurisdiction over the applicant's pending Application for Certification for the Hidden Hills Solar Energy Generating System.

Regards,

Bradley Brownlow
Environmental Attorney

Enclosures: 2

Cc: Dana Crom, Assistant County Counsel

BrightSource Energy, Inc.
1999 Harrison Street, Suite 2150
Oakland, CA 94612

www.BrightSourceEnergy.com

Inyo County Planning Department Permit Application
P.O. Drawer L
Independence, CA 93526
(760) 878-0263 (760) 872-2706

Staff Use Only For Public Hearing On: _____
Application Reference Number: _____
Review by: ☐ Staff ☐ Design Review Committee ☐ Planning Commission ☐ Board of Supervisors

Applicant Name:	**Property owner: Name:**
BrightSource Development, LLC	See Attachment A
Address: 1999 Harrison Street, Suite 2150	**Address:** Attachment A
City: Oakland **State:** CA **ZIP:** 94612	**City:** Attachment A **State:** **ZIP:**
Telephone: 510-550-8161	**Telephone:** Attachment A
FAX: 510-866-6768	**FAX:**

Assessor's Parcel Number(s): See Attachment B **Zoning:** OS-40

Site Address: This project is generally located at the Northeast corner of Old Spanish Highway and Quartz Street **General Plan:** 2001 as amended

Applicant agrees to indemnify County in accordance with that certain *Agreement Between County of Inyo and BrightSource Development, LLC for theProvision of Environmental Review and Processing Services*, if such agreement is approved by the Board of Supervisors on July 10, 2012.

Property Owner Consent: I consent to the submission of this application:

Date: 7/3/12 **Signature:** MaryJane McMaigle

Applicant or Engineer Certification: I hereby consent that the information contained in this application and any attachments are correct to the best of my knowledge: **Signature:** BrightSource Development, LLC, by BrightSource Energy, Inc. its sole member

Date: July 2, 2012 **Telephone:** 510-550-8161 **Address:** 1999 Harrison Street, Suite 2150, Oakland, CA 94612

Application for:
☒ General Plan Amendment ☒ Zone Change ☐ Use Permit ☐ Variance ☐ Tract Map ☐ Parcel Map
☐ Mobilehome Waiver ☐ Mining Reclamation Plan ☐ Parcel Merger ☐ Road Abandonment ☐ Specific Plan
☐ Certificate of Compliance ☐ Design Review Committee ☐ Time Extension ☐ Other

Environmental Documents: (Staff Use Only)
☐ Environmental Information Form ☐ Categorical Exemption ☐ Initial Study/ Negative Declaration
☐ Environmental Impact Report CEC will provide environmental documentation

Submission Requirements: ☐ Cultural Resources Study ☐ Biological Resources Study ☐ Legal Description ☐ 300 foot property owners list ☐ Stamped Envelopes ☐ Landscaping Plan ☐ Color Chips ☐ Lighting Plan ☐ Parking Plan ☐ Site Plan ☐ Floor Plans ☐ Elevations ☐ Deed ☐ Title Report ☐ Alquist-Priolo Study ☐ Military Notification Required

Site Location: Address: The project is generally located at the Northeast corner of Old Spanish Highway and Quartz Street.
Township/Range: T22N/R10E

Mapping Requirements:
☐ 2 foot contours ☐ Buildings and Structures ☐ Wells ☐ Water Lines ☐ Fences ☐ Driveways ☐ Rights of Way ☐ Easements ☐ Roads ☐ Sewage ☐ Drainage ☐ Dimensions of property ☐ Existing land uses ☐ Lot lines ☐ Trash Receptacles ☐ Adjacent street, roads, and highways ☐ Ditches ☐ 100-year floodplain ☐ Fault Zones ☐ Vegetation ☐ Mining Area ☐ Slopes ☐ Grading

Project Description: Describe in detail the entire project proposal being as specific as possible (attached additional sheets as necessary): List permits needed.

See Attachment C

Project Goals: Describe the goals and project benefits (i.e. jobs, housing, services created and revenues generated to the community, etc., attached additional sheets as necessary).

See Attachment D

Inyo County Planning Department
ENVIRONMENTAL INFORMATION FORM
(To be Completed by Applicant)

Date Filed: _____

GENERAL INFORMATION

1. Name and Address of property owner: See Attachment A

2. Name and address of developer or project sponsor: BrightSource Development, LLC
1999 Harrison Street, Suite 2150, Oakland, CA 94612

3. Address of project: The project is generally located at the Northeast corner of Old Spanish Highway and Quartz Street
Assessor's Parcel Number: Please see attached.

4. Name, address, and telephone number of person to be contacted concerning this project:
Clay Jensen
Sr. Director, Project Development
702-556-0600

5. Indicate permit application number for the project to which this form pertains: _____

6. List and describe any other related permits and other public approvals required for this project, including those required by city, regional, state and federal agencies:

7. Existing zoning district: OS-40

8. Proposed use of site (Proposed Project): The proposed project is a general plan amendment for and application of an overlay zone to the parcels identified on Attachement C.1 to provide for solar thermal electric generating systems and related facilities in those areas.

PROJECT DESCRIPTION

9. Site size. 3100 acres

10. Buildings and site square footage. 0

11. Number of floors of construction. 0

12. Amount of off-street parking provided. 0

13. Attach plans. N/A

14. Proposed scheduling. N/A

15. Associated projects. N/A

16. Anticipated incremental development. N/A

17. If residential, include the number of units, schedule of unit sizes, range of sale prices or rents, and type of household size expected. N/A

18. If commercial, indicate the type, whether neighborhood, city or regionally oriented, square footage of sales area, and loading facilities. N/A

19. If industrial, indicate type, estimated employment per shift, and loading facilities. N/A

20. If institutional, indicate the major function, estimated employment per shift, estimated occupancy, loading facilities, and community benefits to be derived from the project. N/A

21. If the project involves a variance, conditional use or rezoning application, state this and indicate clearly

why the application is required. N/A

PROJECT CHECKLIST

Are the following items applicable to the project or its effects? Please include written discussions of any items checked "yes" (attach additional sheets as necessary).

	Yes	No
21. Change in existing features of any bays, tidelands, beaches, or hills, or substantial alteration of ground contours.	☐	☒
22. Change in scenic views or vistas from existing residential areas or public lands or roads.	☐	☒
23. Change in pattern, scale, or character of general area of project.	☐	☒
24. Significant amounts of solid waste or litter.	☐	☒
25. Change in dust, ash, smoke, fumes, or odors in vicinity.	☐	☒
26. Change in ocean, bay, lake, stream or ground water quality or quantity, or alteration of existing drainage patterns.	☐	☒
27. Substantial change in existing noise or vibration levels in the vicinity.	☐	☒
28. Site on filled land or on slope of 10 percent or more.	☐	☒
29. Use of disposal of potentially hazardous materials, such as toxic substances, flammables or explosives.	☐	☒
30. Substantial change in demand for municipal services (police, fire, water, sewage, etc.).	☐	☒
31. Substantially increase fossil fuel consumption (electricity, oil, natural gas, etc.).	☐	☒
32. Relationship to a larger project or series of projects.	☐	☒

ENVIRONMENTAL SETTING

33. Describe the project site as it exists before the project, including information on topography, soil stability, plants and animals, and any cultural, historical or scenic aspects. Describe any existing structures on the site, and the use of the structures. Attach photographs of the site. Attach additional sheets as necessary.
34. Describe the surrounding properties, including information on plant and animals and any cultural, historical or scenic aspects. Indicate the type of land use (residential, commercial, etc.), intensity of land use (one-family, apartment houses, shops, department stores, etc.), and scale of development (height, frontage, setback, rear yard, etc.). Attach photographs of the vicinity. Attach additional sheets as necessary.

CERTIFICATION

I hereby certify that written statements, attachments, and exhibits present facts required for this initial evaluation to the best of my ability, and that the facts, statements, and in formation presented are true and correct to the best of my knowledge and belief.

BrightSource Development, LLC, by BrightSource Energy, Inc. its sole member
Christopher Moore, VP Project Development

Date JULY 3, 2012.

Signature _____

Signature _____

For _____

CONSENT OF PROPERTY OWNER AND DESIGNATION OF AUTHORIZED AGENT

Inyo County Planning Department File No._____

I (we) the undersigned owner of record of the fee interest in the parcel of land located at: (print address)_____
identified as Assessor Parcel Number _____-_____-_____ for which a land use permit, land division, general plan or ordinance amendment, or LAFCO application referral is being filed with Inyo county requesting an approval for: (specify type of project, for example: General Plan amendment)_____;
do hereby certify that:

1. Such application may be filed and processed with my (our) full consent, and that I (we) have authorized (print name of agent)_____ to act as my (our) agent in all contacts with Inyo County and to sign for all necessary permits in connection with this matter.
2. I (we) hereby grant consent to the Inyo County, its officers, agents, employees, independent contractors, consultants, subconsultants and their officers, agents, and employees to enter the property identified above to conduct any and all surveys and inspections that are considered appropriate by the inspecting person or entity to process this application. This consent also extends to governmental entities other than the county, their officers, agencies, employees, independent contractors, consultants, subconsultants, and their officers agents or employees if the other governmental entities are providing review, inspections and surveys to assist the county in processing this application. This consent will expire upon completion of the project.
3. If prior notice is required for an entry to survey or inspect the property. Please contact:
   Print Name:_____
   Print Address:_____
   Daytime Telephone Number:_____
4. I (we) hereby give notice of the following concealed or unconcealed dangerous conditions on the property: _____
   _____

Person or entity granting consent:
Print Name: Mary Jane McMonigle, TRUSTEE and Individual
Print Address: 612 S. 7th street LAS VEGAS NV 89101
Daytime Telephone Number: (702) 385-7269 Date: 7/3/12
Signature of property owner: _____

Authorized agent:
Print Name: SECTION 20 LLC
Print Address: 612 S. 7th STREET LAS VEGAS NV 89101
Daytime Telephone Number: (702) 385-7269
Signature of authorized agent: _____ Date: 7/3/12

Revised 12/17/98

Inyo County Planning Department

The following applications require the provision of public hearing notices to surrounding property owners within 300 feet:

- Conditional Use Permit
- Certificates of Compliance (boundary line adjustments and land divisions)
- General Plan Amendment
- Mobile Home Waiver
- Road Abandonment
- Surface Mining Reclamation Plan
- Variance
- Zoning Reclassification
- Tentative Parcel Map
- Tentative Tract Map

When applying for any of the above, you are required to provide the information necessary to notify the surrounding property owners about all public hearings for your project. This information shall be provided in the following manner:

1. Using the current Inyo Assessor's map(s) that includes the parcel(s) upon which your project is located and all parcels within 300 feet of the exterior boundary of that parcel, clearly outline the exterior boundaries of the parcel(s) on which your project is located. A second line must be drawn to clearly indicate a distance of 300 feet from the exterior boundaries of the parcel(s) upon which the project is located. Check the scale shown on each map (they may be different), and use all necessary adjoining maps to include surrounding properties within 300 feet.

2. Using the latest information from the Inyo County Assessor's tax roll under preparation, list the Assessor Parcel Numbers (APNs), property owners name, and address for all parcels located within, partially within, or touching the areas included within the 300 foot boundary of the parcel(s) upon which your project is located.

3. Assessor's Maps may be purchased from the Inyo County Assessor's Office. Staff can help you determine which map(s) you will need. **The Inyo County Assessor's Office will provide the required list of surrounding property owners for a fee. You may contact the Assessor's Office at (760) 878-0302.**

4. You must also prepare a list of the names and addresses of service providers to your proposed project including water service, sewer service, schools, fire protection, electricity, telephone, and cable television.

5. Include the following with your application when you submit it to the Planning Department:
   - The county assessor maps(s) covering your project site with the 300 foot surrounding area shown outlined.
   - The list of Assessor Parcel Numbers, property owners, and addresses for all properties within 300 feet of the subject site.
   - Names and addresses of the applicant, the applicant's representative or other interested parties.
   - Number 10 envelopes (letter-sized) with first class postage affixed and addressed to each owner and service provider.
   - This form signed and dated at the bottom.

CERTIFIED PROPERTY OWNER LIST

I, hereby certify that the attached information contains all of the assessor parcel numbers from the latest Assessor's Roll under preparation of all the properties within the area described on the attached application and within a distance of three hundred (300) feet from all exterior boundaries of that property. In addition, all service providers' names and addresses have been provided.
I certify under penalty of perjury that the foregoing is true and correct.

Signed _____ Date JULY 3, 2012

BrightSource Development, LLC by BrightSource Energy, Inc. its sole member
Christopher Moore, VP Project Development

Revised 12/12/2001

INYO COUNTY PLANNING DEPARTMENT
P.O. Drawer L
Independence, CA 93526

CUSTOMER SURVEY

This survey is part of the Planning Department's ongoing effort to improve services to citizens using the Inyo County permit processing system. This completed survey should be mailed in the enclosed postage paid envelope. Thank your for your feedback.

YES	NO	
		1. Is the Planning Department office located conveniently for your access?
		2. Would Planning Department field offices in other parts of Inyo County be important to you?
		3. Were you readily able to reach the Planning office by telephone?
		4. Were return calls made within a reasonable amount of time?
		5. Were handouts available explaining the various permits?
		6. Were the application forms clear and easy to use?
		7. Did you receive a clear indication of the processing time for your project?
		8. At the time of application were you told your public hearing date?
		9. Did you receive the help you needed from the Planning staff?
		10. Was a review copy of the staff report submitted to you before the Planning Commission meeting?
		11. Did you discuss the staff report and recommended conditions with staff before the Planning Commission meeting?
		12. Did staff recommend fair and reasonable permit conditions?
		13. Did the Planning staff present information to you understandably?
		15. Were the applications processing fees required by the County for your Planning applications appropriate for the services received?
		16. Was your interaction with the Planning Department agreeable?
		17. Did the Planning Commission conduct an impartial hearing for your project?

Do you have any suggestions for improving service or complaints concerning the service you received from the Planning Department?

_____
_____
_____
_____
_____
_____
_____
_____

If you would like a response to your comments, please provide your name and telephone number (optional).

Name: _____ Telephone: (___) _____

Attachment A

Hidden Hills Ranch Project
Property Owners

1. Mary Jane McMonigle, Mary Wiley Trust, Section 20, LLC---
   c/o Steven R. Scow, Esq.
   612 S. 7th St.
   Las Vegas, NV 89010
   Ph: 702-385-7269

2. Roland John Wiley---
   3045 Newcastle Road
   Ann Arbor, MI 48104-4147

   Copy to: (Roland John Wiley land only)
   Phillip Savage and Ernest Riffenburgh
   Gresham, Savage, Nolan and Tilden
   550 E. Hospitality Lane, Suite 300
   San Bernardino, CA 92408
   Ph: 909-890-4490

Attachement B

APN	NAME	ADDRESS	CITY	STATE	ZIP
04871008	RIEKER, MARY J C/O STEVEN R SCOW, ESQ	612 S SEVENTH ST	LAS VEGAS	NV	89101
04871007	RIEKER, MARY J C/O STEVEN R SCOW, ESQ	612 S SEVENTH ST	LAS VEGAS	NV	89101
04871006	RIEKER, MARY J C/O STEVEN R SCOW, ESQ	612 S SEVENTH ST	LAS VEGAS	NV	89101
04871005	RIEKER, MARY J C/O STEVEN R SCOW, ESQ	612 S SEVENTH ST	LAS VEGAS	NV	89101
04869007	RIEKER, MARY J C/O STEVEN R SCOW, ESQ	612 S SEVENTH ST	LAS VEGAS	NV	89101
04869006	RIEKER, MARY J C/O STEVEN R SCOW, ESQ	612 S SEVENTH ST	LAS VEGAS	NV	89101
04869005	RIEKER, MARY J C/O STEVEN R SCOW, ESQ	612 S SEVENTH ST	LAS VEGAS	NV	89101
04871001	WILEY TRUST, MARY L 1997 C/O STEVEN R SCOW, ESQ	612 S SEVENTH ST	LAS VEGAS	NV	89101
04871002	WILEY TRUST, MARY L 1997 C/O STEVEN R SCOW, ESQ	612 S SEVENTH ST	LAS VEGAS	NV	89101
04871003	WILEY TRUST, MARY L 1997 C/O STEVEN R SCOW, ESQ	612 S SEVENTH ST	LAS VEGAS	NV	89101
04871004	WILEY TRUST, MARY L 1997 C/O STEVEN R SCOW, ESQ	612 S SEVENTH ST	LAS VEGAS	NV	89101
04869001	WILEY TRUST, MARY L 1997 C/O STEVEN R SCOW, ESQ	612 S SEVENTH ST	LAS VEGAS	NV	89101
04869002	WILEY TRUST, MARY L 1997 C/O STEVEN R SCOW, ESQ	612 S SEVENTH ST	LAS VEGAS	NV	89101
04869003	WILEY TRUST, MARY L 1997 C/O STEVEN R SCOW, ESQ	612 S SEVENTH ST	LAS VEGAS	NV	89101
04869004	RIEKER TRUST, JAMES J C/O STEVEN R SCOW, ESQ	612 S SEVENTH ST	LAS VEGAS	NV	89101
04869008	TSIAMIS, NICK & ARETI	5620 PASEO DEL NORTE #127	CARLSBAD	CA	92008
04870016	WILEY TRUST, MARY L 1997 C/O STEVEN R SCOW, ESQ	612 S SEVENTH ST	LAS VEGAS	NV	89101
04870015	WILEY TRUST, MARY L 1997 C/O STEVEN R SCOW, ESQ	612 S SEVENTH ST	LAS VEGAS	NV	89101
04870014	WILEY TRUST, MARY L 1997 C/O STEVEN R SCOW, ESQ	612 S SEVENTH ST	LAS VEGAS	NV	89101
04870013	WILEY TRUST, MARY L 1997 C/O STEVEN R SCOW, ESQ	612 S SEVENTH ST	LAS VEGAS	NV	89101
04868016	WILEY TRUST, MARY L 1997 C/O STEVEN R SCOW, ESQ	612 S SEVENTH ST	LAS VEGAS	NV	89101
04868015	WILEY TRUST, MARY L 1997 C/O STEVEN R SCOW, ESQ	612 S SEVENTH ST	LAS VEGAS	NV	89101
04868014	WILEY TRUST, MARY L 1997 C/O STEVEN R SCOW, ESQ	612 S SEVENTH ST	LAS VEGAS	NV	89101
04868013	RIEKER TRUST, JAMES J C/O STEVEN R SCOW, ESQ	612 S SEVENTH ST	LAS VEGAS	NV	89101
04850209	WILEY TRUST, MARY L 1997 C/O STEVEN R SCOW, ESQ	612 S SEVENTH ST	LAS VEGAS	NV	89101
04850210	WILEY TRUST, MARY L 1997 C/O STEVEN R SCOW, ESQ	612 S SEVENTH ST	LAS VEGAS	NV	89101
04850211	WILEY TRUST, MARY L 1997 C/O STEVEN R SCOW, ESQ	612 S SEVENTH ST	LAS VEGAS	NV	89101
04850212	WILEY TRUST, MARY L 1997 C/O STEVEN R SCOW, ESQ	612 S SEVENTH ST	LAS VEGAS	NV	89101
04850213	WILEY TRUST, MARY L 1997 C/O STEVEN R SCOW, ESQ	612 S SEVENTH ST	LAS VEGAS	NV	89101
04850214	WILEY TRUST, MARY L 1997 C/O STEVEN R SCOW, ESQ	612 S SEVENTH ST	LAS VEGAS	NV	89101
04850215	WILEY TRUST, MARY L 1997 C/O STEVEN R SCOW, ESQ	612 S SEVENTH ST	LAS VEGAS	NV	89101
04850216	WILEY TRUST, MARY L 1997 C/O STEVEN R SCOW, ESQ	612 S SEVENTH ST	LAS VEGAS	NV	89101
04850306	RIEKER, MARY J C/O STEVEN R SCOW, ESQ	612 S SEVENTH ST	LAS VEGAS	NV	89101
04850305	RIEKER, MARY J C/O STEVEN R SCOW, ESQ	612 S SEVENTH ST	LAS VEGAS	NV	89101
04850304	PALENCIA-SALAZAR, BERTO ETUX	3616 DEL RIO DRIVE	NORTH LAS VEGAS	NV	89030
04870009	WILEY TRUST, MARY L 1997 C/O STEVEN R SCOW, ESQ	612 S SEVENTH ST	LAS VEGAS	NV	89101
04870010	WILEY TRUST, MARY L 1997 C/O STEVEN R SCOW, ESQ	612 S SEVENTH ST	LAS VEGAS	NV	89101
04870011	WILEY TRUST, MARY L 1997 C/O STEVEN R SCOW, ESQ	612 S SEVENTH ST	LAS VEGAS	NV	89101
04870012	WILEY TRUST, MARY L 1997 C/O STEVEN R SCOW, ESQ	612 S SEVENTH ST	LAS VEGAS	NV	89101
04868009	WILEY TRUST, MARY L 1997 C/O STEVEN R SCOW, ESQ	612 S SEVENTH ST	LAS VEGAS	NV	89101

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04868010	WILEY TRUST, MARY L 1997 C/O STEVEN R SCOW, ESQ	612 S SEVENTH ST	LAS VEGAS	NV	89101
04868011	WILEY TRUST, MARY L 1997 C/O STEVEN R SCOW, ESQ	612 S SEVENTH ST	LAS VEGAS	NV	89101
04868012	WILEY TRUST, MARY L 1997 C/O STEVEN R SCOW, ESQ	612 S SEVENTH ST	LAS VEGAS	NV	89101
04850208	WILEY TRUST, MARY L 1997 C/O STEVEN R SCOW, ESQ	612 S SEVENTH ST	LAS VEGAS	NV	89101
04850207	WILEY TRUST, MARY L 1997 C/O STEVEN R SCOW, ESQ	612 S SEVENTH ST	LAS VEGAS	NV	89101
04850206	WILEY TRUST, MARY L 1997 C/O STEVEN R SCOW, ESQ	612 S SEVENTH ST	LAS VEGAS	NV	89101
04850205	WILEY TRUST, MARY L 1997 C/O STEVEN R SCOW, ESQ	612 S SEVENTH ST	LAS VEGAS	NV	89101
04850204	WILEY TRUST, MARY L 1997 C/O STEVEN R SCOW, ESQ	612 S SEVENTH ST	LAS VEGAS	NV	89101
04850203	WILEY TRUST, MARY L 1997 C/O STEVEN R SCOW, ESQ	612 S SEVENTH ST	LAS VEGAS	NV	89101
04850202	WILEY TRUST, MARY L 1997 C/O STEVEN R SCOW, ESQ	612 S SEVENTH ST	LAS VEGAS	NV	89101
04850201	WILEY TRUST, MARY L 1997 C/O STEVEN R SCOW, ESQ	612 S SEVENTH ST	LAS VEGAS	NV	89101
04850302	RIEKER, MARY J C/O STEVEN R SCOW, ESQ	612 S SEVENTH ST	LAS VEGAS	NV	89101
04850303	RIEKER, MARY J C/O STEVEN R SCOW, ESQ	612 S SEVENTH ST	LAS VEGAS	NV	89101
04850122	WILEY TRUST, MARY L 1997 C/O STEVEN R SCOW, ESQ	612 S SEVENTH ST	LAS VEGAS	NV	89101
04850123	WILEY TRUST, MARY L 1997 C/O STEVEN R SCOW, ESQ	612 S SEVENTH ST	LAS VEGAS	NV	89101
04850124	WILEY TRUST, MARY L 1997 C/O STEVEN R SCOW, ESQ	612 S SEVENTH ST	LAS VEGAS	NV	89101
04850125	WILEY TRUST, MARY L 1997 C/O STEVEN R SCOW, ESQ	612 S SEVENTH ST	LAS VEGAS	NV	89101
04850126	WILEY TRUST, MARY L 1997 C/O STEVEN R SCOW, ESQ	612 S SEVENTH ST	LAS VEGAS	NV	89101
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04850128	WILEY TRUST, MARY L 1997 C/O STEVEN R SCOW, ESQ	612 S SEVENTH ST	LAS VEGAS	NV	89101
04850129	RIEKER, MARY J C/O STEVEN R SCOW, ESQ	612 S SEVENTH ST	LAS VEGAS	NV	89101
04850111	WILEY TRUST, MARY L 1997 C/O STEVEN R SCOW, ESQ	612 S SEVENTH ST	LAS VEGAS	NV	89101
04870001	RIEKER, MARY J C/O STEVEN R SCOW, ESQ	612 S SEVENTH ST	LAS VEGAS	NV	89101
04870004	RIEKER, MARY J C/O STEVEN R SCOW, ESQ	612 S SEVENTH ST	LAS VEGAS	NV	89101
04868001	RIEKER, MARY J C/O STEVEN R SCOW, ESQ	612 S SEVENTH ST	LAS VEGAS	NV	89101
04868004	RIEKER, MARY J C/O STEVEN R SCOW, ESQ	612 S SEVENTH ST	LAS VEGAS	NV	89101
04850102	ESCOBAR, JOAQUIN	65 LAILANI ST	LAS VEGAS	NV	89110
04850101	COLMINES, MARIA T	65 LAILANI ST	LAS VEGAS	NV	89110
04865016	RIEKER, MARY J C/O STEVEN R SCOW, ESQ	612 S SEVENTH ST	LAS VEGAS	NV	89101
04865015	RIEKER, MARY J C/O STEVEN R SCOW, ESQ	612 S SEVENTH ST	LAS VEGAS	NV	89101
04865014	RIEKER, MARY J C/O STEVEN R SCOW, ESQ	612 S SEVENTH ST	LAS VEGAS	NV	89101
04865013	RIEKER, MARY J C/O STEVEN R SCOW, ESQ	612 S SEVENTH ST	LAS VEGAS	NV	89101
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04867008	RIEKER, MARY J C/O STEVEN R SCOW, ESQ	612 S SEVENTH ST	LAS VEGAS	NV	89101
04864010	WILEY TRUST, MARY L 1997 C/O STEVEN R SCOW, ESQ	612 S SEVENTH ST	LAS VEGAS	NV	89101
04866001	RIEKER, MARY J C/O STEVEN R SCOW, ESQ	612 S SEVENTH ST	LAS VEGAS	NV	89101
04866002	RIEKER, MARY J C/O STEVEN R SCOW, ESQ	612 S SEVENTH ST	LAS VEGAS	NV	89101

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04864001	RIEKER, MARY J C/O STEVEN R SCOW, ESQ	612 S SEVENTH ST	LAS VEGAS	NV	89101
04864002	RIEKER, MARY J C/O STEVEN R SCOW, ESQ	612 S SEVENTH ST	LAS VEGAS	NV	89101
04864003	RIEKER, MARY J C/O STEVEN R SCOW, ESQ	612 S SEVENTH ST	LAS VEGAS	NV	89101
04864004	RIEKER, MARY J C/O STEVEN R SCOW, ESQ	612 S SEVENTH ST	LAS VEGAS	NV	89101
04861012	RIEKER, MARY J C/O STEVEN R SCOW, ESQ	612 S SEVENTH ST	LAS VEGAS	NV	89101
04861011	RIEKER, MARY J C/O STEVEN R SCOW, ESQ	612 S SEVENTH ST	LAS VEGAS	NV	89101
04861010	RIEKER, MARY J C/O STEVEN R SCOW, ESQ	612 S SEVENTH ST	LAS VEGAS	NV	89101
04861009	RIEKER, MARY J C/O STEVEN R SCOW, ESQ	612 S SEVENTH ST	LAS VEGAS	NV	89101
04861005	RIEKER, MARY J C/O STEVEN R SCOW, ESQ	612 S SEVENTH ST	LAS VEGAS	NV	89101
04861006	RIEKER, MARY J C/O STEVEN R SCOW, ESQ	612 S SEVENTH ST	LAS VEGAS	NV	89101
04861007	RIEKER, MARY J C/O STEVEN R SCOW, ESQ	612 S SEVENTH ST	LAS VEGAS	NV	89101
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04860004	RIEKER, MARY J C/O STEVEN R SCOW, ESQ	612 S SEVENTH ST	LAS VEGAS	NV	89101
04860003	RIEKER, MARY J C/O STEVEN R SCOW, ESQ	612 S SEVENTH ST	LAS VEGAS	NV	89101
04860001	RIEKER, MARY J C/O STEVEN R SCOW, ESQ	612 S SEVENTH ST	LAS VEGAS	NV	89101
04860002	RIEKER, MARY J C/O STEVEN R SCOW, ESQ	612 S SEVENTH ST	LAS VEGAS	NV	89101
04870008	WILEY TRUST, MARY L 1997 C/O STEVEN R SCOW, ESQ	612 S SEVENTH ST	LAS VEGAS	NV	89101
04870007	WILEY TRUST, MARY L 1997 C/O STEVEN R SCOW, ESQ	612 S SEVENTH ST	LAS VEGAS	NV	89101
04870006	WILEY TRUST, MARY L 1997 C/O STEVEN R SCOW, ESQ	612 S SEVENTH ST	LAS VEGAS	NV	89101
04870005	WILEY TRUST, MARY L 1997 C/O STEVEN R SCOW, ESQ	612 S SEVENTH ST	LAS VEGAS	NV	89101
04850301	RIEKER, MARY J C/O STEVEN R SCOW, ESQ	612 S SEVENTH ST	LAS VEGAS	NV	89101
04868008	WILEY TRUST, MARY L 1997 C/O STEVEN R SCOW, ESQ	612 S SEVENTH ST	LAS VEGAS	NV	89101
04868007	WILEY TRUST, MARY L 1997 C/O STEVEN R SCOW, ESQ	612 S SEVENTH ST	LAS VEGAS	NV	89101
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04850115	RIEKER, MARY J C/O STEVEN R SCOW, ESQ	612 S SEVENTH ST	LAS VEGAS	NV	89101
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04850112	RIEKER, MARY J C/O STEVEN R SCOW, ESQ	612 S SEVENTH ST	LAS VEGAS	NV	89101
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04864006	WILEY TRUST, MARY L 1997 C/O STEVEN R SCOW, ESQ	612 S SEVENTH ST	LAS VEGAS	NV	89101
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04869009	WILEY TRUST, MARY L 1997 C/O STEVEN R SCOW, ESQ	612 S SEVENTH ST	LAS VEGAS	NV	89101
04863014	PAGE, RBT J & CYNTHIA	15 FOX CHAPEL TERR	HENDERSON	NV	89052
04863013	RIEKER, MARY J C/O STEVEN R SCOW, ESQ	612 S SEVENTH ST	LAS VEGAS	NV	89101
04863011	LLR LLC C/O LYNN MIRABELLA	50 RIDGEWAY BLVD	BAY SHORE	NY	11706
04863012	GUILD, DOUGLAS & NANETTE	290 WILLOW GROVE	HENDERSON	NV	89014
04863006	AHMAD, SHEHZAD ETUX	22851 BRIARCLIFF	MISSION VIEJO	CA	92692
04863005	CROSS TRUST, CHRIS & DIANE	109 SUNHAVEN RD	DANVILLE	CA	94506
04863003	PICCININNI, ANTHONY & LOREN	9303 GILCREASE AVE #1252	LAS VEGAS	NV	89149
04863004	DE ROCHE, DAVID &NANCY 1/2INT	2083 OAKLAND AVE	PIEDMONT	CA	94611
04862014	SCOW, STEVEN B	612 S SEVENTH ST	LAS VEGAS	NV	89101
04862013	DE ROCHE, DAVID N & NANCY B	2083 OAKLAND AVE	PIEDMONT	CA	94611
04862011	SCOW, STEVEN B	612 S SEVENTH ST	LAS VEGAS	NV	89101
04862006	SCOW, STEVEN B	612 S SEVENTH ST	LAS VEGAS	NV	89101
04862005	MCMONIGLE, MARY J C/O STEVEN R SCOW	612 S SEVENTH ST	LAS VEGAS	NV	89101
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04862004	MCMONIGLE, MARY J C/O STEVEN R SCOW	612 S SEVENTH ST	LAS VEGAS	NV	89101
04862012	MCMONIGLE, MARY J C/O STEVEN R SCOW	612 S SEVENTH ST	LAS VEGAS	NV	89101

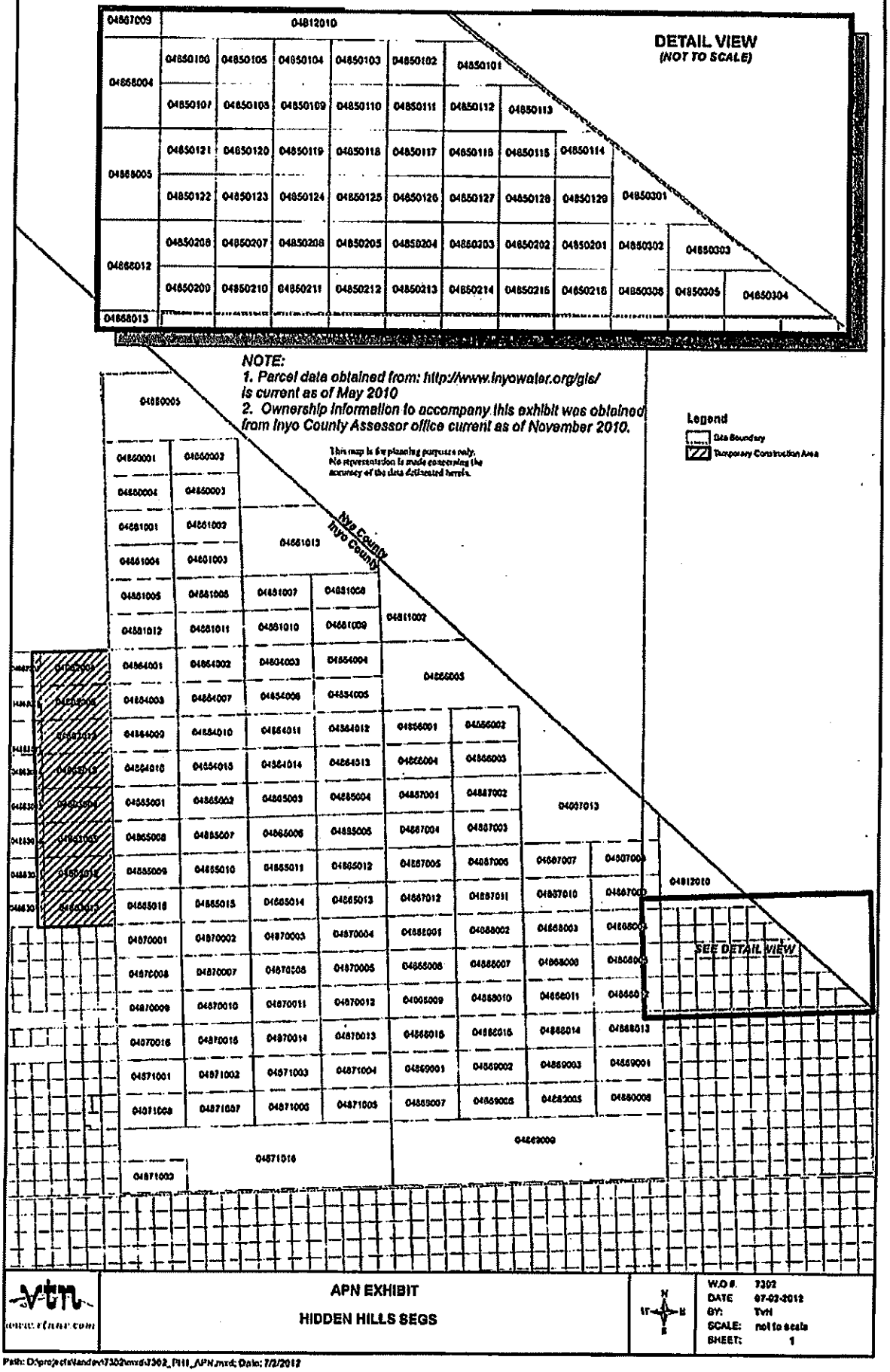
Attachment C

The "project" for the purposes of this Application is:

1. A general plan amendment for the adoption of a land use designation overlay permitting solar thermal electric generating systems and related facilities ("Solar Overlay") within the areas set forth in Attachment C.1 while retaining the existing underlying general plan designation(s) for such areas.

2. Concurrent amendment of the zoning designations of the areas set forth in Attachment C.1 to apply a "Solar Overlay Zone" permitting solar thermal electric generating systems and related facilities as a principally permitted use to ensure consistency between the proposed amendment and implementing zoning codes while retaining the existing underlying zoning designation(s) for such areas.

Attachement C.1



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Application by BrightSource Development, LLC for General Plan Amendment and Rezone

Attachment D

Project Goals

As described in Attachment C, the "project" for the purposes of this Application is:

1. A general plan amendment for the adoption of a land use designation overlay permitting solar thermal electric generating systems and related facilities ("Solar Overlay") within the areas set forth in Attachment C.1 while retaining the existing underlying general plan designation(s) for such areas.

2. Concurrent amendment of the zoning designations of the areas set forth in Attachment C.1 to create and apply a "Solar Overlay Zone" permitting solar thermal electric generating systems and related facilities as a principally permitted use to ensure consistency between the proposed amendment and implementing zoning codes while retaining the existing underlying zoning designation(s) for such areas.

The goal of the project is to amend Inyo County's general plan and zoning designations applicable to the area set forth in Attachment C.1 to specifically provide for renewable energy generation from solar thermal electric generating systems as a permitted land use.

The project allows achievement of County goals and policies such as the responsible utilization of the County's solar resources for the generation and transmission of clean, renewable energy. Moreover, the project will allow for the increased use of solar radiation to generate and transmit clean, renewable energy as a benefit not only to the citizens of Inyo County, but also to citizens of California and the United States.

The project will benefit the County by increasing economic activity within the County. Providing for renewable energy development in an area previously identified by the County as suitable for renewable energy development allows for the diversification of sources of economic development in the County, in addition to utilizing one of Inyo County's most abundant natural resources, solar. Renewable energy development engendered by the project will also provide significant financial benefits to the County, such as by increasing property tax revenues, increased sales and/or use taxes, and procurement of construction materials directly from local sources where available.

AGREEMENT BETWEEN COUNTY OF INYO, AND BRIGHTSOURCE DEVELOPMENT, LLC. FOR THE PROVISION OF ENVIRONMENTAL REVIEW AND PROCESSING SERVICES

INTRODUCTION

WHEREAS, BrightSource Development, LLC of 1999 Harrison Street, Suite 2150, Oakland, CA 94612 ("Applicant") has submitted an Application for Certification ("AFC") to the California Energy Commission ("CEC") for the 500 megawatt Hidden Hills Solar Energy Generating System ("HHSEGS Project") which is located in the County of Inyo.

WHEREAS, Applicant has the need for the Environmental Review and Processing services of the County of Inyo ("County") in connection with its application for a general plan amendment and rezoning that is related to the HHSEGS ("Application").

WHEREAS, by this Agreement, Applicant and County intend to provide for the provision of environmental review and processing services of the County in connection with the Application, all as set forth in this Agreement.

AGREEMENT

THEREFORE, in consideration of the mutual promises, covenants, terms, and conditions hereinafter contained, the parties hereby agree as follows:

TERMS AND CONDITIONS

1. SCOPE OF WORK

The County shall provide to Applicant those services and work set forth in Attachment A, attached hereto and by reference incorporated herein. Attachment A describes the environmental review and processing services that will be performed by the County in connection with the Application and a budget for performing such review and services ("GPA Budget").

Work or services under this Agreement may be performed either by its own employees (hereinafter collectively referred to as "Employees or employees") or, upon approval of the Applicant, by one or more additional County Contractors ("County Contractors"). Applicant approves the use of County Contractors Gruen Gruen + Associates and Greg James, Attorney, to perform work or services under this Agreement. County has the right in its sole discretion to determine which employee(s) are qualified and capable, and to determine which employee(s) of those which are deemed qualified and capable, are to actually perform the work and services under this Agreement. Applicant has no right to designate, or require the work or services to be performed by, a particular County Department, class of County employees, or particular employee(s). Further, County need not obtain Applicant's approval prior to or after incurring any travel and/or per diem, or overtime expenses in performing work or services under this Agreement.

Services and work provided by the County under this Agreement will be performed by: (i) County employees; or (ii) County contractors hired by County in a manner consistent with the requirements and standards established by applicable federal, state, and County laws, ordinances, regulations, and resolutions. Such laws, ordinances, regulations, and resolutions include, but are not limited to, those which are referred to in this Agreement.

This Agreement is for the provision of environmental review and processing services in connection with the Application . Under the California Environmental Quality Act ("CEQA"), the CEC is the Lead Agency and County is a responsible agency, except for the exclusive jurisdiction of the Commission to certify the HHSEGS Project. (CEQA Guidelines section 15381; Public Resources Code section 25500). As a responsible agency, the County will consult with the CEC, will rely on the CEC's environmental document in acting upon the Application and will prepare and issue its

own findings regarding the General Plan Amendment and rezoning. Also, County shall provide information to, and consult with, the CEC concerning the County's laws, ordinances and regulations that are relevant to the HHSEGS project. Applicant is aware and agrees that, by entering into this Agreement, County makes no representation, promise, commitment, or agreement to Applicant or any other person that it will approve the Application, concerning which said review and processing services will be rendered; further, this Agreement shall not be construed as creating any such representation, promise, commitment, or agreement.

2. TERM

The term of this Agreement shall commence effective July 3, 2012. This Agreement shall terminate and be of no further force or effect upon the approval or disapproval by County of the Application following a noticed public hearing. Notwithstanding the previous sentence, if the Application is approved by the County, the County shall have the obligation to timely file a notice of determination in accordance with Public Resources Code § 21152(a) and Applicant shall have the obligation to indemnify the County in accordance with Section 8 of this Agreement, both of which obligations shall survive a termination of this Agreement in accordance with this Section 2. In no event, however, shall County be obligated to file a notice of determination unless and until Applicant has paid to County the applicable Department of Fish and Game filing fee contemplated by Public Resources Code § 21089(b).

3. COUNTY COSTS, COUNTY CONTRACTOR COSTS AND CONSIDERATION

A. Obligation for Payment of County Costs for Processing General Plan Amendment Application.
The parties acknowledge and agree that reimbursement of the County for the reasonable costs of processing the Application is governed by the hourly rates for County employees and County Contractors set forth in Attachment B.

B. Calculation of Line Items in Budgets. The line items in the GPA Budget which correspond to work performed by the County employees and County Contractors shall be calculated in accordance with the following provisions:

a. Employee Hourly Rates/Special Commission Meeting Costs. A non-exclusive list of hourly rate costs (non-overtime), with fringe benefits, for County employees who may provide work and services under this Agreement, and the cost of special meetings of the planning commission are set forth on Attachment B. County will update this list as necessary so that it reflects any future changes in an employee's hourly rate and to add any employees not listed who will perform work or services under this Agreement. The total hourly rate cost for a County employee shall be the product of the number of hours (rounded up or down to the nearest 1/2 of an hour) which are worked by a County employee multiplied by the employee's hourly rate cost. Costs of fringe benefits shall be the number of hours that a County employee works (including overtime, if applicable, as set forth below), multiplied by the employee's hourly rate of pay, multiplied by forty percent (0.40).

b. Overtime. Where the circumstances of the services and work requested by Applicant under this Agreement require a County employee to work in excess of eight (8) hours per day or 40 hours per week (in the case of an 8 hour per day employee), or 7 hours per day or 35 hours per week (in the case of a seven hour per day employee), and County is obligated by law or contract to compensate the employee for such work at a rate of one and one half (1½) times their hourly rate of pay (hereinafter referred to as "overtime"), the hourly rate of pay for such overtime hours worked under this Agreement will be one and one half (1½) times the employee's hourly rate of pay, as set forth on Attachment B.

c. Travel Costs. Travel and per diem costs shall be the actual costs incurred by the County when an employee travels and/or incurs per diem expenses in performing work under this Agreement.

Actual costs to the County will be determined by the County policy then in effect that establishes travel and per diem reimbursement rates for County employees.

d. Special Costs. Special costs are those costs incurred by the County that have been approved in advance in writing by Applicant for the purchase of particular specialized equipment, supplies, tools and materials used by County in performing work or services under this Agreement.

e. Amount of Payment for Services and Work Performed by County. Although Inyo County is not the lead agency for the HHSEGS Project, in accordance with Inyo County Code Paragraph 15.08.020, Applicant shall pay all the County costs for the services and work performed by County employee(s) under this Agreement relating to processing of the general plan amendment and rezoning for the HHSEGS Project. The County's costs for these services and work shall be the sum of the following: (1) the total hourly rate costs (including overtime, if any) of the employees who performed the work or services, the cost of any special Water Commission or Planning Commission meetings conducted pursuant to this Agreement, and the costs of employees' fringe benefits as set forth in Attachment B, (2) special costs incurred by the County, (3) the costs of any travel incurred by employees while performing any work or services under this Agreement, and (4) the sum of the total hourly rate, fringe benefits, travel, and special costs, multiplied by 20% (this additional 20% is in lieu of the overhead factor determined by reference to the A-87 Countywide Cost Plan as approved by the California State Controller's Office).

f. Amount of Payment for Services and Work Performed by County Contractors. Applicant shall pay all of the County's costs for any County Contractor retained by the County to perform services or work under this Agreement relating to processing the general plan amendment and rezoning for the HHSEGS Project. The County's costs for these services and work shall be the actual cost to the County for the services.

C. Procedure for reimbursement of General Plan Amendment Costs: Project Fund. County shall establish a project fund in a segregated account (hereinafter referred to as "Project Fund") to hold and administer all funds provided by Applicant to County for the review and consideration of the Application pursuant to this Agreement. All costs incurred by County that arise from the review and consideration of the Application will be paid from the Project Fund subject to the terms of this Agreement. Any money deposited in the Project Fund shall be used for no purpose other than the payment of costs included in the GPA Budget; however, within sixty days following the termination of this Agreement and after payment has been made of all outstanding costs incurred by the County under the GPA Budget, any funds remaining in the Project Fund will be returned to Applicant. Applicant shall be entitled to all unexpended interest earned on funds deposited and held in the Project Fund. The Inyo County Administrator, or his designee, shall be responsible for insuring that all payments from Project Fund are made in the appropriate time and manner.

Subject to adjustments as provided in section 3.G, the maximum compensation payable by Applicant to the County for processing the Application shall be the amount set forth in the GPA Budget on Attachment A.

D. Deposit/Payments to County and County Contractors. Within 5 business days of the effective date of this Agreement, Applicant shall deposit with the County the sum of $50,000.00 which shall be held by the County in the manner set forth below and charged against to pay the estimated cost of services and work to be performed pursuant to this Agreement for the review and consideration of the Application outlined in Attachment A. County shall immediately deposit the funds into the Project Fund, which fund shall be replenished by Applicant as provided for in Section G(ii), below. Thereafter, between the first (1st) and fifteenth (15th) day of each succeeding month, County shall transfer to itself from the Project Fund amounts equal to any costs (plus overhead) incurred by the County from the first day of the preceding month through and including the last day of the preceding month for work or services performed by the County, for special costs incurred by the County, and for the costs of County Contractors retained by the County pursuant to Inyo County Code Paragraph 15.48.090, in accordance with this Agreement.

E. Statements. County shall submit to Applicant an itemized statement of the costs of all environmental review and processing services performed by the County in connection with the Application. The statements will include any special costs incurred by the County, and the costs of any County Contractor. The statement shall cover the period from the first (1st) day of the preceding month through and including the last day of the month. The statement will be submitted to Applicant by the fifteenth (15^{th}) day of each month. These statements will identify the date on which the services and work were performed, describe the nature of the services and work, itemize any travel or special costs incurred by County during the period, provide copies of all County Contractor's invoices paid by the County during the period and itemize all transfers from the Project Fund during the preceding month.

F. Objections to a Transfer to County. County shall be entitled to transfer funds from the Project Fund, depending upon the budget charged for the expenses. Should Applicant object to any such transfer, Applicant shall submit to the County a written objection within ten (10) days of receiving the statement itemizing the transfer. The parties shall meet and confer to resolve any dispute within ten (10) business days following the day Applicant submits its written objection to the County. The objection shall identify the specific transfer and the basis for the objection. If the dispute is not resolved within the ten (10) day period, the County may cease processing the application and either party may submit the dispute to arbitration as provided in section 18. In the alternative, if the dispute is not resolved within the (10) day period, the Applicant may withdraw the application by providing written notice as set forth in Section 9.

G. Revision to Cost Estimate/Additional Funds. Concurrent with sending the itemized statement of costs every 30 days, the County shall advise the Applicant of any potential revision in the GPA Budget, including the need for additional funds. Within fifteen (15) days from the date such proposed revisions are received, the Applicant shall advise the County in writing by sending notice as provided in Section 17 of this Agreement whether the Applicant agrees or objects to the requested budget revisions. The parties acknowledge that the County's budget estimates provided in this Agreement are based on the Applicant's schedule anticipating completion of the CEC process no later than January 1, 2013. In the event the CEC process extends beyond January 1, 2013, the parties acknowledge that the extension may require revisions to the County's budgets and, thus, the maximum amount payable under this Agreement, as provided below.

(i) With respect to the GPA Budget and Project Fund, within 15 days of receipt of a statement describing a budget revision, Applicant may provide notice to the County, as provided by Section 17, whether Applicant objects to the amount of the County's proposed budget revisions. If Applicant does not provide notice of an objection to the proposed budget revisions within fifteen (15) days after receiving a statement describing the proposed revision, the budget revision will be deemed acceptable to Applicant. If the Applicant objects to a proposed budget revision, the parties shall meet and confer to resolve any dispute within ten (10) business days following the day Applicant submits to the County its written objection. If the dispute is not resolved within the ten (10) day period, the County may cease processing the application and either party may submit the dispute to arbitration as provided in section 18. In the alternative, if the dispute is not resolved within the (10) day period, the Applicant may withdraw the application by providing written notice as set forth in Section 9.

(ii) If, at any time, the Project Fund is depleted to an amount equal to or less than $10,000.00, County shall provide notice to Applicant of the amount that must be deposited sufficient funds to bring the Project Fund to a balance of $50,000.00. Within 15 days of receipt of the notice, Applicant shall deposit the funds with the County or shall provide notice to the County, as provided by Paragraph 17, that Applicant objects to the amount of the deposit requested by the County. If Applicant objects to the amount of the requested deposit, the parties shall meet and confer to resolve the dispute within ten (10) business days following the day Applicant submits to the County its written objection. If the dispute is not resolved within the ten (10) day period, the County may cease processing the application and either party may submit the dispute to arbitration as provided in section 18. In the alternative, if the dispute is not resolved within the (10) day period, the Applicant may withdraw the application by providing written notice as set forth in Section 9.

H. Pursuant to Section 1715 of the CEC Siting Regulations, the County will not be reimbursed under this Agreement for expenses incurred in advocating a position as a formal intervenor to the proceeding and should the

County file a petition to intervene in the CEC AFC proceeding for HHSEGS, the Applicant may withdraw this Application by providing written notice as set forth in Section 9.

I. Federal and State Taxes. Applicant will not withhold any federal or state income taxes or social security from any payments made by Applicant to County pursuant to this Agreement, unless otherwise required by law.

4. WORK PLANS, SCHEDULE

Prior to the execution of this Agreement, County and Applicant shall establish a mutually acceptable master time schedule, budget, and work plan for the performance of the work described in Attachments A. The schedule shall provide for the completion of all work within the time requirements of all applicable laws while providing sufficient time for review of work products by other agencies. A goal of the work plan will be to avoid duplication of effort by the involved County departments and by any County Contractors. Applicant understands that the performance of the work within the time limits of the schedule will require mutual cooperation and coordination between County and Applicant.

5. ADDITIONAL PROCEDURES AND OBLIGATIONS

A. The procedures that will be followed in preparing and processing the environmental document(s) necessary for completing the work under this Agreement are set forth in Attachments A.

B. The Inyo County Administrator at his/her discretion may establish a working group composed of the County Administrator, the Inyo County Counsel, the Director of the Planning Department, and such other County employees and County Contractors as are deemed necessary to review and consider the Application in accordance with Attachment A. The working group will meet as necessary, to provide internal staff communication and coordination in regard to the County's work on the Application.

C. Representatives of the County shall attend regular meetings with the Applicant, the CEC, with federal, state, regional, and local agencies, with concerned groups, and attend other meetings as necessary, for the purpose of processing the Application and work plan, receiving comments on the Application and fulfilling its responsibilities as a responsible agency with regard to the CEC's environmental document. County will notify Applicant of any meetings that are scheduled in regard to the Application. County will immediately notify Applicant of any matter raised by a federal, state, regional, or local agency that may require significant changes to the Application, or that may result in County incurring significant additional costs pursuant to this Agreement.

D. County shall make the final determination as to the accuracy, inclusion, deletion, or revision of any material, (including all issues, data, analyses, and conclusions) relating to the documents the County prepares for processing the Application.

E. Any determination by the planning commission or the County Board of Supervisors as to whether the Application will be approved shall be based upon the whole of the record including the environmental document, recommendations of the county departments, testimony from public hearings, and all relevant written evidence submitted on the Application.

F. If the County intends to enter into contracts with County Contractors, the planning department will:

(1) Prepare and circulate a request for qualifications to appropriate County Contractors for the preparation of the environmental document.

(2) Select a County Contractor to assist the planning department as set forth in Chapter 15.48 of the Inyo County Code, and consistent with the Inyo County Purchasing and Contracting Policy and Procedures Manual.

(3) Manage the preparation of the environmental document(s), which will include all evaluations required to be performed pursuant to the California Environmental Quality Act, and Title 15 of the Inyo County Code. The preparation of the environmental document will proceed according to the work plan described in Paragraph 4 and Attachment A. The work plan will include provisions for the analysis of the direct, indirect and cumulative effects mitigation and alternatives of the Application.

(4) The planning department will prepare all necessary documents and notices for planning commission and board of supervisors use in rendering decisions on the environmental document for the Application.

(5) The planning commission shall serve as the Environmental Review Board of the County with the responsibility for the County's compliance with CEQA and for certification of the adequacy of the environmental document(s) for the Application.

(6) The planning department will perform additional services in regard to the Application as may be requested by the Inyo County Planning Commission or the Inyo County Board of Supervisors.

6. STATUS OF PARTIES

All acts of County, its agents, its County Contractors, officers, and employees, relating to the performance of this Agreement, shall be performed as independent contractors, and not as agents, officers, or employees of Applicant. Applicant has no authority to bind or incur any obligation on behalf of County. County has no authority or responsibility to exercise any rights or power vested in the Applicant. No agent, officer, or employee of the County is to be considered an employee of Applicant. This Agreement shall not, under any circumstances, be construed or considered to create an employer-employee relationship or a joint venture between County and Applicant. County shall determine the method, details, and means of performing the work and services to be provided by County under this Agreement. County shall be responsible to Applicant only for the responsibilities and work specified in this Agreement, and, except as expressly provided in this Agreement, shall not be subjected to control with respect to the physical action or activities of Applicant in fulfillment of this Agreement. Applicant, its agents, officers, and employees are not, and at all times during the term of this Agreement shall not, represent or conduct themselves as employees of County. County shall not be relieved of any of its obligations or liabilities under this Agreement by reason of any subcontract and shall be responsible for the acts and omissions of County Contractors in their performance of the obligations under this Agreement to the same extent as if such acts and omissions were performed or made by County.

7. WARRANTY OF ELIGIBILITY

Applicant warrants that it is not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation in covered transactions by any federal department or agency.

8. DEFENSE AND INDEMNIFICATION

A. Applicant shall defend, indemnify, and hold harmless County, its agents, officers and employees, but not its County Contractors, from and against all claims, damages, losses, judgments, liabilities, expenses, and other costs, including litigation costs and attorney's fees, arising out of, resulting from, or in connection with the approval or disapproval of the Application by County.

Applicant's obligations to defend, indemnify, and hold the County, its agents, officers, and employees, but not its County Contractors, harmless applies to any actual or alleged personal injury, death, or damage or destruction to

tangible or intangible property, including the loss of use. Applicant's obligation under this paragraph extends to any claim, damage, loss, liability, expense, or other costs which is caused, or alleged to be caused, in whole or in part by any act or omission of Applicant, its agents, employees, suppliers, consultants, or any one directly or indirectly employed by any of them, or anyone for whose acts or omissions any of them may be liable.

B. Applicant shall defend, indemnify, and hold harmless County, its agents, officers and employees, but not its County Contractors, from and against all claims, damages, losses, judgments, liabilities, expenses, and other costs, including litigation costs and attorney's fees, arising out of, resulting from, or in connection with, the County's acts or omissions with regard to its compliance with CEQA, with regard to the preparation and processing of the environmental document and with regard to the decision based thereon concerning the Application. Specifically, Applicant's obligation to defend, indemnify, and hold the County harmless extends to any suit or challenge by any party to this Agreement, or any third party, against the County which contests the legality or adequacy of the environmental document or the County's compliance with the requirements of CEQA. Should Applicant fail to defend, indemnify, and hold harmless County, County may discontinue the defense of any such litigation. Nothing in this Agreement shall be construed to waive or diminish either party's right, or the right of a non-party, to challenge any decision, or defend any challenge, arising out of the CEQA process.

(1) Applicant's obligations to defend, indemnify, and hold the County, its agents, officers and employees, but not its County Contractors, harmless under the provisions of this paragraph shall include, but not be limited to:

a. the costs of any judgments or awards against the County for damages, losses, litigation costs, or attorney's fees arising out of a suit or challenge contesting the adequacy of the environmental document and/or County's compliance with CEQA or other laws;

b. the costs of any settlement representing damages, litigation costs, and attorney's fees to be paid to other parties arising out of a suit or challenge contesting the adequacy of the environmental document and/or the County's compliance with CEQA or other laws.

(2) In the event any such suit or challenge is brought, the County shall promptly notify the Applicant of the proceeding, and the County shall consult and cooperate with Applicant in the defense of the suit or challenge as provided in the following paragraph. If the County fails to promptly notify the Applicant of the proceeding, or to cooperate in the defense, the Applicant shall not thereafter be responsible to defend, indemnify, or hold harmless the County.

As to any judgments, awards or settlement costs described in (1)(a) and/or (1)(b) above, County will proceed in good faith and with reasonable diligence to achieve a settlement or other disposition of the same which will minimize, to the extent reasonably practicable, Applicant's costs of defense and indemnification of County under this Agreement. The Applicant shall not be required to pay or perform any settlement unless the settlement is approved by the Applicant; however, if Applicant disapproves a proposed settlement, Applicant's obligation to defend, indemnify and hold harmless shall remain in full force and effect. In the event Applicant requests County's approval for a settlement of a suit or challenge on terms acceptable to plaintiff, and the County refuses Applicant's request, County shall be solely responsible for any attorney's fees and costs incurred from the date of County's refusal and, in the event any judgment or award exceeds the amount of the settlement proposed by Applicant and accepted by the plaintiff but then rejected by County, County shall be responsible for the excess amount.

C. Applicant's obligations to defend, indemnify, and hold the County, its agents, officers and employees harmless under the provisions of this paragraph are not limited to, or restricted by, any policy of insurance or contract limit.

D. Except as provided in paragraphs A and B, and to the extent permitted by law, County shall defend, indemnify, and hold harmless Applicant, its agents, officers, and employees from and against all claims, damages, losses, judgments, liabilities, expenses, and other costs, including litigation costs and attorney's fees, arising out of, or resulting from, the breach by County of this Agreement or active negligence, or wrongful or intentional acts of County,

its officers, or employees. County does not by this Agreement waive any claim-filing requirement established by the California Government Code.

9. WITHDRAWAL OF APPLICATION

As provided in Sections 3(F), (3)(G)(i), (3)(G)(ii) or (3)(H), Applicant may withdraw this Application by giving to County written notice of withdrawal. Upon receipt of notice of withdrawal, County shall terminate all contracts with County Contractors and make final payment from the Project Fund to such County Contractors in accordance with the GPA Budget. County also shall make final payment to itself for any other unpaid costs incurred by the County in providing services or work under this Agreement in accordance with the GPA Budget. Within sixty (60) days of the withdrawal, County shall pay to Applicant any funds remaining in the Project Fund after the County has paid all County Contractors, all costs incurred for work or services performed by County employees, and all special costs in accordance with the GPA Budget, at which time this Agreement shall be of no further force or effect, including, but not limited to, the indemnification provisions of Section 8, above.

10. ASSIGNMENT

Applicant may not assign its rights or delegate its duties or any part thereof under this Agreement without prior written authorization from the County, but such authorization may not be unreasonably withheld. Notwithstanding the foregoing, Applicant shall have the right, without the consent of County, to assign, pledge or otherwise transfer in whole or part, its rights and obligations under this Agreement to an entity that is controlled by, or under common control with, Applicant, or to any partner, joint venture or in connection with any debt or equity financing of Applicant's project; and County agrees to enter into such direct agreements and other documents as may be reasonably be required or requested by Applicant in connection with such assignment, pledge or transfer. Other than in the context of an assignment made for collateral purposes in connection with any debt or equity financing, any assignee of Applicant under this Agreement shall agree in writing to be bound by all of the terms, covenants and conditions of this Agreement.

11. DEFAULT

If either party should fail to comply with the other terms and conditions of this Agreement, the other party may declare default and notify the "defaulting" party in writing of the facts constituting such default. Upon making such written notification, the defaulting party will have thirty (30) calendar days to cure such default. A party shall be deemed to cure the default if within the time period set forth herein, the defaulting party begins and thereafter diligently continues to completion curing such default. Service of a notice of default on the defaulting party and allowance of the thirty (30) calendar day period for the defaulting party to commence with diligence to cure such default shall be a condition precedent to the bringing of an arbitration action based upon such default.

12. WAIVER OF DEFAULT

Waiver of any default by either party to this Agreement shall not be deemed to be waiver of any subsequent default. Waiver of any breach of any provision of this Agreement shall not be deemed to be a waiver of any other or subsequent breach, and shall not be construed to be a modification of the terms of this Agreement unless this Agreement is modified as provided in Section 16, below.

13. CONFIDENTIALITY

In the course of performance of this Agreement, the parties agree to comply with all provisions of federal, state, and county laws, regulations, and ordinances providing that information and records must, as the case may be, be disclosed, made accessible or kept or maintained as privileged, restricted, or confidential records. Subject to the foregoing sentence, each party agrees that it will not divulge to third parties, without the written consent of the other party, any information obtained from or through such party, or developed or obtained by such party, in connection with the performance of this Agreement.

14. SEVERABILITY

If any portion of this Agreement or application thereof to any person or circumstance shall be declared invalid by a court of competent jurisdiction, or if it is found in contravention of any federal, state, or county statute, ordinance, or regulation, the remaining provisions of this Agreement, or the application thereof, shall not be invalidated thereby, and shall remain in full force and effect to the extent that the provisions of this Agreement are severable.

15. ATTORNEY'S FEES

If either of the parties hereto brings an action or proceeding against the other, including, but not limited to, an action to enforce the Agreement, the prevailing party in such action or proceeding shall be entitled to receive from the other party all reasonable attorney's fees and costs incurred in connection therewith.

16. AMENDMENT

This Agreement may be modified, amended, changed, added to, or subtracted from, by the mutual consent of the parties hereto, if such amendment or change is in written form and executed with the same formalities as this Agreement, and attached to the original Agreement to maintain continuity.

17. NOTICE

Any notice, communication, amendments, additions, or deletions to this Agreement, including change of address of either party during the terms of this Agreement, which Applicant or County shall be required, or may desire, to make, shall be in writing and may be personally served, or sent by prepaid first class mail to, the respective parties as follows:

County of Inyo:

PLANNING DEPARTMENT
P.O. Drawer L
168 North Edwards
Independence, California 93526

Applicant:

BrightSource Development, LLC
c/o BrightSource Energy, Inc.
1999 Harrison Street, Suite 2150
Oakland, CA 94612
Attn: General Counsel

18. ARBITRATION.

Any dispute arising out of this Agreement that is not resolved by the parties will be resolved by arbitration conducted by a private arbitration service under the laws of the State of California. Venue for any arbitration will be in Inyo County, California. Any arbitration will be governed by the rules of evidence and procedure then in effect in the Inyo County Superior Court. The arbitrator will have the power and discretion to permit discovery under the California Code of Civil Procedure and will award reasonable costs and expenses, including attorneys' fees, to the prevailing party. The award of the arbitrator may be entered as a judgment in any court of competent jurisdiction.

19. ENTIRE AGREEMENT.

This Agreement contains the entire agreement of the parties, and no representations, inducements, promises, or agreements otherwise between the parties not embodied herein or incorporated herein by reference, shall be of any force or effect. Further, no term or provision hereof may be changed, waived, discharged, or terminated, unless the same be in writing executed by the parties hereto.

[*The next page is the signature page*]

AGREEMENT BETWEEN COUNTY OF INYO,
AND
BRIGHTSOURCE DEVELOPMENT, LLC.
FOR THE PROVISION OF ENVIRONMENTAL REVIEW
AND PROCESSING SERVICES

IN WITNESS THEREOF, THE PARTIES HERETO HAVE SET THEIR HANDS THIS ____ DAY OF _____.

COUNTY OF INYO:

By: _____

Date: _____

APPLICANT:

BrightSource Development, LLC

By: BrightSource Energy, Inc.,
its sole member.

By: _____ Name: Stephen Tiley

Date: _____ Title: SVP, US Development

Date: June 25, 2012

APPROVED AS TO FORM AND LEGALITY:

_____
County Counsel

APPROVED AS TO ACCOUNTING FORM:

_____
County Auditor

APPROVED AS TO PERSONNEL REQUIREMENTS:

_____
Personnel Services

APPROVED AS TO RISK ASSESSMENT:

_____
County Risk Manager

ATTACHMENT A

AGREEMENT BETWEEN COUNTY OF INYO AND
BRIGHTSOURCE DEVELOPMENT, LLC
FOR THE PROVISION OF ENVIRONMENTAL REVIEW
AND PROCESSING SERVICES

Scope of Work
General Plan Amendment/Zoning Reclassification
Hidden Hills Solar Energy Generating System

Upon submittal of an application from Applicant, the County will process a General Plan Amendment/Zoning Reclassification per County and State requirements for the proposed Hidden Hills Solar Energy Generating System. The County will coordinate with the applicant and the California Energy Commission (CEC) throughout the process. This scope of work relies on the CEC's review process for compliance with the California Environmental Quality Act (CEQA).

The scope of work involves the following four phases.

1. Preliminary Review
2. Consultation with CEC
3. Laws, ordinances, regulations and standards
4. Public Outreach
5. Planning Commission Review/Hearing
6. Board of Supervisors Review/Hearing

Through the process, County staff will coordinate with Applicant and CEC staff, including participating in conference calls and other electronic communication; providing information, research, and technical assistance; responding to requests for input and soliciting technical assistance from other affected agencies; facilitating community contacts and information dissemination; and, coordinating permitting/processing and legal strategy.

Preliminary Review

The submitted documents will be reviewed for compliance with County regulations and State law. Background information will be evaluated, in coordination with the CEC process, and additional information may be gathered. Any missing information will be identified and reported to Applicant. Once all of the required information has been provided, the application may be deemed complete for processing. Consultation with Native American tribes will be initiated and processed pursuant to SB18.

Consultation with CEC

As a responsible agency but for the exclusive jurisdiction of the Commission, the County will consult with CEC as provided in CEQA Guidelines section 15096.

Laws, Ordinances, Regulations and Standards

The County will provide information to, and consult with the CEC concerning the County's laws, ordinances, regulation and standards that are applicable to the project.

Public Outreach

Community contacts will be identified and preliminary outreach undertaken, and relevant local agencies will be consulted. Subsequently, a community meeting will be held to solicit input.

Planning Commission Review/Hearing

Once the preliminary public engagement is completed and all necessary information has been gathered, the results will be analyzed and presented to the Planning Commission for a recommendation to the Board of Supervisors. Draft and final staff reports will be prepared, and a hearing will be scheduled, noticed, and held.

Board of Supervisors Review/Hearing

The results of the Planning Commission hearing will be evaluated and presented to the Board of Supervisors for action. Draft and final staff reports will be prepared, and a hearing will be scheduled, noticed, and conducted. A Notice of Decision and Notice of Determination (if necessary) will be prepared and processed.

GPA BUDGET

GPA Budget is set forth in the attached Excel Spreadsheet. The GPA Budget estimates costs and expenses through December 31, 2012, based on Applicant's proposed schedule to the California Energy Commission. In the event the CEC process extends past January 1, 2013, the parties shall revise the GPA budget as set forth in this Agreement.

Exhibit A - GPA Budget
GPA/ZR
Phase

	Inyo County Staff										
	KC	RK	DC	JH	BH	Other	Subtotal	Greg James	Gruens	Expenses	Total
Rate	$106.24	$98.00	$98.00	$66.23	$76.88	$50.00					
Preliminary Review											
Review Application	1	1	4	8	2	4	$1,480	$200	$500		$2,180
In/Complete Letter	1	1	2	4	1	1	$792	$400	$250	$50	$1,492
Coord. w/ Bright Source Staff	2	2	8	8	2	4	$2,076	$200	$500	$50	$2,826
Coord. w/ CEC Staff	1	1	8	8	4	4	$2,026	$150	$500	$50	$2,726
Data Collection/SB18 Outreach	4	8	16	40	24	32	$8,871	$2,500	$5,000	$1,500	$17,871
Public Outreach											
Prel. Outreach/Meeting Prep	4	2	6	12	6	24	$3,665	$1,000	$15,000	$1,000	$20,665
Coord. w/ Bright Source Staff	1		4	8	4	4	$1,536	$500	$1,000	$50	$3,086
Coord. w/ CEC Staff	1	1	4	8	4	4	$1,634	$500	$1,000	$50	$3,184
Public Meeting	12	12	12	12	12	48	$7,744	$2,000	$5,000	$2,500	$17,244
Planning Commission											
Data Collection	4	8	16	32	24	24	$7,941	$2,500	$5,000	$1,000	$16,441
Coord. w/ Bright Source Staff	2	2	6	10	4	4	$2,166	$1,000	$1,000	$50	$4,216
Coord. w/ CEC Staff	2	2	6	10	4	4	$2,166	$1,000	$1,000	$50	$4,216
Draft Staff Report	2	2	8	16	8	16	$3,667	$2,000	$3,000	$100	$8,767
Final Staff Report	1	1	4	8	2	12	$1,880	$1,000	$2,000	$50	$4,930
Hearing	6	6	6	6	6	24	$3,872	$2,000	$5,000	$250	$11,122
BOS											
Data Collection	4	8	16	32	24	24	$7,941	$2,500	$5,000	$1,000	$16,441
Coord. w/ Bright Source Staff	2	2	6	10	4	4	$2,166	$1,000	$1,000	$50	$4,216
Coord. w/ CEC Staff	2	2	6	10	4	4	$2,166	$1,000	$1,000	$50	$4,216
Draft Staff Report	2	2	8	16	8	16	$3,667	$2,000	$3,000	$100	$8,767
Final Staff Report	1	1	4	8	2	12	$1,880	$1,000	$2,000	$50	$4,930
Hearing/Final Docs	10	10	16	24	8	32	$7,415	$2,500	$6,000	$250	$16,165
Subtotal	65	74	166	290	157	301	$76,752	$26,950	$63,750	$8,250	$175,702
Crossover Tasks from CEC Scope											
Coord. w/ BS Staff	4	2	8	8	8	16	$3,350	$250.00	$2,500.00	$50.00	$6,149.84
Research	4		4	8	12	40	$4,269	$500.00	$10,000.00	$250.00	$15,019.36
Staff Mtgs.	8	4	16	16	8	80	$8,485	$1,000.00	$10,000.00	$500.00	$19,984.64
Prepare Draft Report	2	2	8	8	4	12	$2,630	$500.00	$15,000.00	$500.00	$18,629.84
Prepare Final Report	1	1	4	4	2	8	$1,415	$250.00	$10,000.00	$250.00	$11,914.92
Subtotal	19	9	40	44	34	156	$20,149	$2,500.00	$47,500.00	$1,550.00	$71,698.60
Total	**84**	**83**	**206**	**334**	**191**	**457**	**96901.06**	**$29,450.00**	**$111,250.00**	**$9,800.00**	**$247,401.06**

ATTACHMENT B

AGREEMENT BETWEEN COUNTY OF INYO AND BRIGHTSOURCE DEVELOPMENT, LLC FOR THE PROVISION OF ENVIRONMENTAL REVIEW AND PROCESSING SERVICES

HOURLY RATES (NON OVERTIME) OF COUNTY PERSONNEL INCLUDING BENEFITS:

POSITION	HOURLY RATE WITH FRINGE BENEFITS
Office of County Counsel:	$98.00 per hour (Flat Rate)
Planning Department:	
Planning Director	$65.08 per hour
Senior Planner	$49.06 per hour
Associate Planner	$45.76 per hour
Planning Coordinator	$32.89 per hour
Special Planning Commission Meeting	$ 750 per meeting
Special Water Commission Meeting	$ 750 per meeting
County Auditor:	$65.00 per hour
Greg James, Attorney at Law:	$150.00 per hour
Gruen Gruen + Associates:	$350.00 per hour

Noise

I. Introduction

A. Name: Mark Bastasch, P.E., INCE, CWRE

B. Qualifications: Mr. Bastasch's qualifications are as noted in his resume contained in Appendix A.

C. Prior Filings: In addition to the statements herein, this testimony includes by reference the following documents submitted in this proceeding:

- Application for Certification, Volume 1 & Volume 2, dated August 5, 2011 [Exhibit 1]
- Applicant's Preliminary Staff Assessment Comments, Set 2, dated July 23, 2012. [Exhibit 70]

To the best of my knowledge, all of the facts contained in this testimony (including all referenced documents) are true and correct. To the extent this testimony contains opinions, such opinions are my own. I make these statements, and render these opinions freely and under oath for the purpose of constituting sworn testimony in this proceeding.

II. Summary of Testimony

A. Affected Environment

The project area is sparsely populated, with a few scattered residences south and east of the HHSEGS site. HHSEGS consists of two Solar Plants (Solar Plant 1 and Solar Plant 2). Each solar plant is centered on a power block that is surrounded by concentric rings of mirrors. The primary noise generating equipment is located in the center, at the power block, and is similar to the equipment used on conventional combined-cycle power facilities (steam turbine, air cooled condenser, transformers, etc.) The nearest residence to any power block equipment is approximately 3,500 feet south of the Solar Plant 2 power block and about 800 feet south of the mirrors located along the project's southern boundary in the Calvada Springs (also known as Charleston View) area. There are two trailers located approximately 300 feet east of the Solar Plant 2 fence line. These trailers, which are indicated on AFC Figure 5.7-1 [Exhibit 1] as residences, are now known to be only periodically occupied.

As described in AFC Section 5.7 [Exhibit 1], ambient sound levels were measured over a multi-day period at two representative locations. Table NOISE-1 summarizes the measurement results and is consistent with AFC Table 5.7-5 and CEC Staff's Final Staff Assessment Noise Table 2. M1 is located at the St. Therese Mission about 0.5 mile south of the HHSEGS' common area fenceline. M2 is at a residence south of the project in the Calvada Springs area. M2 is not the closest residence but was used for the noise monitoring station because the owners of M2 agreed to provide access to their property for the monitoring equipment. The monitoring information gathered at M2 was used to establish existing noise levels at the closest residence, located approximately 3,500 feet to the south of the Solar Plant 2 power block.

TABLE NOISE-1
Summary of Measurement Results (dBA)

Map ID	Location Description	Average Daytime L_{eq}	Average Nighttime L_{eq}	Average L_{dn}
M1	St. Therese Mission Project	42	34	47
M2	Residential Monitor	45	40	51

Source: AFC Table 5.7-5

B. Potential Construction Related Impacts; Avoidance and Minimization Measures

Anticipated sound levels from construction activities are discussed in Section 5.7.5.2.2 of the AFC [Exhibit 1]. Typical construction equipment noise levels vary between 37 and 52 dBA with the exception of large impact pile drivers that may result in 68 dBA at a distance of 3,000 feet. The final geotechnical report may require impact pile driving to achieve the necessary foundational support (bearing capacity) for major power block equipment. Consistent with good construction practices and Conditions of Certification of other facilities, impact pile driving, if necessary, will be limited to daytime hours. It is anticipated to be limited to the more remote project areas (i.e., the power blocks) and will occur during a fraction of the entire construction period. The pylons that the mirrors (heliostats) are mounted on are not installed with the large impact pile drivers; rather a quieter vibratory and/or direct push technology is used that is capable of providing the necessary bearing capacity. Construction noise levels from this type of equipment is anticipated to be similar in range to the non-pile driving equipment presented in Section 5.7.5.2.2 of the AFC [Exhibit 1], that is 85 to 90 dBA at a distance of 50 feet.

Potential construction noise impacts will be limited by ensuring noisy construction activities occurring within 500 feet of a noise-sensitive use will be restricted to 7:00 a.m. to 7:00 p.m., Monday through Saturday. Project-related haul trucks will be operated in accordance with posted speed limits, and truck engine exhaust brake use will be limited to emergencies. Such limitations comply with the County's general plan requirements as discussed in Section 5.7.2.3.1 of the AFC [Exhibit 1]. In addition, a telephone number will be established for the public to file a noise complaint and all complaints will be followed up on in a timely manner.

C. Potential Operational Related Impacts; Avoidance and Minimization Measures

Given the solar nature of this project, during operation most noise-generating activities will occur during the daytime hours. Activity at night will primarily be limited to maintenance-related activities such as mirror washing. Mirror washing activities are expected to be similar in sound level to a heavy truck. Start up activities may also occur for a short-time prior to sunrise to ensure the facility will be fully operational when the sun is of the appropriate intensity and continue for a short-time after sunset. Operational noise from the HHSEGS is predicted not to exceed an hourly average of 54 dBA at the closest residence in Calvada Springs [referred to by Staff as CR1 in the FSA] or 52 dBA at the St. Therese Mission (M1). Such levels comply with the County's general plan requirements as discussed in Section 5.7.2.3.1 of the AFC [Exhibit 1].

It is the Applicant's intention to anticipate the potential for audible tones in the design and specification of the plant's equipment and take necessary steps to prevent sources from emitting tones that might be disturbing at the nearest receptors.

D. Summary of Compliance with Applicable LORS

AFC Table 5.7-2 [Exhibit 1] summarizes the noise levels used by Inyo County for evaluating land use compatibility. For residences, schools and churches, the Noise Element established a Normally Acceptable Day-Night Noise Level (L_{dn}) of 60 dBA and a Conditionally Acceptable L_{dn} of 70 dBA. The Normally Acceptable L_{dn} of 60 dBA equates to an Equivalent Noise Level (L_{eq}) of 54 dBA continuously throughout the day and night. The Conditionally Acceptable L_{dn} of 70 dBA equates to 64 dBA continuously throughout the day and night.

The project design incorporates appropriate mitigation to ensure the project sound level does not exceed 54 dBA at the nearest residences. Staff agrees these levels are consistent with the Applicable LORS [FSA at 4.6-10].

E. Summary of the Potential Cumulative Impacts

The St. Therese Mission is the only proposed project near the HHSEGS site to potentially result in a cumulative noise effect. The facility developer estimates that as many as 1,200 visitors per month could visit the facility. The noise generated from such visitors would be predominately associated with vehicular travel. Given these circumstances, HHSEGS would not have impacts that would combine with other closely related past, present, and reasonably foreseeable future projects to create a significant cumulative noise impact.

III. Response to Certain Issues Raised in the FSA

A. Evaluation of Construction Noise

Staff has elected to evaluate the construction-related noise levels by comparing the projected construction noise levels from various activities to the measured existing levels. Staff asserts that for the purposes of CEQA “increases above 5 and up to 10 dBA could be significant or insignificant depending on the particular circumstances of a case” [FSA at 4.6-7] and subsequently notes that a construction related increase of “15-20 dBA would likely constitute an annoyance…potentially cause[ing] a significant noise impact” [FSA at 4.6-9]. Staff then imposes additional mitigation requirements for pile driving activities that may be necessary at distances of over 3,000 feet from the closest residence.

Impact pile driving is a routine construction activity that generates elevated levels of noise over a limited time period. Impact hammers consist of a heavy weight that is repeatedly dropped onto the top of the pile, driving it into the ground and emit a periodic sound each time the pile is struck by the hammer. Vibratory “hammers” emit a continuous sound as the pile is vibrated into the ground and the use of vibratory hammers can extend the time period required for pile driving activities. The bearing capacity is also not known when vibratory methods are used. Vibratory driven piles must often be "proofed" with an impact hammer to verify their bearing capacity. This involves striking the pile a number of times with the impact hammer to ensure that it meets the designed bearing capacity. Thus, impact piling is almost always necessary for bearing piles.

Pile driving noise is typically mitigated by limiting the activity to daytime hours, and if conducted in proximity to sensitive receptors, providing advanced notice. An example notice for such activities conducted much closer (within approximately 700 feet) to a more densely populated area of California can be found at http://www.keepsandiegomoving.com/Libraries/SR76-Corridor-doc/CW_T_SR76_CA_8_FINAL_1.sflb.ashx. CEQA does not impose a limit on the potential increase resulting from short duration construction activities. While a comparative analysis of projected construction activities to existing sound levels is informative, additional mitigation for construction activities based solely on this comparison is not required by CEQA. The resulting levels noted by

Staff for short term impact pile driving of 65 dBA at CR1 and 57 dBA at M1 are similar in level to a normal conversation at 3 to 5 feet and do not exceed the County's conditionally acceptable requirement of 70 dBA for continuous activities. Similar pile driving activities are conducted in much closer proximity to residences throughout California. Requiring mitigation for daytime construction-related activities based solely on the potential increase over existing sound levels presents additional costs, delays and ultimately an impediment to economic activity in rural areas. Proposed Conditions of Certification, NOISE-1, NOISE-2 and NOISE-6 sufficiently mitigate the potential for significant adverse noise impacts from construction-related activities.

Staff's proposed Condition of Certification NOISE-8 is not required and it is impossible for any project or activity to meet a subjective criterion such as "does not cause annoyance." Annoyance has been noted to be related to non-acoustic factors such as fear of danger from the noise source, attitudes towards noise prevention, and perspectives on the importance of the noise source and annoyance with non-noise impacts of the noise source (Fields, J.M. 1993. *Effects of personal and situational variables on noise annoyance in residential areas*. Journal of Acoustical Society of America, 93 (5) 2753-2763). Because sensitivity to noise can be influenced by such non-acoustic factors and can be deemed significant by an affected individual, regardless of frequency or level, it is difficult to quantify these impacts or to impose mitigation.

B. Evaluation of Operational Noise

Staff are requiring a lower operational sound level in NOISE-4 based on their updated understanding that some residents do not commute to work during the day, that the residences are accustomed to natural sounds, and that some may be annoyed by the project sounds. The potential for annoyance does not constitute an adverse significant impact and as noted above, Fields (1993) identified many non-acoustical factors that can influence the ones reaction to a sound.

Most economic activity results in the generation of sound. Suggesting that areas where economic activity is limited, areas where only "natural sounds" currently exist, warrant an extra level of protection is a land use policy decision. Some jurisdictions have established designated "quiet areas." Such land use decisions are made at the local level and Inyo County has established Land Use Compatibly Guidelines presented in AFC Table 5.7-2 [Exhibit 1]. As proposed, this project has been determined to comply with Inyo County requirements. Nonetheless, the project has accepted Staff's requirement to lower operational sound levels by 3 dBA.

With respect to periodic mirror washing, Staff opine that beyond administrative controls proposed in the AFC (adjusting the time period that closest mirrors are washed), that electric- or battery-powered equipment can be used. While this is may eventually be feasible, no such suitable equipment is currently available.

IV. Proposed Licensing Conditions

The FSA for the project proposes eight Conditions of Certification for this subject matter. We agree with NOISE-3 and with the other Conditions of Certification set forth in the FSA pertaining to this subject, except as set forth below.

CONDITION NOISE-1, PUBLIC NOTIFICATION PROCESS

Because this condition requires the telephone number (typically used to report construction-related concerns) to be maintained throughout the operational life of the project, please revise NOISE-1 as follows to allow that number to be changed once the project is operational.

NOISE-1 Prior to the start of ground disturbance, the project owner shall notify all residents within one mile of the project site boundaries, by mail or by other effective means, of the commencement of project construction. At the same time, the project owner shall establish a telephone number for use by the public to report any legitimate excessive ~~undesirable~~ noise conditions associated with the construction and operation of the project. If the telephone is not staffed 24 hours a day, the project owner shall include an automatic answering feature, with date and time stamp recording, to answer calls when the phone is unattended. This telephone number shall be posted at the project site during construction where it is visible to passersby. This or a similarly effective telephone number shall be maintained throughout the operational life of the project.

Verification: At least 15 days prior to ground disturbance, the project owner shall transmit to the compliance project manager (CPM) a statement, signed by the project owner's project manager, stating that the above notification has been performed, and describing the method of that notification. This communication shall also verify that the telephone number has been established and posted at the site, and shall provide that telephone number.

CONDITION NOISE-2, NOISE COMPLAINT PROCESS

The Noise Complaint Resolution Form should be filed with the CPM. To provide flexibility in implementing this condition, some of the condition's requirements should be moved into the verification language. NOISE-2 should be revised as follows.

NOISE-2 Throughout the construction and operation of the project, the project owner shall document, investigate, evaluate, and attempt to resolve all legitimate project-related noise complaints.

Verification: The project owner or authorized agent shall:

- use the Noise Complaint Resolution Form (below), or a functionally equivalent procedure acceptable to the CPM, to document and respond to each legitimate noise complaint;
- attempt to contact the person(s) making the noise complaint within 24 hours;
- conduct an investigation to determine the source of noise in the complaint;
- if the noise is project related, take all feasible measures to reduce the source of the noise; and
- submit a report documenting the complaint and actions taken. The report shall include: a complaint summary, including the final results of noise reduction efforts and, if obtainable, a signed statement by the complainant, stating that the noise problem has been resolved to the complainant's satisfaction.

~~**Verification**~~: Within five days of receiving a legitimate noise complaint, the project owner shall file a Noise Complaint Resolution Form, shown below, with the CPM, which documents the investigation of the complaint. If mitigation is required to resolve the complaint, and the complaint is not resolved within a three business-day period, the project owner shall submit

an updated Noise Complaint Resolution Form when the mitigation is implemented. ~~performed and complete.~~

CONDITION NOISE-4, NOISE RESTRICTIONS

The FSA requires lower sound levels than previously proposed in the AFC or indicated in the PSA. While the Applicant will ensure these new requirements are addressed, additional specificity has been added to ensure the additional requirements are clearly understood. To provide flexibility in implementing this condition, some of the condition's requirements should be moved into the verification language. NOISE-4 should be revised as follows.

NOISE-4 The project design and implementation shall include appropriate noise mitigation measures adequate to ensure that the operation of the project will not cause the noise levels due to normal steady-state plant operation alone to exceed an hourly average of 51 dBA Leq measured at or near monitoring location CR1 and an hourly average of 49 dBA Leq measured at or near monitoring location M1. During transients, start-up and shut-down operations the noise level shall not exceed the allowable steady state noise limits by more than 3 dBA. The above noise limits exclude emergency operations.

No new pure-tone components (as defined by Staff's FSA Noise Table A1), shall be caused by the project. No single piece of equipment shall be allowed to stand out as a source of noise that draws legitimate complaints[1].

~~When the project first achieves a sustained output of 90 % or greater of rated capacity, the project owner shall conduct a 25-hour community noise survey at monitoring locations CR1 and M1, or at a closer location acceptable to the CPM. This survey shall also include measurement of one-third octave band sound pressure levels to ensure that no new pure-tone noise components have been caused by the project.~~

~~The measurement of power plant noise for the purposes of demonstrating compliance with this condition of certification may alternatively be made at a location, acceptable to the CPM, closer to the plant (e.g., 400 feet from the plant boundary) and this measured level then mathematically extrapolated to determine the plant noise contribution at the affected residence. The character of the plant noise shall be evaluated at the affected receptor locations to determine the presence of pure tones or other dominant sources of plant noise.~~

If the results from the noise survey indicate that the power plant noise at the affected receptor site exceeds the above values, mitigation measures shall be implemented to reduce noise to a level of compliance with these limits.

If the results from the noise survey indicate that pure tones are present, mitigation measures shall be implemented to reduce ~~eliminate~~ the pure tones to a level that complies with FSA Noise Table A1.

Verification: Within 30 days of the project achieving a sustained output of 90% or greater of rated capacity, the project owner shall conduct a 25-hour community noise survey at

[1] A legitimate operational complaint refers to a complaint about noise that is caused by the HHSEGS project as opposed to another source (as verified by the CPM). A legitimate complaint constitutes a violation by the project of any noise condition of certification (as confirmed by the CPM), which is documented by an individual or entity affected by such noise.

locations CR1 and M1, or at a closer location acceptable to the CPM. This survey shall also include measurement of one-third octave band sound pressure levels to ensure that no new pure-tone noise components have been caused by the project.

The measurement of power plant noise, for the purposes of demonstrating compliance with this condition of certification, may alternatively be made at a location, acceptable to the CPM, closer to the plant (e.g., 400 feet from the plant boundary or power block) and this measured level then mathematically extrapolated to determine the plant noise contribution at the affected residence. The character of the plant noise shall be evaluated at the affected receptor locations to determine the presence of pure tones or other dominant sources of plant noise.

~~The survey shall take place within 30 days of the project first achieving a sustained output of 90% or greater of rated capacity.~~ Within 15 days after completing the survey, the project owner shall submit a summary report of the survey to the CPM. Included in the survey report will be a description of any additional mitigation measures necessary to achieve compliance with the above listed noise limit, and a schedule, subject to CPM approval, for implementing these measures. When these measures are in place, the project owner shall repeat the noise survey.

Within 15 days of completion of the new survey, the project owner shall submit to the CPM a summary report of the new noise survey, performed as described above and showing compliance with this condition.

CONDITION NOISE-5, OCCUPATIONAL NOISE SURVEY

To provide flexibility in implementing this condition, some of the condition's requirements should be moved into the verification language. NOISE-5 should be revised as follows.

NOISE-5 Following the project's attainment of a sustained output of 90% or greater of its rated capacity, the project owner shall conduct an occupational noise survey to identify any noise hazardous areas in the facility.

Verification: The survey shall be conducted by a qualified person in accordance with the provisions of Title 8, California Code of Regulations, sections 5095-5099 (Article 105) and Title 29, Code of Federal Regulations, section 1910.95. The survey results shall be used to determine the magnitude of employee noise exposure.

The project owner shall prepare a report of the survey results and, if necessary, identify proposed mitigation measures to be employed in order to comply with the applicable California and federal regulations.

~~**Verification:**~~ Within 30 days after completing the survey, the project owner shall submit the noise survey report to the CPM. The project owner shall make the report available to OSHA and Cal-OSHA upon request.

CONDITION NOISE-6, CONSTRUCTION RESTRICTIONS

Construction noise concerns are addressed in Condition NOISE-2, and a large portion of the project area is far removed from existing residences (e.g., Solar Plant 1). In addition, County LORS only require mitigation for construction activities within 500 feet of a residence. Revising NOISE-6 as follows will help reduce the overall construction duration and accommodate desert temperature conditions, particularly in more remote portions of the project.

NOISE-6 Heavy equipment operation and noisy construction work relating to any project features, including pile driving, resulting in a legitimate construction noise complaint,[2] shall be restricted to the times delineated below:

Mondays through Saturdays: 7 a.m. to 7 p.m.

Construction activities may be performed outside the above hours, with CPM approval.

Haul trucks and other engine-powered equipment shall be equipped with adequate mufflers. Haul trucks shall be operated in accordance with posted speed limits. Truck engine exhaust brake use shall be limited to emergencies.

Verification: Prior to ground disturbance, the project owner shall transmit to the CPM a statement acknowledging that the above restrictions will be observed throughout the construction of the project.

At least 5 days prior to pouring of concrete outside of the above hours, the project owner shall submit a statement to the CPM, specifying the time of night and the number of nights for which concrete pouring will occur, and the approximate distance of this activity to CR1 an M1, and the expected sound levels at these receptors. Also prior to pouring of concrete beyond the above hours, the project owner shall notify all residents within one mile of the project site boundaries, by mail or by other effective means, of the commencement of this activity.

CONDITION NOISE-7, STEAM BLOW RESTRICTIONS

Since the required silencing of the steam blow results in an expected sound pressure level of 50 dBA at CR1 and 41 dBA at M1 (staff calculation), which is consistent with the operational requirements of NOISE-4, the daily time restriction for steam blow activities should be consistent with other construction activities. NOISE-7 should be revised as follows.

NOISE-7 If a traditional, high-pressure steam blow process is used the project owner shall equip steam blow piping with a temporary silencer that quiets the noise of steam blows to no greater than 89 dBA measured at a distance of 50 feet. The steam blows shall be conducted between ~~8:00 a.m. and 5:00 p.m.~~ 7:00 a.m. and 7:00 p.m. unless arranged with the CPM such that offsite impacts would not cause annoyance to receptors. If a low-pressure, continuous steam blow process is used, the project owner shall submit to the CPM a description of the process, with expected noise levels and planned hours of steam blow operation.

Verification: At least 15 days prior to the first steam blow, the project owner shall notify all residents or business owners within one mile of the project site boundary. The notification may be in the form of letters, phone calls, fliers, or other effective means as approved by the CPM. The notification shall include a description of the purpose and nature of the steam blow(s), the planned schedule, expected sound levels, and explanation that it is a one-time activity and not part of normal plant operation.

[2] A legitimate construction noise complaint refers to a complaint about noise by an individual affected by a noise that is caused by the HHSEGS construction activities as opposed to another source (as verified by the CPM).

CONDITION NOISE-8, PILE DRIVING MANAGEMENT

Since impact pile driving, if required, is limited to the power block, and the closest power block is over 3,000 feet away from a residence, and pile driving will be limited to daytime hours, and be of limited duration, and of reasonable overall magnitude, please delete NOISE-8. NOISE-1, NOISE-2 and NOISE-6 sufficiently mitigate the potential for significant adverse noise impacts from construction related activities.

Paleontological Resources

I. Introduction

A. Name: W. Geoffrey Spaulding, Ph.D.

B. Qualifications: Dr. Spaulding's qualifications are as noted in his resume contained in Appendix A.

C. Prior Filings: In addition to the statements herein, this testimony includes by reference the following documents submitted in this proceeding:

- Application for Certification, Volume 1 & Volume 2, dated August 5, 2011 [Exhibit 1]
- Applicant's Data Response, Set 1D, dated January 6, 2012. Responses to Data Requests 97 through 134 [Exhibit 21]
- Applicant's Preliminary Staff Assessment Comments, Set 2, dated July 23, 2012. [Exhibit 70]

D. Confidential Filings: The following document was submitted with a Request for Confidential Treatment.

- Interim Assessment of Paleontological Sensitivity-Hidden Hills, Applicant's Data Response Set 1D, Attachment DR100-1, dated January 6, 2012 [Exhibit 21]

To the best of my knowledge, all of the facts contained in this testimony (including all referenced documents) are true and correct. To the extent this testimony contains opinions, such opinions are my own. I make these statements, and render these opinions freely and under oath for the purpose of constituting sworn testimony in this proceeding.

II. Summary of Testimony

A. Affected Environment

The project site is located in the basin bottom, or bolson, of the Pahrump Valley, an internally drained basin bound by the Kingston and Nopah ranges on the west, and by the Spring Mountains on the east. Pahrump Dry Lake lies about 3 miles northwest of the HHSEGS site. To the southeast, a low divide separates Pahrump Valley from Sandy Valley while, to the northwest, another low divide separates it from Stewart Valley. To the northeast and east, a series of subparallel fault scarps in Nevada separate the bolson of Pahrump Valley from the bajada extending down slope from the Spring Mountains. With a high elevation of approximately 2,675 feet on the east side, and a low elevation of approximately 2,585 feet on the west side, the topography across the site is relatively level in the west to undulatory in the east, consistent with a gentle slope from east to west. Several ephemeral (typically dry) drainages extend across the eastern portion of the project site, originating in Nevada and flowing westerly into California on their way to Pahrump Dry Lake.

The subsurface geology of the project site is dominated by older, fine-grained and carbonate-rich basin fill sediments. Lithoid tufa ledges, clay-rich relict basins, and widespread tufa nodules occur where this older basin fill is not covered by more recent alluvium issuing from the east and northeast. However, despite some evidence of paleospring deposits, no fossil material was discovered during paleontological resources survey of the project area (HHSG 2011a §5.8). In addition to the survey, the stratigraphy of soils exposed in geotechnical test pits were examined (HHSG 2011a §5.8), and no indicators of paleontological sensitivity were encountered. No paleontological resources, or records of previous fossil

finds, were found within one mile of the HHSEGS and none were encountered during the excavation of the geotechnical test pits. There is one paleontological record from a site in a different geological setting about 3 miles from the project area.

B. Potential Construction Related Impacts; Avoidance and Minimization Measures

Monitoring geotechnical test pit excavations, geoarchaeological test trenching, paleontological survey, and repeated reconnaissance of the most promising areas by the project paleontologist has failed to identify any paleontological materials whatsoever. Relict landforms and areas where lithoid tufa ledges and concretions suggested older, possibly Middle Pleistocene spring discharge occurs. However, no paleontological material was encountered in any setting and, therefore, the HHSEGS project area possesses low paleontological sensitivity (in the BLM system, Potential Fossil Yield Class 2 (low)). Consequently, construction-related site preparation and excavations, including pylon installation, in the HHSEGS project area will not result in adverse impacts to paleontological resources.

C. Potential Operational Related Impacts; Avoidance and Minimization Measures

No excavations that would disturb paleontologically sensitive sediments will be part of the operation of this facility, and therefore, no operational impacts to paleontological resources will occur.

D. Summary of Compliance with Applicable LORS

The project is in compliance with the following LORS regarding the protection and management of paleontological resources and associated scientific and historic values:

Laws, Ordinances, Regulations, or Standards	Description
State	
CEQA	Requires that impacts on paleontological resources be evaluated and mitigated when appropriate on all discretionary projects, public and private.
Local	
County of Inyo General Plan	The Plan does not specifically address paleontological resources. However, it does provide for the preservation of historic and prehistoric resources and values.
Standards	
Society for Vertebrate Paleontology (SVP), 1995	The “Measures for Assessment and Mitigation of Adverse Impacts to Non-Renewable Paleontological Resources: Standard Procedures” are recommended procedures for assessing and mitigating impacts to vertebrate paleontological resources. The measures were adopted in October 1995 by the SVP, a national organization of professional scientists.
Bureau of Land Management Instructional Memorandum 2008-009	Provides up-to-date methodologies for assessing paleontological sensitivity and management guidelines for paleontological resources on lands managed by the Bureau of Land Management.

E. Summary of the Potential Cumulative Impacts

Application of minimization measures combined with the low paleontological sensitivity of the sediments potentially affected will result in negligible impacts to paleontological resources. Even if fossils are encountered, implementation of the Paleontological Resources Monitoring and Mitigation Plan (PRMMP) would result in their recovery of the associated scientific values, which could be considered a net benefit. Therefore, the potential contributions of this project to cumulative adverse impacts to paleontological resources are avoided and minimized such that they would be less than significant.

III. Response to Certain Issues Raised in the FSA

Staff maintains that one paleontological record provided by the San Bernardino County Museum of a paleontological site approximately 3 miles distant reflects somehow on the paleontological sensitivity of the HHSEGS project area, and that potential adverse impacts to paleontological resources can be anticipated in the project area. However, the basin fill sediments of the HHSEGS project area are considerably older than the area where the paleontological site was recorded, and these older sediments (equivalent to Unit B of the Las Vegas Formation) typically do not yield fossil material. The pedogenic alterations evident in these sediments confirm the low paleontological sensitivity of these sediments, at least within 15 feet or so of the surface.

IV. Proposed Licensing Conditions

The FSA for the project proposes seven Conditions of Certification for this subject matter. We agree with the Conditions of Certification set forth in the FSA pertaining to this subject, except as set forth below.

CONDITION PAL-1

If the PRS is to determine qualifications of the PRM, then the purpose of the letter informing the CPM of additional monitors is advisory, and need not be provided in advance. In any case, one week in advance is unnecessarily burdensome when staffing decisions for monitoring sometimes must be made within 24 hours in the case of a resignation, illness, family emergency, etc. Therefore, the last sentence of verification Item (2) should be revised as follows.

PAL-1 The project owner shall provide the Compliance Project Manager (CPM) with the resume and qualifications of its Paleontological Resource Specialist (PRS) for review and approval. If the approved PRS is replaced prior to completion of project mitigation and submittal of the Paleontological Resources Report, the project owner shall obtain CPM approval of the replacement PRS. The project owner shall keep resumes on file for qualified Paleontological Resource Monitors (PRMs). If a PRM is replaced, the resume of the replacement PRM shall also be provided to the CPM for review and approval.

The PRS resume shall include the names and phone numbers of references. The resume shall also demonstrate to the satisfaction of the CPM the appropriate education and experience to accomplish the required paleontological resource tasks.

As determined by the CPM, the PRS shall meet the minimum qualifications for a vertebrate paleontologist as described in the Society of Vertebrate Paleontology (SVP) guidelines of 1995. The experience of the PRS shall include the following:

1. Institutional affiliations, appropriate credentials, and college degree;
2. Ability to recognize and collect fossils in the field;
3. Local geological and biostratigraphic expertise;
4. Proficiency in identifying vertebrate and invertebrate fossils; and
5. At least three years of paleontological resource mitigation and field experience in California and at least one year of experience leading paleontological resource mitigation and field activities.

The project owner shall ensure that the PRS obtains qualified paleontological resource monitors to monitor as he or she deems necessary on the project. Paleontologic Resource Monitors (PRMs) shall have the equivalent of the following qualifications:

- BS or BA degree in geology or paleontology and one year of experience monitoring in California; or
- AS or AA in geology, paleontology, or biology and four years' experience monitoring in California; or
- Enrollment in upper division classes pursuing a degree in the fields of geology or paleontology and two years of monitoring experience in California.

Verification: (1) At least 60 days prior to the start of ground disturbance, the project owner shall submit a resume and statement of availability of its designated PRS for on-site work.

(2) At least 20 days prior to ground disturbance, the PRS or project owner shall provide a letter with resumes naming anticipated monitors for the project, stating that the identified monitors meet the minimum qualifications for paleontological resource monitoring required by the condition. If additional monitors are obtained during the project, the PRS shall provide additional letters and resumes to the CPM. The letter shall be provided to the CPM no later than one week ~~prior~~ after to the monitor's beginning on-site duties.

(3) Prior to the termination or release of a PRS, the project owner shall submit the resume of the proposed new PRS to the CPM for review and approval.

CONDITION PAL-3

The guidelines of the SVP were developed more than 15 years ago, and since then have been supplemented by more exacting criteria for evaluating paleontological sensitivity (USDI BLM, 2008). This condition should be revised to reflect that both SVP (1995) and BLM (2008) guidelines will be followed and, in the case of a conflict, the more exacting criteria will prevail. Therefore, the second paragraph of PAL-3 should be rewritten as follows.

PAL-3 The project owner shall ensure that the PRS prepares, and the project owner submits to the CPM for review and approval, a paleontological resources monitoring and mitigation plan (PRMMP) to identify general and specific measures to minimize potential impacts to significant paleontological resources. Approval of the PRMMP by the CPM shall occur prior to any ground disturbance. The PRMMP shall function as the formal guide for monitoring, collecting, and sampling activities, and may be

modified with CPM approval. This document shall be used as the basis of discussion when on-site decisions or changes are proposed. Copies of the PRMMP shall reside with the PRS, each monitor, the project owner's on-site manager, and the CPM.

The PRMMP shall be developed ~~in accordance~~ to be consistent with the guidelines of the Bureau of Land Management (BLM2008-009 et seq.) and Society of Vertebrate Paleontology (SVP, 1995) and shall include, but not be limited, to the following:

1. Assurance that the performance and sequence of project-related tasks, such as any literature searches, pre-construction surveys, worker environmental training, fieldwork, flagging or staking, construction monitoring, mapping and data recovery, fossil preparation and collection, identification and inventory, preparation of final reports, and transmittal of materials for curation will be performed according to PRMMP procedures;

2. Identification of the person(s) expected to assist with each of the tasks identified within the PRMMP and the Conditions of Certification;

3. A thorough discussion of the anticipated geologic units expected to be encountered, the location and depth of the units relative to the project when known, and the known sensitivity of those units based on the occurrence of fossils either in that unit or in correlative units;

4. An explanation of why, how, and how much sampling is expected to take place and in what units. Include descriptions of different sampling procedures that shall be used for fine-grained and coarse-grained units;

5. A discussion of the locations of where the monitoring of project construction activities is deemed necessary, and a proposed plan for monitoring and sampling;

6. A discussion of procedures to be followed in the event of a significant fossil discovery, halting construction, resuming construction, and how notifications will be performed;

7. A discussion of equipment and supplies necessary for collection of fossil materials and any specialized equipment needed to prepare, remove, load, transport, and analyze large-sized fossils or extensive fossil deposits;

8. Procedures for inventory, preparation, and delivery for curation into a retrievable storage collection in a public repository or museum, which meet the Society of Vertebrate Paleontology's standards and requirements for the curation of paleontological resources;

9. Identification of the institution that has agreed to receive data and fossil materials collected, requirements or specifications for materials delivered for curation, and how they will be met, and the name and phone number of the contact person at the institution; and

10. A copy of the paleontological Conditions of Certification.

Verification: At least 30 days prior to ground disturbance, the project owner shall provide a copy of the PRMMP to the CPM for review and approval. The PRMMP shall include an affidavit of authorship by the PRS, and acceptance of the PRMMP by the project owner evidenced by a signature.

CONDITION PAL-5

The procedure, proposed by staff in Item 1, whereby concurrence must be sought for a professional assessment, is contrary to the notion that the PRS should be qualified to make these decisions independently. It is, therefore, important that this requirement be revised to read as follows.

PAL-5 The project owner shall ensure that the PRS and PRM(s) monitor consistent with the PRMMP all construction-related grading, excavation, trenching, and augering in areas where potential fossil-bearing materials have been identified, both at the site and along any constructed linear facilities associated with the project. In the event that the PRS determines full-time monitoring is not necessary in locations that were identified as potentially fossil-bearing in the PRMMP, the project owner shall notify and seek the concurrence of the CPM.

The project owner shall ensure that the PRS and PRM(s) have the authority to halt or redirect construction if paleontological resources are encountered. The project owner shall ensure that there is no interference with monitoring activities unless directed by the PRS. Monitoring activities shall be conducted as follows:

1. Notification of any ~~Any~~ change of monitoring from the accepted schedule in the PRMMP shall be provided in a letter or email from the PRS and the project owner to the CPM, along with reasons for that change, by the end of that work week, ~~prior to the change in monitoring~~, and will be included in the monthly compliance report. ~~The letter or email shall include the justification for the change in monitoring and be submitted to the CPM for review and approval.~~

2. The project owner shall ensure that the PRM(s) keep a daily monitoring log of paleontological resource activities. The PRS may informally discuss paleontological resource monitoring and mitigation activities with the CPM at any time.

3. The project owner shall ensure that the PRS notifies the CPM within 24 hours of the occurrence of any incidents of non-compliance with any paleontological resources Conditions of Certification. The PRS shall recommend corrective action to resolve the issues or achieve compliance with the Conditions of Certification.

4. For any significant paleontological resources encountered, either the project owner or the PRS shall notify the CPM within 24 hours, or Monday morning in the case of a weekend event where construction has been halted because of a paleontological find.

The project owner shall ensure that the PRS prepares a summary of monitoring and other paleontological activities placed in the monthly compliance reports. The

summary will include the name(s) of PRS or PRM(s) active during the month, general descriptions of training and monitored construction activities, and general locations of excavations, grading, and other activities. A section of the report shall include the geologic units or subunits encountered, descriptions of samplings within each unit, and a list of identified fossils. A final section of the report will address any issues or concerns about the project relating to paleontologic monitoring, including any incidents of non-compliance or any changes to the monitoring plan that have been approved by the CPM. If no monitoring took place during the month, the report shall include an explanation in the summary as to why monitoring was not conducted.

Verification: The project owner shall ensure that the PRS submits the summary of monitoring and paleontological activities in the MCR. When feasible, the CPM shall be notified 10 days in advance of any proposed changes in monitoring different from the plan identified in the PRMMP. If there is any unforeseen change in monitoring, the notice shall be given as soon as possible prior to implementation of the change.

Project Description

I. Introduction

A. Name: Clay Jensen and Susan Strachan

B. Qualifications: The panel's qualifications are as noted in their resumes contained in Appendix A.

C. Prior Filings: In addition to the statements herein, this testimony includes by reference the following documents submitted in this proceeding:

- Application for Certification, Volume 1 & Volume 2, dated August 5, 2011 [Exhibit 1]
- Applicant's Supplemental Data Response, Set 2 (Boiler Optimization), dated April 2, 2012. Response to Data Request PD-1 [Exhibit 46]
- Applicant's Supplemental Data Response, Set 3, dated April 18, 2012. Response to Data Request PD-2 [Exhibit 47]
- Applicant's Presentation at the Informational Hearing, dated November 3, 2011 [Exhibit 54]
- Applicant's Relocation of the Switchyard and Gas Metering Station Letter, dated August 10, 2012 [Exhibit 62]
- Applicants Updated Workforce Analysis dated October 1, 2012 [Exhibit 63]
- Applicant's Preliminary Staff Assessment Comments, Set 2, dated July 23, 2012 [Exhibit 69]

To the best of our knowledge, all of the facts contained in this testimony (including all referenced documents) are true and correct. To the extent this testimony contains opinions, such opinions are our own. We make these statements, and render these opinions freely and under oath for the purpose of constituting sworn testimony in this proceeding.

II. Summary of Testimony

The Hidden Hills Solar Electric Generating System (HHSEGS) project is being developed by Hidden Hills Solar I, LLC, and Hidden Hills Solar II, LLC (collectively, the Applicant). Each of these entities will own its respective plant individually, and together the entities will own the shared facilities located in an onsite common area as tenants in common. The Applicant intends to acquire a leasehold estate in privately held land as the site for their respective plants and the common area.

HHSEGS will comprise two solar fields and associated facilities: the northern solar plant (Solar Plant 1) and the southern solar plant (Solar Plant 2). Each solar plant will generate 270 megawatts (MW) gross (250 MW net), for a total net output of 500 MW. HHSEGS will be located on approximately 3,096 acres (4.8 square miles) of privately owned land in Inyo County, California, adjacent to the Nevada border (Table PD-1). The project site is approximately 18 miles south of Pahrump, Nevada, and approximately 45 miles west of Las Vegas, Nevada.

TABLE PD-1.
Breakdown of Disturbed Area in Acres and by Impact Category

Facility	Distance (miles)	Temporary Impacts (acres)	Long-term Impacts (acres)	TOTAL Acres
Solar Generation Area				
Solar Plant 1			1,483.1	1,483.1
Solar Plant 2			1,510.1	1,510.1
Subtotal Solar Plants			2,993.2	
Common Area				
Administration/Warehouse			4.8	4.8
Switchyard			3.0	3.0
Gas metering Station			0.7	0.7
Remaining Construction Area			94.5	94.5
Temporary Construction Laydown Area		180.1		180.1
TOTAL PROJECT AREA		**180.1**	**3,096.2**	**3,276.3**
Credit for Existing Dirt Roads Onsite[a]	18.7			(61.0)
Credit for Orchard & Disturbed Areas Onsite				(16.0)
NET AFFECTED AREA				**3,199.3**

[a] Based on GIS data from aerial photos

A. Project Components

This section describes the elements associated with the proposed project design, including the heliostat (mirror) fields, the power blocks, water supply and treatment, wastewater management, linear corridors within California, switchyard, networks of access roads and drive zones, fire protection systems, and an administration/maintenance complex.

Solar Fields

Each solar plant will use heliostats—elevated mirrors guided by a tracking system mounted on a pylon —to focus the sun's rays on a solar receiver steam generator (SRSG) atop a tower near the center of each solar field. In each plant, one Rankine-cycle steam turbine will receive steam from the SRSG (or solar boiler) to generate electricity. The solar field and power generation equipment will start each morning after sunrise and will shut down (unless augmented by the auxiliary boilers) when insolation drops below the level required to keep the turbine online. To save water in the site's desert environment, each plant will use a dry-cooling condenser. Cooling will be provided by air-cooled condensers, supplemented by a partial dry-cooling system for auxiliary equipment cooling. Raw water will be drawn daily from two onsite wells located in each power block and from a well at the administration building. Groundwater will be treated by onsite treatment system for use as boiler make-up water and to wash the heliostats.

Each of the power blocks will be connected via underground and overhead generation tie (gen-tie) lines to the onsite switchyard in the common area. Each power block will also have a gas metering set. Permanent parking areas will be provided at each power block for operations and maintenance personnel.

Common Area

A 103-acre common area will be established on the southeastern corner of the site to accommodate an administration, warehouse, and maintenance complex; an onsite substation; asphalt-paved visitor and employee parking area; and landscape areas. The administration complex will occupy approximately 4.8 acres within the common area and will be served by power from the local 33-kV distribution system and water from water supply wells located in the common area. The common area will also be used for temporary construction parking areas, construction trailers, and other construction support facilities. The surface areas within the common area that are used for construction will be stabilized and dust suppression applied.

Temporary Construction Laydown Area

The 180-acre temporary construction laydown area on the west side of the site will be used for equipment laydown, construction parking, construction trailers, a tire cleaning station, heliostat assembly buildings, and other construction support facilities. The surface areas within the temporary construction area that are used frequently will be stabilized and dust suppression maximized with a layer of crushed stone in areas subject to heavy daily traffic.

Access Roads and Drive Zones

Project access will be from Tecopa Road to the project entrance road on the east side of the project. Tecopa Road is an existing two-lane paved road. Secondary access will be from Tecopa Road along the west side of HHSEGS, then along the paved road between the two solar plants.

The internal roadway and utility corridors for each heliostat field and its power block will contain a 20-foot-wide paved or hardscape access road from the entrance of the solar plant site to the power block, and then around the power block.

In addition to the paved or hardscaped 20-foot-wide access road to the power block of each unit, unpaved maintenance paths will radiate out from the power block to provide access through the solar field to the internal perimeter access road. Within the heliostat fields, 10-foot wide “drive zones” will be located concentrically around the power block to provide access to the heliostat mirrors for maintenance and cleaning. The drive zones will be located approximately 152 feet apart and will be grubbed to remove vegetation and smoothed. A 12-foot-wide unpaved path will be constructed on the inside perimeter of the project boundary fence for use by HHSEGS personnel to monitor and maintain perimeter security and tortoise exclusion fencing. These paths will be grubbed, bladed, and smoothed to facilitate safe use with minimal grading where necessary to cross washes.

Water Supply

Water required for operations will be provided via six onsite wells. Groundwater will go through a treatment system for use as boiler make-up water and to wash the heliostats, and water consumption will be minimal (estimated at a total of 140 acre-feet/year). The onsite groundwater production wells will supply both solar plants and the administration complex with make-up water, mirror-wash water, and domestic water. Each solar plant will include a water treatment and deionizing facility in the power block area. No reject streams from water treatment are planned to be generated onsite under the treatment scheme. A thermal evaporator system will be used to reduce the volume of the process wastewater stream or storm water streams that cannot be recycled back to the service water tank. The reject from the thermal evaporator will be trucked offsite for disposal at an approved facility.

Each solar plant and the administration complex will include a septic tank and leach field system for sanitary streams, including showers and toilets. When needed, septic tank contents will be removed from the site by a sanitary service.

Linear Corridors

The HHSEGS project will require both a 230 kV gen-tie line to allow the transmission of electricity generated by the project to reach electricity consumers and a 12-inch natural gas pipeline to provide fuel for the natural gas boilers. The transmission line will exit the HHSEGS site from the common area and cross over the state line into Nevada and continue east to its intersection with Tecopa Road. There, it will turn northeast following the west side of Tecopa Road about 9.25 miles (total) to Nevada State Route (SR) 160 where it will tap into a new 230/500 kV tap station at the intersection of SR 160 and Tecopa Road (the "SR 160/Tecopa Road" transmission option). The natural gas line will exit the onsite gas metering station in a similar manner, cross the state line into Nevada, and then cross Tecopa Road, following a southeasterly route until it taps into the Kern River Gas Transmission main located near the existing Goodsprings compressor station, about 32.4 miles away.

Major Facility Components

Electricity is produced by each solar plant's STG. The following sections describe the major components of the generating facility.

Solar Field

Each of the heliostat assemblies is composed of two mirrors, each approximately 12 feet high by 8.5 feet wide with a total reflecting surface of 204.7 square feet. Each heliostat assembly is mounted on a single pylon, along with a computer-programmed aiming control system that directs the motion of the heliostat to track the movement of the sun. Communication between the heliostats and the operations center will be done via surface-mounted anchored cable or wireless remote system. The solar field for each solar plant will consist of approximately 85,000 heliostats.

Solar Plants

The following provides further details regarding the two 270-MW solar plants.

- The solar power tower structure height is approximately 620 feet tall.
- The SRSG located at the top of the solar power tower is approximately 160 feet tall, resulting in an overall height of approximately 750 feet, not including any additional appurtenances on the top.
- No heliostat will be built closer than 394 feet from the solar power tower location.
- For Solar Plant 1, the distance between the solar power tower and the farthest heliostat in the solar field, approximately 7,660 feet, is in the northwest section of the heliostat array. For Solar Plant 2, the longest distance between the solar power tower and the farthest heliostat in the solar field, approximately 6,523 feet, is in the northeast section of the heliostat array. Generally, this is due to the higher efficiency of heliostats in the northern section in the northern hemisphere. With the sun predominantly in the southern sky, the cosine effect of incidence and reflection angles are less in the northern heliostats than in the southern ones. The converse (lower collection efficiency in the southern section) is also true, and, therefore, the maximum southern arc radius is the shortest.

- The eastern sector heliostat energy collection is more valuable than the western sector collection because afternoon energy collection, during on-peak utility hours, is more valuable than morning energy collection, during part-peak or off-peak hours.

Steam Turbine Generator

The steam turbine system consists of a condensing STG with gland steam system, lubricating oil system, hydraulic control system, and steam admission/induction valving. High pressure (HP) steam from the SRSG superheater enters the HP steam turbine section through the inlet steam system. The steam expands through multiple stages of the turbine, driving the generator. On exiting the low pressure (LP) turbine, the steam is directed into the air-cooled condenser.

Natural Gas Boilers

Each solar plant will include two gas-fired boilers. The solar field and power generation equipment will start each morning after sunrise and will shut down when insolation drops below the level required to keep the turbine online. Each solar plant will include a 249 MMBtu/hr natural gas-fired auxiliary boiler that will be used to pre-warm the SRSG to minimize the amount of time required for startup each morning, to assist during shutdown cooling operation, and to augment the solar operation during the evening shoulder period as solar energy diminishes. In addition, a small natural gas-fired nighttime preservation boiler will be retained and used to maintain system temperatures overnight.

Fire Protection

The fire protection system will be designed to protect personnel and limit property loss and plant downtime in the event of a fire. The system will be designed to limit the spread of any fire generated at the plant site to adjacent land to avoid igniting a wildland fire. The primary source of fire protection water will be the raw water storage tank.

C. Project Objectives

The Applicant's project objectives are described in more detail in the body of the AFC. Some of the basic project objectives include the following:

- To safely and economically construct and operate a net 500 MW, solar electric generating facility in California capable of selling competitively priced renewable energy, consistent with the procurement obligations of California's publicly owned and privately owned utilities
- To use BrightSource's proprietary technology in another utility-scale project, further proving the technical and economic viability of the technology
- To locate the solar electric generating facility in an area of high solarity
- To reduce stormwater impacts by selecting a site with minimal slope, predominately 5 percent slope or less
- To site the project in a timely manner by minimizing potentially significant impacts and complying with applicable LORS
- To secure site control within a reasonable timeframe and a reasonable effort
- To locate the solar electric generating facility on land that has been identified by local governments as suitable for renewable energy development
- To assist California in repositioning its generation asset portfolio to use more renewable energy in conformance with state policies, including the policy objectives set forth in Senate Bill

(SB) 1078 (California RPS Program), Assembly Bill (AB) 32 (California Global Warming Solutions Act of 2006), and SB X 1-2 (the California Renewable Energy Resources Act) recently signed by Governor Brown codifying the 33 percent RPS by 2020

- To comply with provisions of power sales agreements to develop a net 500 MW solar generating facility that can interconnect to the CAISO Balancing Authority with the potential of achieving a commercial on-line date as soon as possible, targeted for the first/second quarter of 2015
- To provide renewable power capable of providing grid support by offering power generation that is flexible, and delivered to the grid operator through communications with a scheduling coordinator
- To generate renewable electricity that will be qualified as meeting the RPS requirements of the CEC, California Public Utility Commission, and the Western Renewable Energy Generation Information System program for tradable renewable energy credits

Proprietary Technology

The solar power tower and arrangement of the heliostat field is part of BrightSource Energy's proprietary technology. In addition, the solar power tower technology for the HHSEGS project design incorporates an important technology advancement, the 750-foot-tall solar power tower. One principle advantage of the HHSEGS solar power tower design is that it results in more efficient land use and greater power generation. The new, higher, 750-foot solar power tower (with 10-foot appurtenances) allows the heliostat rows to be placed closer together, with the mirrors at a steeper angle. This substantially reduces mirror shading and allows more heliostats to be placed per acre. More megawatts can be generated per acre and the design is more efficient overall.

Construction Schedule

Construction of HHSEGS, from perimeter fencing to site preparation and grading to commercial operation, is expected to take place from the first quarter of 2013 to the third quarter of 2015 (29 months total). Major milestones are listed in Table PD-2; however, the construction order may change. Construction of the common area facilities would occur concurrently with the construction of the first plant.

TABLE PD-2
Project Schedule Major Milestones

Activity	Date
Solar Plant 1	
Fencing	First Quarter 2013
Tortoise clearance and begin construction	Second Quarter 2013
Startup and commissioning	First Quarter 2015
Commercial operation	Second Quarter 2015
Solar Plant 2	
Fencing	First Quarter 2013
Tortoise Clearance and begin construction	Third Quarter 2013
Startup and commissioning	Second Quarter 2015
Commercial operation	Third Quarter 2015

There will be an average onsite workforce of 1,087 and peak workforce of approximately 2,293 for construction of HHSEGS. Those numbers include construction craft people, supervisory, support, and construction management personnel. The peak construction site workforce is expected to occur in Month 19.

D. Project Benefits

Environmental

HHSEGS will employ advanced, high-efficiency solar power tower technology. This renewable energy source will provide net 500 MW of dependable power to the grid, generally during the hours of peak power consumption by the interconnecting utilities. Because natural gas will only be used for supplemental heat, air emissions will be minimal. HHSEGS will also minimize groundwater use. Air-cooled condensers will be used to cool the steam and water will be reused in the facility, with an estimated use of no more than 140 acre-feet per year for both solar plants. In addition, about half the site is not considered to be suitable desert tortoise habitat.

Employment

HHSEGS will provide for a peak of approximately 2,293 construction jobs at the site, with an average of 1,087 construction jobs over the 29-month construction period. In addition, it will provide approximately 100 full-time, living-wage jobs throughout the life of the project.

Financial

HHSEGS is expected to bring both sales tax and property tax revenue to Inyo County and California. In accordance with California state tax law, HHSEGS qualifies for the exclusion of certain parts from valuation per the Revenue and Taxation Code. Assuming the property tax exemptions apply, Inyo County would receive about $3.52 million annually in property taxes. This additional property tax revenue would constitute an almost 21 percent increase in the total county taxes received over fiscal year 2010 amounts. As such, the additional property tax revenues generated by the HHSEGS would ***significantly benefit*** Inyo County.

Land Use

The project site is located on privately-owned land, thereby reducing the impacts generally associated with large renewable projects that are often located on public lands. The site was previously disturbed by grading of dirt roads across the site to facilitate residential development.

In addition, this use provides a greater tax base for Inyo County than the residential development (which is typically a drain on governmental resources) that had previously been approved for this area. Not only will more temporary construction jobs be created, but the project will generate operational jobs throughout its life.

The solar power tower also provides a more efficient use of land than large photovoltaic (PV) projects. As explained in detail in Table ALT-3 of the Applicant's Alternatives Testimony, the PV projects cited in the FSA Alternatives analysis would require much more land to produce the same amount of energy as the proposed Project. In order to produce an equivalent amount of energy, the PV projects cited by staff would on average require a 45% increase in acreage compared to the proposed project site. Put differently, on the same project site, the PV alternatives would produce 30.5% less energy on average. Applicant's Alternatives testimony details how the proposed Project represents a far more efficient use of land in terms of annual energy production when compared to the PV alternative.

Renewable Energy without the Limitations of Competing Technologies

HHSEGS will assist California in repositioning its generation asset portfolio to use more renewable energy and reduce greenhouse gas emissions in conformance with state policies as set forth in SB 1078, AB 32, and SBX 1-2. It will help diversify the state's electricity sources, reducing its dependence on natural gas-fired power plants.

Renewable technologies are not "fungible"; that is, different technologies have different attributes. The HHSEGS solar power tower technology offers many advantages over other renewable technologies, most notably, photovoltaic (PV) technology. PV does not provide flexible generation. Intermittency and variability of PV plants, especially those that use fixed-axis technologies that cannot track the sun over the course of the day, brings into question their suitability for large-scale generation. In marked contrast, from the utilities' standpoint, solar thermal power plants in general enjoy substantial operational benefits.

The HHSEGS' design uses solar energy to heat water into superheated steam that drives a turbine connected to a synchronous rotating generator connected to the transmission system. Thermal and rotating equipment contain inertia that serves to "smooth" generation, as well as provide other grid-stabilizing benefits, such as VARs, active power control, and governor control.

The HHSEGS also has the particular ability to increase or decrease the number of heliostats focusing on the receiver to account for variability in time of day and season further stabilizing the generation profile, or shaping to profile to meet system needs. The HHSEGS can decrease or "turn down" excess mirrors when available solar energy is greater than can be absorbed by the receiver system and converted to electricity by the turbine. Similarly, toward the end of the day or, during times of lesser insolation in winter months, HHSEGS can increase the number of heliostats focused on the receiver to increase production and extend the generating day. These capabilities have the effect of reducing the variability of output of the HHSEGS tower technology. For example, each unit in the HHSEGS project will generate at its maximum rating for at least 40 percent of all sunlit hours despite the fact that insolation will be quite variable during those hours—while a corresponding PV plant will be highly variable at all times.

E. Summary of Compliance with Applicable LORS

As demonstrated in each section of this testimony, the project is in compliance with all applicable LORS.

III. Response to Certain Issues Raised in the FSA

A. Several Cumulative Projects Used in the FSA are Not Closely Related to the Project

CEQA Guidelines Section 15355 require that the cumulative impacts of the project be assessed in relation to "closely related" past, present, and reasonably foreseeable future projects. The Hidden Hills Master List of Cumulative Projects (Table 3, pp. 1.1-10 and 1.1-11) in the FSA contains many projects that are not closely related to the HHSEGS project. Many of these projects are far outside any relevant natural resource boundary that is relevant to environmental analysis—outside the viewshed, noiseshed, or watershed of the project. The Applicant listed the following three closely related projects in the AFC because these projects were in close proximity to the project site and within the same viewshed or watershed: St. Therese Mission, Pahrump Airport, and Element Solar. Despite our request in comments on the PSA, the FSA does not include an explanation describing

clearly why the other projects listed in the FSA are "closely related" and does not identify the relevant resource boundary that makes the listed projects related. Therefore, the Commission should reject FSA Table 3 (Hidden Hills Master List of Cumulative Projects), and use instead the list of reasonably foreseeable future projects identified in AFC Section 5.6.7.2 (Reasonably Foreseeable Future Actions in the Vicinity of HHSEGS).

B. Key FSA Definitions Need Clarification

FSA Page 7-1, General Conditions, Key Project Event Definitions: The FSA introduces revised definitions of Site Assessment and Preconstruction Activities, Site Mobilization and Construction, and Ground Disturbance Activities compared to previous CEC licensing decisions. These definitions are somewhat confusing and overlapping. Therefore, the Applicant requests the language on page 7-2 of the FSA be revised as follows:

> Regulatory definitions of ground disturbance or site mobilization vary. To ensure adequate compliance with all conditions of certification and applicable LORS the following definitions apply.
>
> **Site Assessment and Preconstruction Activities**
>
> Site Assessment and preconstruction activities include the following, but only to the extent the activities are minimally disruptive to soil and vegetation and will not affect listed or special-status species or other sensitive resources:
>
> 1. the installation of environmental monitoring equipment;
> 2. a minimally invasive soil or geological investigation;
> 3. a topographical survey;
> 4. any other study or investigation to determine the environmental acceptability or feasibility of the use of the site for any particular facility;
> 5. any minimally invasive work to provide safe access to the site for any of the purposes specified in 1-4 above, including installation and use of groundwater wells for dust suppression
>
> Many of the Energy Commission's conditions of certification require compliance submittals prior to the start of construction, hence the term "preconstruction." When technical staff and the CPM have approved all preconstruction conditions and the project has been certified, then site assessment and preconstruction activities can occur.
>
> **Pre-Construction Site Mobilization ~~and Construction~~**
>
> For compliance monitoring purposes, the definition of site mobilization ~~and construction includes both a calendar date and the activities necessary to provide site access for construction mobilization and facility installation activities including both temporary and permanent equipment and structures. Site Mobilization and construction activities include, but are not limited to,~~ activities includes preconstruction activities at the site to allow for the installation of fencing, construction trailers, construction trailer utilities, and construction trailer parking at the site. Limited ground disturbance, grading, and trenching associated with the above-mentioned pre-construction activities is considered part of site mobilization. Walking, driving or parking a passenger vehicle, pickup truck and/or light vehicles is allowable during site mobilization.

Construction

Onsite work to install permanent equipment or structures for any facility.

Ground Disturbance

Construction-related ground disturbance refers to activities that result in the removal of top soil or vegetation at the site beyond site mobilization needs, and for access roads and linear facilities,

~~1. ground disturbance activities like grading, boring, trenching, leveling, mechanical clearing, grubbing, and scraping;~~

~~2. site preparation activities such as access roads, temporary fencing, construction trailer and utility installation, construction equipment installation and storage,~~ equipment and supply laydown areas, borrow and fill sites, temporary parking facilities, chemical spraying, and controlled burns~~;~~.

~~3. permanent installation activities for all facility and linear structures including access roads, fencing, utilities, parking facilities, equipment storage, mitigation and landscaping activities, and other installations as applicable.~~

Grading, Boring, Trenching, Leveling, Mechanical Clearing, Grubbing, Scraping

Construction-related activities that result in subsurface soil work at the site and for access roads and linear facilities, e.g., alteration of the topographical features such as leveling, removal of hills or high spots, moving of soil from one area to another, and removal of soil.

C. Another FSA Correction

FSA Page 3.1-4, Solar Plants, Bullet #1: Please revise the text as follows, "The SRSG located at the top of the 590 foot tall solar power tower is approximately 160 feet tall, resulting in an overall power tower height of approximately 750 feet, not including any additional appurtenances on the top."

IV. Proposed Licensing Conditions

The FSA recommends adoption of 15 Conditions of Certification that address general conditions, including compliance monitoring and closure of the facility. The Applicant accepts Conditions of Certification: COMPLIANCE-2, 3, 4, 5, 7, 8, 9, 12, 13, and 14 and requests changes or deletion of COMPLIANCE-1, 6, 10, 11, and 15. The changes requested and reasons for them are described below.

CONDITION COM-1, UNRESTRICTED ACCESS

Please add this sentence to COM-1. It is necessary to ensure personnel safety and to protect biological and other resources on the project site.

COM-1: UNRESTRICTED ACCESS

The CPM, responsible Energy Commission Staff, and delegated agencies or consultants are guaranteed and granted unrestricted access to the power plant site, related facilities, project-related staff, and the records maintained on-site to facilitate audits, surveys, inspections, or general site visits. Although the CPM will normally schedule site visits on dates and times agreeable to the project owner, the CPM reserves the right to make unannounced visits at any time. While on-site, the CPM, Energy Commission Staff, other agency staff and all

consultants will comply with all applicable site environmental, safety and health programs, and other related project requirements.

CONDITION COM-6, MONTHLY COMPLIANCE REPORT/KEY EVENT LIST

Based on experience at Ivanpah SEGS, the preparation of the Monthly Compliance Report (MCR) is an extensive, costly and burdensome exercise. The MCR requires the coordination of multiple working teams to assemble, review and publish the document on a monthly basis. A minimum of 15 days after the end of the reporting month is necessary to complete each report. Therefore, the second paragraph of COM-6 should be revised to provide 15 days, rather than 10 days, to produce the report.

COM-6: Monthly Compliance Report/Key Event List

The first Monthly Compliance Report is due thirty (30) days following the docketing of the Energy Commission's Final Decision unless otherwise agreed to by the CPM. The first Monthly Compliance Report shall include the AFC number and an initial list of dates for each of the events identified on the **Key Events List. The Key Events List** form is found at the end of these **General Conditions**.

During preconstruction and construction of the project, the project owner or authorized agent shall submit an electronic searchable version of the Monthly Compliance Report within ~~ten~~ fifteen ~~(10)~~ (15) days after the end of each reporting month. Monthly Compliance Reports shall be clearly identified for the month being reported. The searchable electronic copy may be filed on an electronic storage medium or by e-mail, subject to CPM approval. The reports shall contain, at a minimum:

1. a table of contents clearly identifying by title and page number of each section, table, graphic, exhibit or addendum;

2. a summary of the current project construction status, a revised/updated schedule if there are significant delays, and an explanation of any significant changes to the schedule;

3. documents required by specific conditions to be submitted along with the Monthly Compliance Report. Each of these items must be identified in the transmittal letter, as well as the conditions they satisfy, and submitted as attachments to the Monthly Compliance Report;

4. an initial, and thereafter updated, compliance matrix showing the status of all conditions of certification;

5. a list of conditions that have been satisfied during the reporting period, and a description or reference to the actions that satisfied the condition;

6. a list of any submittal deadlines that were missed, accompanied by an explanation and an estimate of when the information will be provided;

7. a cumulative listing of any approved changes to the conditions of certification;

8. a listing of any filings submitted to, or permits issued by, other governmental agencies during the month;

9. a projection of project compliance activities scheduled during the next two months. The project owner shall notify the CPM as soon as any changes are made to the project construction schedule that would affect compliance with conditions of certification;

10. a listing of the month's additions to the on-site compliance file; and

11. a listing of complaints, notices of violation, official warnings, and citations received during the month, a description of the actions taken to date to resolve the issue, and the status of any unresolved actions.

CONDITION COM-10, SITE CONTINGENCY PLANS

We recommend this condition be deleted in its entirety. The Applicant has multiple concerns with Staff's recommended Condition of Certification COM-10. The condition requires duplication of large volumes of information already required in other Conditions of Certification. A large part of the information being requested has been thoroughly analyzed in the Application for Certification, Preliminary Staff Assessment, and Final Staff Assessment. The requested contingency plans are similarly required in other Conditions of Certification. For example, Fire and accidents will be addressed in the plans required under WORKER SAFETY-1 and 2. Contingency plan information is also addressed in COM-14. The condition also requires submission of information, such as major equipment warranties, that are not relevant to the CPM's role at the facility.

CONDITION COM-11, UNEXPECTED INCIDENT REPORTING REQUIREMENTS

Notification of an incident to the CPM or COM within 1 hour is many times not feasible. The time required to properly assess the incident and assure that the incident is being properly addressed may take significantly more than 1 hour. The appropriate personnel should be given adequate time to respond to the incident itself before notifying third parties. COM-11 should be revised to increase the notification requirement to 4 hours.

Parts A and B, Item 3. The reference to reporting "off-site" incidents is undefined and unexplained. In the absence of a clear definition of the term "off-site" and an explanation of how such incidents are within the jurisdiction of the Commission, this provision should be deleted.

Part C. This part should be revised to increase the required time to submit an incident report to 1 workday following the request to allow for the possibility of a request being received just before a weekend or holiday.

Please revise COM-11 as follows:

COM-11: UNEXPECTED INCIDENT REPORTING REQUIREMENTS

In the event of any incident requiring any emergency response, including but not limited to, a response from fire, hazardous materials, medical, or police emergency services (as a result, for example, of personal injury, hazardous materials spill, flood, fire, or explosion, etc), the project owner shall:

A. Notify the CPM or COM directly within ~~one~~ four (~~1~~) (4) hours by phone of the circumstances, current status, and expected duration of all accidents,

emergencies, and other abnormal incidents at the facility or appurtenant facilities, that have resulted or could result in any of the following situations:

1. Reduction in the facility's ability to respond to dispatch (excluding forced outages caused by protective equipment or other typically encountered shut down events);

2. Health and safety impacts on the surrounding population;

~~3. Property damage off-site;~~

4. Response by off-site emergency response agencies;

5. Serious on-site injury;

6. Significant environmental damage;

7. Filing of bankruptcy by the owner or operator of the facility; and/or

8. Emergency reporting to any federal, state, or local agency.

B. Submit to the CPM a detailed report describing the incident and any impacts as described in ***section A*** within thirty (30) days that shall include, as appropriate to the incident, the following information:

1. A brief description of the incident including its date, time and location;

2. A description of cause of the incident, or likely causes if it is still under investigation;

~~3. The location of any off-site impacts;~~

4. A description of emergency response actions associated with the incident;

5. Identification of responding agencies;

6. Identification of emergency notifications made to other federal, state, and/or local agencies;

7. Identification of any hazardous materials released and an estimate of the quantity released;

8. A description of any injuries, fatalities, or property damage that occurred as a result of the incident;

9. Fines or violations assessed or being processed by other agencies;

10. Name, phone number, and email address of the appropriate facility contact person having knowledge of the event; and

11. Corrective actions or repairs necessary, a proposed schedule, and potential cost to restore the facility to acceptable performance and availability.

C. Maintain records of the ***incident*** report(s) described in ***sections A and B*** for the life of the project. Additionally, the project owner shall submit to the CPM copies of these project reports within ~~twenty-four (24) hours~~ one (1) business day of an email, phone, mail, or in person request.

CONDITION COM-15, FINANCIAL ASSURANCE FOR CLOSURE

This condition should be deleted. The Commission should not require "financial assurances" any greater than the assurances required of other projects that have been licensed by the Commission.

The Commission has previously found that it is not necessary to require a project owner to post financial guarantees in order to ensure financial responsibility for decommissioning a power plant (see Sutter Power Plant Project Final Decision (97-AFC-2), pp. 293-295). The Commission has held that the requirement to submit a specific closure plan is all that is reasonably necessary to ensure that mitigation measures and additional closure conditions will be implemented to prevent any significant impacts to the environment and public health and safety. Such a condition, COM-14, has been proposed to ensure proper decommissioning of the project, in accordance with the LORS in place at the time of decommissioning.

As in the Sutter case, there is no evidence in the record of this proceeding that would lead the Commission to conclude that the project owner will not have the financial resources necessary to carry out any reasonably anticipated closure measures at the time the facility ceases operation.In this instance, the Applicant has more than sufficient resources to decommission the site. The salvage value of the plant alone is more than sufficient to offset the costs to decommission the facility. The HHSEGS project will have several pieces of salvageable equipment, including step-up transformers, steam turbine generator sets, emergency generators, and steam turbine feed pumps. As described in Tables PD-3 and PD-4 (at the end of this testimony) the estimated revenue from salvaging this equipment is $25,712,940.00. In addition, because the steel, aluminum, copper, glass, and other components and parts of the facility will be recycled, as required by applicable law, the likely estimated revenue from recycling is $14,296,136. The combined estimated $40,009,076 value of these salvageable and recyclable pieces of equipment exceeds the costs to decommission the facility, which, as set forth in Table PD-5 (at the end of this testimony), is estimated at $33,966,030.

As to the FSA's proposed revegetation of the site, it is premature to require revegetation as a condition of certification. If, after closure of HHSEGS, the project owner decides to use the project site for another solar project or other form of development, then revegetation would be unnecessary and wasteful. Therefore, revegetation should be the option of the property owner, and should not be dictated by the Commission.

Should revegetation of the site be required by the property owner, the estimated cost of restoring the disturbed areas of the site to pre-project conditions is $688,600. This figure assumes restoration of approximately 313 acres. However, even if the estimated disturbance of 851 acres from SOILS&SURFACE WATERS Table 6 in the FSA are used, the estimated cost of restoring the site is only $1,872,200. As explained above, the revegetation cost is more than covered by the funds that will be received from salvage and recycling of project parts.

There is no evidence in the record that would lead the Commission to conclude that the project owner does not, or will not have the financial resources necessary to carry out any reasonably

anticipated closure measures at the time the facility ceases operation. Therefore, because the salvage and recycling value of the plant alone is more than sufficient to ensure decommissioning of the facility and restoration of the site, the COM-15 is unnecessary and should be deleted.

V. Correlation to FSA and Hearing Topics:

Introduction, Project Description, and General Conditions

TABLE PD-3
ESTIMATED REVENUE FROM RECYCLING MATERIALS

Description	Unit	Common Volume	Unit 1 Volume	Unit 2 Volume
STEEL				
Material Sources				
Turbine Generator	*Ton*	-	*225*	*225*
Boiler	Ton	-	45	45
Air Condenser	Ton	-	700	700
Feed Water Heaters	Ton	-	120	120
Deaerator	Ton	-	9	9
Water Storage Tanks	Ton	720	753	753
Turbine Lube System	Ton	-	1	1
Emergency Generator (500kW)	Ton	*10*	-	-
Emergency Generator (2500kW)	*Ton*	-	*24*	*24*
Diesel Fire Pump	Ton	9	9	9
HVAC	Ton	-	15	15
Switchyard Buses and Towers	Ton	3	3	3
Solar Arrays (Poles & H-Frames)	Ton	-	9,120	9,120
Rebar (recycle 60% only)	Ton	-	239	239
Buildings	Ton	61	19	19
Pipe	Ton	-	279	279
Underground	Ton	-	164	164
Total Material Volume	**Ton**	**803**	**11,725**	**11,725**
Total Material Volume (Common Area split between units)	**Ton**	**-**	**12,126**	**12,126**
Recycle Value Income				
Possible Low	$ 240	$	2,910,240	$ 2,910,240
Possible High	$ 330	$	4,001,580	$ 4,001,580
Most Likely	$ 290	$	3,516,540	$ 3,516,540
Transportation Costs				
To Las Vegas	$ 69.31	$	(840,453)	$ (840,453)
Total Possible Revenue				
Most Likely		$	2,676,087	$ 2,676,087
ALUMINUM				
Material Sources				
Heliostat Grounding Rods	Ton		2,482	2,482
Air Cooled Condenser	Ton		100	100
Pipe Racks / Cable Trays	Ton		3	3
Utility Poles (30 feet) (lighting)	Ton	11	52	52
HVAC and Refrigerant System	Ton		90	90
Total Material Volume	**Ton**	**11**	**2,727**	**2,727**
Total Material Volume (Common Area split between units)	**Ton**	**-**	**2,732**	**2,732**
Recycle Value Income	Ton			
Possible Low	$ 460	$	1,256,720	$ 1,256,720
Possible High	$ 1,540	$	4,207,280	$ 4,207,280
Most Likely	$ 1,400	$	3,824,800	$ 3,824,800
Transportation Costs				
To Las Vegas	$ 69.31	$	(189,355)	$ (189,355)
Total Possible Revenue				
Most Likely		$	3,635,445	$ 3,635,445

TABLE PD-3
ESTIMATED REVENUE FROM RECYCLING MATERIALS

Description	Unit	Common Volume	Unit 1 Volume	Unit 2 Volume
COPPER				
Material Sources				
Power Supply Cabling	Ton	-	4.62	4.62
Air Compressors / Inst Air	Ton	-	2.70	2.70
Turbine Generator	*Ton*	-	*131.25*	*131.25*
220 kV wire	Ton	-	19.50	19.50
Air Cooled Condenser	Ton	-	600.00	600.00
HVAC and Refrigerant System	Ton	-	15,00	15,00
Total Material Volume	**Ton**	**-**	**773**	**772**
Total Material Volume (Common Area split between units)	**Ton**		**773**	**773**
Recycle Value Income				
Possible Low	$ 2,100		$ 1,623,300	$ 1,623,300
Possible High	$ 6,260		$ 4,838,980	$ 4,838,980
Most Likely	$ 3,420		$ 2,643,660	$ 2,643,660
Transportation Costs				
To Las Vegas	$ 69.31		$ (53,577)	$ (53,577)
Total Possible Revenue				
Most Likely			$ 2,590,083	$ 2,590,083
GLASS / MIRRORS				
MATERIAL SOURCES				
Glass Mirrors	Ton	-	21,810	21,810
Total Material Volume	**Ton**	-	**21,810**	**21,810**
Total Material Volume (Common Area split between units)	**Ton**	-	**21,810**	**21,810**
Recycle Value Income				
Possible Low	$ 4.50		$ 98,145	$ 98,145
Possible High	$ 25.50		$ 556,155	$ 556,155
Most Likely	$ 4.90		$ 106,869	$ 106,869
Transportation Costs				
To Las Vegas	$ 69.31		$ (1,511,651)	$ (1,511,651)
Total Possible Revenue				
Most Likely			$ (1,404,782)	$ (1,404,782)
BATTERIES				
MATERIAL SOURCES				
Heliostat Batteries	Ton	-	850	850
Stationary Batteries	Ton	-	6	6
Total Material Volume	**Ton**	-	**856**	**856**
Total Material Volume (Common Area split between units)	**Ton**	-	**856**	**856**
Recycle Value Income				
Possible Low	$ 280.00		$ 239,680	$ 239,680
Possible High	$ 360.00		$ 308,160	$ 308,160
Most Likely	$ 300.00		$ 256,800	$ 256,800
Transportation Costs				
To Las Vegas	$ 69.31		$ (56,329)	$ (56,329)
Total Possible Revenue				
Most Likely			$ 200,471	$ 200,471

TABLE PD-3
ESTIMATED REVENUE FROM RECYCLING MATERIALS

Description	Unit	Common Volume	Unit 1 Volume	Unit 2 Volume
SUMMARY – ALL ABOVE MATERIALS (INCLUDING SALVAGE)				
Total Possible Revenue				
Most Likely			$ 7,697,304	$ 7,697,304
			Total (both units)	**$ 15,394,608**
SUMMARY- MATERIALS (NOT INCLUDING ITEMS IDENTIFIED AS POTENTIAL FOR SALVAGE)				
Total Possible Revenue				
Most Likely			$ 7,148,068	$ 7,148,068
			TOTAL (BOTH UNITS)	**$ 14,296,136**

(Note: Items in Italics have been identified as potential for salvage)

TABLE PD-4
ESTIMATED REVENUE FROM SALVAGING EQUIPMENT

	Estimated Value Range (Each)			**Estimated Value Range (Total)**			
	Low ($)	High ($)	Most Likely ($)	Quantity Available	Low ($)	High ($)	Most Likely ($)
21kV/230kV Step Up Transformers	2,437,500	4,062,500	3,250,000	2	4,875,000	8,125,000	6,500,000
250 MW Steam Turbine Generator Set	2,200,000	16,500,000	9,350,000	2	4,400,000	33,000,000	18,700,000
2500 kW Emergency Generator with Diesel Driver	90,000	210,000	150,000	2	180,000	420,000	300,000
Steam Turbine Feed Pump	10,140	202,800	106,470	2	20,280	405,600	212,940
TOTAL SALVAGE REVENUE					**$9,475,280**	**$41,950,600**	**$25,712,940**

TABLE PD-5
Decommissioning Cost Estimate with Equipment Salvaged and Remaining Material Recycled

DESCRIPTION	UNIT 1			UNIT 2		
	HOURS		COST	HOURS		COST
Solar Collection / Heliostats	96,770	$	2,621,102	96,770	$	2,621,102
Power Block						
Power Tower	1,187	$	1,790,708	1,187	$	1,790,708
Power Generation	2,514	$	232,321	2,514	$	232,321
Condenser & Cooling Towers	11,784	$	568,724	11,784	$	568,724
Process & Support Systems (Feed, Condensate, Water, Fire)	13,764	$	638,643	13,764	$	638,643
Transmission/Switchyard Areas	3,337	$	217,687	3,337	$	217,687
Unit Support					$	
Fencing	3,053	$	78,280	3,053	$	78,280
Roads	2,500	$	267,904	2,500	$	267,904
Gas Lines and buried piping	2,250	$	147,350	2,250	$	147,350
Buildings	5,853	$	178,493	5,853	$	178,493
Restore – Backfill/Re-contour	4,418	$	696,845	4,418	$	696,845
Subtotal	147,430	$	7,438,057	147,430	$	7,438,057
Common Area – Split Equally Between Units						
Power Production						
Transmission / Switchyard	8,454	$	264,065	8,454	$	264,065
Unit Support						
Buildings	15,750	$	480,318	15,750	$	480,318
Water Treatment & Tanks	2,759	$	127,529	2,759	$	127,529
Generator	21	$	945	21	$	945
Evaporation Ponds	243	$	65,229	243	$	65,229
Fencing	266	$	6,804	266	$	6,804
Road, Parking Lots, Paved Areas	3,279	$	332,774	3,279	$	332,774
Gas Lines and buried piping	2,565	$	167,979	2,565	$	167,979
Water Wells and piping	90	$	16,020	90	$	16,020
Restore – Backfill/Re-contour	1,998	$	321,986	1,998	$	321,986
Subtotal	35,425	$	1,783,649	35,425	$	1,783,649
Administration – Split Equally Between Units						
Project Management	46055	$	2879528	46055	$	2879528
Recycling Center Set Up	26501	$	579941	26501	$	579941
Equipment	312	$	4301840	312	$	4301840
Subtotal	72,868	$	7,761,309	72,868	$	7,761,309
TOTAL Cost (without Recycling and Salvage)		$	16,983,015		$	16,983,015
Recycling Revenue		$	7,148,068		$	7,148,068
Salvage Revenue		$	12,856,470		$	12,856,470
TOTAL Cost (with Recycling and Salvage)		$	(3,021,523)		$	(3,021,523)
TOTAL Cost (with Recycling and Salvage) Site					**$**	**(6,043,046)**

Public Health

I. Introduction

A. Name: Gary Rubenstein

B. Qualifications: Mr. Rubenstein's qualifications are as noted in his resume contained in Appendix A.

C. Prior Filings: In addition to the statements herein, this testimony includes by reference the following documents submitted in this proceeding:

- Application for Certification, Volume 1 & Volume 2, dated August 5, 2011 [Exhibit 1]
- Applicant's Data Response, Set 2E, dated May 4, 2012. Response to Data Request 185 [Exhibit 42]
- Applicant's Supplemental Data Response, Set 2, Boiler Optimization Plan and Design Change, dated April 2, 2012 [Exhibit 46]
- Applicant's Preliminary Staff Assessment Comments, Set 2, dated July 23, 2012. [Exhibit 70]

D. Documents Prepared By Others

- California Air Resources Board (CARB). n.d. HARP Model, Version 1.4d. Available at: http://www.arb.ca.gov/toxics/harp/harp.htm.
- California Air Resources Board (CARB). 2011. Consolidated Table of OEHHA/CARB Approved Risk Assessment Health Values. Updated February 14. Available at: http://arbis.arb.ca.gov/toxics/healthval/contable.pdf.
- California Air Resources Board (CARB). 2010. Hot Spots Risk Assessment. Available at: http://www.arb.ca.gov/ab2588/riskassess.htm
- California Air Resources Board (CARB). 2009a. *California Almanac of Emissions and Air Quality – 2009 Edition.* Available at http://www.arb.ca.gov/aqd/almanac/almanac09/almanac09.htm
- California Air Resources Board (CARB). 2009b. HARP On-Ramp Version 1, accessed at http://www.arb.ca.gov/toxics/harp/downloads.htm.

To the best of my knowledge, all of the facts contained in this testimony (including all referenced documents) are true and correct. To the extent this testimony contains opinions, such opinions are my own. I make these statements, and render these opinions freely and under oath for the purpose of constituting sworn testimony in this proceeding.

II. Summary of Testimony

The risk assessment for the project was conducted using the methodology and values for health risks developed by the California Office of Environmental Health Hazard Assessment (OEHHA). Emissions of non-criteria pollutants from HHSEGS were estimated using emission factors developed by the U.S. Environmental Protection Agency (USEPA). Air dispersion modeling was conducted following USEPA and CARB guidance for modeling. Health risks potentially associated with the estimated concentrations of pollutants in air were characterized in terms of potential lifetime cancer risk (for carcinogenic

substances), or comparison with reference exposure levels (RELs) for non-cancer health effects (for non-carcinogenic substances), using dose-response factors published by OEHHA.

A. Affected Environment

There are no ambient monitors measuring toxic air contaminants in Inyo County. However, air quality and health risk data presented for the upwind San Joaquin Valley Air Basin in CARB's 2009 Almanac of Emissions and Air Quality show that over the period 1990 through 2005, the average concentrations for the top ten toxic air contaminants (TACs) have been substantially reduced, and the associated health risks for the air basin are showing a steady downward trend as well.

The nearest residence to any power block equipment is approximately 3,500 feet south of the Plant 2 power block and about 800 feet south of the project's southern boundary. There are two trailers located approximately 360 feet south of the common area fenceline. No daycare, hospital, park, preschool, or school receptors were found within 6 miles. The St. Therese Mission, a commercial facility, is under construction approximately 0.5 mile southeast of the project site. Because this development is planned to include a chapel, garden, restaurant, a visitor center that will include a children's playground, and a residential unit, this future development was treated as a sensitive receptor in the health risk assessment performed for the project.

B. Potential Construction-Related Impacts; Avoidance and Minimization Measures

No significant public health effects are expected during construction. Construction-related emissions are temporary and localized, resulting in no long-term significant impacts to the public. Strict construction practices that incorporate safety and compliance with applicable LORS will be followed. In addition, measures to reduce impacts from construction air emissions will be implemented as described in the AFC.

C. Potential Operational-Related Impacts; Avoidance and Minimization Measures

No significant public health effects are expected during operation. The non-criteria pollutants emitted from Hidden Hills SEGS include certain volatile organic compounds (VOCs) and polycyclic aromatic hydrocarbons (PAHs) from the combustion of natural gas and diesel exhaust particulate matter (DPM) from combustion of diesel fuel in the emergency engines and maintenance vehicles.

D. Project Benefits

Beneficial aspects of HHSEGS regarding protection of public health include the following:

- Use of the sun to generate electricity, and limiting the size and operation of combustion devices at the facility.
- Use of clean-burning natural gas fuel.
- Low-sulfur content of the natural gas, which reduces sulfate fine particulate generation.
- Emission of significantly lower levels of TACs to the environment than most other energy sources available in California.

E. Summary of Compliance with Applicable LORS

The screening health risk assessment prepared for the project demonstrates that maximum potential project impacts are well below levels of concern. The estimated potential maximum cancer risks at the location of maximum impact are below the GBUAPCD's 1-in-one-million threshold for triggering additional analysis and well below the CEC's 10–in-one-million threshold of significance.

The maximum potential acute non-cancer health hazard indexes for 1-hour and 8-hour exposures associated with concentrations in air fall well below 1.0, the threshold of significance. The chronic non-cancer health hazard index also falls below 1.0, the threshold of significance.

F. Summary of the Potential Cumulative Impacts

In contrast with the approach used to estimate impacts for criteria pollutants, the significance thresholds developed for TACs are set sufficiently stringently so as to preclude the potential for any significant cumulative impacts. Nevertheless, Applicant requested information regarding projects that could potentially result in cumulative impacts from the GBUAPCD and Nevada air agencies with jurisdiction over areas near the project site. No such projects were identified, with the exception of the temporary, construction-related impacts of the St. Therese Mission project, which will not be a source of HAPs. The analysis supports a finding that Hidden Hills SEGS, in combination with other nearby, foreseeable projects, will not cause a combined impact to public health that exceeds significance thresholds.

III. Response to Certain Issues Raised in the FSA

No issues have been identified.

IV. Proposed Licensing Conditions

The FSA for the project proposes no Conditions of Certification for this subject matter.

Socioeconomics

I. Introduction

A. Names: Fatuma Yusuf, Ph.D.; and Clay Jensen, P.E.

B. Qualifications: The panel's qualifications are as noted in their resumes contained in Appendix A.

C. Prior Filings: In addition to the statements herein, this testimony includes by reference the following documents submitted in this proceeding:

- Application for Certification, Volume 1 & Volume 2, dated August 5, 2011 [Exhibit 1]
- Applicant's Data Response, Set 1A, dated November 16, 2011. Responses to Data Requests 17 through 24 [Exhibit 4]
- Applicant's Attachment DR20-1 (omitted from DR Set 1A), dated December 5, 2011. Response to Data Request 20 [Exhibit 5].
- Applicant's Data Response, Set 1B, dated December 5, 2011. Response to Data Request 76 [Exhibit 7]
- Applicant's Data Response, Set 2F, dated May 8, 2012. Responses to Data Requests 189 through 198 [Exhibit 43]
- Applicant's Supplemental Data Response, Set 2, Boiler Optimization Plan and Design Change, dated April 2, 2012. Response to Data Request PD-1 [Exhibit 46]
- Applicant's Supplemental Data Response, Set 3, dated April 18, 2012. Responses to Data Requests SE-1 through SE-6 [Exhibit 47]
- Applicant's Presentation at the Informational Hearing, dated November 3, 2011 [Exhibit 54]
- Applicant's Updated Workforce Analysis, dated October 1, 2012 [Exhibit 63]
- Applicant's Preliminary Staff Assessment Comments, Set 2, dated July 23, 2012. [Exhibit 70]

D. Documents Prepared By Others

- Appendix SOCIO-1: Socioeconomic and Fiscal Impacts of the Hidden Hills Solar Electric Generating System on Inyo County by Dr. Richard McCann, MPP, Ph.D., contained in the Hidden Hills Solar Electric Generating System (HHSEGS) Final Staff Assessment, December 2012.

E. Attachments

- Applicant's Errata for Socioeconomics Section of the Updated Workforce Analysis, dated October 1, 2012 [Exhibit 66]
- Email response from Fatuma Yusuf (CH2) to Steven Kerr (CEC) regarding HHSEGS: Response to Your Phone Call about Socio Tables, dated October 18, 2012.

To the best of our knowledge, all of the facts contained in this testimony (including all referenced documents) are true and correct. To the extent this testimony contains opinions, such opinions are our own based upon our professional judgment. We make these statements, and render these opinions freely and under oath for the purpose of constituting sworn testimony in this proceeding.

II. Summary of Testimony

A. Affected Environment

The Hidden Hills Solar Electric Generating System (HHSEGS) will be located on privately owned land in Inyo County, California, adjacent to the California-Nevada border. It will comprise two solar fields and associated facilities: the northern solar plant (Solar Plant 1) and the southern solar plant (Solar Plant 2). Each solar plant will generate 270 megawatts (MW) gross (250 MW net), for a total output of 500 MW.

B. Potential Construction Related Impacts; Avoidance and Minimization Measures

HHSEGS construction will take place over a 29-month period. Construction of Solar Plant 1 will commence 3 months before start of construction for Solar Plant 2, although the order may be reversed. Total personnel requirements during construction (both onsite and offsite) will be approximately 32,933 person-months; whereas, the total workforce onsite is 32,620 person-months. Construction personnel requirements for the site will peak at approximately 2,293 workers in Month 19 of the construction period.

It is anticipated that most (70 percent) of the construction workforce will be drawn from the counties of Inyo, Kern, Mono, San Bernardino, and Riverside, in California. Of the remaining 30 percent that will be drawn from Nevada, 25 percent are anticipated to be from Clark County and 5 percent from Nye County.

Available skilled labor was evaluated by surveying the Building and Trades Council representing Kern, Inyo, Mono, Riverside, and San Bernardino counties and contacting the California Employment Development Department (CEDD). Both sources show that the combined workforce will be adequate to fulfill California's portion (70 percent) of HHSEGS labor requirements for construction. As a result, the construction of the HHSEGS will not create any significant adverse impacts to the local school system since most construction workers will commute to the site and the school district is not at capacity. Due to the remote nature of the area, the construction phases of the project may have potential minor impacts on police, fire, or hazardous materials handling resources. However, HHSEGS construction is not expected to create significant adverse impacts on medical resources in the area.

HHSEGS's initial capital cost is estimated to be about $2,176 billion (in 2011 dollars). The estimated value of materials and supplies that will be purchased locally during construction is $71.4 million. The total local sales tax that would be generated during construction on the $50 million in local expenditures expected to be spent within California is $3.85 million. HHSEGS will provide about $305.3 million in construction payroll, at an average salary of $50 per hour (including benefits). Since 70 percent of the construction workforce is assumed to reside in the 5-county region, about $185.3 million of the $305.3 million in construction payroll is assumed to stay in the 5-county region. The remaining 30 percent, or about $111.1 million in the estimated construction payroll, which includes the amount spent on accommodation, food, and gas during the week by California construction workers, is expected to remain in the 2-county region in Nevada.

In addition to the direct impacts of the project, construction activity will result in secondary beneficial economic impacts (indirect and induced impacts) within the 5-county region in California and the 2-county region in Nevada. The estimated indirect and induced impacts in the 5-county region in California result from the $20.7 million in annual local construction expenditures as well as the $53.7 million (disposable portion of the $76.7 million in annual spending – here assumed to be 70 percent) in spending by local construction workers.

The estimated indirect and induced impacts in the 2-county region in Nevada result from the $8.9 million in annual local construction expenditures as well as the $34.8 million (disposable portion of the $49.7 million in annual spending – here assumed to be 70 percent) in spending by local construction workers.

C. Potential Operational Related Impacts; Avoidance and Minimization Measures

HHSEGS is expected to employ up to 100 full-time employees. Although some of the operational workforce may be drawn from the local population (Pahrump, NV), most will be drawn from Las Vegas in Clark County as well as parts of the surrounding rural areas in Inyo County. The HHSEGS' operation will generate a small benefit by employing 100 full-time employees at an average annual salary of $130,435 resulting in an annual payroll of about $13.04 million. In addition to the payroll, there will be an annual operations and maintenance budget of $0.54 million; of this 5 percent (or $27,000) is assumed to be spent within Inyo County while the remaining 95 percent ($513,000) is assumed to be spent within the 2-county region.

The operation of the proposed project would result in secondary beneficial economic impacts (indirect and induced impacts) that would occur within Inyo County. These indirect and induced impacts represent permanent increases in the county's economic variables. The estimated indirect and induced impacts would result from the $456,520 in disposable payroll and the $27,000 in annual operations and maintenance (O&M).

There will be no significant impacts due to plant operations, since the entire permanent workforce is expected to commute from within Inyo County, Pahrump (Nye County) or Las Vegas (Clark County). HHSEGS is expected to pay approximately $3.52 million per year in property taxes and about $2,090 in annual sales tax revenues to Inyo County.

Based on the analysis prepared in compliance of *Executive Order 12898, Federal Actions to Address Environmental Justice in Minority and Low Income Populations (1994)*, HHSEGS will be in compliance because local minority and low-income populations are very small and no disproportionately high and adverse effects are expected on any populations. We agree with the conclusions in the Socioeconomics section related to Environmental Justice issues.

D. Project Benefits

- Tax revenues from the project will far exceed any potential cost impacts to Inyo County services.
- Annual increase in property taxes from the project will result in nearly $2.2 million to County school districts.
- Annual increase in property taxes from the project will result in nearly $1.0 million to the Inyo County general fund.
- Annual property taxes from the project will result in nearly $41,000 to incorporated cities in Inyo County.

- Annual property taxes from the project will result in nearly $243,000 to special districts in Inyo County.
- Sales and use tax from the project are estimated to be $81.375 million, of which $46.62 million or 57 percent will be distributed to California's General Fund, based on the estimated $1.05 billion in total project construction expenditures on equipment, materials, and supplies either purchased or assumed to be used in Inyo County.
- Sales and use tax from the project are estimated to be $81.375 million, of which $34.755 million or 43 percent will be distributed to Inyo County, based on the estimated $1.05 billion in total project construction expenditures on equipment, materials, and supplies either purchased or assumed to be used in Inyo County.
- Sales and use tax generated from the project during construction from purchases in Inyo County are estimated to be $3,875,000, of which $3,125,000 or 6.25 percent will be distributed to California's General Fund.
- Sales and use tax generated from the project during construction from purchases in Inyo County are estimated to be $3,875,000, of which $750,000 or 1.5 percent will be distributed to Inyo County.
- Annual creation of 1,098 direct construction jobs; of which 769 will be in California.
- Creation of 100 permanent, full-time jobs during operations.

E. Summary of Compliance with Applicable LORS

As discussed above, the project is in compliance with Executive Order 12898. Also, to comply with Government Code Sections 65996-65997 and Education Code Section 17620, the Applicant will pay the one-time impact fee to the Death Valley Unified School District.

F. Summary of the Potential Cumulative Impacts

No adverse cumulative socioeconomic impacts are anticipated from either the construction or operation of HHSEGS. Instead, the local community will enjoy a beneficial (but not significant) impact from short-term construction and longer-term operations employment. In addition, the long-term payment of taxes and fees are expected to have a significant beneficial impact to the region.

Despite the potential for construction schedule overlap with the Pahrump Valley General Aviation Airport, no adverse cumulative socioeconomic effects are anticipated from either the construction or operation of HHSEGS because construction workforce will ramp up slowly and would allow for workers to complete construction work and move to this project.

III. Response to Certain Issues Raised in the FSA

- The FSA should include the updated estimated annual property tax revenues of $3.52 million, rather than $3.9 million.
- The FSA conclusions regarding the impacts to fire and emergency services are somewhat confusing. Under the *Public Services – Results in Substantial Physical Impacts to Government Facilities* and the *Cumulative* discussions, the FSA states that staff "cannot conclude that the proposed project would not significantly impact fire and emergency medical services." However, in the *Summary of Conclusions* and *Proposed Findings of Fact* discussions, staff correctly concludes that the project would not cause significant impact on fire and emergency medical services. Following the finding of possible significant impact to

fire and emergency services, staff concludes that with mitigation and proposed funding, this impact can be reduced to less-than-significant.

- The potential impact of the HHSEGS project on SIFPD emergency response times is an economic effect, not an environmental effect that must be mitigated.
- To meet the Sheriff's identified need for additional resources, the FSA concludes that two additional resident deputies would be sufficient to provide adequate police protection and response times. The FSA also correctly concludes that an additional substation would not be required and that the County would have adequate financial resources (from HHSEGS tax revenues) to provide appropriate Sheriff's protection to the project site and southern Inyo County. Staff's conclusion on adequate funding is supported by the analysis presented in Appendix Socio-1, *Socioeconomic and Fiscal Impacts of the Hidden Hills Solar Electric Generation System on Inyo County*.
- The Applicant concurs with CEC staff that there will not be any Environmental Justice impacts from the project.
- The Applicant concurs with the CEC staff that the project will not result in growth inducing impacts.

IV. Proposed Licensing Conditions

The FSA for the project proposes three Conditions of Certification for this subject matter.

The Applicant has no changes to SOCIO-1, but provides the following recommended changes to SOCIO-2. Applicant objects to Condition SOCIO-3 in its entirety because, as explained below, there is no legal basis for this condition. Therefore, SOCIO-3 should be deleted.

CONDITION SOCIO-2

The Applicant has no objection to SOCIO-2. However, the Applicant requests that the Verification timing be revised to be consisted with the requirements of the WEAP training for Cultural and Paleontological Resources because the WEAP training will be developed to comply with these disciplines as well. Therefore, the Applicant requests the following changes to the Verification section:

SOCIO-2 Information regarding illegal and unauthorized camping shall be provided to all onsite personnel at the time of their Worker Environmental Awareness (WEAP) training.

Verification: At least ~~60~~ 30 days prior to the start of any project-related pre-construction site mobilization, the project owner shall provide to the CPM (for review and approval, and to Inyo County for review and comment), electronic copies of the information regarding illegal and unauthorized camping that will be provided to all onsite personnel at the time of their WEAP training. At least ~~30~~ 15 days prior to the start of any project-related pre-construction site mobilization, the project owner will provide two copies of the final information regarding illegal camping to the CPM and begin implementation of the training for all workers at the time of their WEAP training.

CONDITION SOCIO-3

Please delete Condition SOCIO-3 in its entirety. Applicant's objections to Condition SOCIO-3 are as follows.

First, there is no nexus, as required by CEQA, between this condition and a significant, adverse socioeconomic impact identified by Staff.

Second, the FSA fails to cite to any applicable LORS requiring Applicant to ensure economic benefits accrue to Inyo County and to the State of California through sales and use tax revenues. Contrary to the language of SOCIO-3, the "intent" of the enactment of the Renewables Portfolio Standard is not to guarantee economic benefits to local agencies, but to require that retail sellers of electricity procure a certain percentage of electricity from renewable energy resources and to increase the diversity, reliability, public health and environmental benefits of the energy mix.

Third, the Applicant is concerned that the FSA is attempting to dictate and limit commercial terms, including the creation of a corporate entity, relating to construction, purchase of supplies and deliveries that are wholly unrelated to the potential environmental impacts of the project, without any legal basis.

In particular, sections (3) through (6) are infeasible. As to sections (3) and (4), the terms of the master and construction contracts are negotiated and determined by the EPC contractor, not the Applicant. The Applicant cannot bind the EPC contractor to specific terms, or control what contracts the EPC contractor enters into. Similarly, the scope of section (5) also requires the Applicant to bind third parties to particular commercial contracts, and is overly broad as it applies to *all agreements related to the Project*, regardless of the subject of the agreement, and the parties to the agreement. The Applicant simply cannot bind third parties to include these terms, or even implement a mechanism to ensure that all agreements related to the project contain these terms. Section (6) contains several objectionable flaws. First, the section is overly broad because it applies to *any relationship* that the Applicant might have with contractors, suppliers, or designers. Second, the section requires the formation of specific corporate entities- either a buying company or an entity with a principal place of business in Inyo County- based on *any relationship* that the Applicant enters into with contractors, suppliers, or designers. Third, this term requires that *negotiations for all such sales* occur in Inyo County. It is completely unreasonable to require the Applicant to constrain its commercial negotiations and business decisions in this manner. Finally, Section (7) is overly broad and vague in its scope, as it requires notice to *all* out-of-state suppliers of goods and equipment that Inyo County is the jurisdiction where the first functional use of the property is made. The Applicant simply cannot make this statement because the first functional use of goods and equipment may not be Inyo County.

V. Correlation to FSA and Hearing Topics:

- Socioeconomics; Environmental Justice; and Growth Inducing Impacts

Attachment

Carrier, John/SAC

From: Carrier, John/SAC
Sent: Thursday, October 18, 2012 4:35 PM
To: 'Steven.Kerr@energy.ca.gov'
Cc: 'Susan Strachan'; Mike Monasmith (mmonasmi@energy.state.ca.us); Parker, Karen/SAC; Yusuf, Fatuma/SAC
Subject: HHSEGS: Response to Your Phone Call about Socio Tables
Attachments: HHSEGS_Socio Tables Errata.docx

Steven,
I've attached a errata document that we prepared in response to your phone call to Fatuma with questions on the Updated Workforce Analysis that we filed on October 1st. I hope this provides clarification. Let us know if you have any other questions.

John L. Carrier, J.D.
Program Manager
CH2M HILL
2485 Natomas Park Dr. #600
Sacramento, CA 95833-2937
Office: 916-286-0224
Fax: 916-614-3424
Cell: 916-996-9349

Errata for Socioeconomics Section of the Updated Workforce Analysis, filed on October 1, 2012

1. In responding to a request for clarification via phone call from Steven Kerr (CEC Staff), he asked about the definition of non-craft workers as used in Table 5.10-16R2. He noted that in Table 5.10-16R1 (Data Response, Set 1A) that there was a footnote that defined non-craft workers and wanted to know if the definition had changed since the footnote was not included in Table 5.10-R2.

Response: The definition did not change, the footnote was inadvertently dropped. Table 5.10-16R2 is reprinted in Attachment Socio-1 with the footnote included.

2. In reviewing the material that was included in the Updated Workforce Analysis, we found a summation error with the "Total Sales Taxes" number in Table 5.10-20R1, and also that a footnote had been dropped from that table. The corrected table follows:

TABLE 5.10-20R2
Summary of Total Economic Impacts from Construction

	5-County[a] Region, California	**2-County[b] Region, Nevada**	**Total**
Capital Cost (million $)	$2,176	$0.0	$2,176
Local Materials & Supply Purchases (million $)	$50.0	$21.4	$71.4
Total Construction Payroll (million $)	$185.3	$120.0	$305.3
Construction Payroll (Disposable) (million $)	$129.7	$84.0	$213.7
Annual Local Construction Expenditures (million $)	$20.7	$8.9	$29.6
Annual Average Local Construction Payroll (million $)	$76.7	$49.7	$126.3
Annual Average Local Construction Payroll (Disposable) (million $)	$53.7	$34.8	$88.4
Average Monthly Direct Construction Employment	769	329	1,098
Indirect Employment	89	41	130
Induced Employment	409	257	666
Construction Employment Multiplier	1.6	1.9	NA
Indirect Income	$3,594,400	$1,687,620	$5,282,020
Induced Income	$15,189,370	$11,131,100	$26,320,470
Construction Income Multiplier	1.3	1.3	NA
Total Sales Taxes	$3,875,000[c] ~~3,850,110~~	$1,721,480	$5,571,590

[a] The 5-county region is: Inyo, Mono, Kern, Riverside, and San Bernardino counties
[b] The 2-county region is: Clark and Nye counties
[c] Estimate applies to Inyo County only

Attachment SOCIO-1
Construction Personnel by Month

TABLE 5.10-16R2
Construction Personnel by Month

Month	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
PROJECT SITE															
Craft Day-shift															
Boilermaker	0	0	4	5	7	9	11	11	11	14	28	34	47	55	66
Carpenter	1	3	8	17	31	52	59	70	82	97	89	93	90	85	81
Cement Finisher	0	3	1	2	5	7	8	10	12	14	14	14	14	13	13
Electrician	1	4	5	10	21	35	39	38	35	38	44	62	73	79	88
Iron Worker	0	0	0	10	3	13	19	27	36	50	53	61	66	70	75
Laborer	4	6	13	24	38	60	70	77	83	99	93	94	86	83	83
Millwright	0	0	0	3	5	1	1	1	0	2	20	28	44	52	57
Equipment Operator	1	4	8	13	24	35	41	43	46	53	54	55	53	55	58
Pipefitter	0	0	11	18	34	43	48	53	59	70	81	92	108	123	146
Teamster	1	3	3	4	7	10	13	14	14	17	18	19	18	18	19
Craft-Day-Shift Subtotal	**8**	**23**	**53**	**106**	**175**	**265**	**309**	**344**	**378**	**454**	**494**	**552**	**599**	**633**	**686**
Non-craft[1]-Day-shift															
Subcontractors	16	32	40	80	96	96	104	104	112	120	120	120	120	120	160
Owner + Others (non-manual)	14	14	28	33	49	66	68	73	78	95	103	107	108	108	109
Startup (non-manual) Labor	0	0	0	0	0	0	2	2	3	4	5	4	4	4	4
Compliance Support	80	80	30	30	30	30	30	30	30	30	30	30	30	80	80
Transmission Line	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gas Line	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Linear Compliance Support	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Non-craft Day-shift Subtotal	**110**	**126**	**98**	**143**	**175**	**192**	**204**	**209**	**223**	**249**	**258**	**261**	**262**	**312**	**353**
TOTAL DAY SHIFT	**118**	**149**	**151**	**249**	**350**	**457**	**513**	**553**	**601**	**703**	**752**	**813**	**861**	**945**	**1,039**

TABLE 5.10-16R2
Construction Personnel by Month

Month	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Craft Swing-shift															
Boilermaker	0	0	0	2	2	2	3	3	3	4	9	11	15	18	23
Carpenter	1	1	4	7	9	14	17	21	25	33	32	34	33	32	32
Cement Finisher	0	1	1	1	1	2	2	3	3	4	4	4	4	5	4
Electrician	0	1	2	5	9	15	17	18	17	19	22	28	32	35	38
Iron Worker	0	0	0	5	20	23	26	28	34	36	38	42	44	46	48
Instrument Tech	0	0	0	0	12	12	12	12	12	12	12	12	12	12	12
Laborer	2	5	6	8	3	12	17	19	22	28	28	30	28	28	28
Millwright	0	0	0	1	9	10	10	10	10	11	17	19	25	27	29
Equipment Operator	0	2	3	6	6	11	14	15	16	20	20	22	22	22	24
Pipefitter	0	0	6	9	2	9	11	14	16	22	24	29	36	41	50
Teamster	0	0	1	2	2	3	4	4	4	6	6	6	6	6	6
Craft Swing-shift Subtotal	**3**	**10**	**23**	**46**	**75**	**113**	**133**	**147**	**162**	**195**	**212**	**237**	**257**	**272**	**294**
Non-Craft[1] Swing Shift															
Subcontractors	4	8	10	20	24	24	26	26	28	30	30	30	30	30	40
Owner + Others (Non-manual)	3	4	7	8	12	16	17	18	20	24	26	27	27	27	27
Startup Non-manual Labor	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
Non-Craft Swing Shift Subtotal	7	12	17	28	36	40	43	45	49	55	57	58	58	58	68
TOTAL SWING SHIFT	**10**	**22**	**40**	**74**	**111**	**153**	**176**	**192**	**211**	**250**	**269**	**295**	**315**	**330**	**362**
SUBTOTAL ONSITE	**128**	**171**	**191**	**323**	**461**	**610**	**689**	**745**	**812**	**953**	**1,021**	**1,108**	**1,176**	**1,275**	**1,401**
OFFSITE LINEARS[2]															
Transmission Line	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
Gas Line	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Linear Compliance Support	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
OFFSITE LINEAR SUBTOTAL	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**5**
TOTAL WORKFORCE	**128**	**171**	**191**	**323**	**461**	**610**	**689**	**745**	**812**	**953**	**1,021**	**1,108**	**1,176**	**1,275**	**1,406**

[1] Non-craft workers are the non-union superintendents and construction personnel onsite.
[2] Workforce for linears was included for use in determining cumulative impacts.

TABLE 5.10-16R1
Construction Personnel by Month (Continued)

Month	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	TOTAL
PROJECT SITE																
Craft Day-shift																
Boilermaker	87	114	144	169	192	198	186	158	131	102	76	55	39	31	27	2,011
Carpenter	76	72	65	55	52	46	37	34	29	24	18	14	11	9	8	1,408
Cement Finisher	11	10	9	7	7	6	5	4	4	3	2	1	1	1	1	202
Electrician	110	141	180	217	255	259	249	228	198	165	123	97	79	62	53	2,988
Iron Worker	80	84	85	79	75	67	54	55	44	34	25	18	14	11	11	1,219
Laborer	84	84	80	67	59	51	43	44	37	31	22	19	16	14	13	1,577
Millwright	66	76	84	90	95	105	101	92	78	64	50	36	31	27	27	1,236
Equipment Operator	64	70	74	73	71	67	60	54	45	36	27	20	17	14	13	1,248
Pipefitter	186	234	282	326	368	375	352	305	256	208	152	114	91	69	61	4,265
Teamster	20	21	21	20	18	17	15	12	10	8	6	5	4	4	4	363
Craft Day-shift Subtotal	**784**	**906**	**1,024**	**1,103**	**1,192**	**1,191**	**1,102**	**986**	**832**	**675**	**501**	**379**	**303**	**242**	**218**	**16,517**
Non-craft[1] Day-shift																
Subcontractors	168	184	200	240	280	280	240	200	168	160	120	104	96	80	40	4,000
Owner + Others (NM)	112	112	112	112	111	111	111	98	97	94	67	58	46	36	28	2,358
Startup NM labor	4	4	5	6	6	6	6	6	6	5	5	5	5	3	3	107
Compliance Support	30	30	20	20	20	10	10	5	5	5	5	5	5	5	5	830
Transmission Line	0	0	0	0	37	37	0	0	0	0	0	0	0	0	0	74
Gas Line	0	0	0	0	30	0	0	0	0	0	0	0	0	0	0	30
Linear Compliance	0	0	0	0	6	3	0	0	0	0	0	0	0	0	0	9
Non-Craft Day-shift Subtotal	**314**	**330**	**337**	**378**	**490**	**447**	**367**	**309**	**276**	**264**	**197**	**172**	**152**	**124**	**76**	**7,408**
TOTAL DAY SHIFT	**1,098**	**1,236**	**1,361**	**1,481**	**1,682**	**1,638**	**1,469**	**1,295**	**1,108**	**939**	**698**	**551**	**455**	**366**	**294**	**23,925**

TABLE 5.10-16R2
Construction Personnel by Month

Month	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Craft Swing Shift															
Boilermaker	31	41	53	63	72	75	70	68	56	44	32	23	17	13	12	**765**
Carpenter	31	30	28	24	23	21	18	15	12	10	7	6	5	4	4	**533**
Cement Finisher	4	4	4	3	2	2	2	2	1	1	1	1	1	1	1	**69**
Electrician	46	59	75	89	104	106	101	98	85	70	53	41	34	26	23	**1,268**
Iron Worker	50	53	53	51	51	48	42	24	19	15	10	7	6	5	4	**828**
Instrument Tech	12	12	12	12	12	12	12	0	0	0	0	0	0	0	0	**216**
Laborer	29	31	29	25	23	19	16	19	16	13	10	8	7	6	6	**521**
Millwright	33	37	41	44	46	50	48	39	33	28	22	16	13	12	12	**652**
Equipment Operator	27	30	32	31	31	29	27	23	19	16	11	9	7	6	5	**506**
Pipefitter	66	84	104	123	140	142	131	129	111	89	66	49	38	30	25	**1,596**
Teamster	7	7	8	7	7	6	5	5	4	3	2	2	2	1	1	**123**
Craft Swing-shift Subtotal	**336**	**388**	**439**	**472**	**511**	**510**	**472**	**422**	**356**	**289**	**214**	**162**	**130**	**104**	**93**	**7,077**
Non-craft[1] Swing-shift															
Subcontractors	42	46	50	60	70	70	60	50	42	40	30	26	24	20	10	**1,000**
Owner + Others (NM)	28	28	28	28	28	28	28	25	24	24	17	14	11	9	7	**590**
Startup NM Labor	1	1	1	2	2	2	2	2	1	1	1	1	1	1	1	**28**
Non-Craft Swing Shift Subtotal	71	75	79	90	100	100	90	77	67	65	48	41	36	30	18	**1,618**
TOTAL SWING SHIFT	**407**	**463**	**518**	**562**	**611**	**610**	**562**	**499**	**423**	**354**	**262**	**203**	**166**	**134**	**111**	**8,695**
SUBTOTAL ONSITE	**1,505**	**1,699**	**1,879**	**2,043**	**2,293**	**2,248**	**2,031**	**1,794**	**1,531**	**1,293**	**960**	**754**	**621**	**500**	**405**	**32,620**

TABLE 5.10-16R2

Construction Personnel by Month

Month	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
OFFSITE LINEARS[2]															
Transmission Line	3	3	15	36	39	29	10	10	6	0	5	0	0	0	0	159	
Gas Line	2	21	21	21	21	21	0	0	0	0	0	0	0	0	0	109	
Linear Compliance Support	0	6	6	6	6	7	4	4	4	0	2	0	0	0	0	45	
OFFSITE LINEARS SUBTOTAL	**5**	**30**	**42**	**63**	**66**	**57**	**14**	**14**	**10**	**0**	**7**	**0**	**0**	**0**	**0**	**313**	
TOTAL WORKFORCE	**1,510**	**1,729**	**1,921**	**2,106**	**2,359**	**2,305**	**2,045**	**1,808**	**1,541**	**1,293**	**967**	**754**	**621**	**500**	**405**	**32,933**	

[1] Non-craft workers are the non-union superintendents and construction personnel onsite.

[2] Workforce for linears was included for use in determining cumulative impacts.

Soils and Surface Waters

I. Introduction

A. Names: Michael Rojansky, Ph.D., P.E.; Matt Franck (surface water); Kathy Rose, Ph.D. (Waters of the United States/Waters of the State); and Steve Long (soils)

B. Qualifications: The panel's qualifications are as noted in their resumes contained in Appendix A.

C. Prior Filings: In addition to the statements herein, this testimony includes by reference the following documents submitted in this proceeding:

- Application for Certification, Volume 1 & Volume 2, dated August 5, 2011 [Exhibit 1]
- Applicant's Data Adequacy Supplement, dated September 7, 2011 [Exhibit 2]
- Applicant's Data Response , Set 1C-4, dated October 22, 2012 [Exhibit 20]
- Applicant's Supplemental Data Response, Set 4, dated May 11, 2012. Response to Data Response WR-3 [Exhibit 48]
- Applicant's Supplemental Data Response, Set 4B, dated September 10, 2012. Response to Data Response WR-3 [Exhibit 49]
- Applicant's Preliminary Staff Assessment Comments, Set 2, dated July 23, 2012. [Exhibit 70]

To the best of our knowledge, all of the facts contained in this testimony (including all referenced documents) are true and correct. To the extent this testimony contains opinions, such opinions are our own. We make these statements, and render these opinions freely and under oath for the purpose of constituting sworn testimony in this proceeding.

II. Summary of Testimony

A. Affected Environment

A detailed description of the HHSEGS is described in the AFC [Exhibit 1]. The HHSEGS site is located in Inyo County, California, on private land that has been partially disturbed as part of a previously approved residential development. Although the residential development was never completed, graded and partially gravelled roads were installed in a grid pattern that remains to the present date. The remainder of the site is mostly bare soil with sparse natural vegetation that is similar to the surrounding area.

Information derived from available National Cooperative Soil Survey (NRCS) soil mapping (STATSGO database) is summarized in the AFC [Exhibit 1]. Soils in the project area have a variety of characteristics depending on landform and location. Land uses for these soils are generally limited to pasture, range, or wildlife habitat. Natural vegetation is expected to be sparse and dominated by salt- and drought-tolerant species. Except for a small, former orchard located on the project site, there is no agricultural land or mapped important farmlands (including prime farmlands) around the HHSEGS.

The tributary watershed for the project site includes areas that extend to the northeast, southeast, and south of the project site location. The entire watershed drains into the Pahrump Valley low point—a dry lake to the northwest of the project site. The surrounding watershed has two main watercourses: Stump Springs and Lovell Wash, which are located southeast of the project site. The two watercourses converge south of the site and are routed within the Pahrump Valley to the dry lake bed.

Several small desert washes cross the state border downslope from Nevada to California in the project area associated with alluvial fans originating in the Spring Mountains. The slope gradient diminishes from east to west and ephemeral drainages quickly fade away. Many of the washes interconnect with other nearby washes either by natural means or by following roadways that form a grid in the project area. Soil permeability across the site is expected to vary from rapid to very slow, based on STATSGO soil mapping and site observations.

The project site is located in an area affected by two Federal Emergency Management Agency (FEMA) established Special Flood Hazard Zones. Both zones are classified as Zone A, which is defined as an area subject to a 1-percent annual chance of flooding with no base flood elevation determined. During major storm events, localized flooding may occur and ephemeral washes can overflow for a period of a few hours to up to a 24-hour period.

B. Potential Construction Related Impacts; Avoidance and Minimization Measures

Expected construction-related impacts include soil loss due to wind and water erosion as detailed in the AFC [Exhibit 1]. The estimated soil loss at the project site by water erosion is 562 tons without the use of construction BMPs. With the implementation of construction BMPs, the total estimated soil loss from the project site is significantly reduced to approximately 12.1 tons over the same period. These estimates of accelerated soil loss by water are very conservative (i.e., will tend to overestimate soil loss) because they assume a single BMP (i.e., straw wattles); whereas, the actual SWPPP for the project will require the implementation of multiple soil erosion control measures.

Without mitigation, the maximum predicted wind erosion of material from the site is estimated to be 194.7 tons over the course of the project construction cycle. This estimate is greatly reduced to approximately 29 tons by implementing a single, basic mitigation measure, such as water and soil stabilizer application. These estimates are conservative because they make use of emission rates for a generalized soil rather than site-specific soil properties, and assume the worst-case for blowing conditions.

While the predicted soil losses by water and wind erosion seem significant, it is expected that actual soil losses will be much smaller due to the conservative nature of these estimates and the application of multiple control measures as part of the SWPPP implementation. The technology proposed for this project allows for several strategies to reduce environmental impacts and take advantage of the site's natural attributes, as follows:

- Cutting vegetation to a height that will not interfere with construction and operation of the heliostat fields but not clearing or grading the entire field
- Restricting clearing and grading activities to areas where foundations, drainage facilities, and all-weather roads must be placed
- Taking advantage of the natural permeability of the soils at the site by minimizing compaction and decompacting soils where necessary

- Implementing a revegetation and rehabilitation program to accelerate the return of areas that have been temporarily disturbed to a vegetated state
- Implementing a stormwater control design that promotes sheet flow and greater infiltration
- Use of onsite storm water retention area to prevent accelerated runoff

Through implementation of these strategies, all potential pollutants generated during construction will be sufficiently mitigated such that the beneficial uses of downstream receiving waters will be protected.

C. Potential Operational Related Impacts; Avoidance and Minimization Measures

Potential Operational Impacts are described in the documents listed in Section I. Project operation will not result in impacts to the soil from erosion or compaction. Routine vehicle traffic during project operation will be limited to existing roads. These same routes will be used for the occasional cutting of vegetation to prevent obstruction or to reduce the risk of fire due to plant regrowth.

Solar field development will maintain unobstructed sheet flow, with water exiting the site in existing natural contours and flowpaths. Relatively small rock filters and local diversion berms through the heliostat fields may be installed as required to discourage water from concentrating and maintain sheet flow. An onsite retention area would be created along the western site boundary by elevating the western perimeter roadway. The berm created by the elevated roadway would mitigate the increase in peak flows from project development. Post-construction runoff from the 24-hour, 100-year storm would be slightly less than preconstruction runoff.

D. Summary of Compliance with Applicable LORS

Project compliance with applicable LORS is described in are described the documents listed in Section I. In summary, the project will comply with the Federal Clean Water Act and the NPDES program through the preparation and implementation of both a Construction and an Industrial Stormwater Pollution Prevention Plan (SWPPP). The project will comply with USDA Engineering standards during grading and construction to limit soil erosion. No discharges of soil into surface waters are anticipated, and thus, no waste discharge permit under the California Porter–Cologne Water Quality Control Act is anticipated. The project will comply with applicable Inyo County ordinances for grading and vegetation reclamation during construction to control soil erosion. The project will comply with applicable Inyo County General Plan goals and policies to prevent wind and water erosion and protect soil and air resources.

E. Summary of the Potential Cumulative Impacts

Project cumulative effects are described in the documents listed in Section I.Because it is expected that other projects that could contribute to a cumulative impacts analysis will also be required to employ construction and operational BMPs and to comply with applicable federal, state, and local LORS; it is unlikely that HHSEGS will have combined cumulative impacts on soil and water resources with other closely related past, present, and reasonably foreseeable future projects.

III. Response to Certain Issues Raised in the FSA

A. Edits to FSA Text Regarding State Jurisdictional Waters

The following revisions to the FSA are provided with respect to State jurisdictional waters, in order to ensure the Soils and Surface Water section is current, accurate, *and consistent with the Biological Resources section of the FSA.*

FSA p. 4.9-7, Surface Water Features

Surface Water Features

Numerous small desert washes (ephemeral drainages) from the Spring Mountains cross the state border from Nevada and into California in the project area. The slope gradient diminishes from east to west. ~~Surface waters~~ Ephemeral drainages that enter the proposed project site ~~occur~~ carry flows only during heavy rains and ~~dissipate~~ water infiltrates quickly into the well-drained, sandy ~~surface soils~~ streambed substrate as the slope gradient flattens out.

Features of the drainages include single, large channels with well-defined bed and banks, as well as broad, but sometimes weakly expressed, assemblages of shallow braided ephemeral channels. Many of the washes interconnect with other nearby washes either by natural forces or by following the grid of existing dirt roadways on the project area which interfere with the natural ~~hydrology~~ drainage patterns. Water runoff generally drains toward the west and northwest via sheet flow and ~~in these~~ natural drainage channels, draining ~~to the northwest and eventually into~~ toward Stewart (dry) Lake ~~located northwest of the project~~ (HHSG 2011a, App 5.15C).

A total of 80 ephemeral washes were mapped in the project area by the applicant and identified as potential "Waters of the State" (CH2 2012k). ~~The Lahontan RWQCB and California Department of Fish and Game (CDFG) are currently reviewing the project to determine whether any of the onsite washes are "Waters of the State".~~ Following coordination with RWQCB, CDFG and the Energy Commission, total waters of the State have been verified to include 23.21 acres of ephemeral desert drainages. ~~The Lahontan RWQCB will verify the extent of jurisdictional Waters of the State on the site, and CDFG and the Energy Commission will verify which of these features will be subject to streambed alteration requirements under Section 1600 of the Fish and Game Code.~~ Two of the ephemeral washes, totaling 0.42 acre, were determined to be "Waters of the U.S." by the U.S. Army Corps of Engineers under Section 404 of the Clean Water Act (CH2 2012k), as shown on **Soils & Surface Water Figure 2**. For further discussion of waters of the U.S./State, ~~on the jurisdictional determination~~, please refer to the **BIOLOGICAL RESOURCES** section of this **FSA**.

FSA p. 4.9-11, Soil Erosion and Storm Water Control

Soil Erosion and Storm Water Control

During construction, portions of the project site would be graded, including portions along the ephemeral washes. Grading is not intended to level the site, but rather to prepare the site for installation of the heliostats and ease future maintenance activities. As such, ~~the existing depressions for~~ the drainages would remain, to the extent feasible, and natural drainage waters are expected to continue to flow in and through these ephemeral washes.

Any grading required would be designed to ~~promote sheet flow~~ maintain existing drainage pathways, where possible (HHSG 2011a, App 5.15C).

FSA p. 4.9-12, Solar Fields – Roads, 1st para. after the bullets

Most of the natural drainage features would be maintained and any grading required would be designed to ~~promote sheet flow where possible~~ maintain existing drainage pathways. At some washes, limited grading may be required. Paved access roads would be protected from floods with ditches, culverts, and local fords with reinforced concrete shoulders (HHSG 2011a, App 5.15A).

FSA p. 4.9-15, 1st partial para.

impervious material (i.e. concrete foundations, asphalt pavement, heliostat assemblies) and temporary construction areas would be ~~restored to natural existing conditions~~ stabilized in accordance with the Construction General Permit.

FSA p. 4.9-17, 2nd full para.

Grading and mowing during construction, and continued vegetation control during operations, could affect a large portion of the onsite ephemeral drainages over the life of the project. Natural hydrologic processes would be expected to be maintained, however, ~~directly result in a permanent loss of a large portion of the ephemeral drainages that are present due to their shallow depths; however, affected drainages would be expected to reform naturally~~ in this landscape where flow patterns are highly variable, both temporally and spatially (HHSG 2011a, App 5.15A).

B. Condition of Certification SOILS-6

Condition of Certification SOILS-6 was added subsequent to the PSA. The Applicant agrees that a Perimeter Drainage Management Plan would be beneficial. However, additional quantitative analysis should not be required. The Applicant submitted its hydrologic analysis as part of the licensing process, including complete FLO-2D modeling, and will prepare a detailed grading and drainage plan as required by Condition of Certification CIVIL-1 including "related calculations and specifications, signed and stamped by the responsible civil engineer." The additional analysis – "detailed hydraulic analysis using FLO-2D" – is unwarranted.

We are suggesting added text to clarify that the Applicant will only be responsible for *incremental* changes in flood depth on Tecopa Road. This is important to differentiate between changes from the project, and changes from current conditions and other upstream development. The clarification is partly in response to the use of desert tortoise exclusion fencing and landscape screening along the southern project boundary. "The tortoise fencing in particular has the potential to trap vegetation and debris which could block or slow the flow of water to the site." [FSA p. 4.9-34] It should be noted that the tortoise fencing would not cause a significant rise to the water surface due to the large open area to wire fence ratio. If the tortoise fence becomes clogged with debris, the most probable outcome is that flows simply would be routed around to an unobstructed area. With extensive clogging, the low strength of the fence material and the relative shallow post depths would most likely create a failure of the fence long before a backwater depth of 1 foot is created. The likelihood of these conditions being created can be minimized by the design and good-housekeeping requirements in Conditions of Certification SOILS-5 and SOILS-6. Since the tortoise fence would not create a true flow obstruction, there is no need to revise the FLO-2D calculations already provided, which showed no impact.

For these reasons, the Applicant requests that the quantitative requirements of Condition of Certification SOILS-6 be deleted (see edits in Section IV below).

IV. Proposed Licensing Conditions

The FSA for the project proposes nine Conditions of Certification for this subject matter. Eight of these conditions were presented in draft form in the PSA. Staff has considered our comments on these eight conditions, and we agree with the final versions of these eight conditions as set forth in the FSA, except for the proposed changes to condition SOILS-1, below. In addition, the Applicant has comments on the new condition, SOILS-6.

CONDITION SOILS-1, DRAINAGE, EROSION, AND SEDIMENTATION CONTROL PLAN (DESCP)

The following revisions are suggested in order to ensure that reviews and approvals of the DESCP do not cause substantial, unnecessary delays in construction.

SOILS-1 Prior to site mobilization, the project owner shall obtain the CPM's approval for a site specific DESCP that ensures protection of water quality and soil resources of the project site and all onsite linear facilities for both the construction and operation phases of the project. This plan shall address appropriate methods and actions, both temporary and permanent, for the protection of water quality and soil resources, demonstrate no increase in off-site flooding potential, and identify all monitoring and maintenance activities. The project owner shall complete all engineering plans, reports, and documents necessary for the CMP to conduct a review of the proposed project and provide a written evaluation as to whether the proposed grading, drainage improvements, and flood management activities comply with all requirements presented herein. The DESCP may be combined with Condition of Certification SOILS-2 (Construction SWPPP). The plan shall be consistent with the grading and drainage plan as required by Condition of Certification **CIVIL-1** and shall contain the following elements:

Vicinity Map: A map shall be provided indicating the location of all project elements with depictions of all major geographic features to include watercourses, washes, irrigation and drainage canals, major utilities, and sensitive areas.

Site Delineation: The site and all project elements shall be delineated showing boundary lines of all construction areas and the location of all existing and proposed structures, underground utilities, roads, and drainage facilities. With legend, indicate types and locations of storm water control measures built to permanently control storm water pollution. Distinguish between pollution prevention, treatment, and containment devices. Identify sanitary waste facilities. Adjacent property owners shall be identified on the plan maps. All maps shall be presented at a legible scale

Drainage: The DESCP shall include the following elements:

a. Topography. Topography for offsite areas are required to define the existing upstream tributary areas to the site and downstream to provide enough definition to map the existing storm water flow and flood hazard. Spot elevations shall be required where relatively flat conditions exist.

b. Proposed Grade. Proposed grade contours shall be shown at a scale appropriate for delineation of onsite ephemeral washes, drainage ditches, and tie-ins to the existing topography.

c. Hydrology. Existing and proposed hydrologic calculations for onsite areas and offsite areas that drain to the site; include maps showing the drainage area boundaries and sizes in acres, topography and typical overland flow directions, and show all existing, interim, and proposed drainage infrastructure and their intended direction of flow. Show each discharge location from the site.

d. Hydraulics. Provide hydraulic calculations to support the selection and sizing of the onsite drainage network, diversion facilities and BMPs.

Watercourses and Critical Areas: The DESCP shall show the location of all onsite and nearby watercourses including washes, irrigation and drainage canals, and drainage ditches, and shall indicate the proximity of those features to the construction site. Maps shall identify high hazard flood prone areas. Maps shall show with legend locations of expected sources of pollution generation (i.e. outdoor work and storage areas, delivery areas, trash enclosures, fueling areas) during construction activities and separate maps for operational activities.

Clearing and Grading: The plan shall provide a delineation of all areas to be cleared of vegetation, areas to be preserved, and areas where vegetation would be cut to allow clear movement of the heliostats. The plan shall provide elevations, slopes, locations, and extent of all proposed grading as shown by contours, cross-sections, cut/fill depths or other means. The locations of any disposal areas, fills, or other special features shall also be shown. Existing and proposed topography tying in proposed contours with existing topography shall be illustrated. The DESCP shall include a statement of the quantities of material excavated at the site, whether such excavations or fill is temporary or permanent, and the amount of such material to be imported or exported or a statement explaining that there would be no clearing and/or grading conducted for each element of the project. Areas of no disturbance shall be properly identified and delineated on the plan maps.

Soil Wind and Water Erosion Control: The plan shall address exposed soil treatments to be used during construction and operation of the proposed project for both road and non-road surfaces including specifically identifying all chemical based dust palliatives, soil bonding, and weighting agents appropriate for use at the proposed project site that would not cause adverse effects to vegetation; BMPs shall include measures designed to prevent wind and water erosion including application of chemical dust palliatives after rough grading to limit water use. All dust palliatives, soil binders, and weighting agents shall be approved by the CPM prior to use.

Project Schedule: The DESCP shall identify on the topographic site map the location of the site-specific BMPs to be employed during each phase of construction (initial grading, project element construction, and final grading/stabilization). BMP implementation schedules shall be provided for each project element for each phase of construction.

Best Management Practices: The DESCP shall show the location, timing, and maintenance schedule of all erosion- and sediment-control BMPs to be used prior to initial grading, during project element excavation and construction, during final grading/stabilization, and after construction. BMPs shall include measures designed to control dust and stabilize construction access roads and entrances. The maintenance schedule shall include post-construction maintenance of treatment-control BMPs applied to disturbed areas following construction.

Erosion Control Drawings: The erosion-control drawings and narrative shall be designed, stamped and sealed by a professional engineer or erosion-control specialist.

Agency Comments: The DESCP shall include copies of recommendations from the County of Inyo and the California Department of Fish and Game (CDFG). If the DESCP is combined with the Construction SWPPP, the document shall include copies of recommendations from the Lahontan Regional Water Quality Control Board (RWQCB).

Monitoring Plan: Monitoring activities shall include routine measurement and photographs of the volume of accumulated sediment in the onsite drainage ditches, and storm water diversions.

Verification: The DESCP shall be consistent with the grading and drainage plan as required by Condition of Certification **CIVIL-1**, and relevant portions of the DESCP shall be submitted to the chief building official (CBO) for review and approval. In addition, the project owner shall do all of the following:

- No later than ninety (90) days prior to start of site mobilization, the project owner shall submit a copy of the DESCP to Inyo County for review and comment. If the DESCP is combined with the Construction SWPPP, the project owner shall also submit a copy of the document to the Lahontan RWQCB for review and comment. The CPM shall consider comments received when approving the DESCP. If comments are not received within 30 days after project owner's submittal of the DESCP to Inyo County (and the Lahontan RWQCB, if required), it will be assumed that the reviewing agency has no comments for CPM consideration.
- During construction, the project owner shall provide an analysis in the monthly compliance report on the effectiveness of the drainage-, erosion- and sediment control measures and the results of monitoring and maintenance activities.
- Once operational, the project owner shall provide in the annual compliance report information on the results of storm water BMP monitoring and maintenance activities.

CONDITION SOILS-6, PERIMETER DRAINAGE MANAGEMENT PLAN

One new condition – SOILS-6 – requires preparation of a Perimeter Drainage Management Plan. With the changes noted below, based on the discussion in Section III.B above, we agree with Condition of Certification SOILS-6 as set forth in the FSA.

SOILS-6: The project owner shall develop and implement a Perimeter Drainage Management Plan to reduce flooding and erosion damage to the section of Old Spanish Trail Highway/Tecopa Road adjacent to the project site. The post-

development flood depth calculated for the 100-year, 24-hour storm shall not increase more than one foot at any point on Tecopa Road adjacent to the project site as a result of project construction.

~~The project owner shall provide a detailed hydraulic analysis utilizing FLO-2D which models pre- and post-development flood conditions for the 2-, 5-, 10-, 25-, and 100-year storm events. Boundaries of the analysis shall include the floodplain area from where Stump Springs area runoff flows cross the Nevada border to one mile west of the HHSEGS west property line. The methodology and assumptions for the modeling shall be reviewed and approved by the CPM.~~

The Perimeter Drainage Management Plan shall be submitted to the CPM for review and approval and shall incorporate the following:

- Vegetation shall be placed to promote infiltration and flow into the solar field. Vegetation planting and establishment shall comply with Condition of Certification **VIS-2**. Vegetation management shall include control of invasive vegetation as prescribed in Condition of Certification **BIO-18**. Fencing shall comply with VIS-2 and **BIO-9**.
- Landscape area between the roadway and perimeter fence shall implement erosion protection from flow velocity of two feet per second along the roadway and discharge from these flows to adjacent property west of the project site.
- Storm water control and conveyance structures (i.e. drop inlets, culverts) shall be designed to prevent desert tortoise from entering the structure or entering the project site. Localized ponding shall not remain longer than 24 hours.
- The use of dry wells or injection wells shall be considered for management of flood flows and artificial recharge of the groundwater aquifer in the project area. These infiltration devices shall be designed and operated in accordance with USEPA Class V Injection Well requirements. The groundwater recharge that may be achieved by these wells can be considered as credit for mitigation in accordance with **WATER SUPPLY-1**.
- Maintenance methods and scheduling shall be identified in the Plan to ensure proper operation of storm water control and conveyance structures and other Best Management Practices (BMPs)
- Elements of monitoring, inspection, and damage response (short-term and long-term) prescribed in Condition of Certification **SOILS-5** shall be implemented in maintenance of storm water conveyance and erosion control features identified in the Perimeter Drainage Management Plan.

Verification: At least sixty (60) days prior to perimeter fence installation, the project owner shall submit to the CPM a copy of the preliminary Perimeter Drainage Management Plan for review.

In combination with Condition of Certification **CIVIL-1**, at least fifteen (15) days (or project owner- and CBO-approved alternative time frame) prior to the start of site grading the

project owner shall submit the documents described above to the CBO for design review and approval. In the next monthly compliance report following the CBO's approval, the project owner shall submit a written statement certifying that the documents have been approved by the CBO.

Any proposed changes or revisions to the approved ~~Storm Water Damage Monitoring and Response~~ Perimeter Drainage Management Plan must be reviewed and approved by the CPM.

Transmission Line Safety & Nuisance

I. Introduction

A. **Name:** Robert Pearson, Ph.D., P.E.

B. **Qualifications:** Dr. Pearson's qualifications are as noted in his resume contained in Appendix A.

C. **Prior Filings:** In addition to the statements herein, this testimony includes by reference the following documents submitted in this proceeding:

- Application for Certification, Volume 1 & Volume 2, dated August 5, 2011 [Exhibit 1]
- Applicant's Data Response, Set 1A, dated November 16, 2011. Response to Data Request 38 [Exhibit 4]
- Applicant's Response to CEC Staff Requests, Supplemental Data Response Set 2, dated April 2, 2012, Response to Data Request PD-1 [Exhibit 46]
- Applicant's Preliminary Staff Assessment Comments, Set 2, dated July 23, 2012 [Exhibit 70]

To the best of my knowledge, all of the facts contained in this testimony (including all referenced documents) are true and correct. To the extent this testimony contains opinions, such opinions are my own. I make these statements, and render these opinions freely and under oath for the purpose of constituting sworn testimony in this proceeding.

II. Summary of Testimony

A. Affected Environment

Electrical Clearances

Typical high-voltage overhead transmission lines are composed of bare conductors connected to supporting structures by means of porcelain, glass, or plastic insulators. The air surrounding the energized conductor acts as the insulating medium. Maintaining sufficient clearances, or air space, around the conductors to protect the public and utility workers is paramount to safe operation of the line. The safety clearance required around the conductors is determined by normal operating voltages, conductor temperatures, short-term abnormal voltages, wind-blown swinging conductors, contamination of the insulators, clearances for workers, and clearances for public safety. Minimum clearances are specified in the National Electrical Safety Code (NESC). Electric utilities, state regulators, and local ordinances may specify additional (more restrictive) clearances. Typically, clearances are specified for:

- Distance between the energized conductors themselves
- Distance between the energized conductors and the supporting structure
- Distance between the energized conductors and other power or communication wires on the same supporting structure, or between other power or communication wires above or below the conductors
- Distance from the energized conductors to the ground and features such as roadways, railroads, driveways, parking lots, navigable waterways, airports, etc.
- Distance from the energized conductors to buildings and signs

- Distance from the energized conductors to other parallel power lines

The HHSEGS transmission lines will be designed to meet all national, state, and local code clearance requirements.

Electric and Magnetic Fields, and Audible Noise

The AFC discusses in detail the electrical effects, magnetic fields, and audible noise issues. This testimony reiterates these conclusions. The discussions in the AFC are incorporated by reference as set forth in Section I.C above.

Transmission Line EMF Reduction

In keeping with the goal of electric and magnetic field (EMF) reduction, the transmission lines will be designed and constructed using the principles outlined in the Southern California Edison Company (SCE) publication, "EMF Design Guidelines for Electrical Facilities" (SCE, 2004).

The primary techniques for reducing EMF anywhere along a transmission line are to:

1. Increase the pole height for overhead design
2. Use compact pole-head configuration
3. Minimize the current on the line
4. Optimize the configuration of the phases (A, B, C)

For those portions of the HHSEGS project within California, there will be no public exposure to EMF and audible noise levels from the transmission lines since they will generally be located on the project site and will not be located near any public facilities, residences, or habitable structures.

Fire Hazards

In California, the transmission lines will be designed, constructed, and maintained in accordance with the stringent requirement of the NESC. The NESC establishes clearances from other man-made and natural structures as well as tree-trimming requirements to mitigate fire hazards. The proposed onsite transmission corridors are not located in the vicinity of facilities that would contribute to a fire hazard.

B. Potential Construction Related Impacts; Avoidance and Minimization Measures

To avoid potential impacts, the HHSEGS transmission lines will be designed to meet all national, state, and local code clearance requirements. No significant construction-related impacts have been identified and no further mitigation or minimization measures are required.

C. Potential Operational Related Impacts; Avoidance and Minimization Measures

To avoid potential impacts, the HHSEGS transmission lines will be designed to meet all applicable national, state, and local code clearance requirements. No significant construction-related impacts have been identified and no further mitigation or minimization measures are required.

D. Summary of Compliance with Applicable LORS

Electric and Magnetic Fields LORS

The HHSEGS transmission lines will be designed to meet all applicable LORS, as follows.

Table TLSN-1 lists the applicable LORS.

TABLE TLSN-1

Laws, Ordinances, Regulations, and Standards (LORS)

Applicable LORS	Description
Aviation Safety	
Federal	
Title 14, Part 77 of the Code of Federal Regulations (CFR),"Objects Affecting the Navigable Air Space"	Describes the criteria used to determine the need for a Federal Aviation Administration (FAA) "Notice of Proposed Construction or Alteration" in cases of potential obstruction hazards.
FAA Advisory Circular No. 70/7460-1G, "Proposed Construction and/or Alteration of Objects that May Affect the Navigation Space"	Addresses the need to file the "Notice of Proposed Construction or Alteration" (Form 7640) with the FAA in cases of potential for an obstruction hazard.
FAA Advisory Circular 70/460-1G, "Obstruction Marking and Lighting"	Describes the FAA standards for marking and lighting objects that may pose a navigation hazard as established using the criteria in Title 14, Part 77 of the CFR.
Interference with Radio Frequency Communication	
Federal	
Title 47, CFR, section 15.2524, Federal Communications Commission (FCC)	Prohibits operation of devices that can interfere with radio-frequency communication.
State	
California Public Utilities Commission (CPUC) General Order 52 (GO-52)	Governs the construction and operation of power and communications lines to prevent or mitigate interference.
Audible Noise	
Local	
Noise Limits by the Inyo County Planning Commission	Establishes noise standards for the different land uses in the county.
Inyo County General Plan	Establishes exterior noise standards for receptors in the county.
Hazardous and Nuisance Shocks	
State	
CPUC GO-95, "Rules for Overhead Electric Line Construction"	Governs clearance requirements to prevent hazardous shocks, grounding techniques to minimize nuisance shocks, and maintenance and inspection requirements.
CPUC GO 128, Rules for Construction of Underground Electric Supply and Communications Systems	Applies to the design construction of underground transmission lines. Specifically establishes requirements and minimum standards to be used for the underground installation AC power and communication circuits.
Title 8, California Code of Regulations (CCR) section 2700 et seq. "High Voltage Safety Orders"	Specifies requirements and minimum standards for safely installing, operating, working around, and maintaining electrical installations and equipment.
National Electrical Safety Code	Specifies grounding procedures to limit nuisance shocks. Also specifies minimum conductor ground clearances.
Industry Standards	
Institute of Electrical and Electronics Engineers (IEEE) 1119, "IEEE Guide for Fence Safety Clearances in Electric-Supply Stations"	Specifies the guidelines for grounding-related practices within the right-of-way and substations.

TABLE TLSN-1
Laws, Ordinances, Regulations, and Standards (LORS)

Applicable LORS	Description
Electric and Magnetic Fields	
State	
CPUC GO-131-D, "Rules for Planning and Construction of Electric Generation Line and Substation Facilities in California"	Specifies application and noticing requirements for new line construction including EMF reduction.
CPUC Decision 93-11-013	Specifies CPUC requirements for reducing power frequency electric and magnetic fields.
Industry Standards	
American National Standards Institute (ANSI/IEEE) 644-1944 Standard Procedures for Measurement of Power Frequency Electric and Magnetic Fields from AC Power Lines	Specifies standard procedures for measuring electric and magnetic fields from an operating electric line.
Fire Hazards	
State	
14 CCR sections 1250–1258, "Fire Prevention Standards for Electric Utilities"	Provides specific exemptions from electric pole and tower firebreak and conductor clearance standards and specifies when and where standards apply.

E. Summary of the Potential Cumulative Impacts

When field intensities are measured or calculated for a specific location, they reflect the interactive, and therefore, cumulative effects of fields from all contributing conductors. This interaction could be additive or subtractive depending on prevailing conditions. Since the proposed transmission lines would be designed and erected according to applicable field-reducing SCE guidelines as currently required by the CPUC, any contribution to cumulative area exposures should be at levels expected for transmission lines of similar voltage and current-carrying capacity. It is this similarity in intensity that constitutes compliance with current CPUC requirements on EMF management.

III. Response to Certain Issues Raised in the FSA

No specific issues were raised in the FSA.

IV. Proposed Licensing Conditions

The FSA for the project proposes three Conditions of Certification for this subject matter. We agree with the language of the Conditions of Certification set forth in the FSA pertaining to this subject, except that the text of the Conditions needs to clearly limit the CEC's authority to the state of California, as has been noted in Staff's Final Staff Assessment on p. 4.11-4.

CONDITION TLSN-1

TLSN-1 The project owner shall construct the California portion of the ~~chosen~~ 230-kV ~~or 500-kV~~ transmission line according to the requirements of California Public Utility Commission's GO-95, GO-52, GO-131-D, Title 8, and Group 2, High Voltage Electrical Safety Orders, sections 2700 through 2974 of the California Code of Regulations, GO-128 (in the case of any underground segment), and SCE's EMF-reduction guidelines.

Verification: At least 30 days before starting the construction of the ~~chosen~~ 230-kV line ~~option~~ and related facilities in California, the project owner shall submit to the Compliance Project Manager (CPM) a letter signed by a California registered electrical engineer affirming that the lines will be constructed according to the requirements stated in the condition.

CONDITION TLSN-2

TLSN-2 The project owner shall use a qualified individual to measure the strengths of the electric and magnetic fields from the onsite transmission ~~chosen~~ line in California at the points of maximum intensity along its route. The measurements shall be made after energization according to the American National Standard Institute/Institute of Electrical and Electronic Engineers (ANSI/IEEE) standard procedures. These measurements shall be completed no later than six months after the start of operations.

Verification: The project owner shall file copies of the post-energization measurements with the CPM within 60 days after completion of the measurements.

CONDITION TLSN-3

TLSN-3 The project owner shall ensure that all permanent metallic objects within the right-of-way of each of the onsite overhead transmission ~~chosen project~~ line in California are grounded according to industry standards.

Verification: At least 30 days before the lines are energized, the project owner shall transmit to the CPM a letter confirming compliance with this condition.

Traffic and Transportation

I. Introduction

A. Name: Loren Bloomberg, P.E.

B. Qualifications: Mr. Bloomberg's qualifications are as noted in his resume contained in Appendix A.

C. Prior Filings: In addition to the statements herein, this testimony includes by reference the following documents submitted in this proceeding:

- Application for Certification, Volume 1 & Volume 2, dated August 5, 2011 [Exhibit 1]
- Applicant's Data Adequacy Supplement, dated September 7, 2011 [Exhibit 2]
- Applicant's Data Response, Set 1A, dated November 16, 2011. Responses to Data Requests 25 through 31 [Exhibit 4]
- Applicant's Data Response, Set 2C, dated March 5, 2012. Responses to Data Requests 148 to 151 [Exhibit 34]
- Applicant's Data Response, Set 2E, dated May 4, 2012. Responses to Data Requests 186 and 187 [Exhibit 42]
- Applicant's Supplemental Data Response, Set 2, Boiler Optimization Plan and Design Change, dated April 2, 2012. Response to Data Request PD-1 [Exhibit 46]
- Applicant's Supplemental Data Response, Set 3, dated April 18, 2012. Responses to Data Requests TT-1 through TT-5 [Exhibit 47]
- Applicant's Supplemental Data Response, Set 4, dated May 11, 2012. Response to Data Request TT-6 [Exhibit 48]
- Applicant's C. MacDonald Response Letter - Response to your request for immediate rectification of errors in HHSEGS AFC (11-AFC-02), dated July 31, 2012 [Exhibit 61]
- Applicant's Updated Workforce Analysis, dated October 1, 2012 [Exhibit 63]
- Applicant's Preliminary Staff Assessment Comments, Set 2, dated July 23, 2012. [Exhibit 70]

D. Attachments:

- Email response from John Carrier (CH2) to Candice Hill (CEC) regarding HHSEGS: Questions for CalTrans, dated October 18, 2012.
- Email response from John Carrier (CH2) to Candice Hill (CEC) regarding HHSEGS: Questions from San Bernardino County, dated October 18, 2012.
- Email response from John Carrier (CH2) to Candice Hill (CEC) regarding HHSEGS: traffic questions, dated October 30, 2012.
- Email response from John Carrier (CH2) to Candice Hill (CEC) regarding HHSEGS: Questions from San Bernardino County—Baker Blvd, dated December 12, 2012.

To the best of my knowledge, all of the facts contained in this testimony (including all referenced documents) are true and correct. To the extent this testimony contains opinions, such opinions are my own. I make these statements, and render these opinions freely and under oath for the purpose of constituting sworn testimony in this proceeding.

II. Summary of Testimony

A. Affected Environment

HHSEGS will be located in southern California's Mojave Desert in Inyo County adjacent to the California–Nevada border. The project site is located in a rural area and is currently undeveloped and unoccupied. The primary regional transportation corridors within the study area include Interstate 15 (I-15), State Route (SR) 160, and SR 127. The local circulation system near the project site consists of Tecopa Road (also known as Old Spanish Trail Highway). The local roadway characteristics are generally rural in nature, with limited access control. Traffic operations on the local streets are generally level of service (LOS) A due to the low traffic volumes.

B. Potential Construction Related Impacts; Avoidance and Minimization Measures

To analyze the worst-case scenario, traffic impacts associated with peak period construction traffic were considered. The analysis in the AFC concluded that the project was expected to generate approximately 2,744 daily round-trips, with 907 trips occurring during each peak hour. This calculation was based on the assumption of 1,033 on-site workers in the peak month, plus additional vehicles for truck deliveries, for heliostat construction, power block construction, grading, and other construction activities.

Since the AFC was prepared, however, the construction worker and traffic assumptions have been updated based on experience acquired from other large projects in remote locations and from construction of the Ivanpah SEGS project. An Updated Workforce Analysis [Exhibit 63, October 1, 2012] was prepared based on the revised construction worker and traffic assumptions. This analysis is incorporated by reference and summarized below.

Traffic Assumptions

The traffic analysis is based on the following assumptions:

- Onsite peak construction workforce is 2,293 workers in Month 19.
- The day shift will generally[1] be from 5:00 AM to 3:30 PM, and swing shift will be from 6:00 PM to 4:30 AM.
- 70 percent of workforce is assumed to reside in California, with a majority seeking work-week lodging in Nevada. Of the 70 percent coming from California:
  - 15 percent is assumed to have lodging in Pahrump, Nevada
  - 5 percent is assumed to have lodging in Tecopa and Shoshone (Inyo County)
  - 50 percent is assumed to have lodging in the south Las Vegas area
- 30 percent of workforce is assumed to reside in Nevada. Of the 30 percent coming from Nevada:
  - 5 percent is assumed to have permanent residence in Pahrump

[1] The start and end times of the day shift are expected to change based on season and temperature. Thus, summer construction would begin earlier than winter construction.

  - 25 percent is assumed to have permanent residence in the Las Vegas area

- The following commute assumptions were also made:
  - Workers driving from California will use their own personal vehicles to drive to and from their temporary place of lodging.
  - Of the California dayshift workers, 80 percent will drive to their temporary place of lodging on Sunday evening; 20 percent will drive directly to the work site on Monday morning.
  - Of the California swing shift workers, 90 percent will drive directly to the work site on Monday in their own cars. The 10 percent that are staying in town through the weekend will carpool to the work site on Monday.
  - From place of lodging (California workers) or their homes (Nevada workers) to the work site, day shift ridership would average 1.2 persons per vehicle. On an average basis, vehicle use is calculated as 100 workers/1.2 workers per vehicle = 83 vehicles per 100 workers.
  - As the day shift workforce approaches 1,000 workers, 15-passenger vans will be used to increase the day shift ridership to 1.5 persons per vehicle for California workers. Thus, during the peak months of construction, vehicle use is calculated as 100 workers/1.5 workers per vehicle = 67 vehicles per 100 workers. The ridership for Nevada workers will remain at 1.2 persons per vehicle throughout the project construction period.
  - The California and Nevada swing shift carpool rate will average 1.2 persons per vehicle, regardless of the size of the swing shift workforce.
- The following work-week durations were made for both day shift and swing shift:
  - 50 percent of the workforce is assumed to work a 5-day, 10-hour-per-day work week (Monday through Friday for day shift; Monday night through Saturday morning for swing shift). Of those:
    - The California workers are assumed to drive their cars to the work site on Friday and leave to return home following their shift.
    - The Nevada workforce is assumed to carpool at a rate of 1.2 persons per vehicle.
  - 40 percent of the workforce will stay and work an additional 10-hour shift on Saturday, returning home at the end of their shift
  - 10 percent of the California workforce will stay over the weekend

Intersection Analyses

The potential peak hour traffic impacts were analyzed for the day shift during the peak construction month. Although the employee trips would occur outside of typical peak hours (generally 7:00 AM to 9:00 AM and 4:00 PM to 6:00 PM), this shift represents the greatest number of employees arriving and departing the site at one time (1,682 employees). As a conservative analysis, the peak truck trips (assumed to be a maximum of 90 deliveries in a single day or 180 one-way trips) were added to the peak workforce trips although the workforce and truck trips will peak during different months.

To assess the potential project traffic impacts, the intersections of SR 160/Tecopa Road, SR 127/Tecopa Road, and SR 127/Baker Boulevard were analyzed for the Monday commute, weekday commute (Tuesday through Thursday) and for the Friday commute. The SR 160/Tecopa Road intersection was analyzed because the majority of project traffic is anticipated to travel through this intersection during a typical weekday. The SR 127 intersections were analyzed because it is assumed that on Monday morning 20 percent of the California workforce will travel through Baker on their way to the site from I-15. On

Friday afternoon, 50 percent of the California workforce will travel through Baker on their way home via I-15 south.

The existing plus project intersection LOS is presented in Tables TT-1 and TT-2.

TABLE TT-1
AM Peak Hour LOS (Day Shift)

				Existing + Project AM Peak					
		Existing AM Peak		Monday		Tuesday-Thursday		Friday	
Intersection	**Approach/ Movement**	**Delay***	**LOS**	**Delay**	**LOS**	**Delay**	**LOS**	**Delay**	**LOS**
SR 160/Tecopa Road	Northbound left/right	9.3	A	9.9	A	10.0	A	**100+**	**F**
	Westbound left	8.1	A	24.3	C	**60.6**	**F**	**100+**	**F**
SR 127/Tecopa Road	Southbound left	7.4	A	7.9	A				
	Westbound left	9.4	A	9.4	A	N/A*		N/A*	
	Westbound right	8.8	A	10.1	B				
SR 127/Baker Blvd.	Overall delay	8.1	A	11.1	B				
	Eastbound movements	7.6	A	8.7	A				
	Westbound movements	8.4	A	9.6	A	N/A*		N/A*	
	Northbound movements	8.2	A	12.9	B				
	Southbound movements	8.2	A	8.7	A				

*Not applicable. The intersection was not analyzed for weekday/Friday morning peak hour because there will not be any project trips added to the intersection during this period.

TABLE TT-2
PM Peak Hour LOS (Day Shift)

				Existing + Project PM Peak					
		Existing PM Peak		Monday		Tuesday-Thursday		Friday	
Intersection	**Approach/ Movement**	**Delay***	**LOS**	**Delay**	**LOS**	**Delay**	**LOS**	**Delay**	**LOS**
SR 160/Tecopa Road	Northbound left/right	9.7	A	**100+**	**F**	**100+**	**F**	**100+**	**F**
	Westbound left	7.9	A	7.9	A	7.9	A	7.9	A
SR 127/Tecopa Road	Southbound left	7.4	A					7.4	A
	Westbound left	9.4	A	N/A*		N/A*		19.9	C
	Westbound right	8.8	A					8.8	A
SR 127/Baker Blvd.	Overall delay	10.7	B	N/A*		N/A*		**37.6**	**E**

TABLE TT-2
PM Peak Hour LOS (Day Shift)

				Existing + Project PM Peak					
		Existing PM Peak		Monday		Tuesday-Thursday		Friday	
Intersection	**Approach/ Movement**	**Delay***	**LOS**	**Delay**	**LOS**	**Delay**	**LOS**	**Delay**	**LOS**
	Eastbound movements	10.2	B					14.4	B
	Westbound movements	10.7	B					14.5	B
	Northbound movements	12.0	B					16.0	C
	Southbound movements	10.1	B					**67.2**	**F**

*Not applicable. The intersection was not analyzed for Monday/weekday afternoon peak hour because there will not be any project trips added to the intersection during this period.

As shown in the tables:

- The SR 160/Tecopa Road would operate at LOS F during the PM peak hour on Monday and at LOS F during both peak hours, on Tuesday through Friday, under existing plus project conditions. Without mitigation, this would be a significant impact.
- The SR 127/Tecopa Road intersection would operate at LOS C or better during both peak hours, Monday through Friday, under existing plus project conditions. There would be no significant impact at this intersection.
- The SR 127/Baker Boulevard intersection would operate at LOS E during the Friday afternoon peak hour, under existing plus project conditions. Without mitigation, this would be a significant impact.

Implementation of one or more the appropriate proposed mitigation measures described below will reduce these impacts to less than significant. Some or all of these potential measures may be implemented based on the specific circumstances at the time. The intersection operations would return to pre-project conditions once project construction is complete.

Proposed Mitigation Measures

1. **Traffic Control Plan.** Where project construction will require the use of traffic control (signage, flaggers, lead vehicles, etc.), a detailed traffic control plan will be prepared prior to the start of construction for review by the CEC, NDOT, Inyo, Clark and Nye counties, and prepared in accordance with the Manual of Uniform Traffic Control Devices (MUTCD) and the California Supplement of the MUTCD. Project ingress and egress routes will be designated, and project-related vehicle traffic outside these routes will not be allowed. Nearby intersections will be evaluated to determine whether large trucks could complete turning maneuvers through the intersections.

2. **Traffic Monitoring Program**. Traffic operations at the study intersections (SR 160/Tecopa Road, SR 127/Tecopa Road, and SR 127/Baker Boulevard) will be visually monitored by the Applicant's representative once per week, during the morning and afternoon peak hour during peak construction months. It is recommended that the monitoring begin in Month 12 when 1,176 workers are projected (approximately 51 percent of the peak) and continue through the end of Month 24 when 1,293 workers are projected (approximately 56 percent of the peak). Because the construction workforce will increase gradually over the 29-month construction period, with a peak

workforce occurring during Month 19, traffic conditions will be observed as the workforce increases over time, and adjustments will be made as needed.

The following mitigation measures will be considered to address the potential impacts. In general, they will be considered individually: If one mitigation measure addresses the impacts, there is no need to consider additional mitigation measures. If the measure does not address the impacts, or cannot be implemented, adding another mitigation measure will be considered.

- **Carpooling.** If the traffic monitoring program identifies LOS E or F conditions (extended queues during the peak periods), specific measures will be implemented to reduce the number of trips to the site. This analysis already includes an assumption that 15-passenger vans will be used to achieve a carpool rate of 1.5 for the California workforce. However, given the high cost of gas and the remote location of the site, there are opportunities to increase the occupancy (number of people per vehicle). Improvements should target a carpool rate of 2.5 people per car to maintain LOS D at the SR 160/Tecopa Road intersection (consistent with the applicable County thresholds). Two specific steps are included in this mitigation measure:

  - **Rideshare Program.** As part of the rideshare program, employees will be encouraged to take advantage of the existing Club Ride Program sponsored by the Regional Transportation Commission of Southern Nevada. Club Ride offers a free ridematching service that matches individuals who live and work in proximity to one another and have a similar work schedule. The program also assists in forming vanpools when demand is met.

  - **Employer Sponsored Van Program.** As a supplement to the voluntary rideshare program, participation in a mandatory van program (using additional 15-passenger vans) may be needed to obtain the 2.5 occupancy rate for carpools. Because employees will be grouped in several hotels in their lodging areas (Pahrump and Las Vegas area), the vans could pick up and drop off employees at their hotels, significantly reducing the number of vehicles travelling to the site.

- **Temporary Traffic Control**. All of the study intersections would operate at an acceptable LOS if they were signalized. One option would be to install temporary traffic signals, but that is ineffective for several reasons. First, the delays at the intersections are only for an hour or two each day, and the signalization would be 24 hours, unnecessarily delaying other drivers for the remainder of the day. Second, the timing at a temporary signal would not be complex enough to handle the highly peaked demands coming from the work site. Finally, the permit requirements for installing a signal at a state highway would likely require more time than is available once it was determined that this mitigation is needed.

  A better strategy is to institute traffic control (with flaggers or off-duty police) for one or two hours each day. These staff would allow the high-volume construction traffic to pass through the intersection without stopping, occasionally stopping them to allow cross-traffic through. The capacity of the affected intersections will be increased with this approach, and the impacts will be reduced to less-than-significant.

- **Staggered Work Shifts.** If LOS E or F conditions occur at an intersection even with the ridesharing and passenger vans, and temporary traffic control is not implemented, additional work shifts may need to be staggered so workers not using the ridesharing program would arrive and leave the site over a longer period of time (instead of all at once), thus reducing the potential for queues at the intersections.

- **Physical Improvements**. If LOS E or F conditions occur, even with ridesharing and staggered shifts, temporary physical improvements to the intersections may be required and may include installation of a separate northbound right-turn lane at the SR 160/Tecopa Road intersection.

3. **Surface Restoration.** An increase in traffic flow or an increase in heavy equipment on the surrounding roads may contribute to a drop in quality of the road surfaces and an increase in maintenance costs. Roads are designed to handle the weights of a number of vehicles for a specific period (the design life). A road's design life may diminish with increased traffic and heavy travel loads over time, resulting in a worn down road surface. In general, any construction activities that could affect existing surfaces or roadway components shall be mitigated by restoring the facility to its original condition (before construction). Pavement restoration shall meet or exceed the applicable standard specifications. The project Standard Details will outline specifics on pavement restoration. Contract documents will provide details on paving, curb and gutter, signing and striping, detectors, sidewalks, medians and landscaping, and other surface elements.

C. Potential Operational Related Impacts; Avoidance and Minimization Measures

HHSEGS is expected to employ up to 100 full-time employees: 30 with Solar Plant 1, 30 with Solar Plant 2, and 40 with the administration, shop and warehouse facility. The plant will be operated 7 days a week. The full-time employees will generate 200 daily trips.. Consequently, the addition of traffic associated with project operations will be minimal. Given the low volume of project-added traffic, HHSEGS generated traffic will not result in any significant impacts and the surrounding roadways and intersections will continue to operate at acceptable levels of service.

D. Summary of Compliance with Applicable LORS

Table 5.12-1 of the AFC [Exhibit 1] and Section 4.1 of the Updated Workforce Analysis [Exhibit 63] lists the federal, state, and local LORS that apply to traffic and transportation. Because the project's transportation impacts affect both California and Nevada, local LORS for Inyo and San Bernardino counties, California, and Clark and Nye counties, Nevada, were reviewed. With implementation of the proposed mitigation measures and conditions of certifications, the project will comply with all applicable LORS related to traffic and transportation.

E. Summary of the Potential Cumulative Impacts

Section 5.12.3.8 of the AFC identified the Pahrump Valley General Aviation Airport, St. Therese Mission, and Element Power Solar Project as projects that are reasonably foreseeable. Cumulative traffic impacts could occur if construction and/or operation of these projects resulted in a significant number of trips through the study intersection during the HHSEGS peak construction period.

It is unlikely that construction or visitor traffic to the St. Therese Mission would be significant enough to result in a cumulative impact. Mission construction began in early May 2011 and should be completed prior to the start of HHSEGS construction. During operations, visitors to the Mission would likely travel through the SR 160/Tecopa Road intersection. Per the developer's estimate, it is estimated that about 1,200 visitors per month (or approximately 40 per day) would visit the facility and visits would likely occur outside of peak hours.

Impacts from the construction of the Pahrump Valley General Aviation Airport and the Element Power Solar Project cannot be determined because a definitive construction schedule is unknown at this time. Because the projects would require detailed NEPA analysis and adequate mitigation measures, it is reasonable to assume that they would also include mitigation measures to reduce any cumulative traffic impacts to a less-than-significant level. Potential cumulative traffic impacts would be further reduced

with the implementation of the HHSEGS TMP, which will monitor traffic flows through the SR 160/ Tecopa Road, SR 127/Tecopa Road, and SR 127/Baker Boulevard intersections.

III. Response to Certain Issues Raised in the FSA

The assessment of traffic and transportation impacts in the Final Staff Assessment (FSA) is a thorough and accurate analysis of the issue. However, certain proposed conditions are more stringent than the conditions placed on other similarly situated projects licensed by the Commission and are more stringent than is necessary to mitigate impacts. Therefore, as explained in Section IV, we recommend that these more stringent conditions be deleted or revised. In several instances, we recommend use of the standard Commission language, rather than the more restrictive language proposed in the FSA.

IV. Proposed Licensing Conditions

The FSA for the project proposes eight Conditions of Certification (COCs) for this subject matter. A summary of the Preliminary Staff Assessment (PSA) and FSA comments are provided in Table TT-3, and the detailed comments are provided below. Note that many of the comments on the FSA are similar to those comments we offered on the PSA.

TABLE TT-3
Summary of PSA and FSA Comments

COC	Applicant Comment on PSA	Rationale	Addressed in FSA?	Status in FSA	Applicant Comment on FSA
TRANS-1: Roadway Use Permits and Regulations	Delete TRANS-1 in its entirety	Condition too burdensome/ unnecessary	No	TRANS-1 left in FSA unchanged.	Delete TRANS-1 in its entirety
TRANS-2: Right of Way	Recommends submitting traffic study to identify improvements along Tecopa Rd.	Condition too general, not site-specific	No	Minor revisions and additions to COC language, however Staff still requesting 24' of ROW.	Specify only improvements for acceleration and deceleration lanes that are evaluated in a traffic study.
TRANS-3: Restoration of All Public Roads, Easements, and Rights-of-Way	Recommends removing "ALL" from title. Specifies restoring Tecopa Rd. from project site to SR 160 to pre-construction condition.	Condition too stringent	No	Condition now specifies restoration of Tecopa Rd. from SR 127 to SR 160. COC also still states "original" condition of road. Other minor revisions.	Recommends removing "ALL" from title, and specifies restoring Tecopa Rd. from project site to SR 160 to pre-construction condition.
TRANS-4: Truck Route	Recommends prohibiting trucks, originating outside of Inyo County, from using Tecopa Rd., west of project site.	Condition too general; Provide more flexibility during implementation	No	COC still states all construction truck traffic required to use SR 160 for all access to and from project site.	Recommends truck prohibitions be limited to those originating outside of Inyo County from using Tecopa Road west of project site.

TABLE TT-3
Summary of PSA and FSA Comments

COC	Applicant Comment on PSA	Rationale	Addressed in FSA?	Status in FSA	Applicant Comment on FSA
TRANS-5: Traffic Control Plan, Heavy Hauling Plan, and Parking/Staging Plan	Recommends minor changes to wording/order of text.	Provide more flexibility during implementation	Yes	Some comments were addressed, but new language was added.	Additional changes to wording have been recommended to make the COCs practical.
TRANS-6: Transport of Hazardous Materials	Delete TRANS-6 in its entirety	Condition too burdensome/ unnecessary. Existing law	No	TRANS-6 left in FSA unchanged.	Delete TRANS-6 in its entirety
TRANS-7: FAA Notification	Recommends minor text revision- replace "exhaust stack" with "the solar power tower"	Correct error	Yes	Comments were addressed, but new language was added	FAA approval should be limited to the conditions of the existing No Hazard Determination Letter.
TRANS-8: Heliostat Operations	Recommends minor changes to wording/order of text.	Condition too burdensome; Provide more flexibility during implementation	No	COC was changed significantly and new language was added.	Needs to be revised to make it workable

Our rationale for proposing changes to the Conditions of Certification are detailed in the comments on each condition. Proposed revisions to Conditions TRANS-1 through TRANS-8 follow.

CONDITION TRANS-1, ROADWAY USE PERMITS AND REGULATIONS

TRANS-1 should be deleted in its entirety. Under California law, the transporters, not the customer, are responsible for obtaining oversized /overweight permits from relevant jurisdictions. It is unnecessary, burdensome, and inconsistent with previous CEC projects to require that these permits be submitted to the CEC by the project owner. This condition has not been imposed on other similarly situated renewable energy projects and there has been no justification shown in the FSA for imposing this condition on the HHSEGS project.

Thousands of vehicles are likely to travel to the HHSEGS during construction and operation of the facility. To require the Project Owner to obtain, retain, and report the permits for each of these vehicles would be an extraordinarily burdensome and costly task. Moreover, in the absence of any evidence that vehicles serving the HHSEGS project will not be in compliance with transportation laws, the condition is entirely unnecessary. Finally, it has not been shown that the Commission has the authority to impose a condition regarding the permits for vehicles that travel roads in California and Nevada. The Commission has jurisdiction over power plant “sites and related facilities.”While roads on and adjacent to the project site are related facilities, there has been no showing that the Commission has jurisdiction over vehicles that travel to and from the project site. Therefore, this condition would be a significantly burdensome and unnecessary expansion of the Commission’s jurisdiction.

CONDITION TRANS-2, RIGHT-OF-WAY

Inyo County has requested additional right-of-way along Tecopa Road to provide for acceleration and deceleration lanes. Condition of Certification TRANS-2 is written more broadly than necessary. As written, this condition would require the project owner to "offer to dedicate to the County of Inyo 24 feet of right-of-way along Old Spanish Trail Highway Road for the length of HHSEGS site." Since design of these lanes has not occurred, this condition should be revised to specify that the project owner shall provide the necessary right-of-way for acceleration and deceleration lanes at entrances or exits from the project site. Please revise as follows:

TRANS-2: Right-of-Way

The project owner shall submit a traffic study to the CPM that will identify improvements along Tecopa Road in the vicinity of entrances to the project site that are necessary to provide adequate acceleration/deceleration lanes for construction traffic. Upon approval of the this traffic study, the project owner shall offer to dedicate to the County of Inyo the land identified in the traffic study that is necessary to accommodate these acceleration/deceleration lanes. ~~The project owner shall dedicate to the County of Inyo 24 feet of right-of-way along Old Spanish Trail Highway to ensure adequate turn lanes and acceleration/deceleration lanes for construction traffic. Prior to the peak daily truck deliveries, the project owner shall have constructed the turn lanes and acceleration/deceleration lanes for construction traffic.~~

Verification: ~~At least 90 days prior to start of site mobilization,~~ Sixty (60) days prior to the start of construction, the project owner shall submit a traffic study to the CPM that will identify improvements along Tecopa Road in the vicinity of entrances to the project site that are necessary to provide adequate acceleration/deceleration lanes for construction traffic. Upon approval of the traffic study, the project owner shall construct the traffic improvements specified in the study. In addition, the project owner shall provide evidence to the CPM that it has made an offer of dedication of the necessary right-of-way to the County, and shall inform the CPM when the County has accepted this offer, if accepted by the County. ~~the dedication of right-of-way has been accepted and recorded by Inyo County; detailed construction plans that will identify improvements along Old Spanish Trail Highway and at the project entry points for review and comment by Inyo County and the CPM for review and approval. Prior to the peak daily truck deliveries (Month 6), the project owner shall have constructed the turn lanes and acceleration/deceleration lanes for construction traffic.~~

CONDITION TRANS-3, RESTORATION OF ALL PUBLIC ROADS, EASEMENTS, AND RIGHTS-OF-WAY

Condition of Certification TRANS-3 has been revised to require restoration of Tecopa Road from SR 127 to SR 160. However, given that TRANS-4 will restrict heavy truck traffic on Tecopa Road west of the project site, there is no evidence showing that traffic related to project construction will materially affect the condition of this section of Tecopa Road. Therefore, the responsibility for restoration should be limited to that portion of the Tecopa Road between the project and SR 160. In addition, TRANS-3 is more stringent than the standard condition that has been applied to similarly situated projects. The standard condition requires the project owner to restore all public roads that have been damaged due to project-related construction activities to "original or near-original condition" in a timely manner, as directed by the CPM. Condition of Certification TRANS-3, in contrast, requires the project owner to restore all public roads that have been damaged due to project-related construction activities to "original condition *or better* in compliance with the applicable jurisdiction's specifications." There is no justification for requiring restoration to exceed the road's condition as evidenced by the photos and/or video taken prior to the start of construction. In addition, the verification language of Condition of Certification TRANS-3 differs from the standard condition and raises a number of potential ambiguities

in the manner in which it would be applied. To avoid any possible confusion, please apply the standard condition and verification language, as follows:

TRANS-3 Restoration of ~~All~~ Public Roads, Easements, and Rights-of-Way

The project owner shall coordinate with Inyo County to restore all portions of Tecopa Road, from the project site east to the County line ~~public roads, easements, and rights-of-way~~ that have been damaged due to project-related construction activities to the condition that existed prior to the start of construction in a timely manner, as directed by the CPM. ~~This includes Old Spanish Trail Highway from the intersection of SR 127 to the intersection of SR 160. Restoration of significant damage which could cause hazards (such as potholes or deterioration of the pavement edges, damaged signage) must take place immediately after the damage has occurred. The restoration shall be completed in a timely manner to the road's original condition in compliance with the applicable jurisdiction's specifications.~~

Verification: Repair of significant project-related damage that could cause hazards (such as potholes or deterioration of the pavement edges, damaged signage) must take place immediately after the project owner becomes aware of the damage. Prior to the start of site mobilization, the project owner shall photograph or videotape Tecopa Road from the project site to the intersection of SR 160 and shall provide the CPM and Inyo County with a copy of these images. ~~all of the affected public roads, easements, right-of-way segment(s), and/or intersections. This includes all portions of Old Spanish Trail Highway from the intersection of SR 127 (Sate of California) to the intersection of SR 160 (State of Nevada)~~. Prior to project construction, t~~T~~he project owner shall provide ~~the photograph or videotape~~ notice to the CPM, ~~and the affected jurisdictions (California Department of Transportation (~~Caltrans~~)~~, ~~Nevada Department of Transportation (~~NDOT~~),~~ and Inyo County~~)~~. The purpose of this notification is to request that these jurisdictions consider postponement of any planned public right-of-way repair or improvement activities in areas affected by project construction until construction is completed, and to coordinate any concurrent construction-related activities that cannot be postponed.

Within 60 calendar days after completion of construction, the project owner shall meet with the CPM and Inyo County to identify sections of public right-of-way to be repaired as a result of project construction. At that time, the project owner shall establish a schedule to complete the repairs and to receive CPM approval for the action(s). Following completion of these repairs, the project owner shall provide the CPM a letter signed by the County of Inyo stating the results of their review of the repairs. ~~If damage to public roads, easements, or rights-of-way is identified by the project owner or the affected jurisdiction, the project owner shall immediately notify the CPM and the affected jurisdiction(s) to identify the section of the public right-of-way to be repaired. At that time, the project owner shall establish a schedule for completion and approval of the repairs. Following completion of any public right-of-way repairs, the project owner shall provide the CPM letters signed by the person authorized to accept the repairs in the affected jurisdiction(s) stating their satisfaction with the repairs.~~

CONDITION TRANS-4, TRUCK ROUTE

TRANS-4 needs to be revised to limit the process to legitimate complaints and to provide some flexibility in implementation. Please revise TRANS-4 as follows:

TRANS-4: Truck Route

The project owner shall require all construction truck traffic to use State Route 160 for all access to and from the project site. Throughout the construction and operation of the project, the project owner shall ~~document, investigate, evaluate, and~~ resolve legitimate ~~all project truck related~~ complaints concerning the use of Tecopa Road/Old Spanish Trail Highway. ~~The project owner or authorized agent shall:~~

Verification: The project owner shall prohibit use of Tecopa Road west of the project site in its contracts for deliveries originating outside of Inyo County and provide the CPM with a copy of the instructions to be used in such contracts specifying the truck route. The project owner shall retain copies of all such contracts for inspection by the CPM for 1 year following commercial operation.

The project owner, or authorized agent, shall:

- ~~Provide a spotter (an individual, such as a security guard, to monitor truck traffic) to ensure all construction truck traffic does not utilize Old Spanish Trail Highway via State Route 127;~~
- Use the Traffic Complaint Resolution Form (below), or a functionally equivalent procedure acceptable to the CPM, to document and respond to each legitimate traffic complaint of construction truck traffic using Old Spanish Trail Highway west of the project site;
- Attempt to contact the person(s) making the traffic complaint within ~~24 hours~~ one business day;
- Conduct an investigation to determine the transportation company in the complaint and;
- Within 5 days of receipt of a legitimate truck route complaint, ~~S~~submit a ~~report documenting the complaint and actions taken~~ completed Traffic Complaint Resolution Form to the CPM.

~~The report shall include: a complaint summary, including the final resolution and, if obtainable, a signed statement by the complainant stating that the truck route problem has been resolved to the complainant's satisfaction.~~

~~**Verification:** The project owner shall include this specific route in its contracts for truck deliveries and provide the CPM with a copy of the transmittal letter to the contractors specifying the truck route.~~

~~Within five days of receiving a truck route complaint, the project owner shall file a Traffic Complaint Resolution Form, shown below, with the CPM that documents the resolution of the complaint.~~

CONDITION TRANS-5, TRAFFIC CONTROL PLAN, HEAVY HAULING PLAN, AND PARKING/STAGING PLAN

Some of the specifics of the recommended TCP elements are not practical. Other provisions, such as specifying the number of seats in a van, are unduly prescriptive and could trigger the need for an amendment for even slight revisions.

In addition, the FSA has added language that would require the project owner to obtain an encroachment permit from public agencies for "any activity on public roads." This requirement should be deleted for three reasons. First, the CEC license is issued in lieu of all local permits. Therefore, to require the project owner to obtain an encroachment permit post-certification would be an unlawful delegation of the Commission's peremptory jurisdiction, a circumstance the Warren Alquist act was specifically enacted to avoid. Second, other similarly situated projects (such as Ivanpah and Abengoa) have not been required to obtain encroachment permits from local agencies; therefore, to require it for this project would be discriminatory. Third, an encroachment permit is not required for "any activity" on a public road. Instead, in the absence of the Commission's jurisdiction, an encroachment permit would be required only to do work on or improve a public right-of-way.

Therefore, please revise TRANS-5 as follows.

TRANS-5: Traffic Control Plan, Heavy Hauling Plan, and Parking/Staging Plan

The project owner shall prepare and implement a Traffic Control Plan (TCP) for the HHSEGS's construction and operations traffic. The TCP shall address the movement of workers, vehicles, and materials, including arrival and departure schedules and designated workforce and delivery routes.

The project owner shall consult with ~~the Department of Transportation (~~Caltrans~~)~~ District 8 Office; ~~Department of Transportation (~~Caltrans~~)~~ District 9 Office; ~~Nevada Department of Transportation (~~NDOT~~)~~; Inyo County; County of San Bernardino; Clark County and Nye County in the preparation and implementation of the ~~Traffic Control Plan (~~TCP~~)~~. The project owner shall submit the proposed TCP to Caltrans District 8, 9, NDOT, Inyo County; County of San Bernardino; Clark County and Nye County in sufficient time for review and comment, and to the CPM for review and approval prior to the proposed start of construction and implementation of the plan. ~~The Traffic Control Plan (TCP) shall include:~~

Verification: At least 30 calendar days prior to the start of construction, the project owner shall submit the TCP to the applicable agencies for review and comment and to the CPM for review and approval. The project owner shall also provide the CPM with a copy of the transmittal letter to the agencies requesting review and comment.

At least 15 calendar days prior to the start of construction, the project owner shall provide copies of any comment letters received from the agencies, along with any changes to the proposed development plan, to the CPM for review and approval.

The Traffic Control Plan (TCP) shall include:

- Provisions for redirection of construction traffic with a flag person as necessary to ensure traffic safety and minimize interruptions to non-construction related traffic flow;
- Placement of necessary signage, lighting, and traffic control devices at the project construction site and lay-down areas;
- A heavy-haul plan addressing the transport and delivery of heavy and oversized loads requiring permits from ~~Department of Transportation (~~Caltrans~~), Nevada Department of Transportation (~~NDOT~~),~~ other state or federal agencies, and/or the affected local jurisdictions;
- Location and details of construction along affected roadways at night, where permitted;

- Temporary closure of travel lanes or disruptions to street segments and intersections during construction activities;
- Traffic diversion plans (in coordination with the County of Inyo, Caltrans, NDOT, County of San Bernardino; Clark County and Nye County) to ensure access during temporary lane/road closures;
- Access to residential and/or commercial property located near construction work and truck traffic routes;
- Ensure access for emergency vehicles to the project site;
- Advance notification to residents, businesses, emergency providers, hospitals, school districts, such as the Death Valley Unified School District, and the Front Sight Firearms Training Institute that would be affected when roads may be partially or completely closed;
- Visual monitoring of the traffic operations ~~LOS~~ at the study intersections (SR 160/Old Spanish Trail Highway; SR 127/Old Spanish Trail Highway, and SR 127/Baker Boulevard) by the project owner's representative shall occur once per week, during the morning and afternoon peak hour during peak construction months. Monitoring would begin in Month 12 when 1,176 workers are projected (approximately 51 percent of the peak) and continue through the end of Month 24 when 1,293 workers are projected (approximately 56 percent of the peak). The findings shall be reported monthly to the CPM in the monthly compliance report ~~or as necessary~~;
- One or more of t~~T~~he following measures, or other measure as proposed by the project owner, shall be implemented when the visual traffic monitoring identifies average delays to all vehicles of 60 seconds or more (for a period of at least 15 minutes) ~~LOS E conditions~~ occurring during three or more consecutive monitoring periods at the intersections of SR 160/Old Spanish Trail Highway,~~; LOS D conditions at~~ SR 127/Old Spanish Trail Highway, or~~; LOS F conditions at~~ SR 127/ Baker Boulevard:
    - A work schedule and end-of-shift departure plan that would stagger Monday arrivals and Friday departures from the project site;
    - Carpooling - Club Ride Program sponsored by the Regional Transportation Commission of Southern Nevada, or similar program and;
    - Employer Sponsored Van Program designed to transport construction workers to the project site via a van or bus service. ~~15-passenger vans shall be used to achieve highera baseline carpool ratesof 1.5 people per car for the California workforce and the higher carpool rate of 2.5 people per car when the day shift workforce reaches 1,000 employees shall be required~~.
- Identification of safety procedures for exiting and entering the site access gate;
- Parking/Staging Plan (PSP) for all phases of project construction and for project operation.

~~For any activity on public roads, the project owner shall apply for, receive and comply with all conditions of an encroachment permit from the affected jurisdiction.~~

~~**Verification:** At least 60 calendar days prior to the start of construction, the project owner shall submit the TCP to the applicable agencies for review and comment and to the CPM for review and approval. The project owner shall also provide the CPM with a copy of the~~

~~transmittal letter to the agencies requesting review and comment and a copy of the encroachment permit issued by the affected agency for any activities on a public road.~~

~~At least 30 calendar days prior to the start of construction, the project owner shall provide copies of any comment letters received from the agencies, along with any changes to the proposed development plan, to the CPM for review and approval.~~

CONDITION TRANS-6, TRANSPORTATION OF HAZARDOUS MATERIALS

Please delete TRANS-6 in its entirety. As with TRANS-1, this requirement is the responsibility of the transporter, not the customer, and is therefore unnecessary, burdensome, and inconsistent with previous CEC decisions.

CONDITION TRANS-7, FEDERAL AVIATION ADMINISTRATION NOTIFICATION OF CONSTRUCTION CRANES AND OBSTRUCTION MARKING AND LIGHTING

Staff requires that Form 7460-1 be filed with the FAA for use of construction cranes exceeding 200 feet in height. However, the project already has received a No Hazard Determination (NHD) letter from the FAA providing approval for heights of 820 feet above ground level (see Data Response 27, Data Response Set 1A). The NHD letter already states, "*This determination does include temporary construction equipment such as cranes, derricks, etc., which may be used during actual construction of the structure. However, this equipment shall not exceed the overall heights as indicated above [820 feet]. Equipment which has a height greater than the studied structure requires separate notice to the FAA.*" Therefore, TRANS-7 should be revised as follows:

TRANS-7: Federal Aviation Administration Notification of Construction Cranes and Obstruction Marking and Lighting

The project owner shall install obstruction marking and lighting on the two solar power towers and ~~any~~ construction cranes exceeding ~~200~~ 820 feet in height consistent with FAA requirements, as expressed in the following documents:

- FAA ~~Advisory Circular 70/7460-1K~~ Determination of No Hazard to Air Navigation for Solar Tower Unit 1, and
- FAA ~~Safety Alert for Operators (SAFO) 09007~~ Determination of No Hazard to Air Navigation for Solar Tower Unit 2.

Permanent lighting consistent with all requirements shall be installed and activated within 5 days of completion of construction and prior to operation of the HHSEGS. Lighting shall be operational 24 hours a day, 7 days a week for the life of project operation. Upgrades to the required lighting configurations, types, location, or duration shall be implemented consistent with any changes to FAA obstruction marking and lighting requirements.

The project owner shall file a Form 7460-1 with the Federal Aviation Administration (FAA) regarding the use of ~~200 feet tall~~ construction cranes exceeding 820 feet above ground level.

Verification: At least 60 days prior to the start of construction of the solar towers, the project owner shall submit to the CPM for approval final design plans for the two solar towers that depict the required air traffic obstruction marking and lighting.

Within 5 days of completion of the solar power tower construction and prior to plant operation, the project owner shall install and activate permanent obstruction marking and lighting consistent with FAA requirements and shall inform the CPM in writing within 10 days of installation and activation. The lighting shall be inspected and approved by the CPM (or designated inspector) within 30 days of activation.

At least ~~90~~30 days prior to ~~ground disturbance,~~the use of construction cranes taller than 820 feet, the project owner shall submit a copy of the FAA Determination of No Hazard to Navigable Airspace regarding the construction cranes to the CPM.

CONDITION TRANS-8, HELIOSTAT OPERATIONS POSITIONING AND MONITORING PLAN

The three bullets need to be moved into the verification language to provide more flexibility in developing and implementing this plan.

For example, the first bullet, *Safe orientation as default orientation* -- the "heliostat controller" (it is unclear if staff means the individual controller for each heliostat, which depends on stored information regarding the sun's location in the sky, or the SFINKS that controls all of them) cannot detect a malfunction in all cases, such as a failed step motor or gear.

Third bullet, *Normal operation* --no matter where the heliostat is pointed while in the stow position, it will of course reflect radiation to other locations during its transition to power operations, if only for a brief flash. This criterion would be even more problematic when the heliostats are pointed straight up during high-wind events, though light reflected from this position would affect aircraft only. Therefore, this criterion needs to be limited to ground locations.

Please make the following changes to TRANS-8:

TRANS-8: Heliostat Operations Positioning and Monitoring Plan
The project owner shall prepare and implement a Heliostat Operations Positioning and Monitoring Plan (HPMP) that would avoid potential human health and safety hazards. ~~and accomplish the following:~~

Verification: At least 60 days prior to commercial operation of ~~any~~ either of the ~~two~~ HHSEGS Solar Receiver Steam Generators, the project owner shall submit the Heliostat Positioning and Monitoring Plan to the CPM for review and approval. The project owner shall also submit the plan to ~~the Federal Aviation Administration (FAA)~~ Inyo County Airport Land Use Commission for review and comment and forward any comments received to the CPM.

The HPMP would seek to accomplish the following:

- *Safe orientation as default orientation* – heliostats default to the safe orientation common to the whole field in ~~all~~ cases of malfunctions detected by the heliostat's controller, which ensures protection in most cases of malfunctions;
- *Safe path from any orientation to any other orientation* – when heliostats change their orientation, they choose a "path" which avoids reflected sunrays on ~~all~~ unintended areas (~~at least~~ typically the tower and power block, and other designated sensitive areas). Safe path ~~orientation~~ includes normal repositioning operations as well as any contingency repositioning operations (such as during excessive high winds) which may be required.

- *Normal operation* - ~~all~~ the sunlight is reflected either on the receiver or the "standby" areas – located near the receiver – so that no other ground location receives ~~solar radiation~~reflected sunlight.

~~**Verification**: At least 90 days prior to commercial operation of any of the two HHSEGS Solar Receiver Steam Generators, the project owner shall submit the Heliostat Positioning and Monitoring Plan to the CPM for review and approval. The project owner shall also submit the plan to the Federal Aviation Administration (FAA) for review and comment and forward any comments received to the CPM.~~

The project owner shall not test or operate the project until the HPMP is approved by the CPM.

Attachments

Carrier, John/SAC

From: Carrier, John/SAC
Sent: Thursday, October 18, 2012 4:14 PM
To: 'Candace.Hill@energy.ca.gov'
Cc: 'Susan Strachan'; Mike Monasmith (mmonasmi@energy.state.ca.us); Parker, Karen/SAC
Subject: HHSEGS: Questions from CalTrans
Attachments: Traffic_Figures.pdf

Candace,

Susan forwarded your questions to us. Our responses are below in blue font.

John L. Carrier, J.D.
Program Manager
CH2M HILL
2485 Natomas Park Dr. #600
Sacramento, CA 95833-2937
Office: 916-286-0224
Fax: 916-614-3424
Cell: 916-996-9349

From: "Hill, Candace@Energy" <Candace.Hill@energy.ca.gov>
Date: Tue, 9 Oct 2012 23:23:32 +0000
To: Susan Strachan <strachan@dcn.org>, "susan@strachanconsult.com." <susan@strachanconsult.com>
Cc: "Flores, David@Energy" <David.Flores@energy.ca.gov>, "Monasmith, Mike@Energy" <Mike.Monasmith@energy.ca.gov>, "Willis, Kerry@Energy" <Kerry.Willis@energy.ca.gov>
Subject: HHSEGS Revised Data

Hello Susan –
In reviewing the Updated Workforce Analysis dated October 1, 2012 I have a few clarification questions/requested Data by the Department of Transportation (Caltrans) if you could please forward to the appropriate individuals:

- Page 4-1 – Are the Seconds of Delay as shown for SR 127/Tecopa Road/Old Spanish Trail Highway calculated using the Highway Capacity Software (HCS+ McTrans, version 5.21)?

Response: The LOS calculations were conducted using HCS+ McTrans, version 5.5.

- Page 4-3 – The assumption states " 50 percent of the California workforce will return home on Friday afternoon, directly from the site, because it is the end of their 5-day work week." Table 5.12-7BR1 shows 44% would use Tecopa Road/Old Spanish Trail Highway south on Friday. Should this percentage number be 50%?

Response: While it is assumed that 50% of the California workforce will return home on Friday, the actual percentage of trips using Tecopa Road/Old Spanish Highway is less than 50% due to the carpool rate (1.5 people per car) that is applied to the remaining 50% of workers that do not return home on Friday.

- Page 4-4 – Truck Trips – Third Sentence states "peak at 717 trucks during Month 6." Page 248 of the PSA comments #20 Line 13 states…" 717 trucks during Month 5." Please clarify the month.

Response: Initially the peak truck trips were in Month 5, but when the workforce estimates were revised by Bechtel they added a month at the beginning of the construction period that pushed the peak month to Month 6. That is, the number of truck trips per month didn't change; they just shifted one month later.

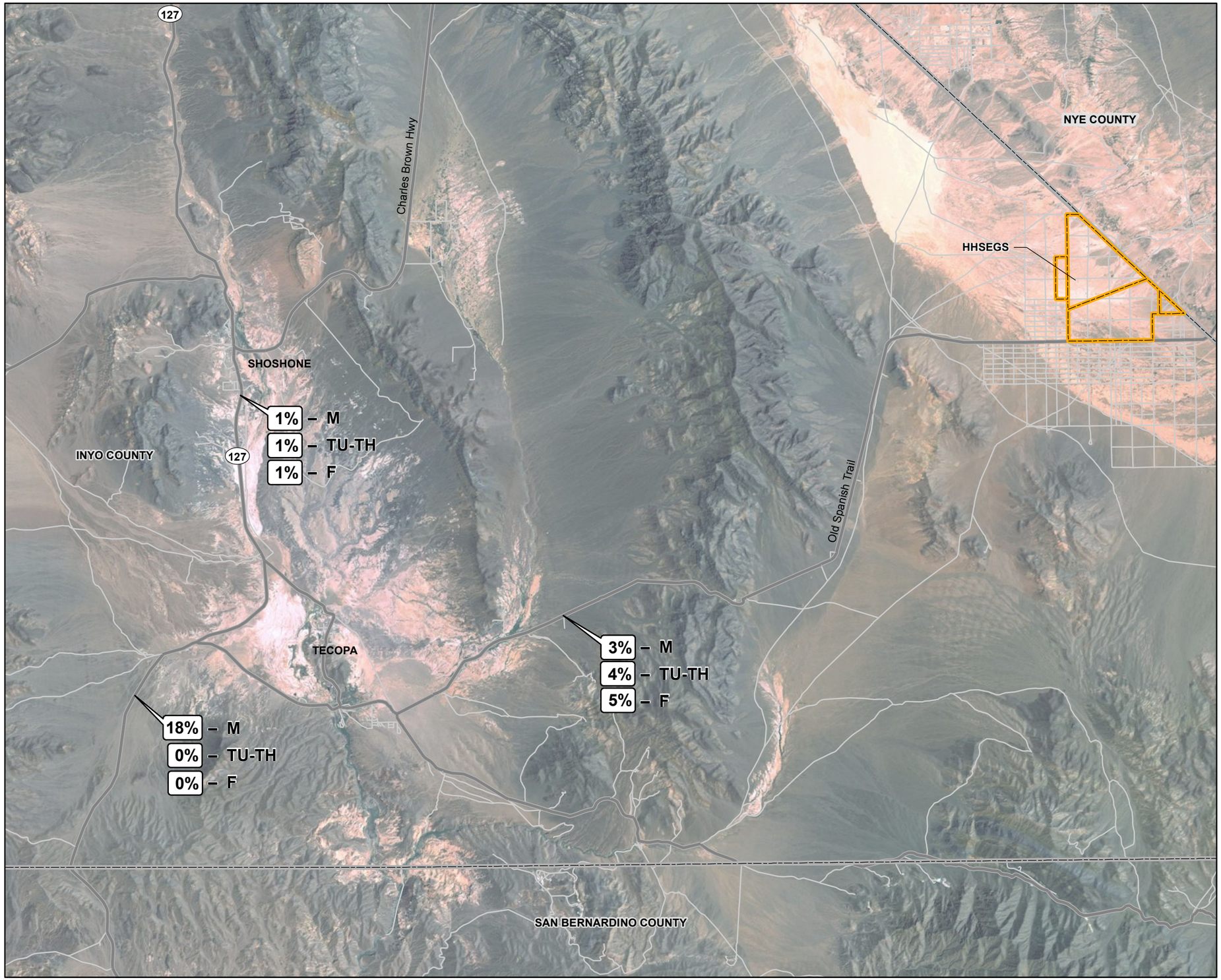
- Department of Transportation Comment: Traffic Figures - Please provide California SR 127 intersection figures for Baker Blvd and Old Spanish Trail Rd with trip distributions similar to figures 5.12-4A R1, 4BR1 and figures 5.12-5R1, 6R1. CEC just received Caltrans comments today but I wanted to get their request to the Applicant ASAP –the complete email with their overall comments hopefully will be docketed tomorrow.

Response: Figures have been generated for the SR 127/Tecopa Road intersection in response to the comment above. See attached Figures 5.12-4c, .5.12-4d, 5.12-5b, 5.12-6b (figure numbers correspond with those from the AFC and the Updated Workforce Analysis). The Applicant is collecting turning movement counts at the SR 127/Baker Blvd. intersection (the results of which are expected to be filed mid-November, 2012). Figures will be generated for this intersection once the traffic counts have been completed.

Please contact me at (916) 653-1643 if you have any questions or require additional information-

Thanks for your assistance –

Candace



LEGEND

Roads

- Interstate
- Highway
- Major Road
- Local Road

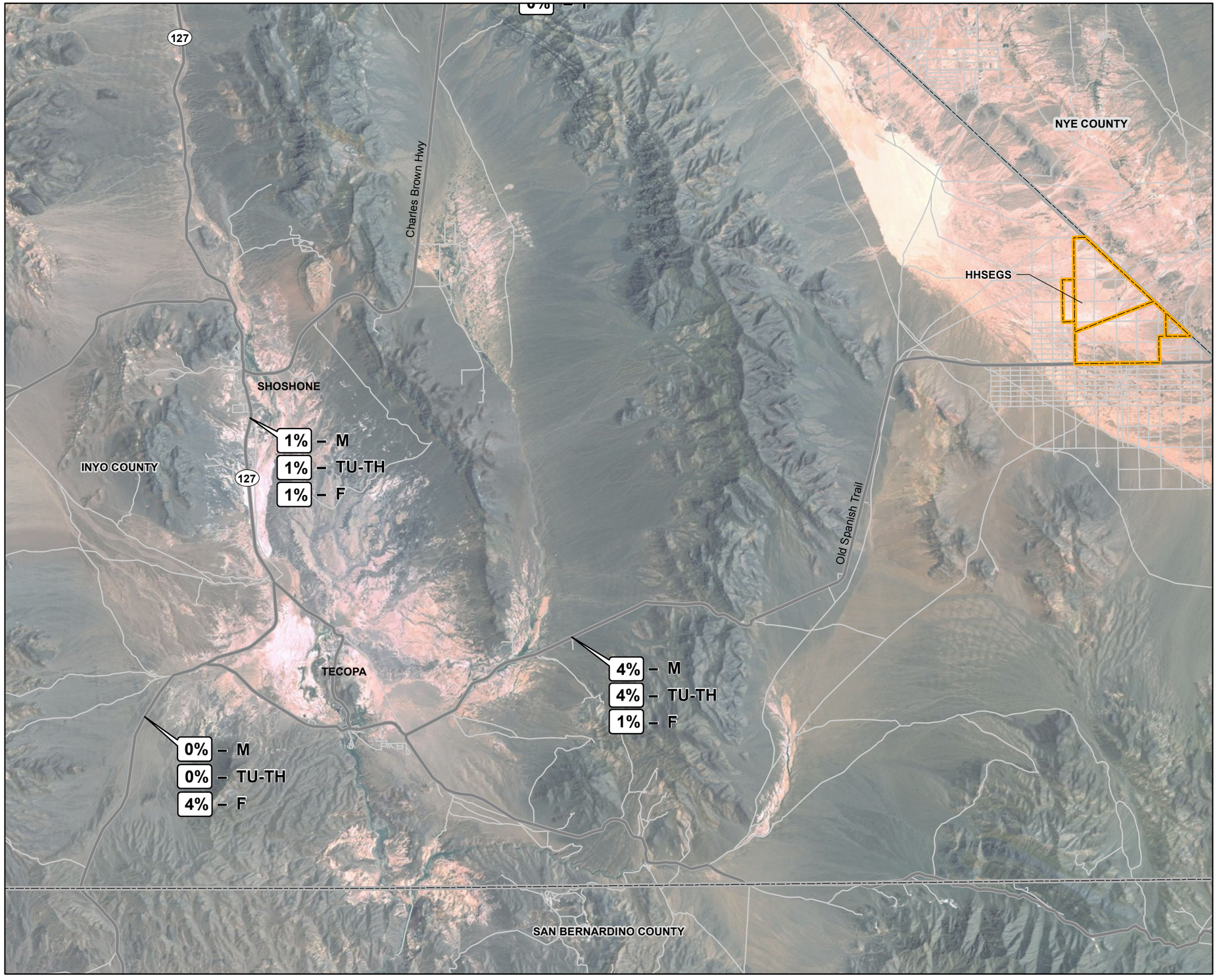
Project Site Data

- HHSEGS Boundary
- X% - M — Monday Trip Distribution Percentage
- X% - TU-TH — Tuesday - Thursday Trip Distribution Percentage
- X% - F — Friday Trip Distribution Percentage

N

0 6,250 12,500
Feet

FIGURE 5.12-4c
Project Trip Distribution Percentages
AM Peak Hour
Hidden Hills Solar Energy System



LEGEND

Roads

- Interstate
- Highway
- Major Road
- Local Road

Project Site Data

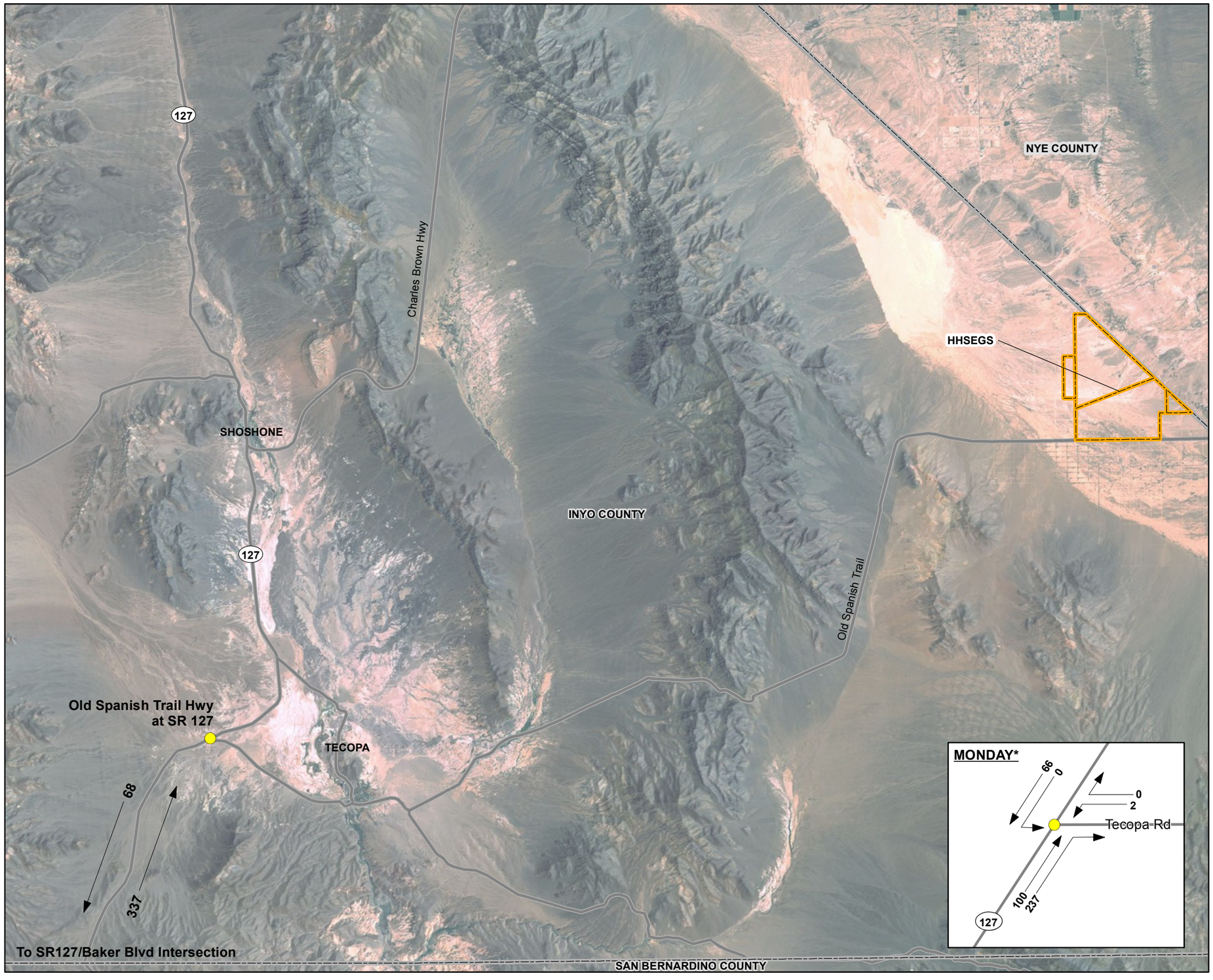
- HHSEGS Boundary
- X% - M — Monday Trip Distribution Percentage
- X% - TU-TH — Tuesday - Thursday Trip Distribution Percentage
- X% - F — Friday Trip Distribution Percentage

N

0 6,250 12,500

Feet

FIGURE 5.12-4d
Project Trip Distribution Percentages
PM Peak Hour
Hidden Hills Solar Energy System



LEGEND

- Study Intersection

Roads

- Interstate
- Highway
- Major Road
- Local Road

Project Site Data

- HHSEGS Boundary
- X Peak Hour Turning Movements

Notes:

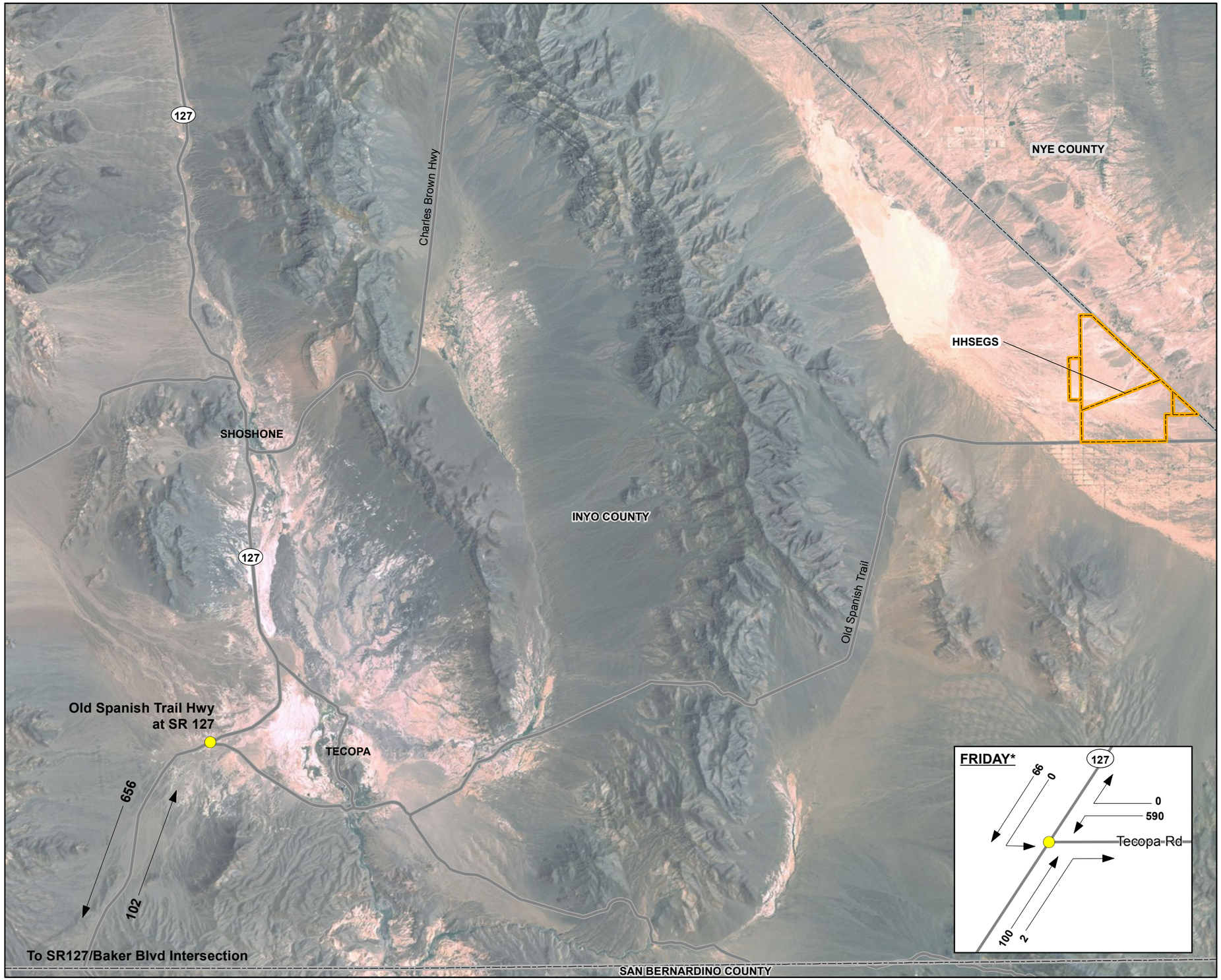
* = Study intersection was analyzed for Monday morning peak hour only because project trips will not be added to the intersection during Weekday/Friday morning peak hour.

N

0 7,500 15,000

Feet

FIGURE 5.12-5b
Existing + Construction Project
AM Peak Hour Intersection Volume
Hidden Hills Solar Energy System



LEGEND

- Study Intersection

Roads

- Interstate
- Highway
- Major Road
- Local Road

Project Site Data

- HHSEGS Boundary
- X Peak Hour Turning Movements

Notes:
* = Study intersection was analyzed for Friday afternoon peak hour only because project trips will not be added to the intersection during Monday/Weekday afternoon peak hour.

N

0 7,500 15,000
Feet

FIGURE 5.12-6b
Existing + Construction Project
PM Peak Hour Intersection Volume
Hidden Hills Solar Energy System

Carrier, John/SAC

From: Carrier, John/SAC
Sent: Thursday, October 18, 2012 4:19 PM
To: 'Candace.Hill@energy.ca.gov'
Cc: 'Susan Strachan'; Mike Monasmith (mmonasmi@energy.state.ca.us); Parker, Karen/SAC
Subject: HHSEGS: Questions from San Bernardino County

Candace,

Susan forwarded your questions to us. Our responses are below in blue font.

John L. Carrier, J.D.
Program Manager
CH2M HILL
2485 Natomas Park Dr. #600
Sacramento, CA 95833-2937
Office: 916-286-0224
Fax: 916-614-3424
Cell: 916-996-9349

------ Forwarded Message
From: "Hill, Candace@Energy" <Candace.Hill@energy.ca.gov>
Date: Fri, 12 Oct 2012 15:41:56 +0000
To: Susan Strachan <strachan@dcn.org>
Cc: "Monasmith, Mike@Energy" <Mike.Monasmith@energy.ca.gov>, "Flores, David@Energy" <David.Flores@energy.ca.gov>, "Willis, Kerry@Energy" <Kerry.Willis@energy.ca.gov>
Subject: FW: Hidden Hills Solar - CT comments

Hello Susan -

We have received comments from the County of San Bernardino - see below. Could you please forward to the appropriate individuals - see comment 1 and 3 - I will address comments 2 and 4. I will request this email be docketed but I wanted to alert you and the applicant ASAP to the County of San Bernardino comments as the clock is ticking.

Thanks-

Candace

-----Original Message-----
From: Petre, Ed [mailto:epetre@dpw.sbcounty.gov]
Sent: Thursday, October 11, 2012 4:56 PM
To: Hill, Candace@Energy
Cc: 'Dan Kopulsky'
Subject: RE: Hidden Hills Solar - CT comments

Ms Hill,

The County of San Bernardino Department of Public Works Traffic Division received your "Updated Workforce Analysis for Construction and Operations" report for the proposed solar project in Inyo County. The Traffic Division reviewed Section 4 of this document and we have the following comments:

* The intersection of SR127 and Baker Blvd should be analyzed for the Friday PM peak hour condition. The analysis should address impacts and identify any needed mitigation. If mitigations are needed, the applicant should be conditioned by the CEC to construct the mitigations or pay a fair share contribution (if appropriate).

Response: The Applicant is collecting turning movement counts at the SR 127/Baker Blvd. intersection during the morning and afternoon peak hours to establish the existing traffic conditions. Once the traffic counts have been collected, the intersection will be analyzed with the project-added traffic and mitigation identified, if necessary. The traffic count results should be filed in mid-November.

* I talked to you on the phone on October 5, 2012 and you mentioned that 100% of the construction truck traffic would use SR160 through Nevada. This should be mentioned in the report.

Response: That is correct. One 100 percent of the construction truck traffic will use NV SR-160.

* Page 4-7, #2 states 588 peak hour trips travel through the intersection of SR127 and Baker Blvd on Friday evening. How were the 588 peak hour trips calculated?

Response: The traffic analysis assumes that 50 percent of the California workforce will return home on Friday afternoon, directly from the site, because it is the end of their 5-day work week. The analysis also conservatively assumes that 100 percent of the California workforce (that returns home) will drive their own vehicles and take Tecopa Road to SR 127, to I-15 south. The California dayshift during the peak month is estimated to be 1,177 workers [70% of 1,682 workers]. Therefore: 1,177 workers x 50% leaving on Friday = 588 vehicles.

* If any County of San Bernardino maintained roadways will be used for truck construction traffic, then the developer shall be conditioned by the CEC to enter into a maintenance and restoration agreement with the Department of Public Works, Transportation Operations Division to insure all County maintained roads utilized by construction traffic shall remain in acceptable condition during construction and are returned to their preconstruction condition upon completion of the project..

Response: The CEC's Conditions of Certification address this issue.

If you have any questions, please call me at (909)387-8239.

Sincerely,

Ed Petre, P.E.
County of San Bernardino
Traffic Division
909-387-8239

Carrier, John/SAC

From: Carrier, John/SAC
Sent: Tuesday, October 30, 2012 1:48 PM
To: 'Candace.Hill@energy.ca.gov'
Cc: Mike Monasmith (mmonasmi@energy.state.ca.us); 'Susan Strachan'; Valdez, Lisa/SBA; Bloomberg, Loren/SCO; Parker, Karen/SAC
Subject: HHSEGS: traffic questions

Candace,
Susan forwarded your traffic questions on to us. Our response follows in blue font.

------ Forwarded Message
From: "Hill, Candace@Energy" <Candace.Hill@energy.ca.gov>
Date: Sun, 28 Oct 2012 21:04:08 +0000
To: Susan Strachan <strachan@dcn.org>, "susan@strachanconsult.com." <susan@strachanconsult.com>
Cc: "Flores, David@Energy" <David.Flores@energy.ca.gov>
Subject: Hidden Hills

Hello Susan-
I have a couple of follow-up questions on the Updated Workforce Analysis –

* Does Table 5.12-8AR1 – Am peak hour day shift LOS include truck trips in the calculation?

Response: Yes, the table includes the workforce and truck trips, combined.

* Is the Monthly Construction Delivery Schedule – AFC Table 5.12-6 still valid? Based on the new peak month of 19 the table shows 698 monthly trips but the new information states 180 trips during month 19. Also, how was 10 delivery truck trips per day arrived at?

Response: The monthly construction delivery schedule was updated as part of the Updated Workforce Analysis. The truck trips are expected to peak at 717 trucks during Month 6. As stated in the response to the Caltrans questions (emailed to you on October 18, 2012) the peak truck traffic month shifted from Month 5 to Month 6. In other words, the data in Table 5.12-6 has not changed it was just moved forward one month with 0 truck traffic in the new Month 0. Hence, the monthly peak of 717 trucks is now expected in Month 6 (instead of Month 5).

The 10 delivery trucks per hour number (not 10 delivery trucks per day) presented on page 4-4 of the Updated Workforce Analysis was derived as follows. To be conservative, the peak daily truck trips were added to the peak workforce trips even though the workforce and truck trips will peak during different months. Based on experience with the Ivanpah SEGS project, it was assumed that the maximum number of truck deliveries in a single day would be 90 (or 180 one-way trips). It was assumed that the 90 truck deliveries would be spread out evenly throughout the day, as shown in the following table. Thus, they would average 10 per hour during the peak AM /PM traffic periods.

	Trucks (Deliveries)		
Hours	In	Out	Total
6:00- 7:00 AM	10	0	10
7:00- 8:00 AM	10	**0**	**10**
8:00- 9:00 AM	10	0	10
9:00-10:00 AM	10	10	20
10:00- 11:00 AM	10	10	20
11:00- 12:00 PM	10	10	20
12:00- 1:00 PM	10	10	20
1:00- 2:00 PM	10	10	20
2:00- 3:00 PM	10	10	20

3:00- 4:00 PM	0	10	10
4:00- 5:00 PM	**0**	10	**10**
5:00- 6:00PM	0	10	10
TOTAL	**90**	**90**	**180**

Thus, in Table 5.12-4R1, the 180 daily trips were assumed to be the peak daily maximum. Note, that these are daily trips, not monthly numbers. The monthly peak remains at 717 vehicles (in Month 6).

Please let us know if you have any more questions.

John L. Carrier, J.D.
Program Manager
CH2M HILL
2485 Natomas Park Dr. #600
Sacramento, CA 95833-2937
Office: 916-286-0224
Fax: 916-614-3424
Cell: 916-996-9349

Carrier, John/SAC

From: Carrier, John/SAC
Sent: Monday, December 10, 2012 4:18 PM
To: 'Hill, Candace@Energy'
Cc: 'Susan Strachan'; Monasmith, Mike@Energy; Parker, Karen/SAC
Subject: HHSEGS: Questions from San Bernardino County--Baker Blvd
Attachments: HHSEGS_SR127_Baker Blvd_TM_LR.pdf

Candace,

We have completed the turning movement counts at the Baker Blvd. Intersection. Our Tech Memo of the results is attached.

John L. Carrier, J.D.
Program Manager
CH2M HILL
2485 Natomas Park Dr. #600
Sacramento, CA 95833-2937
Office: 916-286-0224
Fax: 916-614-3424
Cell: 916-996-9349

From: Carrier, John/SAC
Sent: Thursday, October 18, 2012 4:19 PM
To: 'Candace.Hill@energy.ca.gov'
Cc: 'Susan Strachan'; Mike Monasmith (mmonasmi@energy.state.ca.us); Parker, Karen/SAC
Subject: HHSEGS: Questions from San Bernardino County

Candace,

Susan forwarded your questions to us. Our responses are below in blue font.

John L. Carrier, J.D.
Program Manager
CH2M HILL
2485 Natomas Park Dr. #600
Sacramento, CA 95833-2937
Office: 916-286-0224
Fax: 916-614-3424
Cell: 916-996-9349

------ Forwarded Message
From: "Hill, Candace@Energy" <Candace.Hill@energy.ca.gov>
Date: Fri, 12 Oct 2012 15:41:56 +0000
To: Susan Strachan <strachan@dcn.org>
Cc: "Monasmith, Mike@Energy" <Mike.Monasmith@energy.ca.gov>, "Flores, David@Energy" <David.Flores@energy.ca.gov>, "Willis, Kerry@Energy" <Kerry.Willis@energy.ca.gov>
Subject: FW: Hidden Hills Solar - CT comments

Hello Susan -

We have received comments from the County of San Bernardino - see below. Could you please forward to the appropriate individuals - see comment 1 and 3 - I will address comments 2 and 4. I will request this email be docketed but I wanted to alert you and the applicant ASAP to the County of San Bernardino comments as the clock is ticking.

Thanks-

Candace

-----Original Message-----
From: Petre, Ed [mailto:epetre@dpw.sbcounty.gov]
Sent: Thursday, October 11, 2012 4:56 PM
To: Hill, Candace@Energy
Cc: 'Dan Kopulsky'
Subject: RE: Hidden Hills Solar - CT comments

Ms Hill,

The County of San Bernardino Department of Public Works Traffic Division received your "Updated Workforce Analysis for Construction and Operations" report for the proposed solar project in Inyo County. The Traffic Division reviewed Section 4 of this document and we have the following comments:

* The intersection of SR127 and Baker Blvd should be analyzed for the Friday PM peak hour condition. The analysis should address impacts and identify any needed mitigation. If mitigations are needed, the applicant should be conditioned by the CEC to construct the mitigations or pay a fair share contribution (if appropriate).

Response: The Applicant is collecting turning movement counts at the SR 127/Baker Blvd. intersection during the morning and afternoon peak hours to establish the existing traffic conditions. Once the traffic counts have been collected, the intersection will be analyzed with the project-added traffic and mitigation identified, if necessary. The traffic count results should be filed in mid-November.

* I talked to you on the phone on October 5, 2012 and you mentioned that 100% of the construction truck traffic would use SR160 through Nevada. This should be mentioned in the report.

Response: That is correct. One 100 percent of the construction truck traffic will use NV SR-160.

* Page 4-7, #2 states 588 peak hour trips travel through the intersection of SR127 and Baker Blvd on Friday evening. How were the 588 peak hour trips calculated?

Response: The traffic analysis assumes that 50 percent of the California workforce will return home on Friday afternoon, directly from the site, because it is the end of their 5-day work week. The analysis also conservatively assumes that 100 percent of the California workforce (that returns home) will drive their own vehicles and take Tecopa Road to SR 127, to I-15 south. The California dayshift during the peak month is estimated to be 1,177 workers [70% of 1,682 workers]. Therefore: 1,177 workers x 50% leaving on Friday = 588 vehicles.

* If any County of San Bernardino maintained roadways will be used for truck construction traffic, then the developer shall be conditioned by the CEC to enter into a maintenance and restoration agreement with the Department of Public Works, Transportation Operations Division to insure all County maintained roads utilized by construction traffic shall remain in acceptable condition during construction and are returned to their preconstruction condition upon completion of the project..

Response: The CEC's Conditions of Certification address this issue.

If you have any questions, please call me at (909)387-8239.

Sincerely,

Ed Petre, P.E.
County of San Bernardino
Traffic Division
909-387-8239

Hidden Hills Solar Electric Generating System (HHSEGS) State Route 127/Baker Boulevard Intersection Analysis

PREPARED FOR: BrightSource Energy

PREPARED BY: Lisa Valdez/CH2M HILL

DATE: December 10, 2012

INTRODUCTION

The Hidden Hills Solar Electric Generating System (HHSEGS) will be located in southern California's Mojave Desert in Inyo County adjacent to the California–Nevada border. The project's potential traffic impacts are being evaluated as part of the California Energy Commission's (CECs) Application for Certification (AFC) process. This memorandum provides additional information regarding the project's potential construction-related traffic impacts to the intersection of State Route (SR) 127 and Baker Boulevard in San Bernardino County.

The intersection analysis is based on peak hour turning movement counts collected at the intersection in October and November 2012 and based on the project information and traffic assumptions contained in the AFC, Volume 1 & Volume 2 (August 8, 2011) and the Applicant's Updated Workforce Analysis (October 1, 2012).

TRAFFIC IMPACT THRESHOLDS

The focus in this analysis is on unsignalized intersection level of service (LOS), calculated using Synchro (version 8.0). LOS is determined using seconds of delay. The LOS criteria are summarized in Table 1.

TABLE 1
Level of Service Criteria for Unsignalized Intersections

LOS	Control Delay (seconds/vehicle)
A	≤ 10
B	> 10 and < 15
C	> 15 and < 25
D	> 25 and < 35
E	> 35 and < 50
F	> 50

Source: Transportation Research Board, 2000, Highway Capacity Manual.

The intersection of SR 127 and Baker Boulevard is a four-way stop-controlled intersection located in the town of Baker in the Desert Region of San Bernardino County. The Circulation Element of the San Bernardino County General Plan sets forth goals and policies that address regional traffic on freeways and major arterials. Specifically for the Desert region, one of the policies is that *"mitigation may be required if the unsignalized intersection level of service…decreases one level of service (LOS) to LOS B on the major, nonstopped street. Mitigation may also be required if the level of service on the minor, stopped street decreases two levels of service or drops below LOS C…"* The County's policies are based on impacts to a two-way stop-controlled intersection. For the purposes of this analysis, it is assumed that impacts to a four-way stop-controlled intersection would be similar to those of a two-way stop. As such, the project has been evaluated against these policies.

PROJECT TRIP GENERATION AND TRIP DISTRIBUTION

HHSEGS will be constructed over a 29-month period, with the peak construction effort onsite occurring during Month 19, when 2,293 workers are projected to be working onsite. Based on the traffic assumptions contained in the Updated Workforce Analysis (October 1, 2012) it is estimated that approximately 70 percent of the workforce will be from California and 30 percent of the workforce will be from Nevada. During the peak construction period, HHSEGS is estimated to generate a maximum total of 4,000 daily trips, with up to 1,411 trips occurring during the morning peak hour and 1,411 trips occurring during the afternoon peak hour. This estimate includes both auto (personnel) and truck (delivery) trips. The SR 127 intersection in Baker is being analyzed because it is assumed that on Monday morning 20 percent of the California workforce will travel through Baker on their way to the site from I-15. On Friday afternoon, 50 percent of the California workforce will travel through Baker on their way home via I-15 south. As a result, the project is anticipated to add 235 northbound through volumes to the intersection on Monday morning and 588 southbound through volumes to the intersection on Friday afternoon.

INTERSECTION LEVEL OF SERVICE

Turning movement counts were collected at the study intersection on two Mondays (October 22, 2012 and October 29, 2012) from 5:00 AM to 8:00 AM and on two Fridays (November 2, 2012 and November 9, 2012) from 4:00 PM to 7:00 PM. The count period was selected to capture the workforce schedule and anticipated time / day that workers will be travelling through the intersection. As a conservative analysis, the intersection LOS was calculated using the highest peak hour volume observed. The existing peak hour volumes are illustrated in Figure 1 (all figures are at the end of the memo) and the existing AM and PM peak hour intersection LOS is summarized in Table 2.

The project traffic was added to the existing peak hour traffic volumes and the intersection LOS analyses were updated. The existing plus construction-related traffic volumes are illustrated in Figure 2 and the results of these calculations are summarized in Table 2. As shown in the table, the intersection would operate at LOS B during the morning peak hour and at LOS E during the afternoon peak hour, under existing plus project conditions. However, this is a temporary, short-term increase in traffic that would occur for approximately one to two hours once a week during the peak construction period.

TABLE 2
SR 127/Baker Boulevard Intersection – Existing/Existing + Project LOS

		AM Peak		PM Peak	
Scenario	**Approach**	**Delay***	**LOS**	**Delay***	**LOS**
Existing Conditions	Overall delay	8.1	A	10.7	B
	Eastbound	7.6	A	10.2	B
	Westbound	8.4	A	10.7	B
	Northbound	8.2	A	12.0	B
	Southbound	8.2	A	10.1	B
Existing + Project	Overall delay	11.1	B	**37.6**	**E**
	Eastbound	8.7	A	14.4	B
	Westbound	9.6	A	14.5	B
	Northbound	12.9	B	16.0	C
	Southbound	8.7	A	67.2	F

*Seconds of delay
Impacts shown in bold.

SUMMARY

During the peak construction period, the project would result in a short-term impact at the SR 127 / Baker Boulevard intersection during the Friday afternoon peak hour when the California construction workforce is returning to home.

With implementation of the Traffic Management Plan (TMP) measures proposed in the Updated Workforce Analysis, the potential project impacts will be reduced to less-than-significant. The proposed measures are described in detail in the Updated Workforce Analysis and include a Traffic Monitoring Program, carpooling, a Rideshare and Employer-sponsored Van Program, staggered work shifts and a Traffic Control Plan (signage, flaggers, lead vehicles, etc.). Some or all of these potential measures may be implemented based on the specific circumstances at the time. The intersection operation would return to pre-project conditions once project construction is complete.

LEGEND

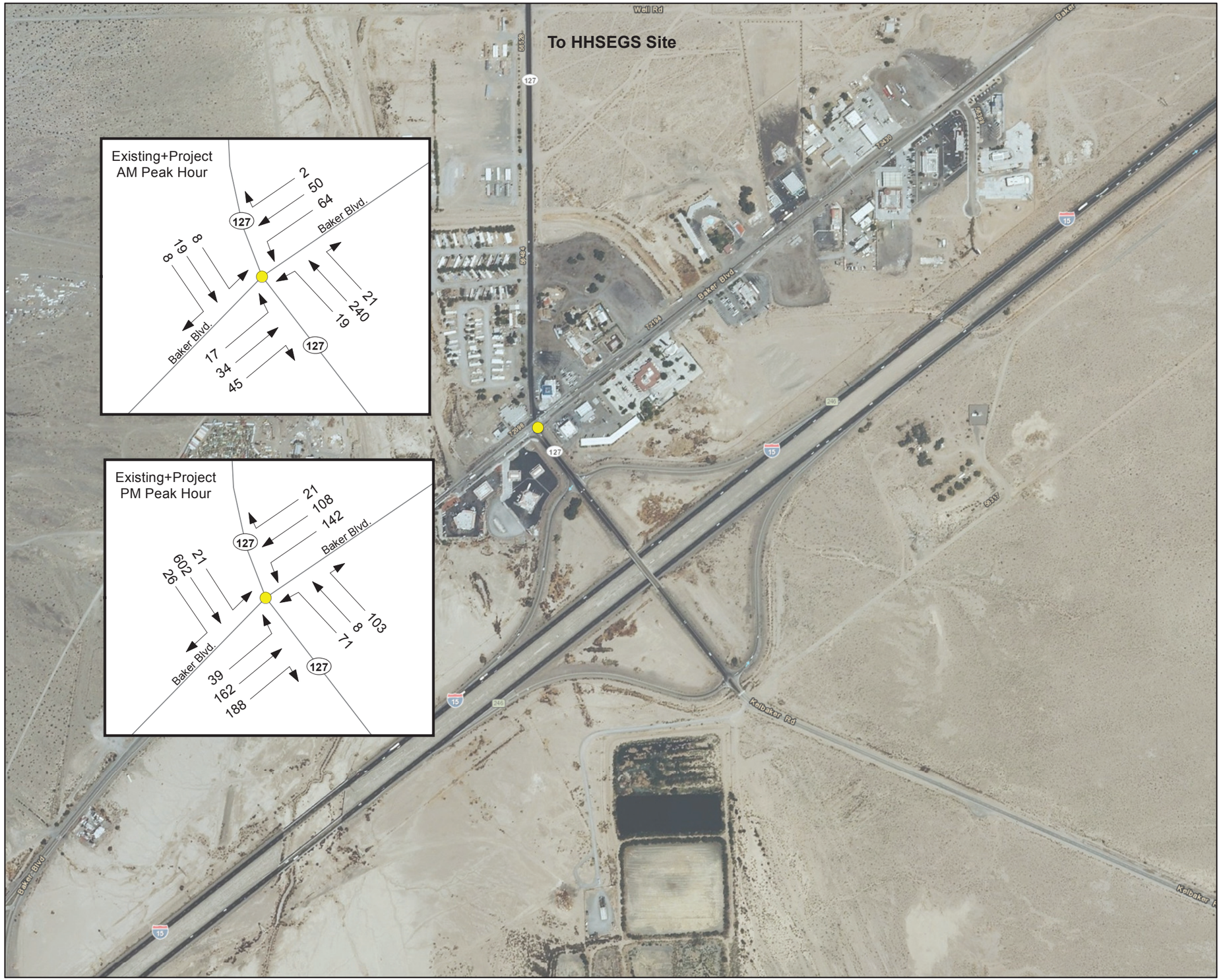
- Study Intersection
- X — Peak Hour Turning Movement
  PM Peak Hour Volume shown in ( ).

N

0 250 500

Feet

FIGURE 1
Existing Peak Hour Intersection Volume
Hidden Hills Solar Energy System



LEGEND

- Study Intersection
- X Peak Hour Turning Movement

N

0 250 500

Feet

FIGURE 2
Existing + Project Peak Hour Intersection Volume
Hidden Hills Solar Energy System

Transmission System Engineering

I. Introduction

A. Names: Clay Jensen, P.E., Channing Haskell, P.E., and Susan Strachan

B. Qualifications: The panel's qualifications are as noted in their resumes contained in Appendix A.

C. Prior Filings: In addition to the statements herein, this testimony includes by reference the following documents submitted in this proceeding:

- Application for Certification, Volume 1 & Volume 2, dated August 5, 2011 [Exhibit 1]
- Applicant's Data Adequacy Supplement, dated September 7, 2011 [Exhibit 2]
- Applicant's Preliminary Staff Assessment Comments, Set 2, dated July 23, 2012. [Exhibit 70]

D Submitted with a Request for Confidential Treatment:

- Confidential California Independent System Operator Cluster 4 Phase I Study Results for the Hidden Hills Solar Electric Generating System (Individual Project Report) [Exhibit 64]
- Confidential Valley Electric Associate Queue Cluster A Phase II Report for the Hidden Hills Solar Electric Generating System Project, Appendix A-Q13 [Exhibit 65]

E. Attachments

The VEA Queue Cluster Alpha Phase II Interconnection Study Report, dated November 19, 2012 (the Group Report)

To the best of our knowledge, all of the facts contained in this testimony (including all referenced documents) are true and correct. To the extent this testimony contains opinions, such opinions are our own. We make these statements, and render these opinions freely and under oath for the purpose of constituting sworn testimony in this proceeding.

II. Summary of Testimony

A. Affected Environment

Background

While two distinct transmission options were being considered, Valley Electric Association (VEA) has selected the Tecopa Road/SR 160 Option (foregoing the 500-kV "Eldorado Option.")

Under the Tecopa Road/SR 160 Option, HHSEGS will interconnect to the Valley Electric Association (VEA) system. The interconnection would require an approximately 10-mile-long transmission line from the HHSEGS to the proposed Crazy Eyes Tap Substation (referred to as the Tap Substation in the AFC), where the project would interconnect to the VEA electric grid. The transmission line would originate at the HHSEGS's onsite switchyard, cross the California-Nevada state line, avoiding the mesquite vegetation to the south, and continue east for approximately 1.5 miles until reaching Tecopa Road. At Tecopa Road, the route would head northeast paralleling Tecopa Road until it reaches the Crazy Eyes Tap Substation, which would be located immediately east of the Tecopa

Road/SR 160 intersection. The Crazy Eyes Tap Substation would interconnect to the existing VEA Pahrump-Bob Tap 230-kV line."

VEA is working through the process to become a participating transmission owner (PTO) and plans to turn operational control of its facilities over to the California Independent System Operator (CAISO). VEA has already passed most of the significant milestones and the transition is expected to be complete in January of 2013.

To advance these proposed transmission arrangements for the project, the Applicant has filed an interconnection request for the projects with both VEA and CAISO. VEA is working with CAISO on a process for integrating its queue with the CAISO queue, and the Applicant is actively engaged in that process.

The approximately 10-mile-long transmission line leaves the state of California 900 feet after exiting the HHSEGS onsite switchyard. The necessary transmission facilities are located in Nevada and are subject to the U.S. Bureau of Land Management's (BLM) permitting process. In addition, because the transmission facilities in Nevada will be addressed in a National Environmental Policy Act (NEPA) Environmental Impact Statement, these facilities are statutorily exempt from the California Environmental Quality Act.

Onsite Facilities

Solar Plants and Transmission Lines

Solar Plant 1 and Solar Plant 2 will be connected to the electric grid via a transmission line (one circuit per generator) between each solar plant's power block and the 230-kV onsite switchyard in the common area. Each facility's interconnections are electrically identical except for the routing of the transmission lines. Based on the preliminary design for the project, power will leave the solar plants through each facility's respective 13.8-kV generator circuit breaker, a 13.8-kV to 230-kV generator step-up transformer, and a 230-kV gas-insulated circuit breaker at the plant switchyard. Each of the transmission lines will be constructed underground from the power block through the heliostat field and will transition to an overhead configuration at the edge of the heliostat field until reaching the onsite switchyard. Power will be transmitted approximately 3,800 feet (0.7 mile) underground and 10,275 feet (1.9 miles) overhead for Solar Plant 1, and approximately 7,300 feet (1.4 miles) underground and 3,270 feet 0.6 mile) overhead for Solar Plant 2.The conductors for each solar plant will be selected based on the maximum operating output capability of each facility determined by final heat balances. Ratings indicate a worst-case nominal output of 800 amperes. A 795-kcmil "DRAKE" ACSR conductor capable of carrying 800 amperes continuous, or alternative conductor selected during final engineering design, are typically recommended for the nameplate rating output.

From the onsite switchyard, the transmission line will head east approximately 900 feet where it crosses the state line into Nevada.

Onsite 230-kV Switchyard

The onsite 230-kV switchyard will consist of six 230-kV sulfur hexafluoride (SF_6) gas-insulated power circuit breakers arranged in a breaker-and-a-half configuration. The switchyard and all associated equipment will be designed for the maximum short-circuit and load-flow design conditions for the installation projected at least 25 years into the future. The switchyard will accept two generation feeds and two 230-kV lines connecting to the electrical grid.

All termination positions will have disconnect switches, surge arrestors, and coupling capacitor voltage devices required for the operation, maintenance, and protection of the lines and facilities.

The switchyard will have a switchyard control building designed to accommodate all protection and control equipment, alternating current and direct current station power equipment and building HVAC equipment.

B. Potential Construction Related Impacts; Avoidance and Minimization Measures

To avoid potential impacts, the HHSEGS transmission system facilities will be designed to meet all applicable LORS, as discussed below. No significant construction-related impacts have been identified and no further mitigation or minimization measures are required.

C. Potential Operational Related Impacts; Avoidance and Minimization Measures

To avoid potential impacts, the HHSEGS transmission system facilities will be designed to meet all applicable LORS, as discussed below. No significant operations-related impacts have been identified and no further mitigation or minimization measures are required.

D. Summary of Compliance with Applicable LORS

Table TSE-1 lists the applicable LORS for the design and construction of the onsite facilities, including the switchyard. The project will be designed to comply with these LORS.

TABLE TSE-1
Design and Construction LORS

LORS	Applicability
IEEE 1119 "IEEE Guide for Fence Safety Clearances in Electric-Supply Stations"	Provides recommended clearance practices to protect persons outside the facility from electric shock.
IEEE 998 "Direct Lightning Stroke Shielding of Substations"	Provides recommendations to protect electrical system from direct lightning strokes.
IEEE 980 "Containment of Oil Spills for Substations"	Provides recommendations to prevent release of fluids into the environment.
Suggestive Practices for Raptor Protection on Power lines, 1994, 2006	Provides guidelines to avoid or reduce raptor collision and electrocution
Overhead Conductor Manual	Provides general design guidelines
Electrical and Biological Effects of Transmission Lines, A Review	Provides guidelines to avoid or reduce raptor collision and electrocution
The National Electric Safety Code, 1999	Provides electrical, mechanical, civil, and structural requirements for overhead electric line construction and operation
California Public Utilities Commission (CPUC) General Order 95 (GO-95), Rules for Overhead Electric Line Construction	Sets forth uniform requirements for the construction of overhead lines.
CPUC General Order 128 (GO-128), Rules for Construction of Underground Electric Supply and Communications Systems	Sets forth uniform requirements and minimum standards for underground supply systems
California ISO/FERC (Federal Energy Regulatory Commission) electricity tariffs and planning standards	Provides guidelines for building all transmission additions/upgrades within the California ISO-controlled grid
Title 8 CCR, Section 2700 et seq. "High Voltage Electrical Safety Orders"	Establishes essential requirements and minimum standards for installation, operation, and maintenance of electrical installation and equipment to provide practical safety and freedom from danger.
NERC/WECC planning standards	Provide system performance standards for assessing the reliability of the interconnected transmission system.

E. Summary of the Potential Cumulative Impacts

A Queue Cluster Alpha (QCA) Phase I Study was initiated to determine the impacts of the QCA projects on the VEA system in southern Nevada and on that portion of the CAISO controlled grid in the "East–of-Pisgah" (EOP) area in southern Nevada and southeastern California. The studies indicate that impacts of certain outages from the QCA projects can be mitigated by the application of special protection schemes (SPS). These mitigation measures will be incorporated into the VEA project design as part of parallel BLM permitting and CAISO processes.

III. Response to Certain Issues Raised in the FSA

Staff used results from VEA's Queue Cluster Alpha Phase I Interconnection Study Report in its description of the impacts and mitigation measures in preparation of the Final Staff Assessment (FSA). The Applicant has recently received VEA's Queue Cluster Alpha Phase II Interconnection Study Report results that describe updated impacts and mitigation measures. The changes between the Phase I and Phase II results are relatively minor and would not affect Staff's conclusions or affect the proposed Conditions of Certifications. The Applicant is providing a copy of the Queue Cluster Alpha Phase II Interconnection Study Report dated November 19, 2012 (the Group Report) at the end of this testimony.

IV. Proposed Licensing Conditions

We agree with the Conditions of Certification set forth in the FSA pertaining to this subject, except as set forth below.

CONDITION TSE-1

The condition should be revised to reflect that the CEC's delegate CBO only has jurisdiction over the transmission facilities in California. It does not have jurisdiction over the transmission facilities once they leave the site and are in Nevada. In addition, the Applicant requests that the timing requirement in TSE-1 be revised. Lastly, similar to the Applicant's requested modifications to the Facility Design conditions, this condition should be revised to remove the duplication of effort for having to submit compliance documents to the CPM and CBO when the CBO manages a project website containing all of the engineering documents and approvals, including those pertaining to Transmission System Engineering.

TSE-1 The project owner shall furnish to the Compliance Project Manager (CPM) and to the Chief Building Official (CBO) a schedule of transmission facility design submittals, a Master Drawing List, a Master Specifications List, and a Major Equipment and Structure List for all facilities located in California. The schedule shall contain a description and list of proposed submittal packages for design, calculations, and specifications for major structures and equipment. To facilitate audits by Energy Commission staff, the project owner shall provide designated packages to the CPM when requested.

Verification: At least 30~~60~~ days prior to the start of construction (or a lesser number of days mutually agreed to by the project owner and the CBO), the project owner shall submit the schedule, a Master Drawing List, and a Master Specifications List to the CBO ~~and to the CPM~~. The schedule shall contain a description and list of proposed submittal packages for design, calculations, and specifications for major structures and equipment (see a list of major equipment in **Table 1: Major Equipment List** below). Additions and deletions shall be

made to the table only with ~~CPM and~~ CBO approval. The project owner shall provide schedule updates in the Monthly Compliance Report.

Transmission System Engineering Table 1 Major Equipment List
Breakers
Step-Up Transformer
Switchyard
Busses
Surge Arrestors
Disconnects
Take Off Facilities
Electrical Control Building
Switchyard Control Building
Transmission Pole/Tower
Grounding System

CONDITION TSE-2

The verification language of this condition should be revised to provide additional flexibility and to reflect that the CEC's delegate CBO only has jurisdiction over the transmission facilities in California. It does not have jurisdiction over the transmission facilities once they leave the site and are in Nevada. In addition, this condition should be revised to remove the duplication of effort for having to submit compliance documents to the CPM and CBO when the CBO manages a project website containing all of the engineering documents and approvals, including those pertaining to Transmission System Engineering.

TSE-2 Prior to the start of construction, the project owner shall assign an electrical engineer and at least one of each of the following to the project: A) a civil engineer; B) a geotechnical engineer or a civil engineer experienced and knowledgeable in the practice of soils engineering; C) a design engineer who is either a structural engineer or a civil engineer fully competent and proficient in the design of power plant structures and equipment supports; or D) a mechanical engineer. (Business and Professions Code Sections 6704 et seq. require state registration to practice as a civil engineer or structural engineer in California).

Verification:

Protocol: The tasks performed by the civil, mechanical, electrical, or design engineers may be divided between two or more engineers, as long as each engineer is responsible for a particular segment of the project (e.g., proposed earthwork, civil structures, power plant structures, equipment support). No segment of the project shall have more than one responsible engineer. The on-site transmission line may be the responsibility of a separate California-registered electrical engineer. The civil, geotechnical or civil, and design engineer assigned in conformance with Facility Design condition **GEN-5**, may be responsible for design and review of the TSE facilities.

Protocol: The project owner shall submit to the CBO for review and approval, the names, qualifications, and registration numbers of all engineers assigned to the project. If any one of the designated engineers is subsequently reassigned or replaced, the project owner shall submit the name, qualifications, and registration number of the newly assigned engineer to the CBO for review and approval. ~~The project owner shall notify the CPM of the CBO's approval of the new engineer.~~ This engineer shall be authorized to halt earthwork and to require changes if site conditions are unsafe or do not conform with predicted conditions used as a basis for design of earthwork or foundations.

Protocol: The electrical engineer shall:

1. Be responsible for the electrical design of the power plant switchyard, outlet and termination facilities; and
2. Sign and stamp electrical design drawings, plans, specifications, and calculations.

~~**Verification:**~~ At least 30 days prior to the start of rough grading (or a lesser number of days mutually agreed to by the project owner and the CBO), the project owner shall submit to the CBO for review and approval, the names, qualifications, and registration numbers of all the responsible engineers assigned to the project. ~~The project owner shall notify the CPM of the CBO's approvals of the engineers within five days of the approval.~~

If the designated responsible engineer is subsequently reassigned or replaced, the project owner has five days in which to submit the name, qualifications, and registration number of the newly assigned engineer to the CBO for review and approval. ~~The project owner shall notify the CPM of the CBO's approval of the new engineer within five days of the approval.~~

CONDITION TSE-4

The verification language of this condition should be revised to remove the duplication of effort for having to submit compliance documents to the CPM and CBO when the CBO manages a project website containing all of the engineering documents and approvals, including those pertaining to Transmission System Engineering.

TSE-4 For the power plant switchyard, outlet line, and termination, the project owner shall not begin any increment of construction until plans for that increment have been approved by the CBO. These plans, together with design changes and design change notices, shall remain on the site for one year after completion of construction. The project owner shall request that the CBO inspect the installation to ensure compliance with the requirements of applicable LORS. The following activities shall be reported in the Monthly Compliance Report:

1. Receipt or delay of major electrical equipment;
2. Testing or energization of major electrical equipment; and
3. The number of electrical drawings approved, submitted for approval, and still to be submitted.

Verification: At least 30 days prior to the start of each increment of construction (or a lesser number of days mutually agreed to by the project owner and the CBO), the project owner shall submit to the CBO for review and approval the final design plans, specifications, and calculations for equipment and systems of the power plant switchyard, outlet line, and

termination, including a copy of the signed and stamped statement from the responsible electrical engineer attesting to compliance with the applicable LORS~~, and send the CPM a copy of the transmittal letter in the next Monthly Compliance Report.~~

CONDITION TSE-5:

More of this condition should be moved into the verification section to provide design flexibility. This condition should also be revised to reflect that the CEC's delegate CBO only has jurisdiction over the transmission facilities in California. It does not have jurisdiction over the transmission facilities once they leave the site and are in Nevada. In additionthe Applicant requests that the timing requirement in TSE-5 be revised to provide sufficient time for preparation of the documents covered in this condition. Lastly, the condition should be revised to reflect that the transmission line termination facilities must meet VEA standards, not SCE.

TSE-5 The project owner shall ensure that the design, construction, and operation of the proposed on-site transmission facilities will conform to all applicable LORS, including the requirements listed below. The project owner shall submit the required number of copies of the design drawings and calculations as determined by the CBO.

Verification:

1. The HHSEGS project will be interconnected to the VEA grid via a 220-kV, 795 kcmil per phase, and approximately 10 miles long single circuit (generator- tie line). The proposed HHSEGS switching station would construct with six 230kV breakers, breaker- and- a- half configuration with 3- bays and 4 positions. The power plant outlet line shall meet or exceed the electrical, mechanical, civil, and structural requirements of CPUC General Order 95 and General Order 98 or National Electric Safety Code (NESC), Title 8 of the California Code and Regulations (Title 8), Articles 35, 36, and 37 of the "High Voltage Electric Safety Orders", California ISO standards, National Electric Code (NEC), and related industry standards.

2. Breakers and busses in the power plant switchyard and other switchyards, where applicable, shall be sized to comply with a short-circuit analysis.

3. Outlet line crossings and line parallels with transmission and distribution facilities shall be coordinated with the transmission line owner and comply with the owner's standards.

4. The project conductors shall be sized to accommodate the full output from the project.

5. Termination facilities shall comply with applicable VEA ~~SCE~~ interconnection standards.

6. The project owner shall provide to the CPM:

   a. The final Detailed Facility Study (DFS) including a description of facility upgrades, operational mitigation measures, and/or Special Protection System (SPS) sequencing and timing if applicable,

   b. Executed project owner and California ISO Facility Interconnection Agreement.

~~Verification:~~ At least 30~~60~~ days prior to the start of construction of on-site transmission facilities (or a fewer~~lessor~~ number of days mutually agreed to by the project owner and CBO), the project owner shall submit to the CBO for approval:

7. Design drawings, specifications, and calculations conforming with CPUC General Order 95 and General Order 98 or NESC; Title 8, California Code of Regulations, Articles 35, 36, and 37 of the "High Voltage Electric Safety Orders"; NEC; applicable interconnection standards, and related industry standards for the poles/towers, foundations, anchor bolts, conductors, grounding systems, and major switchyard equipment.

8. For each element of the on-site transmission facilities identified above, the submittal package to the CBO shall contain the design criteria, a discussion of the calculation method(s), a sample calculation based on "worst-case conditions,"1 and a statement signed and sealed by the registered engineer in responsible charge, or other acceptable alternative verification, that the transmission element(s) will conform with CPUC General Order 95 or NESC; Title 8, California Code of Regulations, Articles 35, 36 and 37 of the "High Voltage Electric Safety Orders"; NEC; applicable interconnection standards, and related industry standards.

9. Electrical one-line diagrams signed and sealed by the registered professional electrical engineer in responsible charge, a route map, and an engineering description of equipment and the configurations covered by requirements TSE-5 1) through 5) above.

10. The final Detailed Facility Study, including a description of facility upgrades, operational mitigation measures, and/or SPS sequencing and timing if applicable, shall be provided concurrently to the CPM.

CONDITION TSE-7

This condition should be revised to reflect that the CEC's delegate CBO only has jurisdiction over the transmission facilities in California.

TSE-7 The project owner shall be responsible for the inspection of the on-site transmission facilities during and after project construction, and any subsequent CPM and CBO approved changes thereto, to ensure conformance with CPUC GO-95 or NESC; Title 8, CCR, Articles 35, 36 and 37 of the "High Voltage Electric Safety Orders"; applicable interconnection standards; NEC; and related industry standards. In case of non-conformance, the project owner shall inform the CPM and CBO in writing, within 10 days of discovering such non-conformance and describe the corrective actions to be taken.

Verification: Within 60 days after first synchronization of the project, the project owner shall transmit to the CPM and CBO:

1. "As built" engineering description(s) and one-line drawings of the electrical portion of the facilities signed and sealed by the registered electrical engineer in responsible charge. A statement attesting to conformance with CPUC GO-95 or NESC; Title 8, California Code of Regulations, Articles 35, 36 and 37 of the "High Voltage Electric Safety Orders"; applicable interconnection standards; NEC; and related industry standards, and these conditions shall be provided concurrently.

2. An "as built" engineering description of the mechanical, structural, and civil portion of the transmission facilities signed and sealed by the registered engineer in responsible

[1] Worst-case conditions for the foundations would include for instance, a dead-end or angle pole.

charge or acceptable alternative verification. “As built” drawings of the electrical, mechanical, structural, and civil portion of the transmission facilities shall be maintained at the power plant and made available, if requested, for CPM audit as set forth in the “Compliance Monitoring Plan.”

3. A summary of inspections of the completed transmission facilities, and identification of any nonconforming work and corrective actions taken, signed and sealed by the registered engineer in charge

Queue Cluster A Phase II Interconnection Study Report

Group Report for VEA Service Area

Valley Electric Association, Inc.

A Touchstone Energy® Cooperative

November 19, 2012

Table of Contents

Appendices:

Definitions

CAISO	California Independent System Operator Corporation
COD	Commercial Operation Date
Deliverability Assessment	Deliverability Assessment
EO	Energy Only Deliverability Status
EOP Cluster	Group of QC 3, 4, and 5 projects located East of Pisgah Substation
FC	Full Capacity Deliverability Status
FERC	Federal Energy Regulatory Commission
IC	Interconnection Customer
LGIA	Large Generator Interconnection Agreement
GIP	Generator Interconnection Procedures
PMax	Maximum generation output (based on interconnection requested amount)
NERC	North American Electric Reliability Corporation
NQC	Net Qualified Capacity as modeled in the Deliverability Assessment
Phase II Study	QC 3 Phase II Study
Phase III Study	QC 3 Phase III Study
NVE	NV Energy
PTO	Participating Transmission Owner
RAS	Remedial Action Scheme (also known as SPS)
POI	Point of Interconnection
POS	Plan of Service
SCE	Southern California Edison Company
SPS	Special Protection System (also known as RAS)
SVC	Static VAR Compensator
TPP	CAISO's Transmission Planning Process
VEA	Valley Electric Association
WAPA	Western Area Power Administration
WECC	Western Electricity Coordinating Council

1. Executive Summary

In accordance with the Valley Electric Association (VEA) Large Generator Interconnection Process (LGIP) this Queue Cluster A (QCA) Phase 2 study was initiated to determine the combined impact of the QCA projects located within the VEA service area. Because the VEA generator interconnection process is being transitioned to reflect the generator interconnection study processes and procedures applied by the California Independent System Operator (CAISO) certain data files and other information for the CAISO controlled-grid as provided by the CAISO were used in the study.

There are two (2) generation projects in the VEA service territory modeled in QCA and both are new interconnection requests submitted during the open window period associated with QCA. For this QCA Phase 2 study, the VEA system has been assumed to be located in the CAISO's East of Pisgah area.

This study report provides the following items:

1. Transmission system impacts caused by the addition of the QCA projects requesting interconnection in the VEA area;

2. System reinforcements necessary to mitigate the adverse impacts under various system conditions of the QCA projects requesting interconnection in the VEA area and;

3. A list of required facilities, a maximum cost responsibility for Network Upgrades assigned to each Interconnection Request and a good faith estimate of the Interconnection Facilities cost and time to construct for each Interconnection Request.

To determine the system impacts caused by QCA projects, the following studies were performed:

- Deliverability Assessment
- Steady State Power Flow Analyses
- Transient Analyses
- Short Circuit Duty Analyses

The results of above studies indicate that the QCA projects are responsible for the overloading of transmission facilities in the VEA area and contribute to transformer overloads at the Eldorado 2 220-kV substation. Network Upgrades needed to mitigate identified problems corresponding to the QCA projects requesting interconnection in the VEA area have been proposed in this report. The following tables show a summary of the proposed Network Upgrades along with an estimated cost.

Table 1.1: Plan of Service Reliability Network Upgrades ($1,000)

1	Various (see individual Appendix A for details)	$11,200
Total Cost for VEA area		**$11,200**

Table 1.2: Reliability Network Upgrades ($1,000)

1	SPS equipment at Crazy Eyes Switch Station and Bob Switch Station to drop one queued generator	$1,100
2	SPS equipment at Crazy Eyes Switch Station and Pahrump Substation to drop one queued generator	$1,100
3	SPS equipment at Innovation, Desert View, and Northwest Substations to drop one queued generator	$1,100
4	SPS equipment at Pahrump and Innovation Substations to open Innovation-Mercury Switch line	$1,100
5	SPS equipment at Crazy Eyes Switch Station and Innovation Substation to open Innovation-Mercury Switch line	$1,100
Total Cost for VEA Area		**$5,500**

Table 1.3: Delivery Network Upgrades ($1,000)

1	Reconductor Pahrump-Crazy Eyes Switch Station, Crazy Eyes Switch Station-Bob Switch Station, and Bob Switch Station-Mead 230-kV lines	$18,400
2	Reconductor Pahrump-Gamebird 138-kV line	$700
3	Replace existing 230/138-kV transformers at Pahrump	$6,200
4	Replace existing 230/138-kV transformer at Amargosa	$3,100
5	Add series compensation to Crazy Eyes Switch Station-Bob Switch Station 230-kV line	$8,400
Total Cost for VEA Area		**$36,800**

** Short Circuit Duty Mitigation costs are allocated across all projects as detailed in Section 8 of this Report.*

The upgrades in the Tables above do not include Interconnection Facilities and Non-Network Non-CAISO Transmission Upgrades, which are the obligation of each Interconnection Customer to finance nor do they include any costs associated with mitigating impacts on the CAISO-controlled grid associated with delivering the QCA project generation to load centers in California. The interconnection facilities relating to each individual project are discussed in the corresponding Appendix A Individual Project Reports.

Given the magnitude of the above upgrades, an estimate to engineer, license, procure, and construct the facilities identified in the above Tables could be up to 24 months from GIA execution.

2. QCA Interconnection Information

Two generation projects totaling a maximum output of 810 MW (net) are included in QCA in the VEA Area. Table 2.1 lists these two projects with essential data obtained from the VEA and CAISO Generation queues and updated to reflect the most current information.

Table 2.1: VEA's QCA Projects

Project Number	Point of Interconnection	Full Capacity Energy Only	Fuel	Max MW
VEA 13 (CAISO 714)	Crazy Eyes Switch Station 230-kV Substation	Full Capacity	Solar	540
VEA 14 (CAISO 740)	Crazy Eyes Switch Station 230-kV Substation	Full Capacity	Solar	270
			Total QCA Generation	**810**

3. Study Objectives

The Phase II Study analysis was performed to identify the conceptual Interconnection Facilities, Plan of Service, Reliability Network Upgrades, and Delivery Network Upgrades necessary to safely and reliably interconnect the QCA projects with the VEA system. An estimated cost and construction schedule for these facilities is provided in this report. As noted above the following studies were performed:

- Deliverability Assessment
- Steady State Power Flow Analyses
- Transient Analyses
- Short Circuit Duty Analyses

4. Study Assumptions

4.1 Power flow base cases

The QCA Study base cases were developed from the same power flow base cases that were utilized by the CAISO in performing the QC3/QC4 Phase 2 studies representing peak and off-peak conditions. The QCA studies were based on a 2015 load forecast. These base cases included all planned VEA transmission projects, all CAISO approved transmission projects, as well as higher queued Serial Group, Transition Cluster, QC1, QC2, and QC3 generation projects with associated Network Upgrades and Special Protection Systems.

4.2 Load Assumptions

The peak load cases utilized in these studies modeled a load of 120 MW load in the VEA area and a load of approximately 26,950 MW in the SCE area while the off-peak load cases used in them modeled a load of 60 MW load in the VEA area and a load of approximately 16,040 MW in the SCE area. While it is impractical to study all combinations of system load and generation levels during all seasons and at all times of the day, the base cases were developed to represent stressed scenarios of loading and generation conditions for the VEA area.

4.3 Generation Assumptions

At the present time there is no existing generation within the VEA service area nor are there any "queued ahead" projects within the VEA service area.

In these studies it was assumed that, due to the storage capability of the QCA projects, they would be operating at 100% of the requested PMax during both on-peak and off-peak conditions.

4.4 New Transmission Projects

This QCA Phase II study included the modeling of VEA's planned Innovation 230/138-kV substation and the associated Innovation-Mercury Switch 138-kV line, VEA's planned Vista-Charleston 138-kV line, VEA's planned interconnection between VEA's Bob Switch Station and SCE's Eldorado 2 220-kV bus, and all CAISO approved transmission projects in the East of Pisgah area base cases. In addition, a number of transmission upgrades previously identified as being required to support load growth and queued ahead generation projects in SCE's East of Pisgah area were modeled in order to determine if additional facilities would be needed to support the QCA projects. Additional information on these projects is contained within the CAISO's QC3/QC4 Phase II study report for the East of Pisgah area.

4.5 Other SPSs and Operator Actions

All new SPSs and modifications to existing SPSs will be designed with consideration of ISO SPS guidelines and are subject to review by Affected Parties and members of the WECC Remedial Action Scheme Reliability Subcommittee (RASRS).

4.5.1 Operating Procedures

Operating procedures, which may include curtailing the output of the QCA projects during planned or extended forced outages may be required for reliable operation of the transmission system. These procedures, if needed, will be developed before the projects' Commercial Operation Date.

4.5.2 Queued Ahead Triggered Circuit Breaker Upgrades, Replacement or Mitigation Requirements

This QCA Study assumed that all previously triggered short-circuit duty impacts, where fault duty contributions are increased with the addition of these Phase II projects, would be mitigated by the corresponding triggering project.

Consequently, for cost allocation purposes this study evaluated the incremental impacts associated with the addition of the Phase II projects, including appropriate transmission upgrades as identified in this study, in effort to cost allocate the incremental upgrades associated with the addition of the Phase II projects. However, it should be clear that for reliability reasons it may be necessary to implement operational mitigation upgrades previously triggered by queued ahead generation projects prior to allowing interconnection of Phase II generation projects.

A determination of such mitigation upgrade needs will be based on the study results of the Operational Studies undertaken for the Phase II generation projects. Should an impact to circuit breakers be identified in the Operational Study that requires the implementation of mitigation upgrades, such upgrades will need to be advanced by the corresponding projects in Operational Queue order to enable interconnection of the project.

5. Study Criteria and Methodology

The applicable reliability criteria, which incorporate the Western Electricity Coordinating Council (WECC) and the North American Electric Reliability Council (NERC) planning criteria and reflect use of the CAISO planning standard, were used to evaluate the impact of QCA projects on the VEA system.

5.1 Steady State Study Criteria

5.1.1 Normal Overloads

Normal overloads are those that exceed 100 percent of normal facility ratings. The CAISO Controlled Grid Reliability Criteria requires the loading of all transmission system facilities be within their normal ratings. Normal overloads refer to overloads that occur during normal operating conditions (no contingency).

5.1.2 Emergency Overloads

Emergency overloads are those that exceed 100 percent of emergency ratings. Emergency overloads refer to overloads that occur during single element contingencies (Category “B”) and multiple element contingencies (Category “C”).

5.1.3 Voltage Violations

Voltage violations will deem to have occurred if voltage deviations exceed +/- 7% of the pre-disturbance level for Category B contingencies and +/ -10% for Category C contingencies.

5.1.4 Contingencies

The contingencies used in this analysis are provided in Appendix B. Various categories of contingencies are summarized in Table 5.1:

Table 5.1: Power Flow Contingencies

Contingencies	Description
Category "A" (No contingency)	All facilities in service – Normal Conditions.
Category "B"	• B1 - All single generator outages. • B2 - All single transmission circuit outages. • B3 - All single transformer outages. • Selected overlapping single generator and transmission circuit outages.
Category "C"	• C1 - SLG Fault, with Normal Clearing: Bus outages (60-230 kV). • C2 - SLG Fault, with Normal Clearing: Breaker failures (excluding bus tie and sectionalizing breakers) at the same bus section above. • C3 - Combination of any two-generator/transmission line/transformer outages. • C4 - Bipolar (dc) Line. • C5 - Outages of double circuit tower lines (60-230-kV). • C6 - SLG Fault, with Delayed Clearing: Generator. • C7 - SLG Fault, with Delayed Clearing: Transmission Line. • C8 - SLG Fault, with Delayed Clearing: Transformer. • C9 - SLG Fault, with Delayed Clearing: Bus Section.

Although most of the VEA Category "C" contingencies were considered as part of this study, it is impractical to study all possible combinations of any two elements throughout the system. Therefore, as allowed under NERC standard TPL-003-0 R1.3.1, only selected critical Category C contingencies (C1 – C9) that were deemed most severe were evaluated in this study.

5.2 Deliverability Assessment Methodology

The goal of the generator deliverability study is to determine if the aggregate of generation output in a given area can be simultaneously transferred to the remainder of the VEA system and then to the ISO Control Area. Any generators requesting Full Capacity Deliverability Status in their interconnection request to VEA will be analyzed for "deliverability" in order to identify the Delivery Network Upgrades necessary to obtain this status and to ensure that capacity is not "bottled" from a resource adequacy perspective. The methodology is designed to ensure that facility enhancements and cost responsibilities can be identified in a fair and nondiscriminatory manner. The main steps of the on-peak deliverability assessment are described below.

VEA Area Bulk Group Deliverability Assessment Base Case

The VEA area bulk group deliverability assessment base cases were developed from the pertinent on-peak and off-peak load base cases developed by the CAISO and assumed that all proposed full capacity resources in the VEA area would be dispatched at 100% of their NQCs.

Network Mitigation Plan and Cost Allocation

A mitigation plan will be proposed and be verified to address the overload issues identified. The mitigation Plan needs to be reevaluated and the deliverability assessment will be repeated to demonstrate that all of the new generation is deliverable. If additional overloaded facilities are found, the mitigation plan will be modified or expanded, as needed, to ensure the deliverability of the new generation. The cost of each delivery network upgrade and of the reliability network upgrades will be allocated to these new generators based on their load flow impacts.

5.3 Short Circuit Duty Criteria

Short circuit studies are performed to determine the maximum fault duty on the busses on the VEA area and on adjacent buses in the SCE and WAPA systems. This study determines the impact of increased fault current resulting from the QCA projects and associated proposed Network Upgrades. Short circuit results will allocate costs for mitigating overstressed breakers to each project on a pro-rata basis based on project contribution to SCD at each location.

To determine the impact on short-circuit duty within the VEA area and the electrical systems of SCE and WAPA in the Eldorado area after inclusion of the QCA generation projects and associated proposed Network Upgrades in the VEA area, the study calculated the maximum 3PH short-circuit duties. Generation, transformer, and generation tie line data provided by each QCA Interconnection Customer was utilized. Bus locations where short-circuit duty is increased with the proposed QCA projects by at least 0.1 kA are flagged for further review. Upon completion of the detailed circuit breaker review, circuit breakers exposed to fault currents in excess of 100 percent of their interrupting capacities will need to be replaced or upgraded, whichever is appropriate. It should be noted that other WECC entities may request specific information within the WECC process to evaluate potential impact within their respective systems of this project addition.

5.4 Transient Stability Criteria

Transient stability analysis is a time-domain simulation that assesses the performance of the power system during (and shortly following) a contingency. Transient stability studies are performed to ensure system stability following critical faults on the system.

The system is considered stable if the following conditions are met:

1. All machines in the WECC interconnected system must remain in synchronism as demonstrated by relative rotor angles (unless modeling problems are identified and concurrence is reached that a problem does not really exist);

2. A stability simulation will be deemed to exhibit positive damping if a line defined by the peaks of the machine relative rotor angle swing curves tends to intersect a second line connecting the valleys of the curves with the passing of time;

3. Corresponding lines on bus voltage swing curves will likewise tend to intersect. A stability simulation, which satisfies these conditions, will be defined as stable;

4. Duration of a stability simulation run will be ten seconds unless a longer time is required to ascertain damping;

5. The transient performance analysis will start immediately after the fault clearing and conclude at the end of the simulation and;

6. A case will be defined as marginally stable if it appears to have zero percent damping and the voltage dips are within (or at) the WECC Reliability Criteria limits.

Performance of the transmission system is measured against the WECC Reliability Criteria and the NERC Planning Standards.

Table 5.2 illustrates the NERC/WECC Reliability Criteria. The reliability and performance criteria are applied to the entire WECC transmission system.

Table 5.2: WECC Disturbance-Performance Table of Allowable Effects on Other Systems (In addition to NERC requirements)

NERC and WECC Categories	Outage Frequency Associated with the Performance Category (Outage/Year)	Transient Voltage Dip Standard	Minimum Transient Frequency Standard	Post-Transient Voltage Deviation Standard (See Note 2)
A	Not Applicable	Nothing in Addition to NERC		
B	≥ 0.33	Not to exceed **25%** at load buses or **30%** at non-load buses. Not to exceed **20% for more than 20 cycles** at load buses.	Not below **59.6 Hz** for 6 cycles or more at a load bus	Not to exceed **5%** at any bus (See Note 3)
C	0.033 – 0.33	Not to exceed 30% at any bus. Not to exceed **20% for more than 40 cycles** at load buses.	Not below **59.0 Hz** for 6 cycles or more at a load bus	Not to exceed **10%** at any bus
D	< 0.033	Nothing in Addition to NERC		

Note 2: As an example in applying the WECC Disturbance-Performance Table, Category B disturbance in one system shall not cause a transient voltage dip in another system that is greater than 20% for more than 20 cycles at load buses, or exceed 25% at load buses or 30% at non-load buses at any time other than during the fault.

5.5 Power Factor Criteria

Table 5.3 summarizes the power factor criteria (which are based on those in the CAISO Tariff) that were applied in these studies. The voltage at the POI must be within criteria under normal and contingency conditions.

Table 5.3: Power Factor Analysis Criteria Summary

Generation Type	Power Factor Criteria
Asynchronous Generator	0.95 lagging to 0.95 leading at the POI if identified as needed in the study
All other Generator Types	0.90 lagging to 0.95 leading at Generator terminals

6. Deliverability Assessment

The deliverability assessment was performed to identify the transmission limitations and a proposed mitigation plan to ensure that the aggregate of generation in VEA area can be simultaneously transferred to the remainder of the ISO Control Area for Category A and B conditions, and that network facility enhancements and cost responsibilities can be identified in a fair and nondiscriminatory manner.

6.1 Delivery Thermal Overload Violations

This study covers on-peak and off-peak deliverability assessments for the active QCA projects in the VEA service area. The bulk systems of SCE and the vicinity bulk systems are monitored for any adverse impacts. The worst case Post-QCA Category A and B thermal overload violations for the VEA Area are summarized in Table 6.1.

More detailed deliverability assessment results for Category A, B and C contingencies are provided in Appendix C.

6.2 Deliverability Assessment Conclusions

Based on the Category A and Category B thermal overloads identified in the deliverability assessment and summarized in Table 6.1, network upgrades including Delivery Network Upgrades and Reliability Network Upgrades are recommended to address the overloads identified.

The Delivery Network Upgrades and Reliability Network Upgrades identified in the VEA Area studies are summarized in Table 6.2A and Table 6.2B respectively. The cost allocated to each QCA project is presented in the individual project report.

Table 6.1: Summary of Delivery Assessment Results for VEA Area

Contingency	Overloaded Facilities	Rating Amps/ MVA	Overload Results (%)	
			Peak	Off-Peak
Base Case – No Contingency (N-0)	Crazy Eyes Switch Station-Pahrump 230-kV line	720	157.7	151.0
	Crazy Eyes Switch Station-Bob Switch Station 230-kV line	720	119.2	124.8
	Pahrump #1 230/138-kV transformer	100	102.4	<90
	Bob Switch Station-Mead 230-kV line	720	93.4	115.3
Crazy Eyes Switch Station-Pahrump 230-kV (L-1)	Crazy Eyes Switch Station-Bob Switch Station 230-kV line	960	211.0	211.0
Crazy Eyes Switch Station-Bob Switch Station 230-kV (L-1)	Crazy Eyes Switch Station-Pahrump 230-kV line	960	214.6	215.1
	Pahrump-Innovation 230-kV line	1,069	121.3	130.8
	Innovation-Desert View 230-kV line	1,069	106.2	118.1
	Amargosa 230/138-kV transformer	66	159.1	178.5
	Pahrump-Gamebird 138-kV line	557	113.7	110.2
Innovation-Desert View-Northwest 230-kV (L-1)	Mercury Switch-Northwest 138-kV lines	300	134.0-145.6	161.6-169.6
Pahrump #1 230/138-kV (T-1)	Pahrump #2 230/138-kV transformer	112	153.0	119.2
Pahrump #2 230/138-kV (T-1)	Pahrump #1 230/138-kV transformer	112	155.1	120.9
One Eldorado/Eldorado 2 500/230-kV (T-1)	Bob Switch Station-Mead 230-kV line	960	135.7	151.8

Table 6.2A: Proposed Delivery Network Upgrades

Upgrades	Needed for
Reconductor Pahrump-Crazy Eyes Switch Station 230-kV line	Mitigate N-0 overload and mitigate/reduce the impacts of numerous outages; including an outage of the Crazy Eyes Switch Station-Bob Switch Station 230-kV line.
Reconductor Crazy Eyes Switch Station-Bob Switch Station 230-kV line	Mitigate N-0 overload and mitigate/reduce the impacts of numerous outages; including an outage of the Crazy Eyes Switch Station-Pahrump line
Reconductor Bob Switch Station-Mead 230-kV line	Mitigate N-0 overload and mitigate/reduce the impacts of numerous outages; including an outage of either of the two Eldorado/Eldorado 2 500/230-kV transformers
Reconductor Pahrump-Gamebird 138-kV line	Mitigate the impacts of numerous outages; including an outage of the Crazy Eyes Switch Station-Bob Switch Station line
Replace Pahrump #1 230/138-kV transformer	Mitigate N-0 overload and the impacts of numerous outages; including an outage of the Pahrump #2 230/138-kV transformer

Table 6.2A: Proposed Delivery Network Upgrades

Upgrades	Needed for
Replace Pahrump #2 230/138-kV transformer	Mitigate the impacts of numerous outages; including an outage of the Pahrump #1 230/138-kV transformer
Replace Amargosa 230/138-kV transformer	Facilitate the utilization of the capacity of the 138-kV lines between Gamebird and Amargosa and to mitigate the impacts of numerous outages; including an outage of the Crazy Eyes Switch Station-Bob Switch Station 230-kV line

Table 6.2B: Proposed Reliability Network Upgrades

Upgrades	Action	Needed for
New SPS #1	Drop one queued unit	Mitigation of overloads due to an L-1 outage involving the Crazy Eyes Switch Station-Pahrump line. This SPS would also mitigate the impacts of two Category C outages involving the Crazy Eyes Switch Station-Pahrump line.
New SPS #2	Drop one queued unit	Mitigation of overloads due to an L-1 outage involving the Crazy Eyes Switch Station-Bob Switch Station line. This SPS would also mitigate the impacts of two Category C outages involving the Crazy Eyes Switch Station-Bob Switch Station line.
New SPS #3	Drop one queued unit	Mitigation of overloads due to an L-1 outage of the Pahrump-Innovation line
New SPS #4	Drop one queued unit	Mitigation of overloads due to an L-1 outage of the Innovation-Desert View-Northwest line during off-peak conditions
New SPS #5	Open Innovation-Mercury Sw. line	Mitigation of overloads due to an L-1 outage of the Innovation-Desert View-Northwest line

7. Steady State Assessment

This assessment is comprised of Power Flow Analysis.

Power flow analysis was performed to ensure that system in the VEA area remains in full compliance with North American Reliability Corporation (NERC) reliability standards TPL-001, 002, 003 and 004 with the proposed interconnection. The results of these power flow analyses will serve as documentation that an evaluation of the reliability impact of new facilities and their connections on interconnected transmission systems is performed.

These study results will be communicated to other neighboring entities that may be impacted, for coordination and incorporation of its transmission assessments. Input from other neighboring entities is solicited to ensure coordination of transmission systems.

While it is impractical to study all combinations of system load and generation levels during all seasons and at all times of the day, the base cases were developed to represent stressed scenarios of loading and generation conditions for the study group area. VEA cannot

guarantee that QCA projects can operate at maximum rated output 24 hours a day, year round, without adverse system impacts, nor can VEA guarantee that these projects would not have adverse system impacts during the times and seasons not studied in the Phase II Study.

The following power flow base cases were used for the analysis in the Phase II Study:

- **Peak Full Loop Base Case:**

  Power flow analyses were performed using a peak full loop base case (in General Electric Power Flow format). This base case was developed from the base cases that were used in the QCA Deliverability Assessment discussed above.

- **Off-Peak Full Loop Base Case:**

  Power flow analyses were performed using an off-peak full loop base case (in General Electric Power Flow format). This base case was developed from the base cases that were used in the QCA Deliverability Assessment discussed above.

These base cases modeled VEA's planned Innovation 230/138-kV substation and the associated Innovation-Mercury Switch 138-kV line, VEA's planned Vista-Charleston 138-kV line, VEA's planned Bob Switch Station-Eldorado 230-kV tie, and all CAISO approved SCE transmission projects. The base cases also modeled the VEA area deliverability upgrades identified above. In addition, they modeled all proposed generation projects that were higher than the QCA projects in the CAISO generation queue in the SCE area. These generation projects were modeled along with the identified transmission upgrades necessary for their interconnection and/or delivery. All existing and planned generation in the VEA and East of Pisgah areas are dispatched to their maximum output in both peak and off-peak base cases except when noted.

The power flow study included a preliminary power flow study, which covered all QCA projects in the VEA area with plans of service as originally requested, as a "screening analysis" to identify potential reliability issues in the original plans of service requested by the developers in QCA. The power flow study also included a modified power flow study, which reflected system changes based on the findings of the preliminary power flow study.

7.1 Preliminary Power Flow Study

The preliminary study modeled all VEA QCA projects with the original requested plan of service for each project. This preliminary assessment was intended to determine if additional VEA system upgrades would be required if any plan of service issues with QCA projects exist that would require modifications to the customer requested plans of service or points of interconnection.

7.1.1 Modeling and Generation Dispatch Assumptions

The preliminary reliability assessment was performed assuming all generation resources in the VEA and East of Pisgah areas were dispatched irrespective of the requested level of transmission service. This was done to identify if any new congestion exposure is created with the additional generation resources in QCA.

7.1.2 Preliminary Power Flow Results (Category “A”, “B”, and “C”)

With both Energy Only and Full Capacity generation resources dispatched at full output in the starting base case, the preliminary power flow analysis identified N-0 (Category “A”), N-1 (Category “B”) and N-2 (Category “C”) overloads that were aggravated with the addition of the QCA projects.

The associated power flow plots are shown in Appendix D. The overloads noted for each critical outage are summarized in Table 7.3-1 through 7.3-2 for the VEA and Eldorado areas.

Table 7.3-1: VEA Area Preliminary Power Flow Overloads – Peak Conditions

Outage	Over Loaded Component	Rating Amps/ MVA	Pre- Project Loading (Amps/MVA |%Rating)		Post- Project Loading (Amps/MVA |%Rating)		% Change from Pre-Project Loading	Comment
Category A (N-0) Overloads								
None								
Category B (N-1) Overloads								
Crazy Eyes Switch Station-Pahrump 230-kV line	Crazy Eyes Switch Station-Bob Switch Station 230-kV line	1,931	n/a	n/a	2,162	112%	n/a	Drop one queued generator (270 MW) via SPS
Crazy Eyes Switch Station-Bob Switch Station 230-kV line	Crazy Eyes Switch Station-Pahrump 230-kV line	1,931	n/a	n/a	2,054	106%	n/a	Drop one queued generator (270 MW) via SPS
	Pahrump-Innovation 230-kV line	1,069	-----	<90%	1,233	115%	>25%	
	Innovation-Desert View 230-kV line	1,069	-----	<90%	1,089	102%	>12%	
	Gamebird-Sandy 138-kV line	557	-----	<90%	583	105%	>15%	
	Sandy-Amargosa 138-kV line	557	-----	<90%	561	101%	>11%	
	Amargosa 230/138-kV transformer	66 (ex)/125 (new)	-----	<90%	138	110%	>20%	
Innovation-Desert View-Northwest 230-kV line	NVE 138-kV lines	300	-----	<90%	300	145%-157%	>55% - >67%	Drop one queued generator or open Innovation-Mercury Switch line via SPS
One Eldorado 2 500/230-kV transformer	Other Eldorado 2 500/230-kV transformer	1,344	-----	<90%[1]	1,394	104%	>14%	Drop approx. 160 MW of generation interconnected at Eldorado 2 or one queued generator via SPS
Category C (N-2) Overloads								
Common structure (CS) outage of Crazy Eyes Switch Station-Pahrump and Pahrump-Gamebird lines	Crazy Eyes Switch Station-Bob Switch Station 230-kV line	1,931	n/a	n/a	2,162	112%	n/a	Drop one queued generator via SPS

[1] Transformer is not overloaded because during post-contingency conditions power is flowing from Eldorado 2 to Bob Switching Station. If Bob Switching Station-Eldorado 2 230-kV line was not in service the transformer would be overloaded by approximately 20%.

Table 7.3-1: VEA Area Preliminary Power Flow Overloads – Peak Conditions

Outage	Over Loaded Component	Rating Amps/ MVA	Pre- Project Loading (Amps/MVA |%Rating)		Post- Project Loading (Amps/MVA |%Rating)		% Change from Pre-Project Loading	Comment
CS outage of Crazy Eyes Switch Station-Bob Switch Station and Gamebird-Sandy lines	Crazy Eyes Switch Station-Pahrump 230-kV line	1,931	n/a	n/a	2,137	111%	n/a	Drop one queued generator and open Innovation-Mercury Switch line via SPS
	Pahrump-Innovation 230-kV line	1,069	-----	<90%	1,570	147%	>57%	
	Innovation-Desert View 230-kV line	1,069	-----	<90%	1,429	134%	>44%	
	NVE 138-kV lines	300	-----	<90%	516-544	172%-181%	>182%->191%	
CS outage of Pahrump-Innovation, Pahrump-Vista, and Vista-Charleston lines	Gamebird-Sandy 138-kV line	557	-----	<90%	642	115%	>25%	Install series compensation in Crazy Eyes Switch Station-Bob Switch Station line or drop one queued generator via SPS
	Sandy-Amargosa 138-kV line	557	-----	<90%	620	111%	>21%	
	Amargosa 230/138-kV transformer	66 (ex)/125 (new)	-----	<90%	153	122%	>32%	
CS outage of Pahrump-Innovation and Vista-Johnnie lines	Gamebird-Sandy 138-kV line	557	-----	<90%	624	112%	>22%	
	Sandy-Amargosa 138-kV line	557	-----	<90%	603	108%	>18%	
	Amargosa 230/138-kV transformer	66 (ex)/125 (new)	-----	<90%	148	119%	>29%	
CS outage of Pahrump-Innovation, Vista-Johnnie, and Vista-Charleston lines	Gamebird-Sandy 138-kV line	557	-----	<90%	620	111%	>21%	
	Sandy-Amargosa 138-kV line	557	-----	<90%	598	107%	>17%	
	Amargosa 230/138-kV transformer	66 (ex)/125 (new)	-----	<90%	147	118%	>28%	
Breaker failure (BF) outage of Crazy Eyes Switch Station-Pahrump line and one Pahrump transformer	Crazy Eyes Switch Station-Bob Switch Station 230-kV line	1,931	n/a	n/a	2,162	112%	n/a	Drop one queued generator via SPS
Breaker failure (BF) at Bob Switch Station	Crazy Eyes Switch Station-Pahrump 230-kV line	1,931	n/a	n/a	2,054	106%	n/a	Drop one queued generator via SPS
	Pahrump-Innovation 230-kV line	1,069	-----	<90%	1,233	115%	>25%	
	Innovation-Desert View 230-kV line	1,069	-----	<90%	1,089	102%	>12%	
	Gamebird-Sandy 138-kV line	557	-----	<90%	584	105%	>15%	
	Sandy-Amargosa 138-kV line	557	-----	<90%	562	101%	>11%	
	Amargosa 230/138-kV transformer	66 (ex)/125 (new)	-----	<90%	138	111%	>21%	

Table 7.3-2: VEA Area Preliminary Power Flow Overloads – Off-Peak Conditions

Outage	Over Loaded Component	Rating Amps/ MVA	Pre- Project Loading (Amps/MVA |%Rating)		Post- Project Loading (Amps/MVA |%Rating)		% Change from Pre-Project Loading	Comment
Category A (N-0) Overloads								
None								
Category B (N-1) Overloads								
Crazy Eyes Switch Station-Pahrump 230-kV line	Crazy Eyes Switch Station-Bob Switch Station 230-kV line	1,931	n/a	n/a	2,162	112%	n/a	Drop one queued generator (270 MW) via SPS
Crazy Eyes Switch Station-Bob Switch Station 230-kV line	Crazy Eyes Switch Station-Pahrump 230-kV line	1,931	n/a	n/a	2,059	107%	n/a	Drop one queued generator via SPS
	Pahrump-Innovation 230-kV line	1,069	-----	<90%	1,331	124%	>34%	
	Innovation-Desert View 230-kV line	1,069	-----	<90%	1,211	113%	>23%	
	Gamebird-Sandy 138-kV line	557	-----	<90%	635	114%	>24%	
	Sandy-Amargosa 138-kV line	557	-----	<90%	623	112%	>22%	
	Amargosa 230/138-kV transformer	66 (ex)/125 (new)	-----	<90%	153	123%	>24%	
Pahrump-Innovation 230-kV line	Jackass Flats-Mercury Sw. 138-kV line	314	-----	<90%	353	112%	>22%	Install series compensation in the Crazy Eyes Switch Station-Bob Switch Station line or drop one queued generator via SPS
Innovation-Desert View-Northwest 230-kV line	NVE 138-kV lines	300	-----	<90%	519-543	173%-181%	>183%->191%	Drop one queued generator via SPS and open Innovation-Mercury Switch line[2]
One Eldorado 2 500/230-kV transformer	Other Eldorado 2 500/230-kV transformer	1,344	-----	<90%[3]	1,409	105%	>15%	Drop approx. 160 MW of generation interconnected at Eldorado 2 or one queued generator via SPS

[2] Only one remedial action would be required if series compensation is included in the Crazy Eyes Switch Station-Bob Switch Station line

[3] Transformer is not overloaded because during post-contingency conditions power is flowing from Eldorado 2 to Bob Switching Station (which results in an overload of about 14% on the existing Bob Switching Station-Mead line). If the Bob Switching Station-Eldorado 2 230-kV line was not in service the transformer would be overloaded by approximately 25%.

Table 7.3-2: VEA Area Preliminary Power Flow Overloads – Off-Peak Conditions

Outage	Over Loaded Component	Rating Amps/ MVA	Pre- Project Loading (Amps/MVA |%Rating)		Post- Project Loading (Amps/MVA |%Rating)		% Change from Pre-Project Loading	Comment
Category C (N-2) Overloads								
Common structure (CS) outage of Crazy Eyes Switch Station-Pahrump and Pahrump-Gamebird lines	Crazy Eyes Switch Station-Bob Switch Station 230-kV line	1,931	n/a	n/a	2,162	112%	n/a	Drop one queued generator via SPS
CS outage of Crazy Eyes Switch Station-Bob Switch Station and Gamebird-Sandy lines	Crazy Eyes Switch Station-Pahrump 230-kV line	1,931	n/a	n/a	2,175	113%	n/a	Drop one queued generator and open Innovation-Mercury Switch line via SPS
	Pahrump-Innovation 230-kV line	1,069	-----	<90%	1,726	161%	>71%	
	Innovation-Desert View 230-kV line	1,069	-----	<90%	1,610	151%	>61%	
	NVE 138-kV lines	300	-----	<90%	592-613	197%-204%	>107%->114%	
CS outage of Pahrump-Innovation, Pahrump-Vista, and Vista-Charleston lines	Gamebird-Sandy 138-kV line	557	-----	<90%	693	124%	>34%	Install series compensation in Crazy Eyes Switch Station-Bob Switch Station line or drop one queued generator via SPS
	Sandy-Amargosa 138-kV line	557	-----	<90%	681	122%	>32%	
	Amargosa 230/138-kV transformer	66 (ex)/125 (new)	-----	<90%	168	134%	>44%	
CS outage of Pahrump-Innovation and Vista-Johnnie lines	Gamebird-Sandy 138-kV line	557	-----	<90%	685	123%	>33%	
	Sandy-Amargosa 138-kV line	557	-----	<90%	674	121%	>31%	
	Amargosa 230/138-kV transformer	66 (ex)/125 (new)	-----	<90%	166	133%	>43%	
CS outage of Pahrump-Innovation, Vista-Johnnie, and Vista-Charleston lines	Gamebird-Sandy 138-kV line	557	-----	<90%	682	122%	>32%	
	Sandy-Amargosa 138-kV line	557	-----	<90%	670	120%	>30%	
	Amargosa 230/138-kV transformer	66 (ex)/125 (new)	-----	<90%	165	132%	>42%	
CS outage of Pahrump-Innovation and Pahrump- Vista lines	Amargosa 230/138-kV transformer	66 (ex)/125 (new)	-----	<90%	131	105%	>25%	
Breaker failure (BF) outage of Crazy Eyes Switch Station-Pahrump line and one Pahrump transformer	Crazy Eyes Switch Station-Bob Switch Station 230-kV line	1,931	n/a	n/a	2,162	112%	n/a	Drop one queued generator via SPS

Table 7.3-2: VEA Area Preliminary Power Flow Overloads – Off-Peak Conditions

Outage	Over Loaded Component	Rating Amps/ MVA	Pre- Project Loading (Amps/MVA |%Rating)		Post- Project Loading (Amps/MVA |%Rating)		% Change from Pre-Project Loading	Comment
Breaker failure (BF) at Bob Switch Station	Crazy Eyes Switch Station-Pahrump 230-kV line	1,931	n/a	n/a	2,059	107%	n/a	Drop one queued generator via SPS
	Pahrump-Innovation 230-kV line	1,069	-----	<90%	1,330	124%	>34%	
	Innovation-Desert View 230-kV line	1,069	-----	<90%	1,210	113%	>23%	
	Gamebird-Sandy 138-kV line	557	-----	<90%	636	114%	>24%	
	Sandy-Amargosa 138-kV line	557	-----	<90%	624	112%	>22%	
	Amargosa 230/138-kV transformer	66 (ex)/125 (new)	-----	<90%	154	123%	>33%	

In addition to the above, studies of several overlapping (L-1/L-1 or L-1/T-1) outages indicated that:

- All of the queued generation in the VEA area would have to be tripped via an SPS should an overlapping outage of the Crazy Eyes Switch Station-Bob Switch Station and Crazy Eyes Switch Station-Pahrump 230-kV lines occur.

- A second queued generator (270 MW) in the VEA area would have to be tripped via an SPS if an outage were to occur on the Pahrump-Innovation line or the Innovation-Desert View-Northwest line if the Crazy Eyes Switch Station-Bob Switch Station line was out-of-service.

- Two queued generators (540 MW) in the VEA area would have to be tripped via an SPS if the Pahrump-Innovation line or the Innovation-Desert View-Northwest line was out-of-service and an outage occurred on the Crazy Eyes Switch Station-Bob Switch Station line.

- An overlapping outage of the Bob Switch Station-Eldorado 2 line and one of the 500/230-kV transformers interconnecting the Eldorado 2 bus with the Eldorado 500-kV bus would result in an overload of about 25% on the remaining bank. Mitigation of this overload would require tripping generation interconnected with the Eldorado 2 bus via an SPS

- An overlapping outage of the Bob Switch Station-Mead line and one of the 500/230-kV transformers interconnecting the Eldorado 2 bus with the Eldorado 500-kV bus would result in an overload of about 44% on the remaining bank (this overload would be about 13% if there was no queued generation on-line on the VEA system). As a result, mitigation of this overload could be accomplished by tripping two QCA units (540 MW) and some queued generation interconnected with the Eldorado 2 bus via an SPS.

7.2 Preliminary Power Flow Study Conclusions

Based on the findings of the preliminary power flow study, the following conclusions were reached:

7.2.1 The Post-Contingency Export Capability of the VEA System is limited

Even with the proposed reconductoring of the Pahrump-Crazy Eyes Switch Station, Crazy Eyes Switch Station-Bob Switch Station, and Bob Switch Station-Mead 230-kV lines a Category B outage involving the Crazy Eyes Switch Station-Bob Switch Station line or the Crazy Eyes Switch Station-Pahrump line and certain Category C contingencies involving these lines result in overloads during both Peak and Off-Peak load conditions. The recommended solution to mitigate these overloads is the application of SPS that would drop one of the queued units (270 MW) for each of the six critical outages. In addition, the Innovation-Mercury Switch 138-kV line would have to be opened via a SPS for a common structure outage of the Crazy Eyes Switch Station-Bob Switch Station 230-kV line and the Gamebird-Sandy 138-kV line.

7.2.2 An Outage of the Innovation-Desert View-Northwest 230-kV line results in Overloads on the NVE 138-kV system

During both Peak and Off-Peak load conditions an outage of the Innovation-Desert View-Northwest 230-kV line results in overloads on the NVE 138-kV lines between Mercury Switch and Northwest. During peak load conditions these overloads could be mitigated by dropping one of the queued units (270 MW) or opening the Innovation-Mercury 138-kV line via an SPS. However, during off-peak load conditions both of these actions would be required to mitigate the noted overloads. Either SPS option would mitigate the off-peak overloads is series compensation was installed in the Crazy Eyes Switch Station-Bob Switch Station 230-kV line.

7.2.3 An Outage of one Eldorado 2 500/230-kV Transformer results in an overload on the other Eldorado 2 transformer

During both Peak and Off-Peak load conditions an outage of one of the Eldorado 2 500/230-kV transformers would result in an overload on the remaining transformer due to the significant amount of queued generation interconnected with the Eldorado 2 220-kV bus. The recommended solution to mitigate these overloads is the use of SPS to drop generation interconnected with the Eldorado 2 bus in that doing so is more effective than would be dropping generation on the VEA system.

7.2.4 A Category B and Several Category C Outages on the VEA System West and North of Pahrump result in Overloads on the 138-kV system

During Off-Peak load conditions an outage of the Pahrump-Innovation 230-kV line results in overloads on the Jackass Flats-Mercury Switch 138-kV line while, during both On-Peak and Off-Peak load conditions, several Category C (Common Structure) outages involving the Pahrump-Innovation 230-kV line and one or more of the 138-kV lines west or north of Pahrump result in overloads on the Gamebird-Sandy 138-kV line, the Sandy-Amargosa 138-kV line, and/or the Amargosa 230/138-kV transformer. The recommended solution to mitigate these overloads is the installation of series compensation equipment in the Crazy Eyes Switch Station-Bob Switch Station 230-kV line to increase the post-contingency flows over the 230-kV facilities east of Crazy Eyes Switch Station and, thereby, off load the impacted 138-kV facilities. An alternative solution would be to expand the use of SPS such that one of the queued units is dropped for the five pertinent outages.

7.3 Modified Power Flow Study

A modified power flow study was performed based on updated base cases that address the findings of the above preliminary power flow studies and the proposed mitigation steps discussed above.

7.3.1 Modeling and Generation Dispatch Assumptions

For the modified power flow study analysis, the preliminary power flow cases were modified to reflect the findings of the preliminary power flow study and the mitigation requirements discussed above.

- Modeled use of the SPS discussed above to drop one of the queued units on the VEA system to mitigate the pertinent thermal overloads and, in two cases, also open the Innovation-Mercury Switch 138-kV line.

- Modeled 40% series compensation on the Crazy Eyes Switch Station-Bob Switch Station 230-kV line.

7.3.2 Modified Power Flow Results (Category "A", "B" and "C")

Table 7.3-3: VEA Area - Modified Power Flow Overloads – Peak Conditions

Over Loaded Component	Rating (Amps/ (MVA)	Pre-Mitigation Loading (Amps/MVA |%Rating)		Post-Mitigation Loading (Amps/MVA |%Rating)		% Change from Pre-Mitigation Loading	Comment
Category B (N-1) Overloads – Peak							
One Eldorado 2 500/230-kV transformer after outage of other bank	1,344	1,408	104%	1,430	106%	2%	Increase amounts of queued generation interconnected at Eldorado 2 that is dropped
Category C (N-2) Overloads – Peak							
None							

Table 7.3-4: Modified Power Flow Overloads – Off-Peak Conditions

Over Loaded Component	Rating (Amps/ (MVA)	Pre-Mitigation Loading (Amps/MVA |%Rating)		Post-Mitigation Loading (Amps/MVA |%Rating)		% Change from Pre-Mitigation Loading	Comment
Category B (N-1) Overloads – Peak							
One Eldorado 2 500/230-kV transformer after outage of other bank	1,344	1,408	105%	1,445	108%	3%	Increase amounts of queued generation interconnected at Eldorado 2 that is dropped
Category C (N-2) Overloads – Peak							
None							

7.4 Modified Power Flow Conclusions

Based on the study findings, most of the power flow problems identified in the preliminary power flow study were eliminated based on the mitigation measures identified in Section 7.2 above. However, the addition of the series compensation in the Crazy Eyes Switch Station-Bob Switch Station 230-kV line did result in a slight increase in the overloads on one of the Eldorado 2 500/230-kV transformers due to an outage on the parallel transformer. This increased overload could be mitigated by increasing the amounts of queued generation interconnected at the Eldorado 2 220-kV bus that is dropped via the proposed SPS in that doing so is more effective than dropping generation on the VEA system.

8. Short Circuit Duty (SCD) Assessment

Short circuit studies were performed to determine the impact on circuit breakers due to the interconnection of QCA projects to the VEA transmission system and the addition of the Reliability and Delivery Network Upgrades identified in the power flow analysis discussed above. The fault duties were calculated before and after QCA projects to identify any equipment overstress conditions. Because the required data for the SCE system is not publically available, these studies were performed using the PSLF model to estimate the three-phase (3PH) short-circuit duties at a number of busses on the VEA system and in the Eldorado area.

8.1 SCD Results

All bus locations where the QCA projects increased the short-circuit duty by 0.1 kA or more are listed in Appendix F. These values have been used to assess the potential for equipment to be overstressed as a result of the QCA interconnections and corresponding network upgrades. These studies indicated that:

- The above threshold level would be exceeded at all of the 230-kV and 138-kV busses on the VEA system, on WAPA's Amargosa 138-kV bus, and on two monitored NVE 138-kV busses.

- The highest 3PH fault currents at the VEA 230-kV busses would occur at Northwest (approximately 50 kA), Bob Switch Station (approximately 31 kA), and Desert View (approximately 28 kA). The 3PH fault currents at all of the other VEA 230-kV busses would be less than 15 kA.

- The highest 3PH fault currents at the VEA 138-kV busses would occur at Pahrump (approximately 9 kA). The 3PH fault currents at all of the other VEA 138-kV busses would be less than 8 kA.

- The 3PH fault currents at the monitored WAPA and NVE 138-kV busses would all be less than 6 kA.

- The 3PH phase fault currents at the Mead and Eldorado 230-kV busses decrease slightly from the pre-QCA level. This is due to the fact that the

impedance of the reconductored line between Pahrump and Mead is higher than that on the existing 230-kV line.

The responsibility to finance short circuit related Reliability Network Upgrades identified through a Group Study shall be assigned to all Interconnection Requests in that Group Study pro rata on the basis of short-circuit duty contribution of each Large Generating Facility. In addition, the SCD impact of the associated Network Upgrades was allocated to each Generating Facility using the same percentage assigned for the triggered Network Upgrade. The pro rata contribution corresponding to each QCA project to the circuit breaker upgrades listed above is provided in each individual report (Appendix A).

9. Transient Stability Analysis

Transient stability analysis was conducted using both the peak and off-peak full loop base cases to ensure that the transmission system remains stable with the addition of QCA Generation Projects. The generator dynamic data used for the study is confidential in nature and is provided with each individual project report.

9.1 Transient Stability Study Scenarios

Disturbance simulations were performed for a study period of 20 seconds to determine whether the QCA projects will create any system instability during a variety of line and generator outages. For the VEA area, selected line and generator outages within this local area were evaluated. The outages were consistent with Category B and Category C requirements (single element and multiple element outages).

9.2 Transient Stability Results

The study identified that with the addition of QCA projects and upgrades and SPS in place to mitigate base case and outage related overload problems, no transient instability problems were identified in the VEA area.

The study concluded that the QCA Projects in the VEA area would not cause the transmission system to go unstable under Category B and Category C Outages. More detailed stability analysis will be performed as part of the Phase III Study. Transient stability plots for peak and off-peak load conditions are provided in Appendix E.

10. Mitigation of Overloaded Facilities

The mitigation requirements triggered by QCA projects, based on the results described in Sections 6-9 above, are as follows.

10.1 Plan of Service Reliability Network Upgrades

Plan of Service Reliability Network Upgrades for QCA projects in the VEA area are discussed in detail in each individual project report (Appendix A).

NOTE: For the Plan of Service and interconnection facilities a non-unit cost estimate was used for the subtransmission and transmission cost estimates because a unit cost estimate does not exist for the installation of individual structures. To ensure there is no undue discrimination, the same methodology that is used to develop unit cost estimates was used for these customized estimates.

10.2 Reliability Network Upgrades

Proposed scope for the Reliability Network Upgrades for QCA projects in the VEA area are discussed below.

10.2.1 Special Protection Systems (SPS)

The SPS Requirements involve the inclusion of the QCA Projects into new SPS's required exclusively for the QCA Projects. These schemes would drop one of the three queued units (270 MW) for three Category B and Category C outages involving the Crazy Eyes Switch Station-Bob Switch Station line, for three Category B and Category C outages involving the Crazy Eyes Switch Station-Pahrump line, and for a Category B outage involving the Innovation-Desert View-Northwest 230-kV line. In addition, SPS would be used to open the Innovation-Mercury Switch 138-kV line to mitigate the impacts of an outage of the Innovation-Desert View-Northwest line and of a common structure outage involving the Crazy Eyes Switch Station-Bob Switch Station and Gamebird-Sandy lines.

10.3 Delivery Network Upgrades

10.3.1 Reconductor Pahrump-Crazy Eyes Switch Station, Crazy Eyes Switch Station-Bob Switch Station, and Bob Switch Station-Mead 230-kV lines

Reconductor above lines (a total of approximately 85 miles) with Drake ACCC/TW conductor and install OPGW on the line segments.

10.3.2 Reconductor Pahrump-Gamebird 138-kV line

Reconductor above line (approximately 5 miles) with ACCC/TW conductor.

10.3.3 Substation Equipment Upgrades

Replace existing 230/138-kV transformers at Pahrump with units rated at 160 MVA (normal) and 200 MVA (emergency).

Replace existing 230/138-kV transformer at Amargosa with unit rated at 100 MVA (normal) and 125 MVA (emergency).

10.3.4 230 kV Line Series Capacitor Bank

Install 230-kV Line Series Capacitors at the Crazy Eyes Switch Station terminal of the Crazy Eyes Switch Station-Bob Switch Station line.

11. Environmental Evaluation / Permitting

Projects may be built on federal lands owned by the Bureau of Land Management (BLM). Required under federal law and the state of Nevada would be a Right of Way Grant, National Environmental Policy Act permit, County Dust Permit (Nye or Clark County, Nevada), EPA Storm Water Pollution Prevention Plans, Surface Area Disturbance Permit (Nevada), biological permit from the U.S. Fish and Wildlife (Endangered Species Act and Biological Opinion), National Historic Preservation Act section 106 compensation, and a Paleontology survey.

12. Upgrades, Cost and Time to Construct Estimates

The cost estimates are based on estimated unit costs, when applicable. Customized costs were developed when the unit costs did not reflect the unique circumstances of a project. The customized costs may include: anticipated purchase of land rights, licensing, environmental mitigation, looping lines into substations, new switchyards, substation upgrades not included in unit costs, and VEA's Interconnection Facilities.

Regardless of the requested Commercial Operating Date, the actual Commercial Operation Dates of the generation projects in QCA are dependent on the completed construction and energizing of the identified Network Upgrades. Without these upgrades, the new generators may be subject to congestion management, including generation tripping. Based on the needed time for permitting, design, and construction, it may not be feasible to complete all of the upgrades needed for this cluster before the requested Commercial Operation Dates.

Costs for each generation project are confidential and are not published in the main body of this report. Each IC is receiving a separate Appendix A report, specific only to that generation project, containing the details of the IC's cost responsibilities.

The estimated cost of Reliability Network Upgrades identified in this Group Study is assigned to all Interconnection Requests in that Group Study according to the following rules: (a) short circuit related Reliability Network Upgrades will be assigned pro rata on the basis of the short circuit duty contribution of each Large Generating Facility and associated proposed Network Upgrades, (b) for all other Reliability Network Upgrades, the cost will be assigned based on the relative impacts that each new Large Generating Facility has on the VEA system. Plan of Service Reliability Upgrades are 100% allocated to the particular IC and are detailed in each IC's Appendix A report.

The estimated cost of all **Delivery Network Upgrades** identified in the Deliverability Assessment are assigned to all Interconnection Requests selecting Full Capacity Deliverability Status based on the impacts of each such Large Generating Facility on the Delivery Network Upgrades.

The estimated cost of all **Interconnection Facilities** is assigned to each Interconnection Request individually. The cost estimates for the Interconnection Facilities are all site specific and details are provided in each individual project report.

Table 12.1: Total VEA Cost Allocated to QCA Projects in VEA Area and Estimated Time to Construct Summary

Type of Upgrade	Upgrade	Description/Mitigates	Estimated Cost ($1,000)		Estimated Time to Construct
			2012 Dollars	OD Dollars	
Deliverability	Reconductor Pahrump-Crazy Eyes Switch Station, Crazy Eyes Switch Station-Bob Switch Station, and Bob Switch Station-Mead 230-kV lines	Reconductor lines (a total of approximately 85 miles) with Drake ACCC/TW conductor. Mitigates Category A overloads on lines and reduces post-contingency overloads on them.	$16,800	$18,400	12 months
	Reconductor Pahrump-Gamebird 138-kV line	Reconductor line (a total of approximately 5 miles) with ACCC/TW conductor. Mitigates post-contingency overloads on line.	$600	$700	6 months
	Replace existing 230/138-kV transformers at Pahrump	Replace existing transformers (rated at 100/112 MVA) with two new units (rated at 160/200 MVA). Mitigates overloads on transformers	$5,600	$6,200	12 months
	Replace existing 230/138-kV transformer at Amargosa	Replace existing transformer (rated at 60/66 MVA) with new unit (rated at 100/125 MVA). Increases export capability over Gamebird-Sandy-Amargosa line and mitigates post-contingency overloads on transformer	$2,800	$3,100	12 months
	Add series compensation to Crazy Eyes Switch Station-Bob Switch Station 230-kV line	Increases flowability of the line and helps to mitigate post-contingency overloads on several 138-kV facilities	$7,400	$8,400	6 months
Plan of Service Reliability	Crazy Eyes Switch Station 230-kV switchyard	New facility for interconnection of gen-ties from queued units and of 230-kV lines to Pahrump and Bob Switch Station	$10,100	$11,200	26 months
Reliability	Add gen-drop SPS equipment at Crazy Eyes Switch Station and Bob Switch Station 230-kV switchyards	Drops one queued generator (270 MW, net) to mitigate post-contingency overloads due to outages involving the Crazy Eyes Switch Station-Bob Switch Station 230-kV line	$1,000	$1,100	6 months
	Add gen-drop SPS equipment at Crazy Eyes Switch Station and Pahrump 230-kV switchyards	Drops one queued generator to mitigate post-contingency overloads due to outages involving the Crazy Eyes Switch Station-Pahrump 230-kV line	$1,000	$1,100	6 months
	Add gen-drop SPS equipment at Innovation, Desert View, and Northwest 230-kV switchyards	Drops one queued generator to mitigate post-contingency overloads due to an outage of the Innovation-Desert View-Northwest 230-kV line	$1,000	$1,100	6 months
	Add SPS equipment at Pahrump and Innovation 230-kV switchyards to open Innovation-Mercury Switch line	Opens line to mitigate post-contingency overloads due to an outage of the Innovation-Desert View-Northwest 230-kV line	$1,000	$1,100	6 months
	Add SPS equipment at Crazy Eyes and Innovation 230-kV switchyards to open Innovation-Mercury Switch line	Opens line to mitigate post-contingency overloads due to a CS outage of the Crazy Eyes-Bob line and the Gamebird-Pahrump line	$1,000	$1,100	6 months
Total Cost for VEA Facilities			$48,300	$53,500	

Note1: The estimated time to construct (ETC) is for a typical project; schedules duration may change due to number of projects approved and release dates. Stacked projects impact resources, system outage availability, and environmental windows of construction. Assumption is VEA will need to obtain pertinent licensing and regulatory approvals prior to design, procurement and construction of the proposed facilities required to serve the interconnection customer and prerequisite facilities are in service.

Note 2: VEA's Phase II cost estimating is done in 'constant' dollars 2012 and then escalated to the estimated O.D.year. For the QCA Phase II study, the estimated O.D. is derived by assuming the duration of the work element will begin in January 2013 plus 90 days for the GIA signing period. For instance, if a work element is estimated to take a total of 24 months (permitting, design, procurement, and construction), then the estimated O.D. would be January 2015. If an IC's requested O.D. (in- service) is beyond the estimated O.D. of a work element, the IC's requested O.D. is used.

13.Coordination with Affected Systems

VEA will coordinate with any affected systems that are potentially impacted by QCA projects.

Appendix A

Individual Project Report

This appendix has been submitted to the CEC under a repeated application for confidentiality.

Appendix B

VEA Area

QCA Phase 2 Contingency List for Outages

Contingency File: VEA_QCA_P2_Innov_10302012.otg

Category	CONTINGENCY DESCRIPTION
B	Line AMARGOSA 138 to SANDY 138 Circuit 1
B	Line BONDGDTP 138 to BEATTY 138 Circuit 1
B	Line BONDGDTP 138 to BONDGLD 138 Circuit 1
B	Line LTHRPWLS 138 to BONDGDTP 138 Circuit 1
B	Line JACKASSF 138 to LTHRPWLS 138 Circuit 1
B	Line PAHRUMP 138 to VISTA 138 Circuit 1
B	Line LTHRPWLS 138 to VALLEYTP 138 Circuit 1
B	Line VALLEYVE 138 to VALLEYTP 138 Circuit 1
B	Line PAHRUMP 138 to GAMEBIRD 138 Circuit 1
B	Line GAMEBIRD 138 to THSNDAIR 138 Circuit 1
B	Line THSNDAIR 138 to CHARLSTN 138 Circuit 1
B	Line VISTA 138 to CHARLSTN 138 Circuit 1
B	Line INNOVATION 138 to MERCRYSW 138 Circuit 1
B	Line MEAD S 230 to BOB TAP 230 Circuit 1
B	Line ELDORDO2 230 to BOB TAP 230 Circuit 1
B	Line NWEST 230 to DESERT VIEW 230 Circuit 1
B	Line NWEST 230 to DESERT VIEW 230 Ckt. 1 & Q14 Gen Drop
B	Line SANDY 138 to GAMEBIRD 138 Circuit 1
B	Line VALLEYTP 138 to JOHNNIE 138 Circuit 1
B	Line VISTA 138 to JOHNNIE 138 Circuit 1
B	Line PAHRUMP_1 230 to INNOVATION 230 Circuit 1
B	Line PAHRUMP_1 230 to INNOVATION 230 Ckt. 1 & Q14 Gen Drop
B	Line INNOVATION 230 to DESERT VIEW 230 Circuit 1
B	Line INNOVATION 230 to DESERT VIEW 230 Ckt. 1 & Q14 Gen Drop
B	INNOVATION-DESERT VIEW 230 Ckt. 1 & Innovation-Mercury SW
B	Line PAHRUMP 1 230 - CRAZY EYE TP 230 Ckt. 1
B	Line PAHRUMP 1 230 - CRAZY EYE TP 230 Ckt. 1 & Q14 Gen Drop
B	Line CRAZY EYE TP 230 - BOB TAP 230 Ckt. 1
B	Line CRAZY EYE TP 230 - BOB TAP 230 Ckt. 1 & Q14 Gen Drop
B	Line CRAZY EYE TP 230 to VEA_Q13 230 Circuit 1
B	Line CRAZY EYE TP 230 to VEA_Q14 230 Circuit 1
B	Tran AMARGOSA 230 to AMARGOSA 138 Circuit 1
B	Tran PAHRUMP_1 230 to PAHRUMP 138 Circuit 1
B	Tran PAHRUMP_1 230 to PAHRUMP 138 Circuit 2
C	ComStruc PAHRUMP-CRAZY EYE TP 230 & PAHRUMP-GAMEBIRD 138
C	ComStruc PAHRUMP-CRAZY EYE TP 230 & PAHRUMP-GAMEBIRD 138 & Q14 Gen Drop
C	ComStruc CRAZY EYE TP-BOB TAP 230 & GAMEBIRD-SANDY 138
C	ComStruc CRAZY EYE TP-BOB TAP 230 & GAMEBIRD-SANDY 138 & Q14 Gen Drop
C	ComStruc CRAZY EYE TP-BOB TP 230 & GAMEBIRD-SANDY 138 & Q14 Gen Drop & Innovation-Mercury SW
C	ComStruc VISTA-PAHRUMP 138 & PAHRUMP-INNOVATION 230 & VISTA-CHAS 138
C	ComStruc VISTA-JOHNNIE 138 & PAHRUMP-INNOVATION 230
C	ComStruc VISTA-JOHNNIE 138 & PAHRUMP-INNOVATION 230 & VISTA-CHAS 138
C	ComStruc PAHRUMP-VISTA 138 & PAHRUMP-INNOVATION 230
C	ComStruc VISTA-PAHRUMP 138 & PAHRUMP-INNOVATION 230 & VISTA-CHAS 138 & Q14 Gen Drop
C	ComStruc VISTA-JOHNNIE 138 & PAHRUMP-INNOVATION 230 & Q14 Gen Drop
C	ComStruc VISTA-JOHNNIE 138 & PAHRUMP-INNOVATION 230 & VISTA-CHAS 138 & Q14 Gen Drop
C	ComStruc PAHRUMP-VISTA 138 & PAHRUMP-INNOVATION 230 & Q14 Gen Drop
C	Bus Fault LTHWLS-JKASSF 138 & LTHWLS-BNDGDT 138 & LTHWLS-VLYTP
C	Bus Fault VLYTP-LTHWLS 138 & VLYTP-VLYVE & VLYTP-JOHNNIE 138
C	Bus Fault CHARLSTN-VISTA 138 & CHARLSTN-THSNDAIR 138
C	Bus Fault THSNDAIR-CHARLSTN 138 & THSNDAIR-GAMEBIRD 138
C	Bus Fault SANDY-AMARGOSA 138 & SANDY-GAMEBIRD 138
C	Brkr Fail CHARLSTN-VISTA 138 & CHARLSTN-THSNDAIR 138

Category	CONTINGENCY DESCRIPTION
C	Brkr Fail LTHWLS-JKASSF 138 & LTHWLS-BDGDT 138 & LTHWLS-VLYT 138
C	Brkr Fail VLYTP-LTHWLS 138 & VLYTP-VLYVE 138 & VLYTP-JOHNNIE 138
C	Brkr Fail VISTA-CHARLESTON 138 & VISTA-JOHNNIE 138
C	Brkr Fail GAMEBIRD-PAHRUMP 138 & GAMEBIRD 138-SANDY 138
C	Brkr Fail VISTA-PAHRUMP 138 & VISTA-CHARLESTON 138
C	Brkr Fail PAHRUMP 138/230kV Tran Bnk 1 & PAHRUMP - CRAZY EYE TP 230
C	Brkr Fail PAHRUMP 138/230kV Tran Bnk 1 & PAHRUMP - CRAZY EYE TP 230 with Q14 Gen Drop
C	Brkr Fail PAHRUMP 138/230kV Transformer BNK 2 & PAHRUMP-VISTA 138
C	Brkr Fail PAHRUMP-VISTA 138 & PAHRUMP-GAMEBIRD 138
C	Brkr Fail PAHRUMP 138/230kV Tran Bnk 1 & PAHRUMP-GAMEBIRD 138
C	Brkr Fail PAHRUMP 138/230kV Tran Bnk 1 & PAHRUMP LD1 & PAHRUMP LD2
C	Brkr Fail PAHRUMP 138/230kV Tran Bnk 2 & PAHRUMP LD1 & PAHRUMP LD2
C	Bus Fault VISTA LD1 & VISTA-PAHRUMP 138
C	Brkr Fail VISTA LD1 & VISTA-JOHNNIE 138
C	Brkr Fail MEAD S-BOB TP 230 & ELDORDO2-BOB TP 230 & CRZY EYE TP-BOB TP 230
C	Brkr Fail MEAD S-BOB TP 230 & ELDORDO2-BOB TP 230 & CRZY EYE TP-BOB TP 230 w/Q14 Gen Drop
B	Line MOENKOPI 500 to ELDORDO 500 Ckt 1
B	Line PISGAH 230 to TOT131TP 230 Ckt 1
B	Line ELDORDO 500 to NIPTON 500 Ckt 1
B	Line ELDORDO 500 to NIPTON 500 Ckt 2
B	Line PRIMM 230 to IVANPAH 230 Ckt 1
B	Line PRIMM 230 to ELDORDO2 230 Ckt 1
B	Line PRIMM 230 to TC08SC68 230 Ckt 1
B	Line MOHAVE 500 to TOT448AH 500 Ckt 1
B	Line ELDORDO2 230 to TOT487S 230 Ckt 1
B	Line ELDORDO 230 to MAGNOLIA 230 Ckt 1
B	Line NSO 230 to ELDORDO 230 Ckt 1
B	Line MCCULLGH 230 to NSO 230 Ckt 1
B	Line HS-CM92 230 to COPPERMTN 230 Ckt 1
B	Line ELDORDO2 230 to TC08SC14 230 Ckt 1
B	Line ELDORDO2 230 to TOT404 230 Ckt 1
B	Line MERCHANT 230 to COPPERMTN 230 Ckt 1
B	Line CAMINO 230 to MEAD S 230 Ckt E
B	Line CAMINO 230 to MEAD S 230 Ckt W
B	Line ELDORDO 500 to MCCULLGH 500 Ckt 1
B	Line MOHAVE 500 to ELDORDO 500 Ckt 1
B	Line PISGAH 230 to ELDORDO 230 Ckt 2
B	Line PISGAH 230 to CIMA 230 Ckt 1
B	Line CIMA 230 to ELDORDO 230 Ckt 1
B	Tran ELDORDO 500 to ELDORDO 230 Bnk 1
B	Tran ELDORDO 500 to ELDORDO 230 Bnk 2
B	Tran MCCULLGH 500 to MCCULLGH 230 Bnk 1
B	Tran MCCULLGH 500 to MCCULLGH 230 Bnk 2
B	Tran MCCULLGH 500 to MCCULLGH 230 Bnk 3
B	Tran ELDORDO 500 to ELDORDO2 230 Bnk 1
B	Tran ELDORDO 500 to ELDORDO2 230 Bnk 2
B	Tran NIPTON 500 to NIPTON 230 Bnk 1
C	Line ELDORDO -NIPTON 500 1 & 2 Lines
C	Line LUGO-MIRALOMA 500kV Line 2 & LUGO-RANCHVST 500kV Line 1
C	Line LUGO-MIRALOMA 500kV Line 2 & 3
C	Line MIDWAY-VINCENT 500kV Line 1 & 2
C	Line LUGO-MIRALOMA 500kV Line 2 & 3
B	Line CRYSTAL 500 to MCCULLGH 500 Ckt 1
B	Line BASIC 230 to HENDRSON 230 Ckt 1
B	Line BASIC 230 to HENDRSON 230 Ckt 2

Category	CONTINGENCY DESCRIPTION
B	Line HENDRSON 230 to MEAD N 230 Ckt 1
B	Line BELTWAY 230 to ARDEN 230 Ckt 2
B	Line CLARK 6 to FAULKNER 230kV Ckt 1 & Clark 138/230kV Xfmr
B	Line CLARK E 230 to HENDRSON 230 Ckt 1
B	Line CLARK W 230 to HENDRSON 230 Ckt 1
B	Line CRYSTAL 230 to H ALLEN 230 Ckt 2
B	Line NAVAJO 500 to CRYSTAL 500 Ckt 1
B	Line CRYSTAL 230 to H ALLEN 230 Ckt 3
B	Line MCCULLGH -VICTORVL 500 1 & 2 Lines
B	Line DECATUR 230 to WESTSIDE 230 Ckt 1
B	Line DECATUR 230 to MCDONLD 230 Ckt 1
B	Line TOLSON 230 to FAULKNER 230 Ckt 1
B	Line TOLSON 230 to MCCULLGH 230 Ckt 1
B	Line FAULKNER to WINTERWD 230kV Ckt 1 & WINTERWD 138/230kV Xfmr
B	Line H ALLEN 230 to PECOS 230 Ckt 1
B	Line H ALLEN 230 to PECOS 230 Ckt 2
B	Line HASSYAMP 500 to N.GILA 500 Ckt 1
B	Line H ALLEN 230 to PECOS 230 Ckt 3
B	Line IRONMTN 230 to NWEST 230 Ckt 1
B	Line IRONMTN 230 to PECOS 230 Ckt 1
B	Line IRONMTN 230 to GRTETON 230 Ckt 1
B	Line IRONMTN 230 to IM RAIN 230 Ckt 1
B	Line NEWPORT 230 to EASTSIDE 230 Ckt 1
B	Line NWEST 230 to BELTWAY 230 Ckt 2
B	Line NWEST 230 to AVERA 230 Ckt 1
B	Line NWEST 230 to WESTSIDE 230 Ckt 1
B	Line NWEST 230 - LOG CAB 230 - IM RAIN 230 Ckt 1
B	Line H ALLEN to REDBUTTE 345kV Ckt 1 & H ALLEN 345kV PS
B	Line RD GDNR 230 to H ALLEN 230 Ckt 1
B	Line RD GDNR 230 to H ALLEN 230 Ckt 2
B	Line RD GDNR 230 to TORTISE 230 Ckt 1
B	Line MCDONLD 230 to ARDEN 230 Ckt 1
B	Line BC TAP 230 to AMARGOSA 230 Ckt 1
B	Line BC TAP 230 to BC TAPNV 230 Ckt 1
B	Line BC TAP 230 to MEAD N 230 Ckt 1
B	Line SLHWK 500 to H ALLEN 500 Ckt 1
B	Line LENZIE 500 to LENZ CB1 500 Ckt 1
B	Line AMARGOSA 230 to HENDRSON 230 Ckt 1
B	Line LENZIE 500 to LENZ CB2 500 Ckt 1
B	Line LENZIE 500 to NWEST 500 Ckt 1
B	Line MIRANT 500 to H ALLEN 500 Ckt 1
B	Line H ALLEN 500 to LENZIE 500 Ckt 1
B	Line H ALLEN 500 to LENZIE 500 Ckt 2
B	Line H ALLEN to CRSTL N 500kV Ckt 1 & CRYSTAL 500kV PS1 & PS2
B	Line H ALLEN 500 to MEAD 500 Ckt 1
B	Line NSO 230 to SOEAST1 230 Ckt 1
B	Line EQUEST 230 to FAULKNER 230 Ckt 1
B	Line MERCHANT 230 to ELDORDO 230 Ckt 1
B	Line MERCHANT 230 to ELDORDO 230 Ckt 2
B	Line ARDEN 230 to TOLSON 230 Ckt 1
B	Line GREENWAY 230 to FAULKNER 230 Ckt 1
B	Line MEAD N 230 to ARDEN 230 Ckt 1
B	Line MEAD N 230 to EASTSIDE 230 Ckt 1
B	Line MEAD N 230 to NEWPORT 230 Ckt 1
B	Line MEAD N 230 to EQUEST 230 Ckt 2

Category	CONTINGENCY DESCRIPTION
B	Line MEAD N 230 to HVRA3A4 230 Ckt 1
B	Line MEAD S 230 to EQUEST 230 Ckt 1
B	Line MEAD S 230 to GREENWAY 230 Ckt 1
B	Line MEAD S 230 to MEAD N 230 Ckt 1
B	Line ARDEN 230 to AVERA 230 Ckt 1
B	Line MEAD S 230 to ELDORDO 230 Ckt 1
B	Line MEAD S 230 to ELDORDO 230 Ckt 2
B	Line MEAD S 230 to MCCULLGH 230 Ckt 1
B	Line MEAD S 230 to MCCULLGH 230 Ckt 2
B	Line DAVIS 230 to MEAD N 230 Ckt 1
B	Line DAVIS 230 to MCCULLGH 230 Ckt 1
B	Line HOVRA5A6 230 to MEAD S 230 Ckt 1
B	Line HOVRA7-9 230 to MEAD S 230 Ckt 1
B	Line MEAD 500 to PERKINS 500 Ckt 1
B	Line MEAD 500 to MARKETPL 500 Ckt 1
B	Line ARDEN 230 to MAGNOLIA 230 Ckt 1
B	Line HOVRN7N8 230 to MEAD S 230 Ckt 1
B	Line HOVRN5N6 230 to MEAD S 230 Ckt 1
B	Line HOVRN3N4 230 to MEAD S 230 Ckt 1
B	Line HOVRN1N2 230 to MEAD S 230 Ckt 1
B	Line HOVRA1A2 230 to MEAD S 230 Ckt 1
B	Line PEACOCK 345 to MEAD 345 Ckt 1
B	Line LUGO 500 to VICTORVL 500 Ckt 1
B	Line MARKETPL 500 to ADELANTO 500 Ckt 1
B	Line MARKETPL 500 to MCCULLGH 500 Ckt 1
B	Line MCCULLGH 230 to FAULKNER 230 Ckt 1
B	Line MCCULLGH 500 to VICTORVL 500 Ckt 1
B	Line MCCULLGH 500 to VICTORVL 500 Ckt 2
B	Line MEAD to VICTORVL 287kV Ckt 1 & Mead 230/287kV Xfmr Bnk 1
B	Line NWEST 138 to SNOW MTN 138 Ckt 1
B	Line IS TAP 138 to MERCRYSW 138 Ckt 1
B	Line JACKASSF 138 to MERCRYSW 138 Ckt 1
B	Tran ARDEN 230 to ARDEN 138 Bnk 1
B	Tran ARDEN 230 to ARDEN 138 Bnk 2
B	Tran BELTWAY 230 to BELTWAY 138 Bnk 1
B	Tran CRYSTAL 500 to CRYSTAL 230 Bnk 2
B	Tran CRYSTAL 500 to CRYSTAL 230 Bnk 3
B	Tran DECATUR 230 to DECATUR 138 Bnk 1
B	Tran TOLSON 230 to TOLSON 138 Bnk 1
B	Tran FAULKNER 230 to FAULKNER 138 Bnk 1
B	Tran IRONMTN 230 to IRONMTN 138 Bnk 1
B	Tran IRONMTN 230 to IRONMTN 138 Bnk 2
B	Tran NWEST 230 to NWEST 138 Bnk 1
B	Tran NWEST 230 to NWEST 138 Bnk 2
B	Tran PECOS 230 to PECOS 138 Bnk 1
B	Tran PECOS 230 to PECOS 138 Bnk 2
B	Tran PECOS 230 to PECOS 138 Bnk 3
B	Tran PECOS 230 to PECOS 138 Bnk 4
B	Tran AVERA 230 to AVERA 138 Bnk 1
B	Tran WESTSIDE 230 to WESTSIDE 138 Bnk 1
B	Tran MAGNOLIA 230 to MAGNOLIA 138 Bnk 1
B	Tran MCDONLD 230 to MCDONLD 138 Bnk 1
B	Tran NWEST 500 to NWEST 230 Bnk 1
B	Tran MEAD 345 to MEAD N 230 Bnk 1
B	Tran MEAD 500 to MEAD N 230 Bnk 1

Category	CONTINGENCY DESCRIPTION
B	Tran MEAD 500 to MEAD N 230 Bnk 2
C	Common Corridor MED-PES & MED-PCK
C	Common Corridor MED-PES & PCK-LIB
C	Bus Fault DAVIS Sub 230kV East Bus (Main & Transfer)
C	Breaker Failure PCK692 Peacock 345kV
C	Breaker Failure PCK192 Peacock 345kV

Appendix C

Deliverability Assessment Results for VEA Area

Appendix C: Deliverability Assessment Results for VEA Area

Table 1: QC4 Deliverability Study – VEA Area Analysis Summary without Delivery Network Upgrade Mitigations

Contingency	Overloaded Facilities	Applicable Rating	Overload Results (%)	
		Amps/MVA	Peak	Off-Peak
Category A (N-0)	Crazy Eyes Tap-Pahrump 230-kV line	720	157.7	151.0
	Crazy Eyes Tap-Bob Tap 230-kV line	720	119.2	124.8
	Pahrump #1 230/138-kV transformer	100	102.4	<90
	Pahrump #2 230/138-kV transformer	100	96.8	<90
	Bob Tap-Mead 230-kV line	720	93.4	115.3
Category B (N-1)				
Bob Tap-Mead 230-kv (L-1)	Crazy Eyes Tap-Pahrump 230-kV line	720	120.1	116.2
Bob Tap-Eldorado 2 230-kV (L-1)	Crazy Eyes Tap-Pahrump 230-kV line	720	118.7	112.3
Pahrump-Innovation 230-kV (L-1)	Crazy Eyes Tap-Bob Tap 230-kV line	960	129.7	138.0
	Pahrump #1 230/138-kV transformer	112	133.5	118.1
	Pahrump #2 230/138-kV transformer	112	126.3	111.7
	Amargosa 230/138-kV transformer	66	116.7	133.7
Innovation-Desert View-Northwest 230-kV (L-1)	Crazy Eyes Tap-Bob Tap 230-kV line	960	118.1	127.3
	Pahrump #1 230/138-kV transformer	112	100.8	<90
	Pahrump #2 230/138-kV transformer	112	95.3	<90
	Amargosa 230/138-kV transformer	66	112.8	132.5
	Mercury Switch-Northwest 138-kV lines	300	134.0-145.6	161.6-169.6
Crazy Eyes Tap-Pahrump 230-kV (L-1)	Crazy Eyes Tap-Bob Tap 230-kV line	960	211.0	211.0
	Bob Tap-Mead 230-kV line	960	105.4	119.5
Crazy Eyes Tap-Bob Tap 230-kV (L-1)	Crazy Eyes Tap-Pahrump 230-kV line	960	214.6	215.1
	Amargosa 230/138-kV transformer	66	159.1	178.5
	Pahrump #1 230/138-kV transformer	112	131.1	114.0
	Pahrump #2 230/138-kV transformer	112	124.0	107.9
	Pahrump-Gamebird 138-kV line	557	113.7	110.2
	Pahrump-Innovation 230-kV line	1,069	121.3	130.8
	Innovation-Desert View 230-kV line	1,069	106.2	118.1
	Mercury Switch-Northwest 138-kV lines	300	129.9-140.0	149.2-156.7
Pahrump #1 230/138-kV (T-1)	Pahrump #2 230/138-kV transformer	112	153.0	119.2
	Pahrump-Crazy Eyes Tap 230-kV line	960	113.8	109.4
Pahrump #2 230/138-kV (T-1)	Pahrump #1 230/138-kV transformer	112	155.1	120.9
	Pahrump-Crazy Eyes Tap 230-kV line	960	114.0	109.6
One Eldorado/Eldorado 2 500/230-kV (T-1)	Bob Tap-Mead 230-kV line	960	135.7	151.8
	Crazy Eyes Tap-Pahrump 230-kV line	960	125.6	120.7
	Other Eldorado/Eldorado 2 500/230-kV trans.	1,344	100.7	101.3

Contingency	Overloaded Facilities	Applicable Rating	Overload Results (%)	
		Amps/MVA	Peak	Off-Peak
Category C (N-2)				
Crazy Eyes Tap-Pahrump 230-kV and Pahrump-Gamebird 138-kv (Common Structure (CS))	Crazy Eyes Tap-Bob Tap 230-kV line	960	211.0	211.0
	Bob Tap-Mead 230-kV line	960	105.4	119.5
Crazy Eyes Tap-Bob Tap 230-kV and Gamebird-Sandy 138-kV (CS)	Crazy Eyes Tap-Pahrump 230-kV line	960	219.1	221.9
	Pahrump-Innovation 230-kV line	1,069	145.2	158.7
	Innovation-Desert View 230-kV line	1,069	131.1	147.1
	Mercury Switch-Northwest 138-kV lines	300	165.9-175.5	191.2-198.4
	Jackass Flats-Mercury Switch 138-kV line	314	<90	106.6
Pahrump-Innovation 230-kV, Vista-Pahrump 138-kV, and Vista-Charleston 138-kV (CS)	Amargosa 230/138-kV transformer	66	161.7	178.8
	Crazy Eyes Tap-Bob Tap 230-kV line	960	153.4	162.3
	Pahrump-Gamebird 138-kV line	557	116.8	109.0
	Bob Tap-Mead 230-kV line	960	<90	104.5
Pahrump-Innovation 230-kV and Vista-Johnnie 138-kV (CS)	Amargosa 230/138-kV transformer	66	156.2	176.5
	Crazy Eyes Tap-Bob Tap 230-kV line	960	149.9	160.4
	Bob Tap-Mead 230-kV line	960	<90	103.9
Pahrump-Innovation 230-kV, Vista-Johnnie 138-kV, and Vista-Charleston 138-kV (CS)	Amargosa 230/138-kV transformer	66	155.2	175.6
	Crazy Eyes Tap-Bob Tap 230-kV line	960	150.1	160.6
	Pahrump-Gamebird 138-kV line	557	113.4	107.3
	Bob Tap-Mead 230-kV line	960	<90	104.0
Pahrump-Innovation 230-kV and Vista-Pahrump 138-kV (CS)	Pahrump-Gamebird 138-kV line	557	163.8	157.3
	Crazy Eyes Tap-Bob Tap 230-kV line	960	135.7	143.7
	Amargosa 230/138-kV transformer	66	121.6	138.1
	Pahrump #1 230/138-kV transformer	112	124.0	108.9
	Pahrump #2 230/138-kV transformer	112	117.3	103.0
Crazy Eyes Tap-Bob Tap 230-kV, Bob Tap-Mead-kV, Bob Tap-Eldorado 2 230-kV (Breaker Failure (BF))	Crazy Eyes Tap-Pahrump 230-kV line	960	214.6	215.1
	Amargosa 230/138-kV transformer	66	149.4	179.1
	Pahrump #1 230/138-kV transformer	112	131.2	114.1
	Pahrump #2 230/138-kV transformer	112	124.1	108.0
	Pahrump-Gamebird 138-kV line	557	113.9	110.5
	Pahrump-Innovation 230-kV line	1,069	121.3	130.8
	Innovation-Desert View 230-kV line	1,069	106.2	118.0
	Mercury Switch-Northwest 138-kV lines	300	129.9-140.0	149.2-146.7
Crazy Eyes Tap-Pahrump 230-kV and Pahrump #1 230/138-kV (BF)	Crazy Eyes Tap-Bob Tap 230-kV line	960	211.0	211.0
	Bob Tap-Mead 230-kV line	960	105.5	119.5
Pahrump-Vista 138-kV and Pahrump #2 230/138-kV (BF)	Pahrump #1 230/138-kV transformer	112	145.5	112.5
Pahrump-Gamebird 138-kV and Pahrump #1 230/138-kV (BF)	Pahrump #2 230/138-kV transformer	112	136.9	104.4

Appendix D

VEA Area

QCA Phase 2 Steady State Power Flow Plots

VEA Area

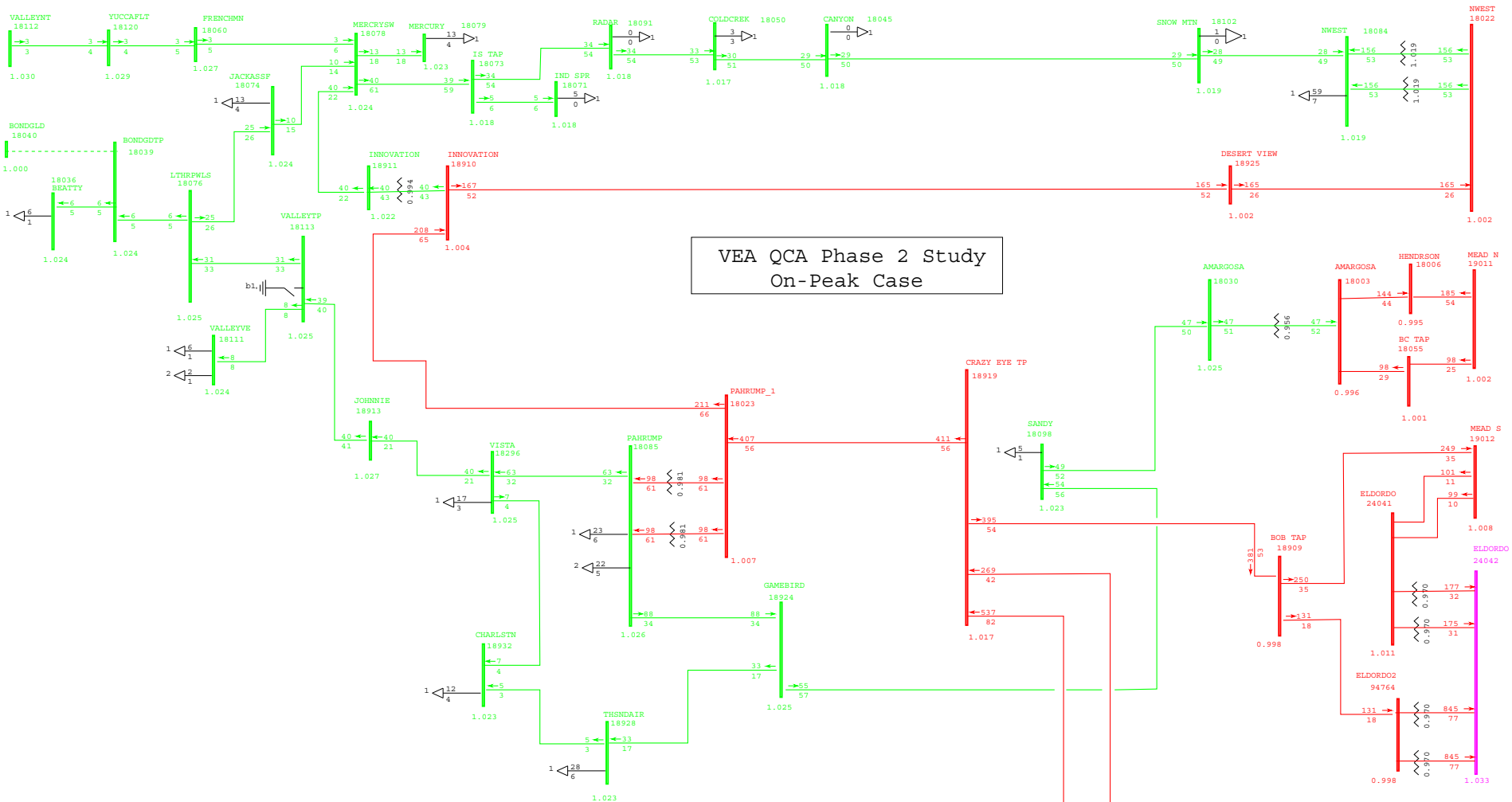
QCA Phase 2 Steady State Power Flow Plots

1. Base Case (N-0)
2. Pahrump-Innovation 230kV Line SLO
3. Innovation-Desert View 230kV Line SLO
4. Innovation-Desert View 230kV Line SLO with Q14 Gen Drop
5. Innovation-Desert View 230kV Line SLO with Innovation-Mercury SW 138kV Line Trip
6. Pahrump-Crazy Eye Tap 230kV Line SLO
7. Pahrump-Crazy Eye Tap 230kV Line SLO with Q14 Gen Drop
8. Crazy Eye Tap-Bob Tap 230kV Line SLO
9. Crazy Eye Tap-Bob Tap 230kV Line with Q14 Gen Drop
10. Pahrump-Crazy Eye Tap 230kV Line & Pahrump-Gamebird 138kV Line DLO (Common Structure)
11. Pahrump-Crazy Eye Tap 230kV Line & Pahrump-Gamebird 138kV Line DLO with Q14 Gen Drop (Common Structure)
12. Crazy Eye Tap-Bob Tap 230kV Line & Gamebird-Sandy 138kV Line DLO (Common Structure)
13. Crazy Eye Tap-Bob Tap 230kV Line & Gamebird-Sandy 138kV Line DLO with Q14 Gen Drop (Common Structure)
14. Crazy Eye Tap-Bob Tap 230kV Line & Gamebird-Sandy 138kV Line DLO with Q14 Gen Drop and Innovation-Mercury SW 138kV Line Trip (Common Structure)
15. Vista-Pahrump 138kV Line & Pahrump-Innovation 230kV Line & Vista-Chas 138kV Line DLO (Common Structure)
16. Vista-Johnnie 138kV Line & Pahrump-Innovation 230kV Line DLO (Common Structure)
17. Vista- Johnnie 138kV Line & Pahrump-Innovation 230kV Line & Vista-Chas 138kV Line DLO (Common Structure)
18. Vista-Pahrump 138kV Line & Pahrump-Innovation 230kV Line DLO (Common Structure)
19. Pahrump 138/230kV Transformer Bank 1 & Pahrump-Crazy Eye Tap 230kV Line (Breaker Failure)
20. Pahrump 138/230kV Transformer Bank 1 & Pahrump-Crazy Eye Tap 230kV Line with Q14 Gen Drop (Breaker Failure)
21. Mead S-Bob Tap 230kV Line & Eldordo2-Bob Tap 230kV Line & Crazy Eye Tap-Bob Tap 230kV Line (Breaker Failure)
22. Mead S-Bob Tap 230kV Line & Eldordo2-Bob Tap 230kV Line & Crazy Eye Tap-Bob Tap 230kV Line with Q14 Gen Drop (Breaker Failure)

VEA Area

QC4 Phase 2 Steady State Power Flow Plots

On-Peak Case



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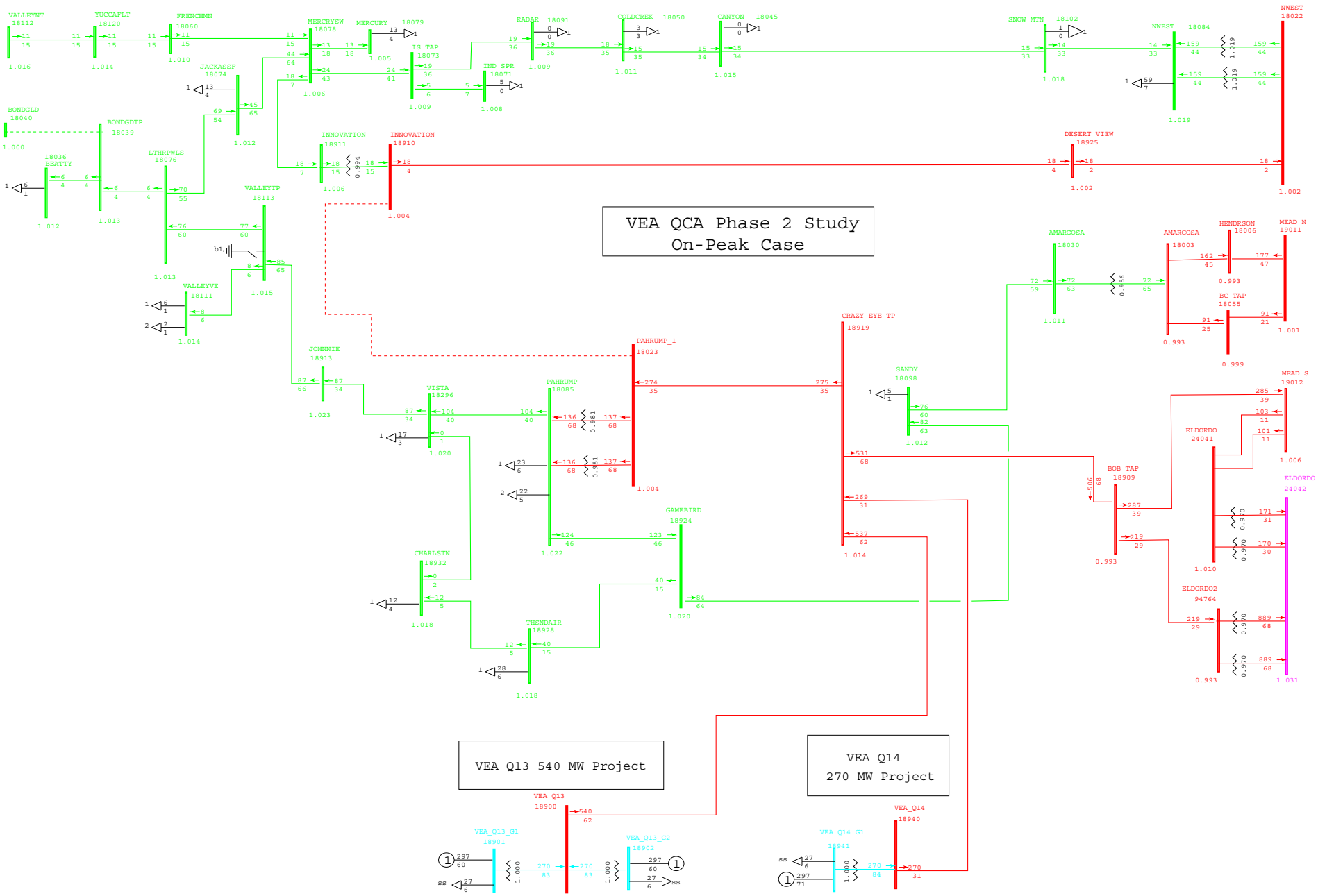

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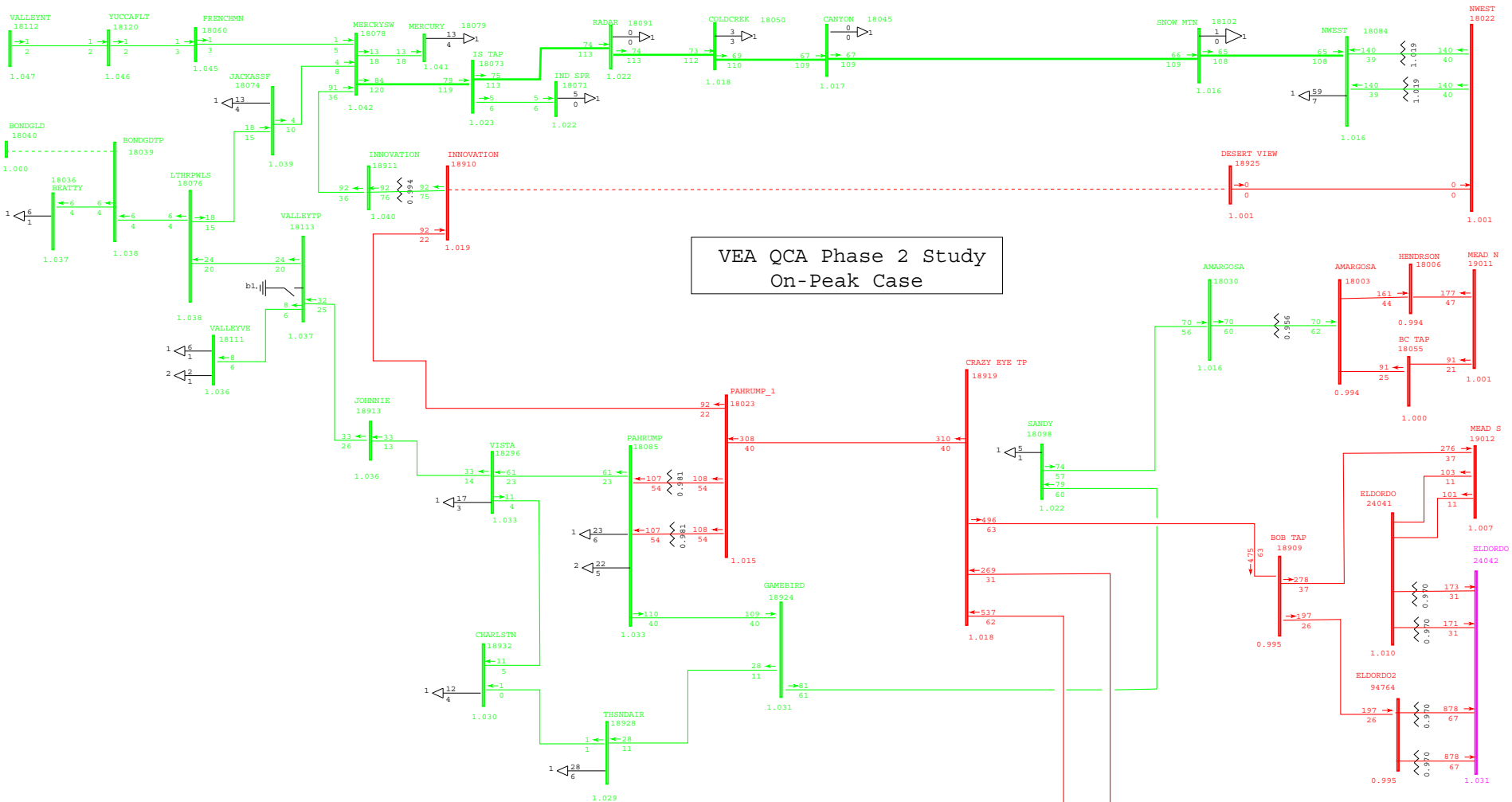

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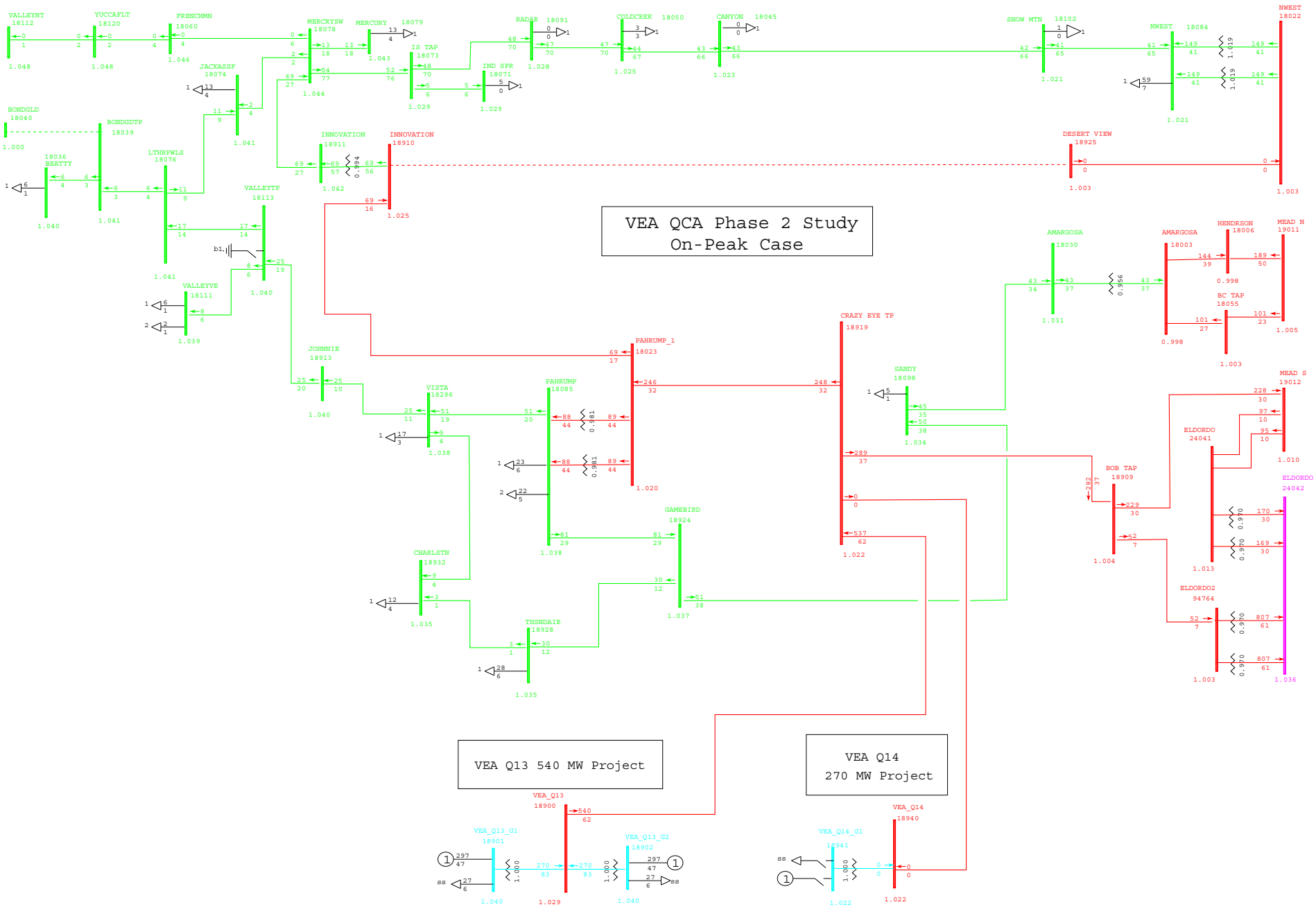

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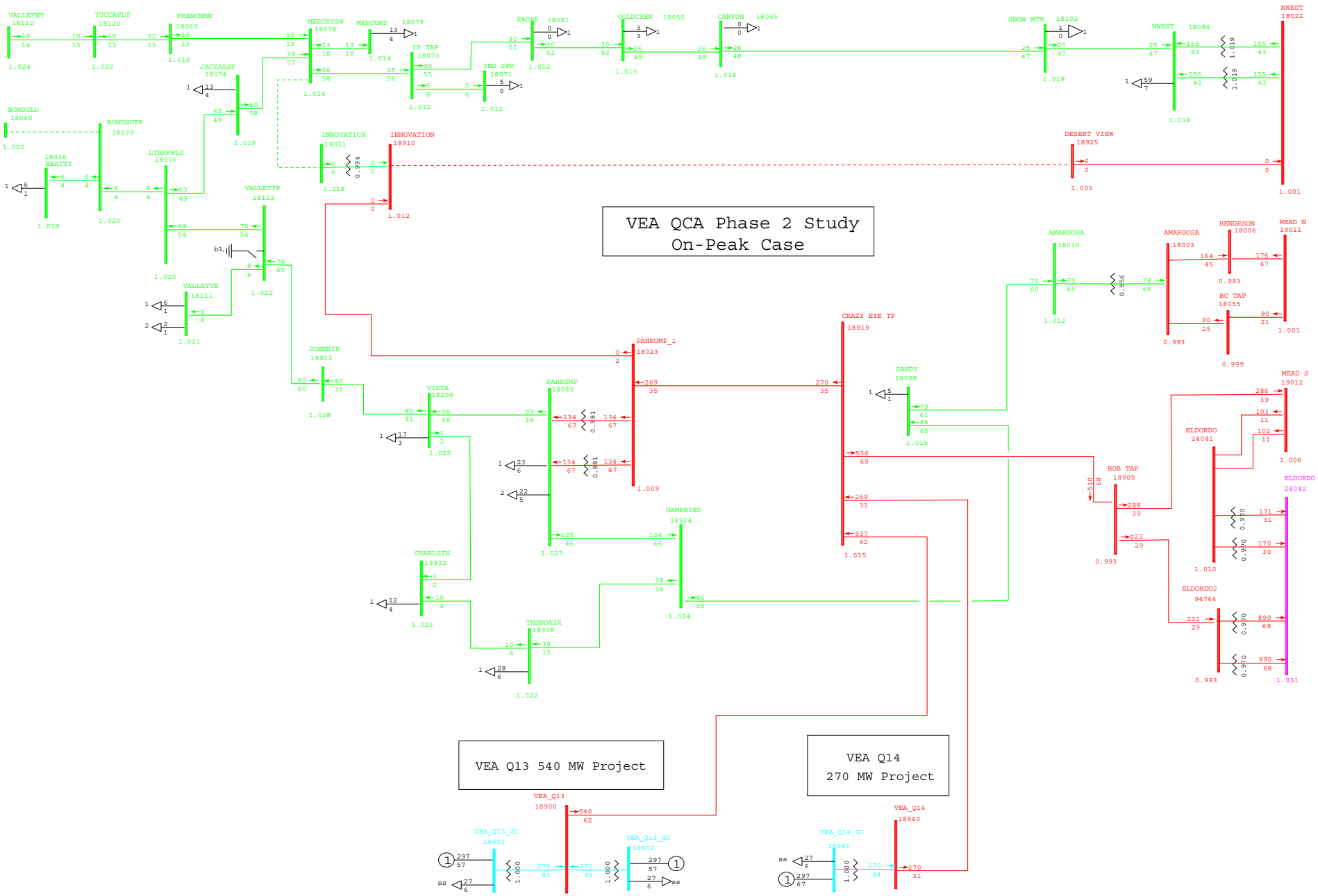

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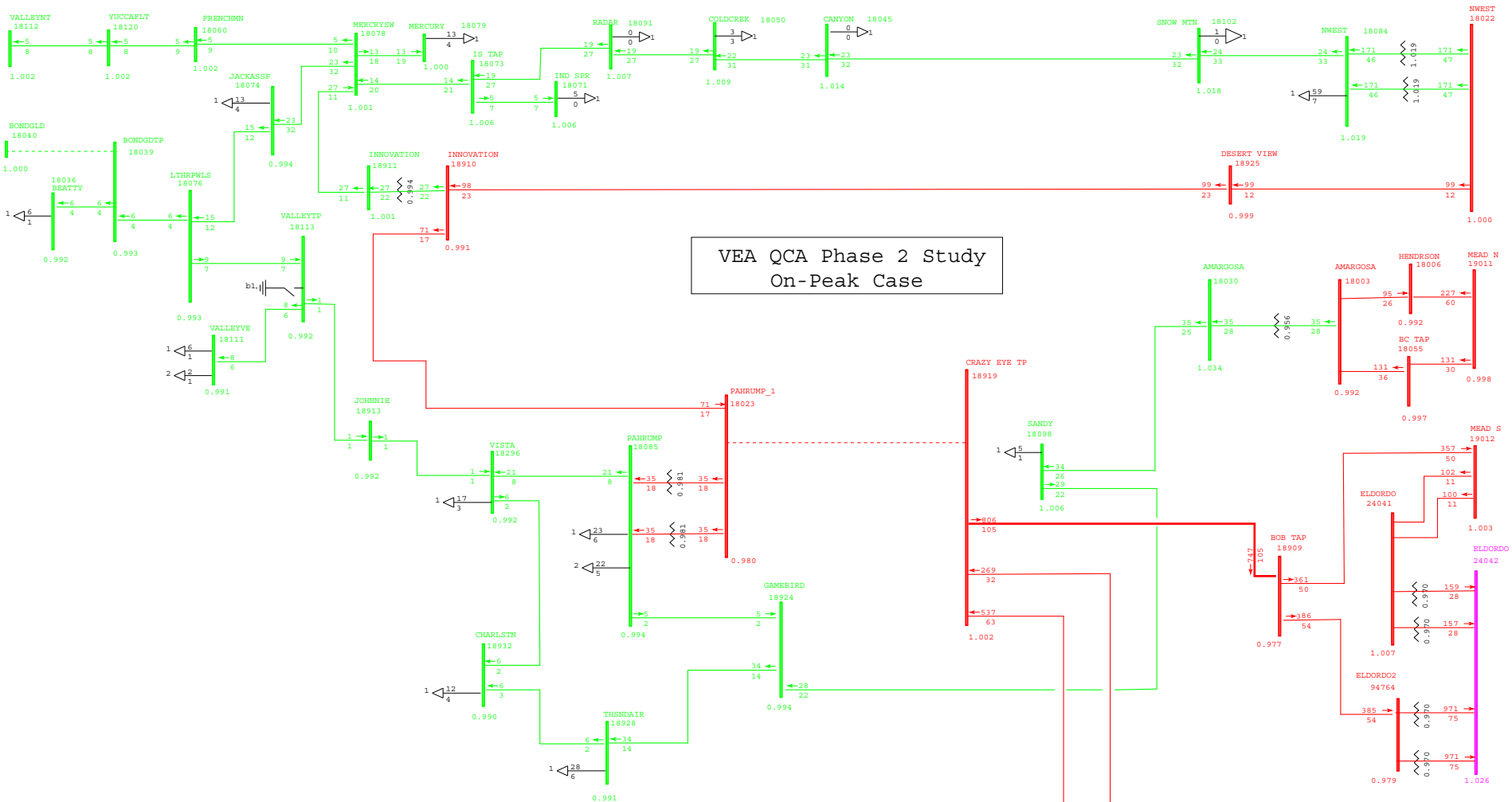

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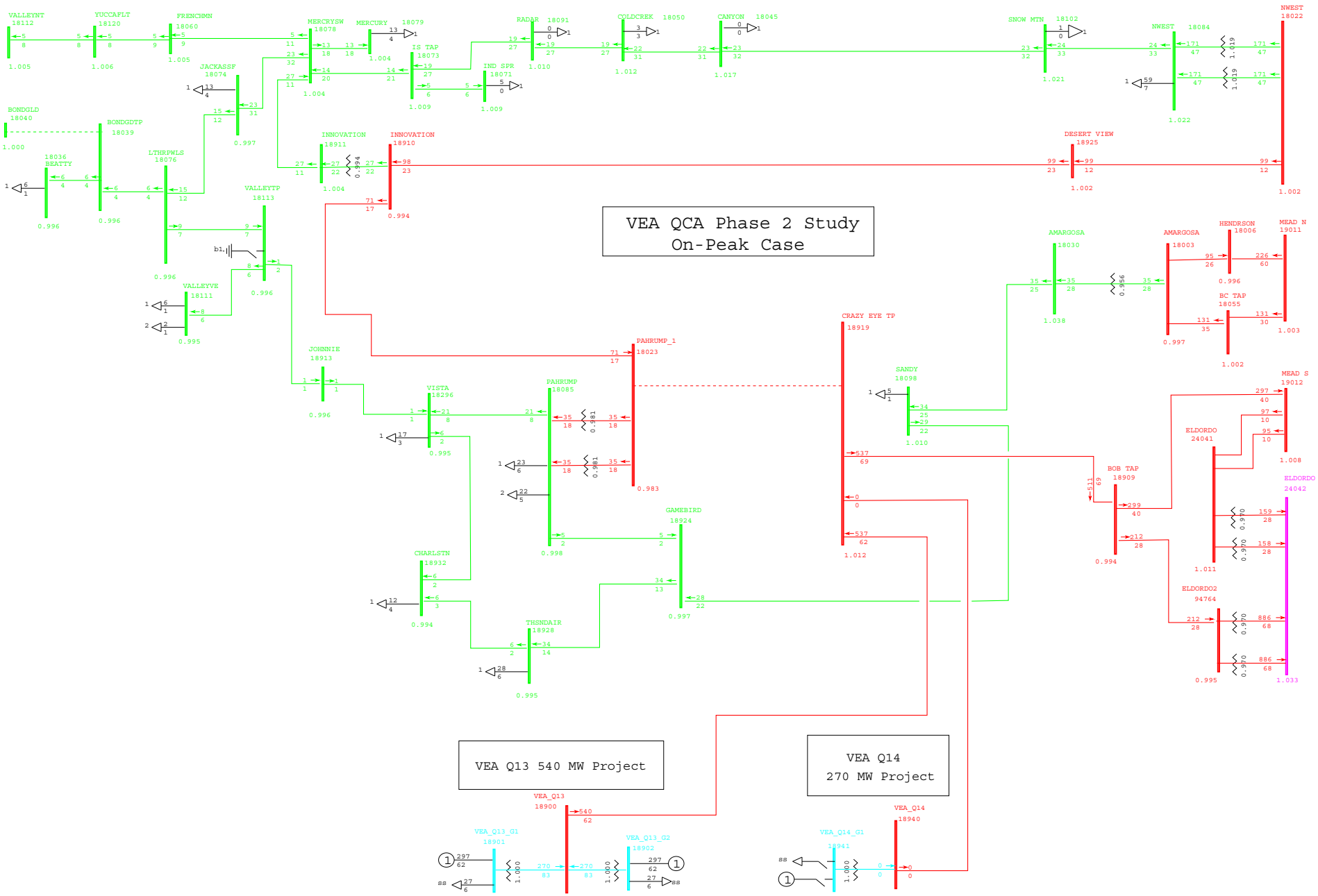
VEA QCA PHASE 2 STUDIES ON-PEAK CASE From CAISO/SCE EOP QC 3-4 Phase 2 Base Case. QCA Projects on-line, Pahrump-Mead and Pahrump-Gamebird recond.; new transformers at Pahrump and	Amargosa; 40% series comp in Crazy Eyes-Bob Tap line; Innovation Tie Added Figure_6 PHRMP-CRAZY EYE TP 230 Line	MW/% rate Rating = 2



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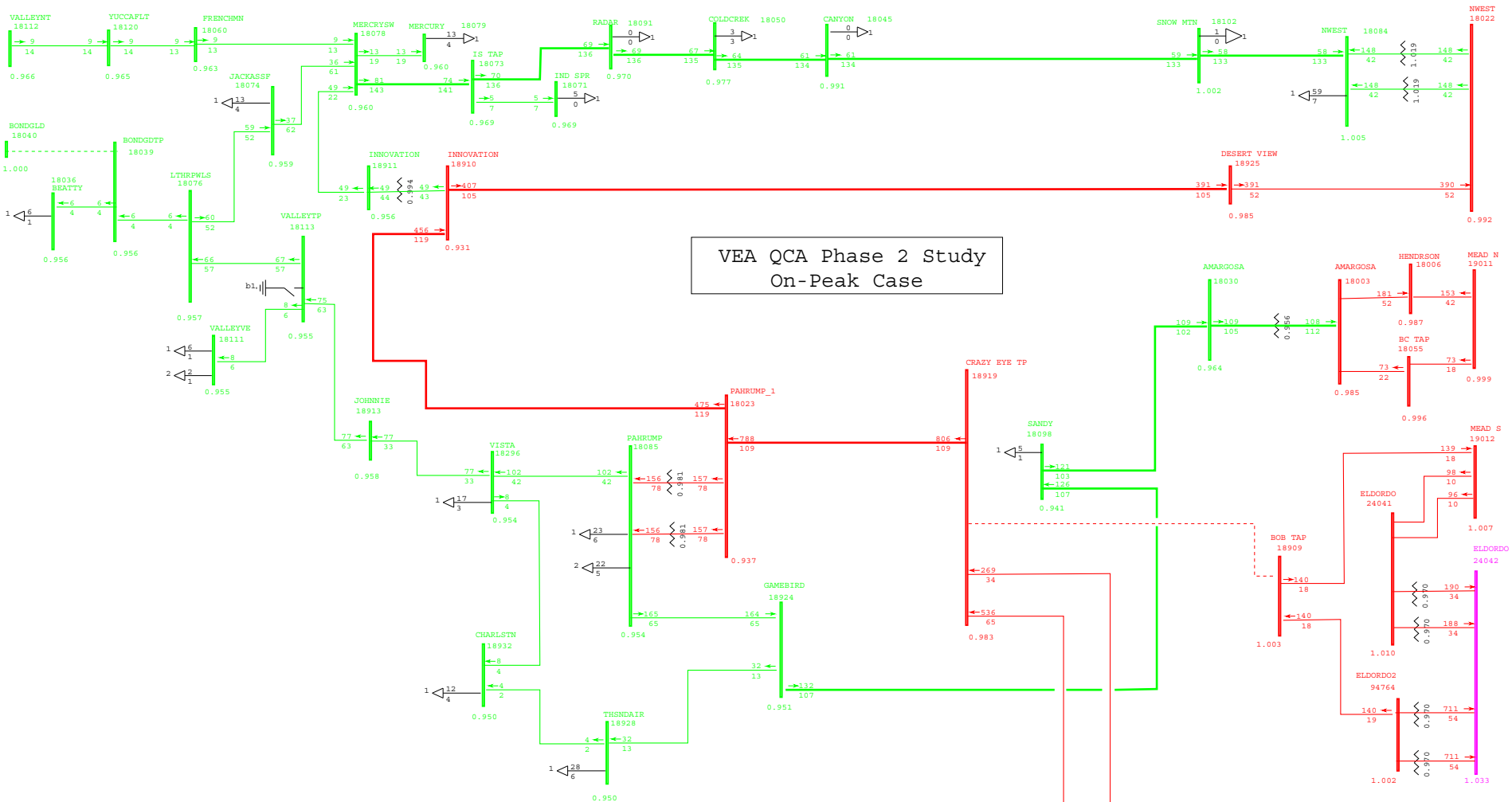

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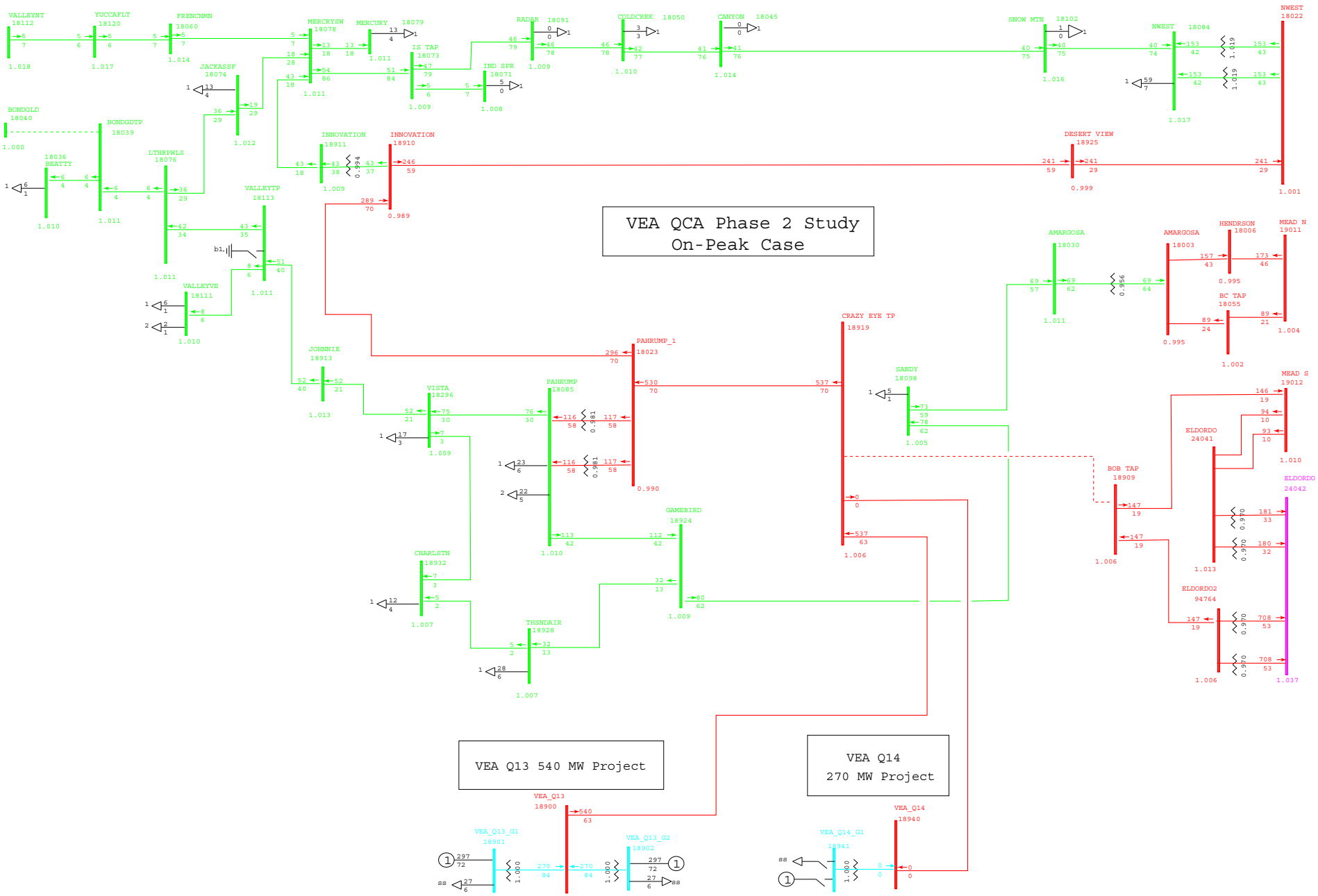
	VEA QCA PHASE 2 STUDIES ON-PEAK CASE From CAISO/SCE EOP QC 3-4 Phase 2 Base Case. QCA Projects on-line, Pahrump-Mead and Pahrump-Gamebird recond.; new transformers at Pahrump and	Amargosa; 40% series comp in Crazy Eyes-Bob Tap line; Innovation Tie Added Figure_8 CRAZY EYE TP-BOB TP 230 Line	MW/% rate Rating = 2



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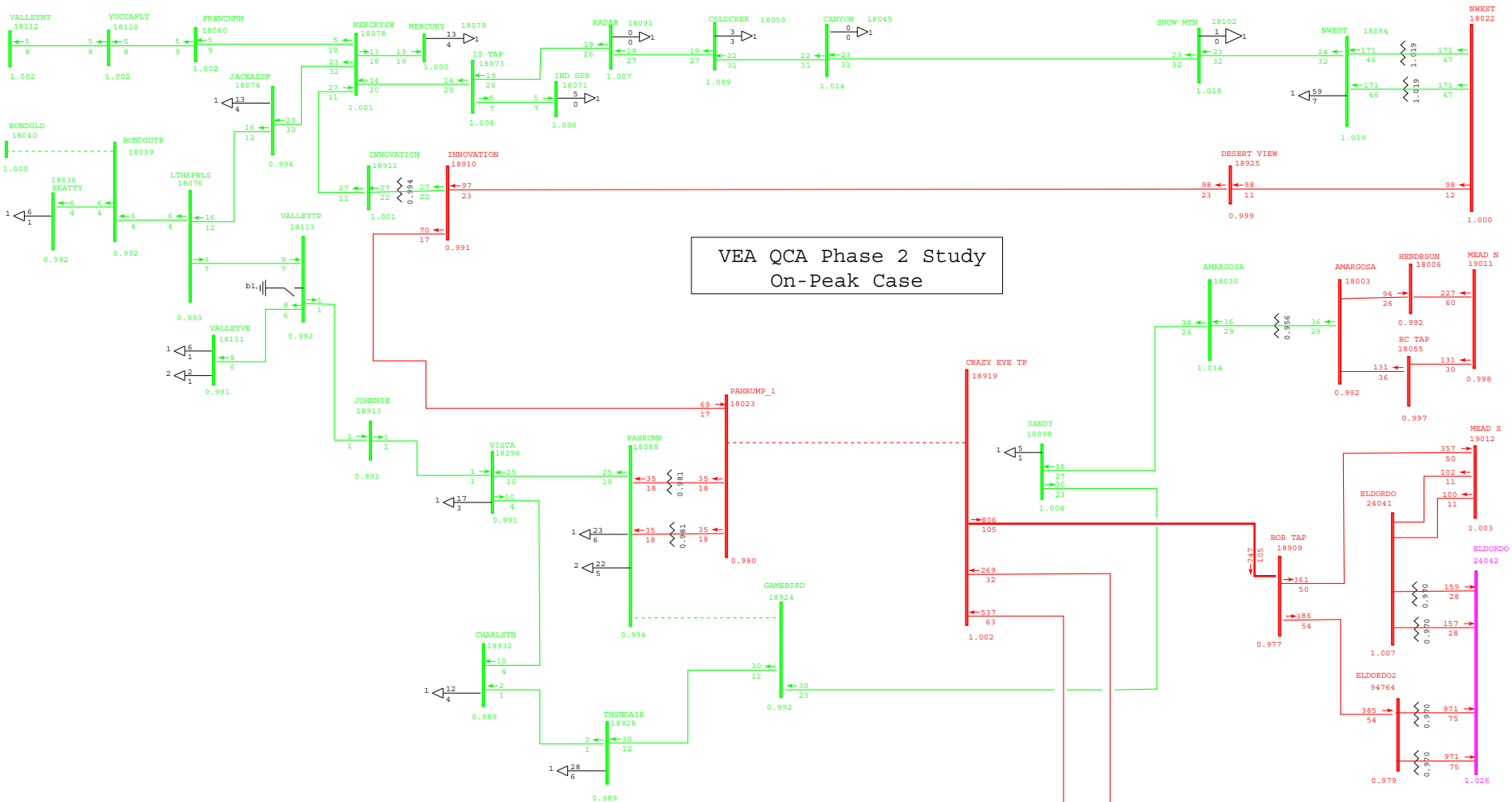
	VEA QCA PHASE 2 STUDIES ON-PEAK CASE From CAISO/SCE EOP QC 3-4 Phase 2 Base Case. QCA Projects on-line, Pahrump-Mead and Pahrump-Gamebird recond.; new transformers at Pahrump and	Amargosa; 40% series comp in Crazy Eyes-Bob Tap line; Innovation Tie Added Figure_9 CRAZY EYE TP-BOB TP 230 Line with Q14 Gen Drop	MW/% rate Rating = 2



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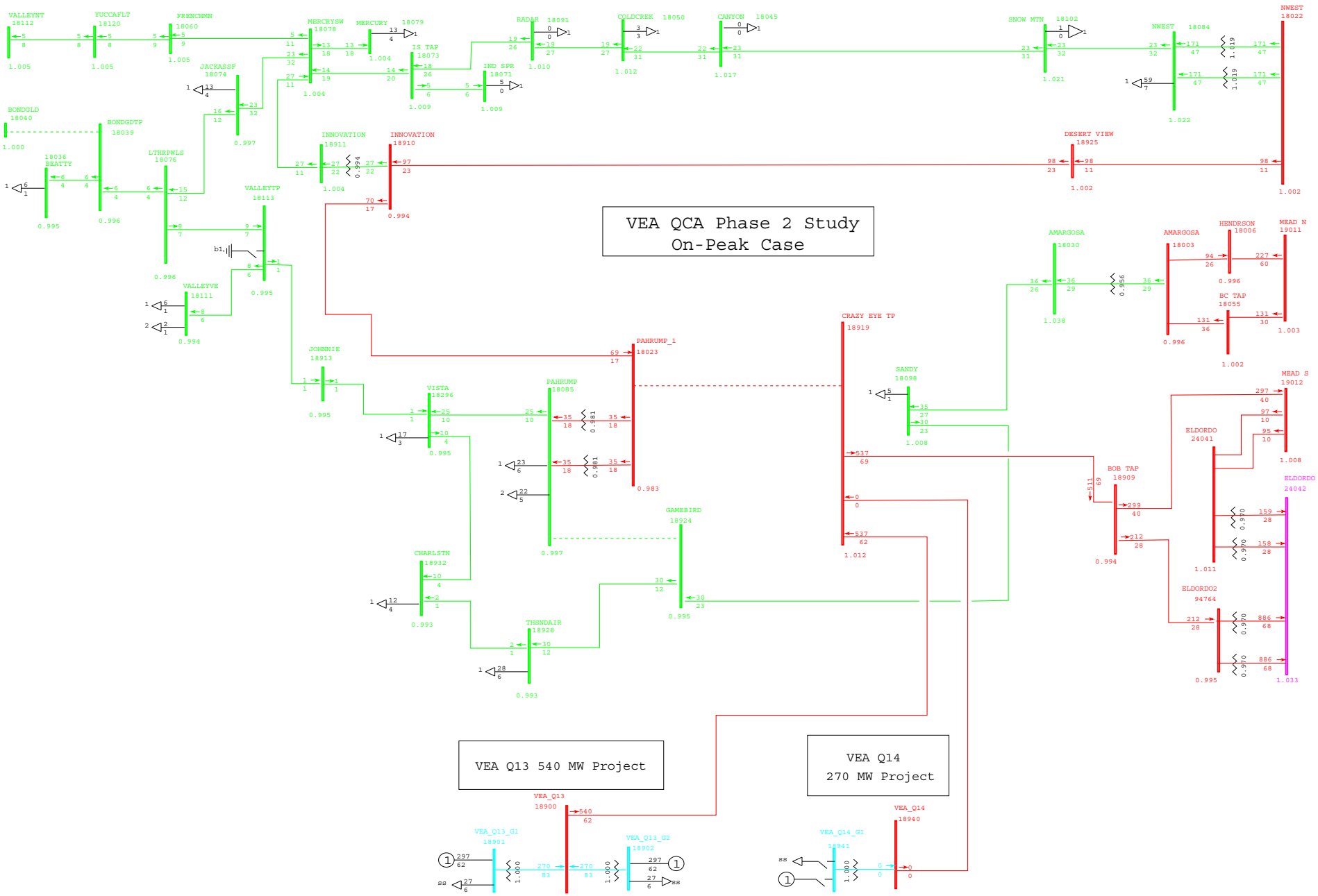
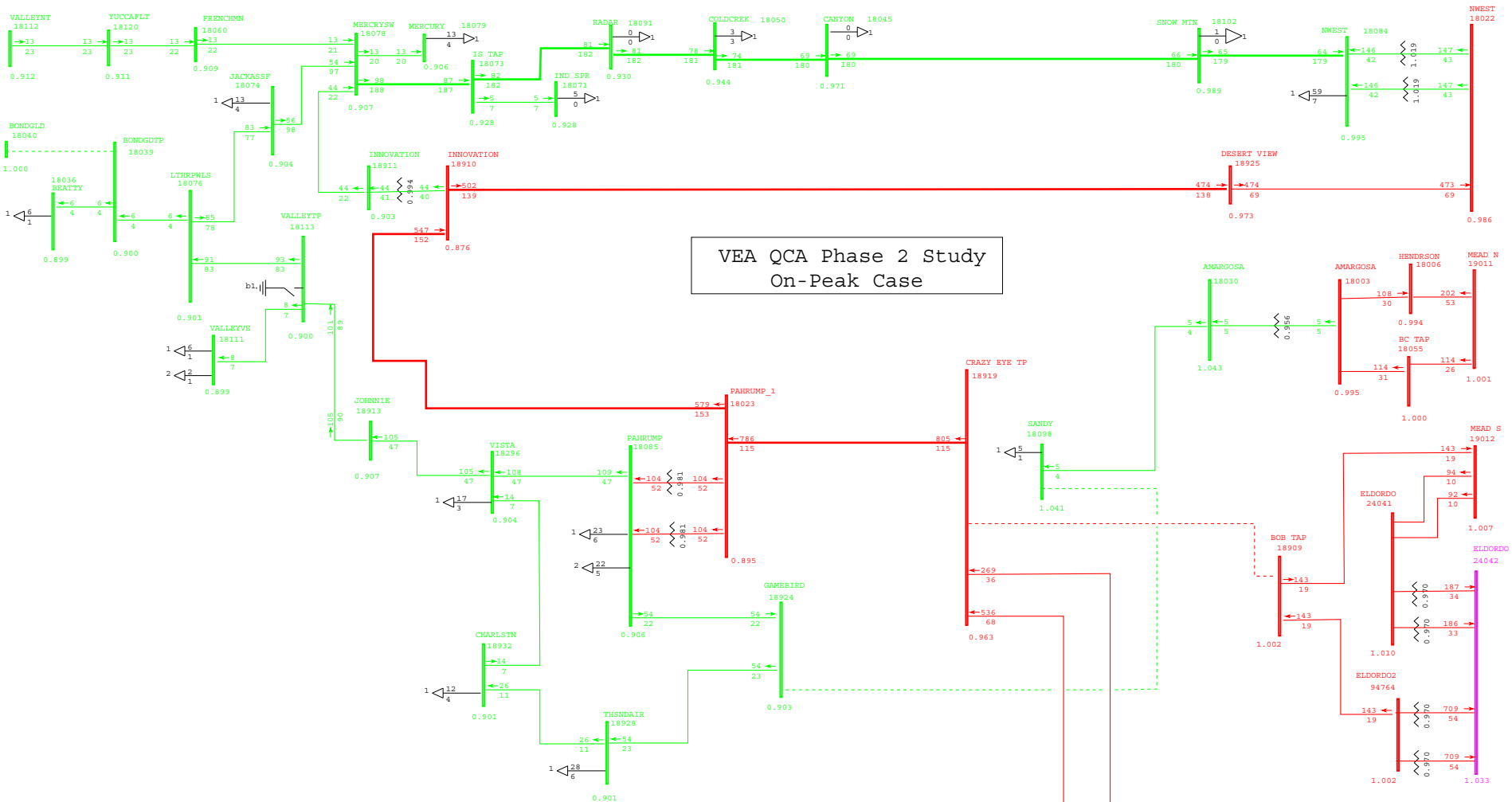
	VEA QCA PHASE 2 STUDIES ON-PEAK CASE From CAISO/SCE EOP QC 3-4 Phase 2 Base Case. QCA Projects on-line, Pahrump-Mead and Pahrump-Gamebird record.; new transformers at Pahrump and	Amargosa; 40% series comp in Crazy Eyes-Bob Tap line; Innovation Tie Added Figure_10 PHRMP-CRAZY EYE TP 230 & PHRMP-GAMEBD 138	MW/% rate Rating = 2



General Electric International, Inc. PSLF Program Thu Nov 01 09:42:12 2012 temp.wrk

VEA QCA PHASE 2 STUDIES ON-PEAK CASE From CAISO/SCE EOP QC 3-4 Phase 2 Base Case. QCA Projects on-line, Pahrump-Mead and Pahrump-Gamebird recond.; new transformers at Pahrump and	Amargosa; 40% series comp in Crazy Eyes-Bob Tap line; Innovation Tie Added Figure_11 PHRMP-CRAZY EYE TP 230 & PHRMP-GAMEBD 138 with Q14 Gen Drop	MW/% rate Rating = 2



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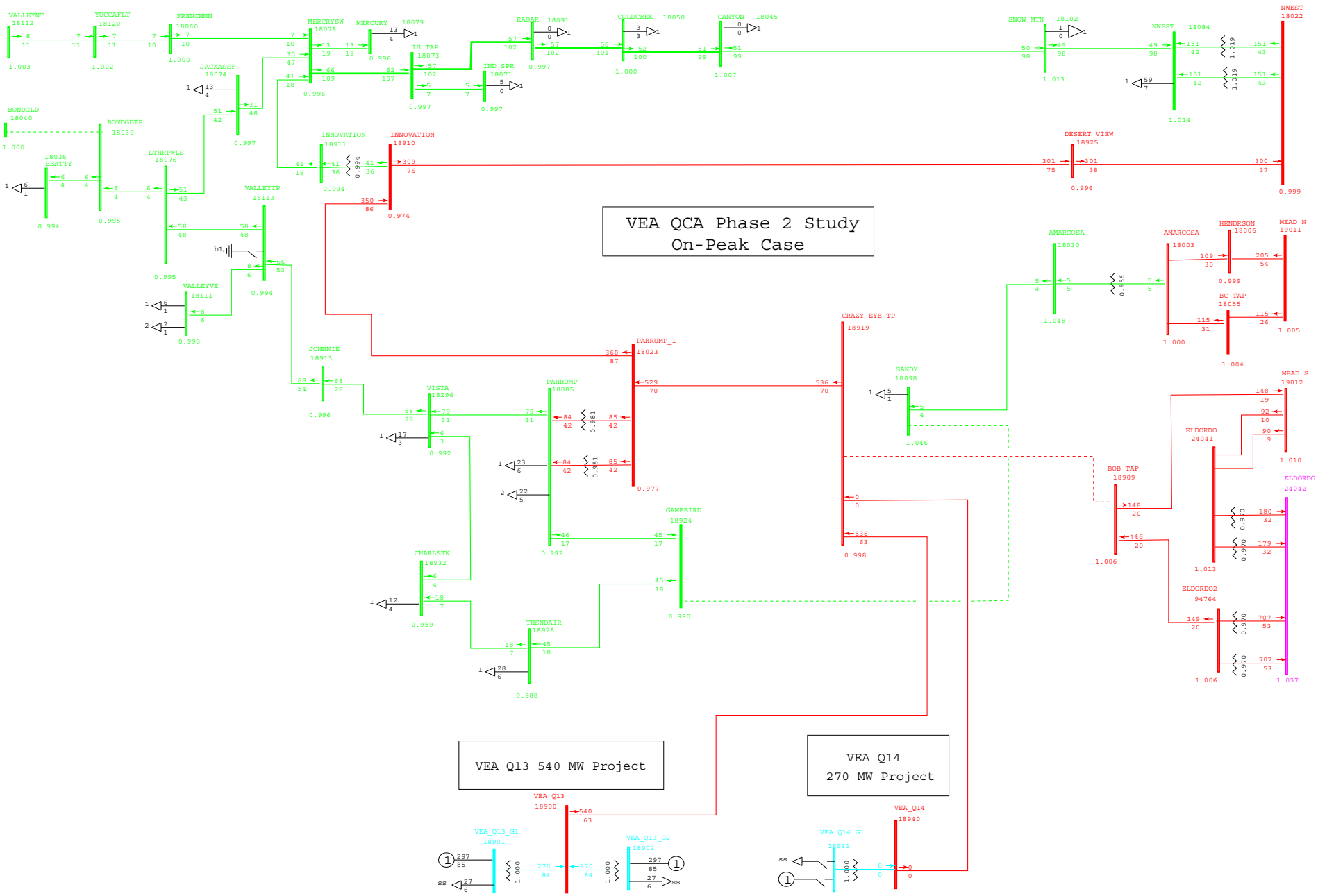

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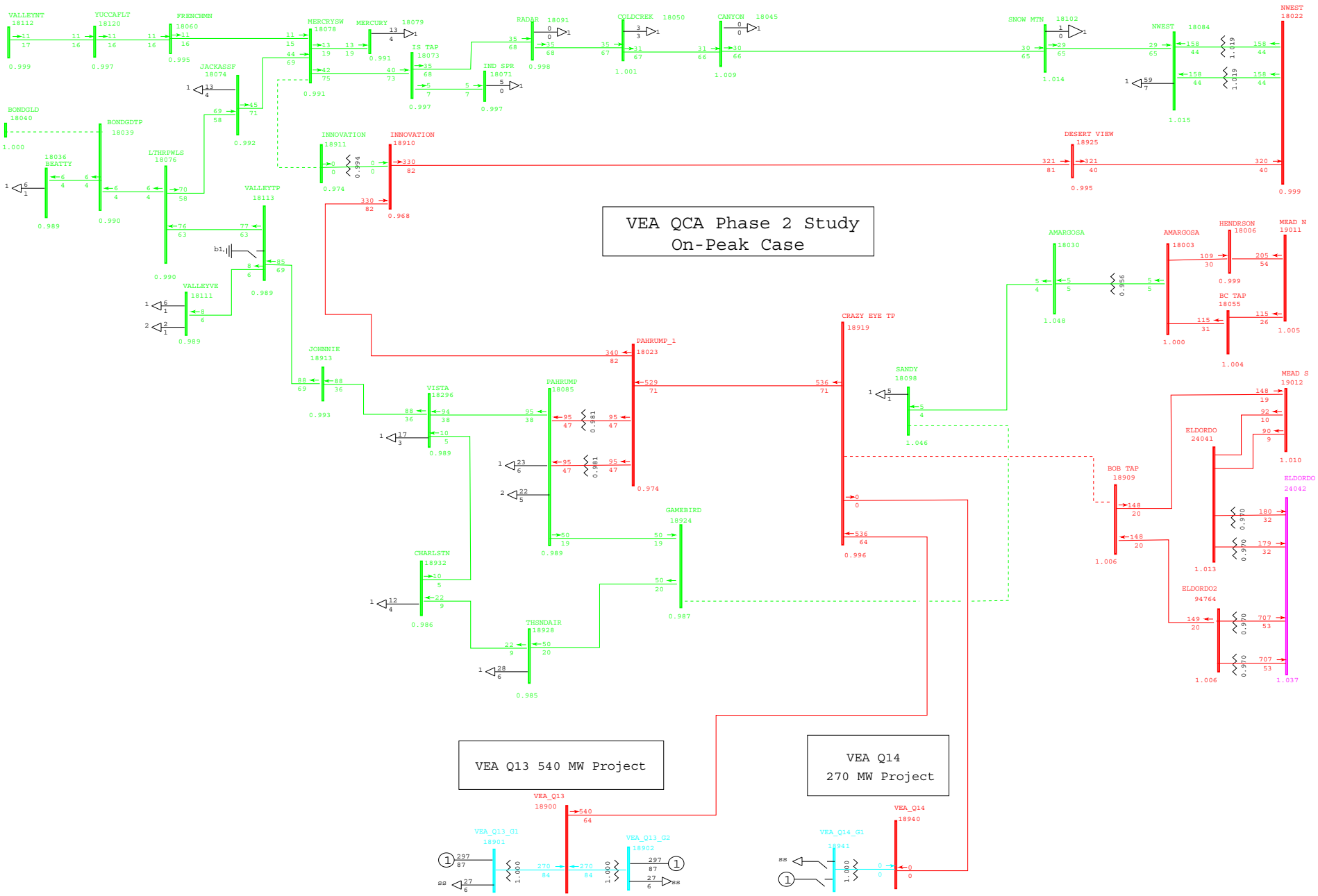
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VEA Q14
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MERCURY 18079
JACKASSF 18074
IS TAP 18073
RADAR 18091
COLDCREK 18050
CANYON 18045
SNOW MTN 18102
NWEST 18084
NWEST 18022
BONDGLD 18040
BONDGDTP 18039
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INNOVATION 18910
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JOHNNIE 18913
VISTA 18296
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CRAZY EYE TP 18919
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AMARGOSA 18030
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ELDORDO 24042
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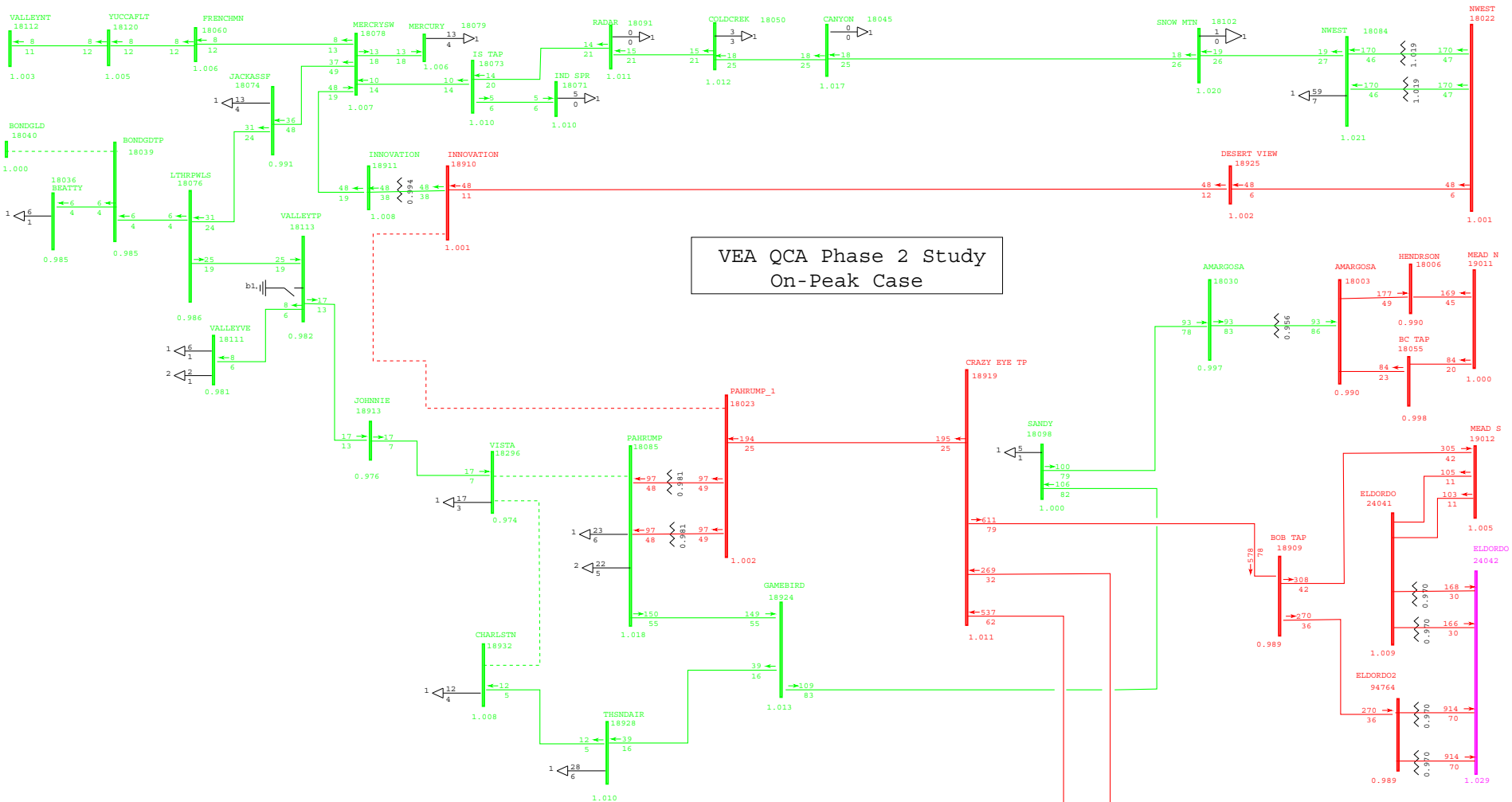
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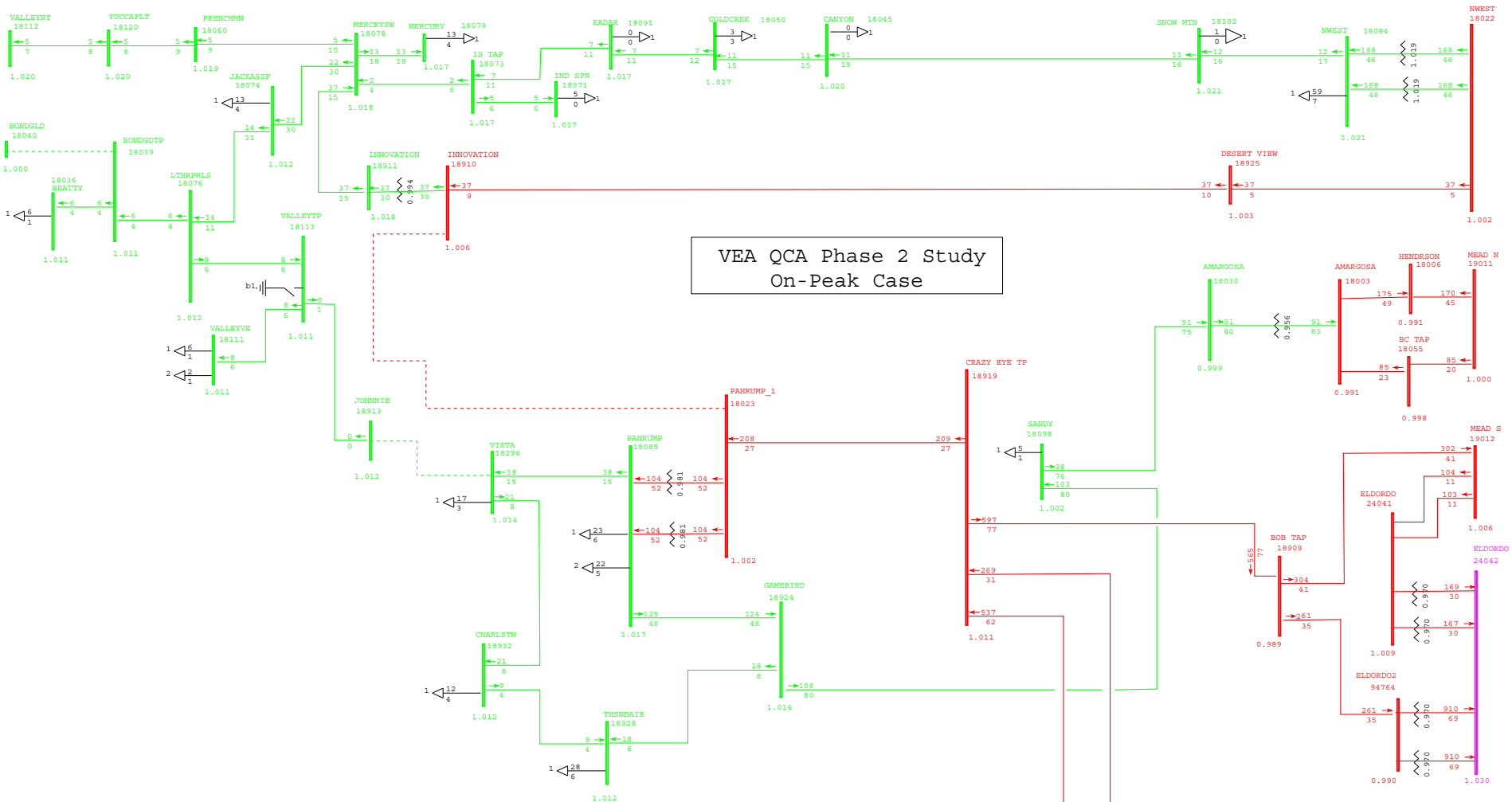
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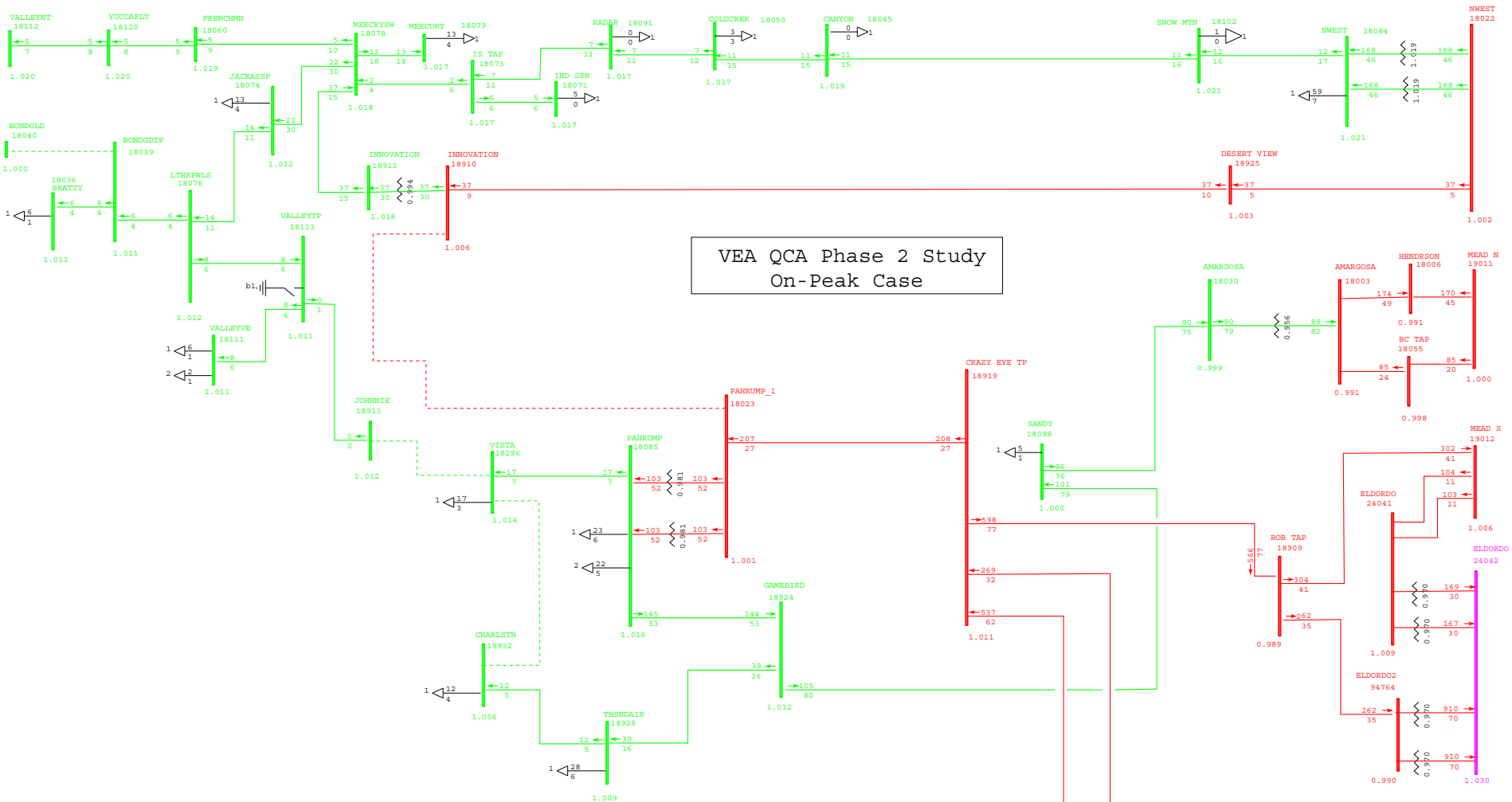
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270 MW Project
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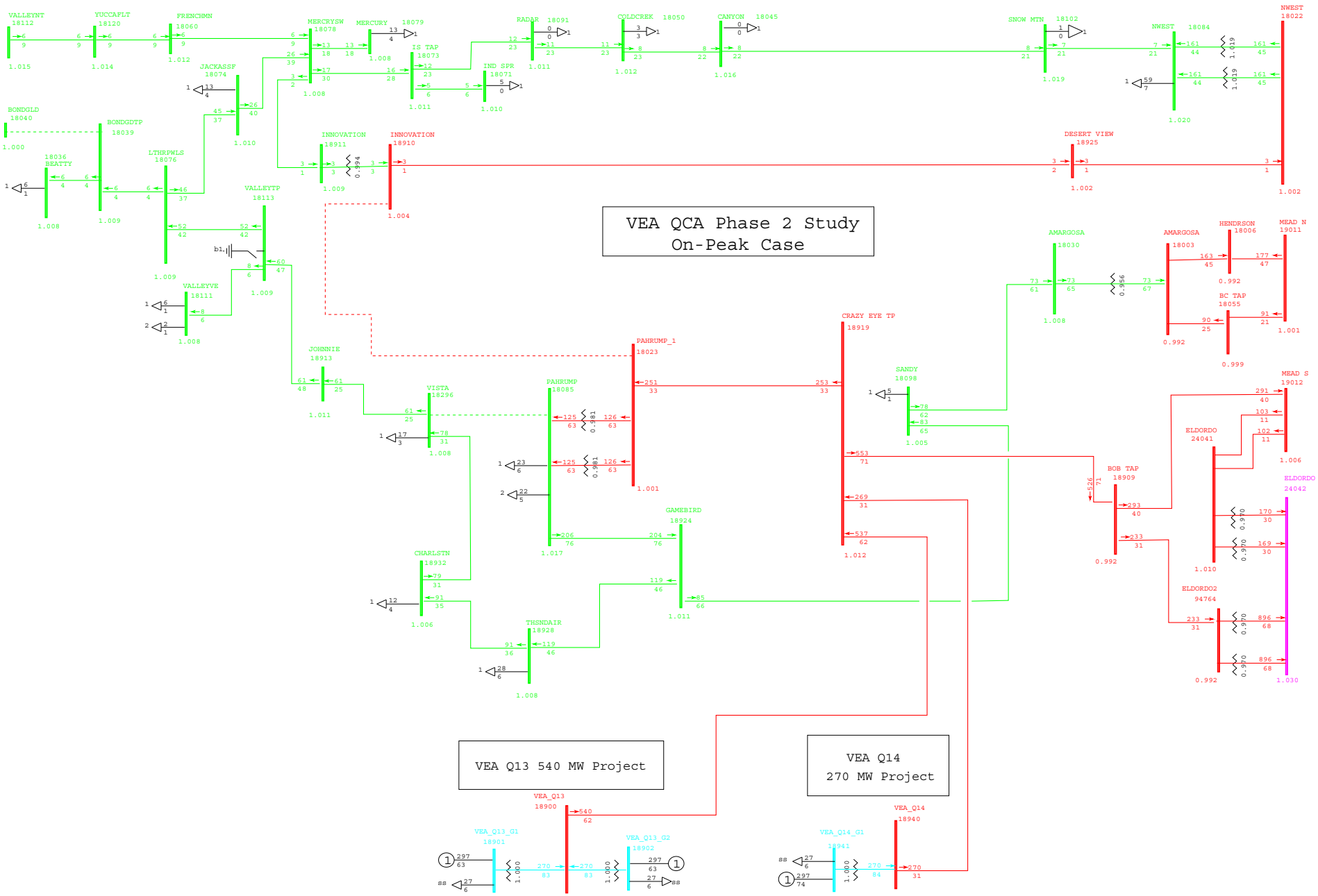
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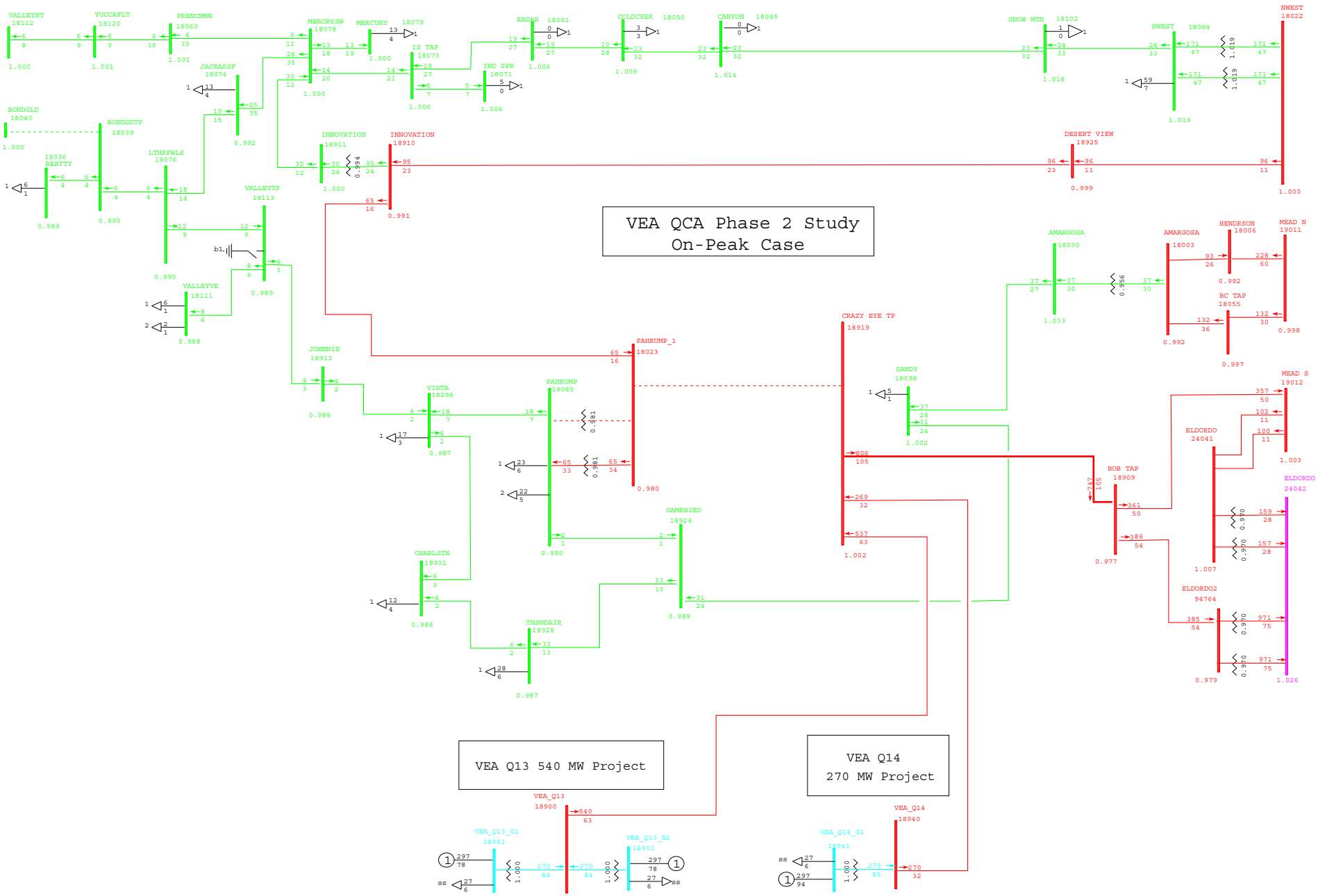

General Electric International, Inc. PSLF Program Thu Nov 01 09:42:19 2012 temp.wrk

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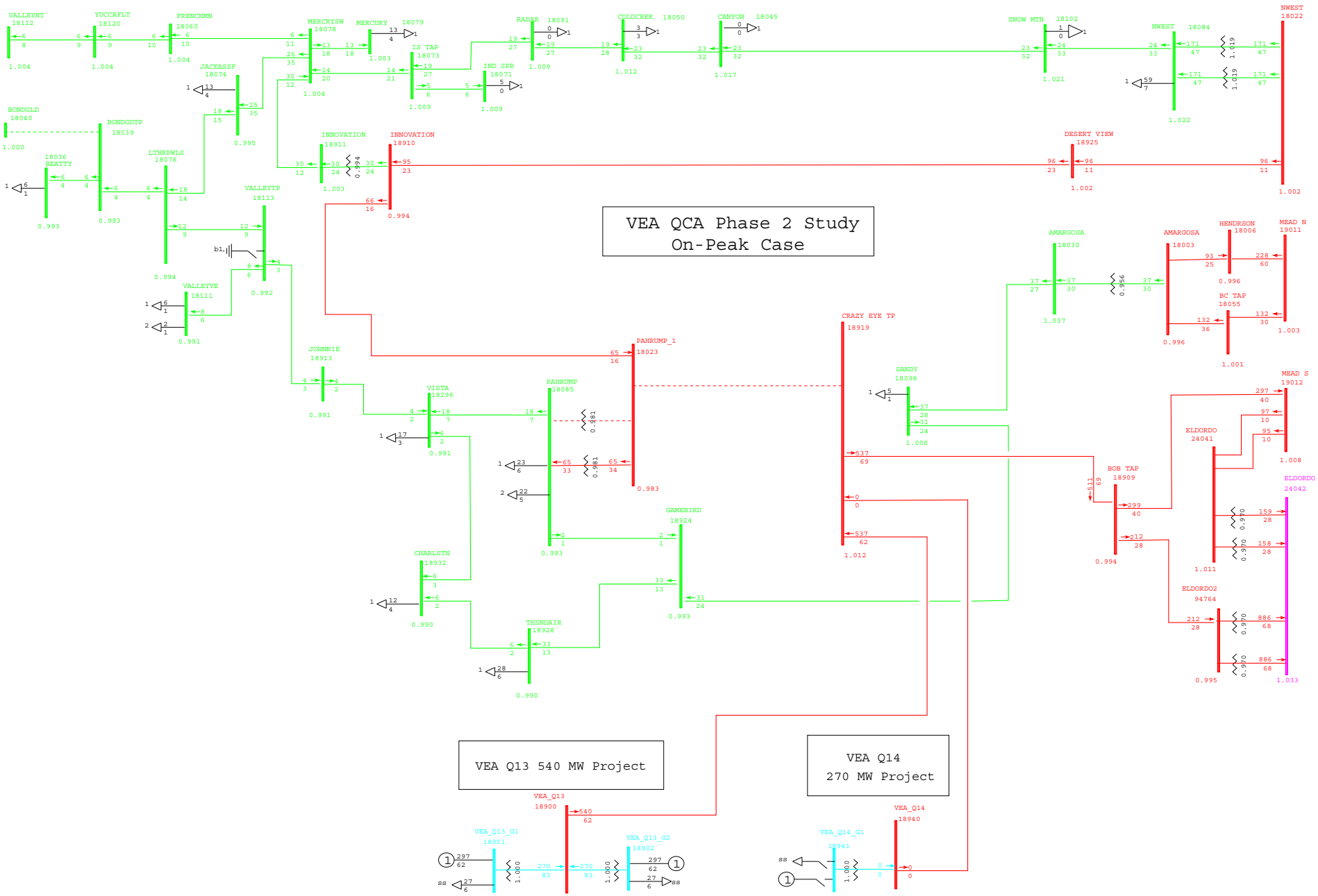
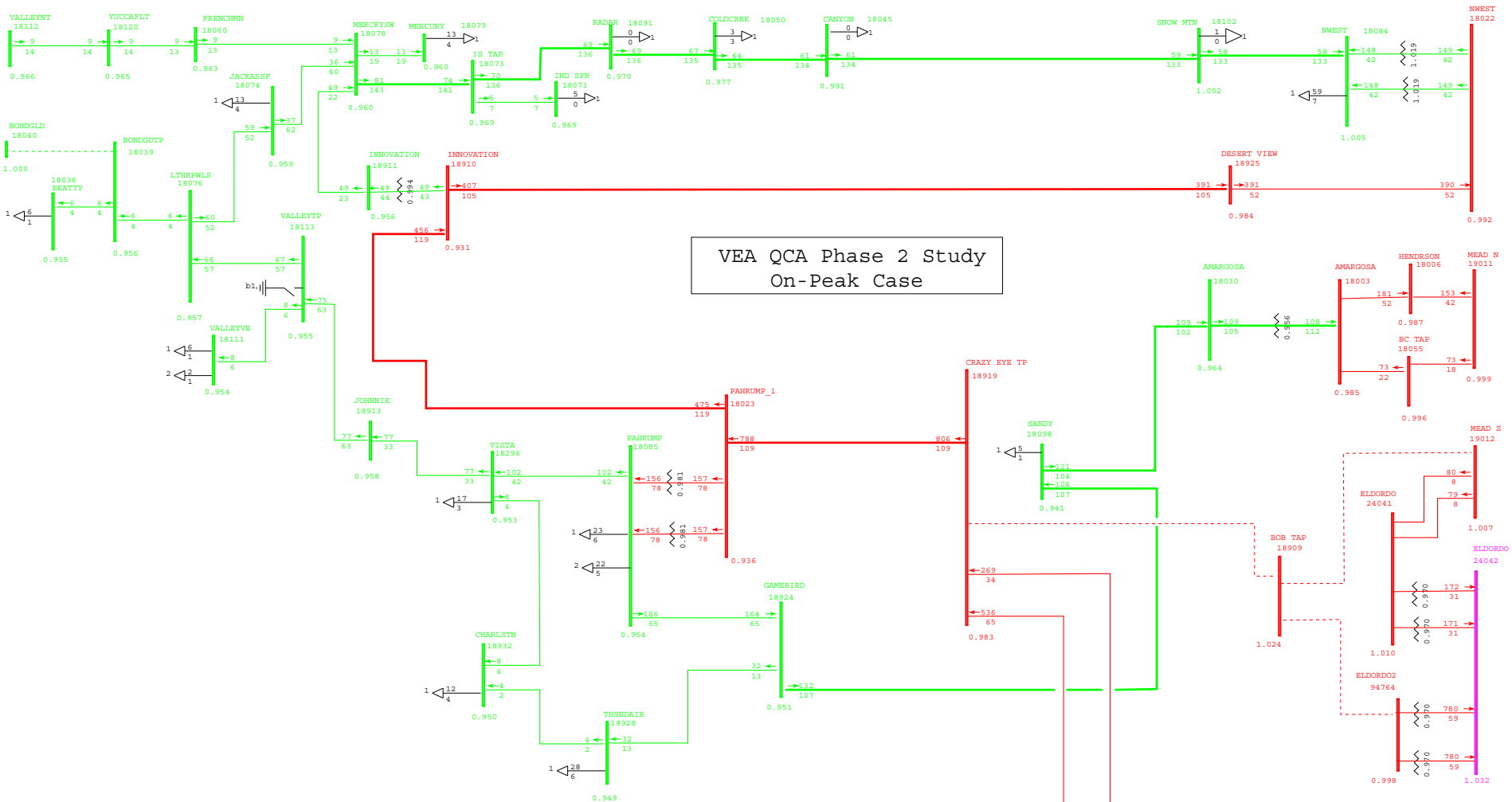


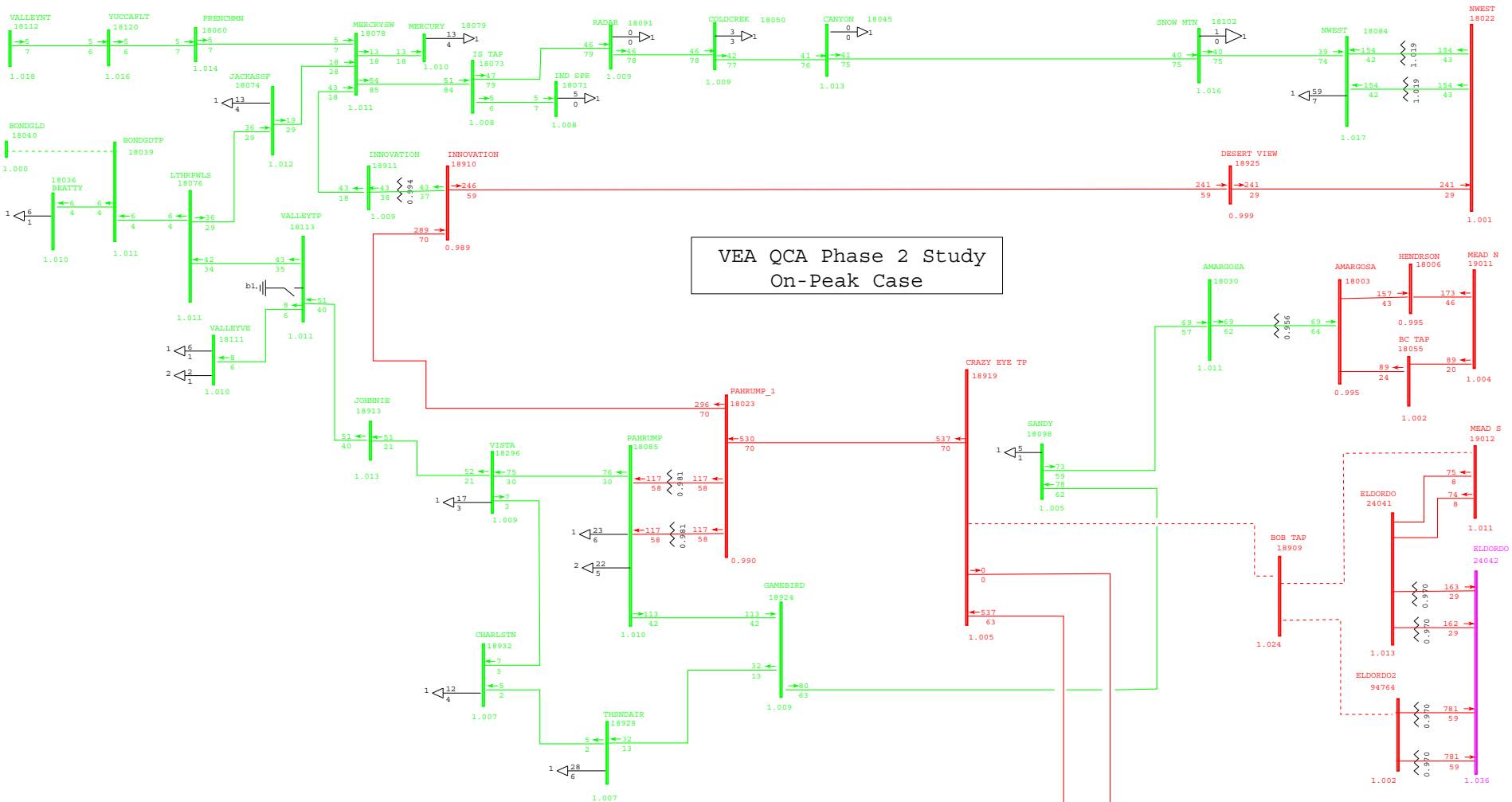
General Electric International, Inc. PSLF Program Thu Nov 01 09:42:20 2012 temp.wrk

VEA QCA PHASE 2 STUDIES ON-PEAK CASE From CAISO/SCE EOP QC 3-4 Phase 2 Base Case. QCA Projects on-line, Pahrump-Mead and Pahrump-Gamebird recond.; new transformers at Pahrump and	Amargosa; 40% series comp in Crazy Eyes-Bob Tap line; Innovation Tie Added Figure_20 PHRMP38/230kV Tran Bnk 1 & PHRMP-CRAZY EYE TP 230 with Q14 Gen Drop	MW/% rate Rating = 2



General Electric International, Inc. PSLF Program Thu Nov 01 09:42:22 2012 temp.wrk

	VEA QCA PHASE 2 STUDIES ON-PEAK CASE From CAISO/SCE EOP QC 3-4 Phase 2 Base Case. QCA Projects on-line, Pahrump-Mead and Pahrump-Gamebird recond.; new transformers at Pahrump and	Amargosa; 40% series comp in Crazy Eyes-Bob Tap line; Innovation Tie Added Figure_21 MEAD S-BOB TP 230 & ELD2-BOB TP 230 & CRZY EYE TP-BOB TP 230	MW/% rate Rating = 2



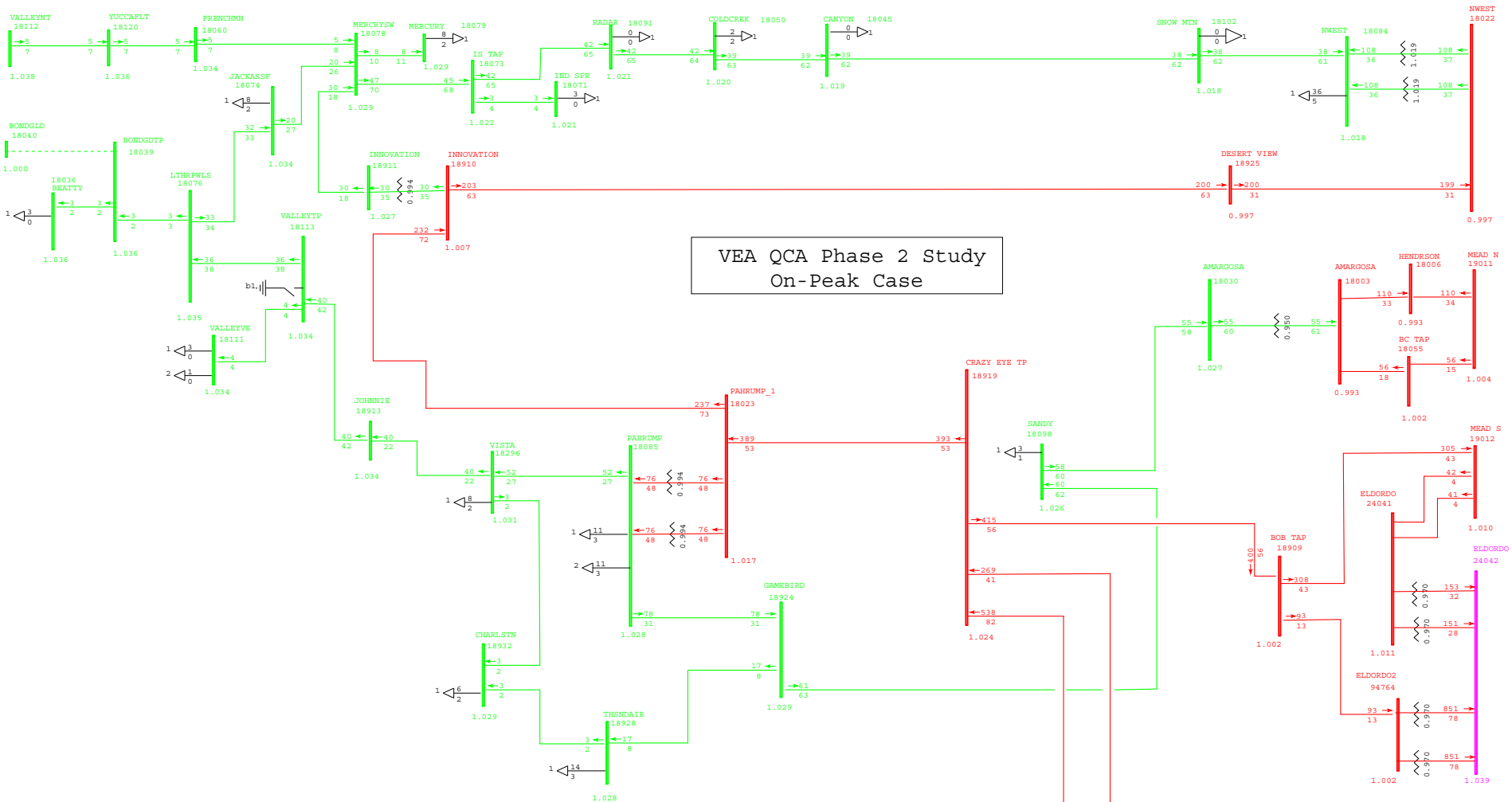
General Electric International, Inc. PSLF Program Thu Nov 01 09:42:23 2012 temp.wrk

	VEA QCA PHASE 2 STUDIES ON-PEAK CASE From CAISO/SCE EOP QC 3-4 Phase 2 Base Case. QCA Projects on-line, Pahrump-Mead and Pahrump-Gamebird recond.; new transformers at Pahrump and	Amargosa; 40% series comp in Crazy Eyes-Bob Tap line; Innovation Tie Added Figure_22 MEAD S-BOB TP 230 & ELD2-BOB TP 230 & CRZY EYE TP-BOB TP 230 with Q1	MW/% rate Rating = 2

VEA Area

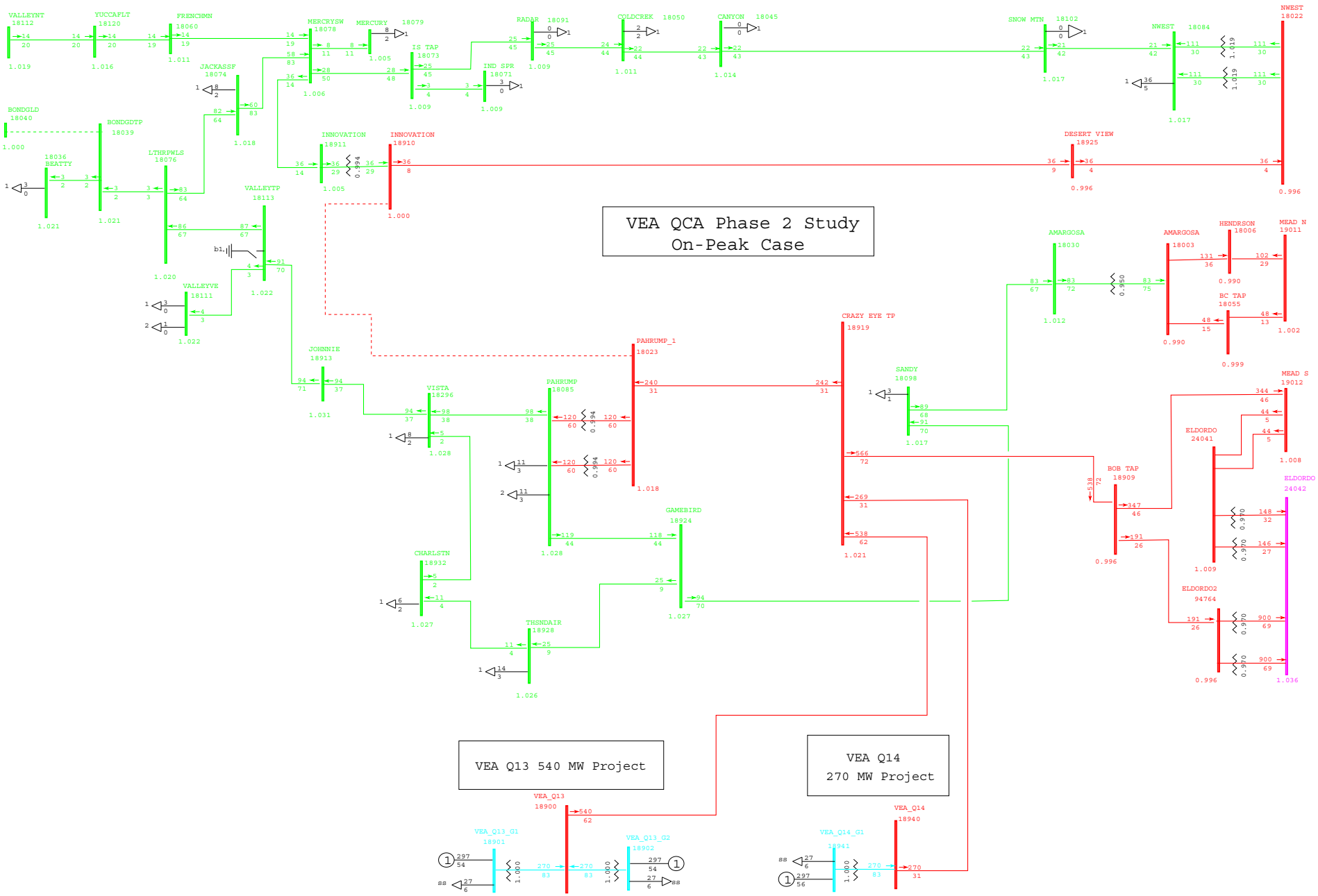
QC4 Phase 2 Steady State Power Flow Plots

Off-Peak Case



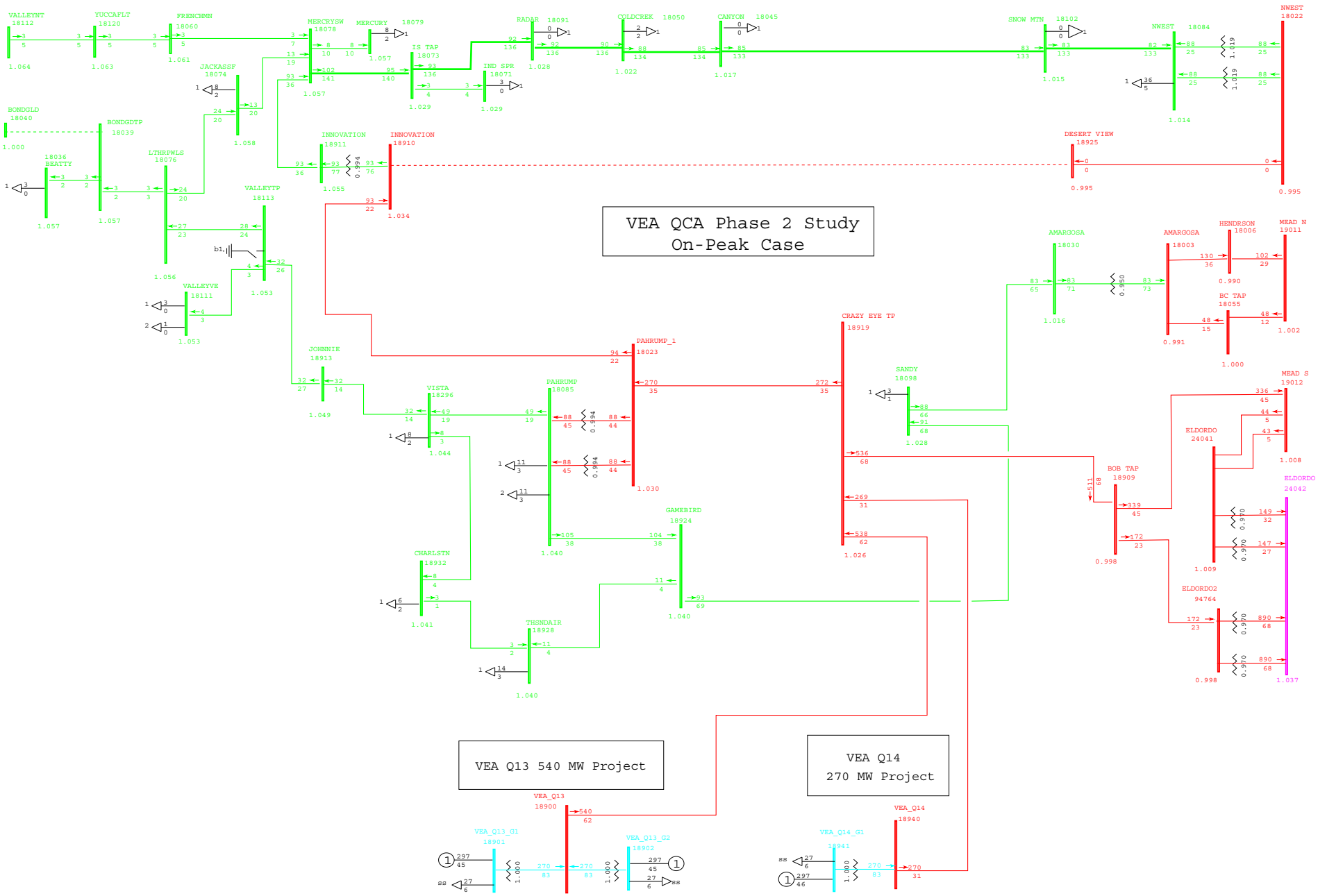
General Electric International, Inc. PSLF Program Thu Nov 01 09:57:40 2012 temp.wrk

	VEA QCA PHASE 2 OFF-PEAK CASE From CAISO/SCE EOP QC 3-4 Phase 2 Base Case. QCA Projects on-line, Pahrump-Mead and Pahrump-Gamebird record; new transformers at Pahrump and	Amargosa; 40% comp in Crazy Eyes-Bob Tap line; Innovation Tie Added Base Case	MW/% rate Rating = 1



General Electric International, Inc. PSLF Program Thu Nov 01 09:57:41 2012 temp.wrk

	VEA QCA PHASE 2 OFF-PEAK CASE From CAISO/SCE EOP QC 3-4 Phase 2 Base Case. QCA Projects on-line, Pahrump-Mead and Pahrump-Gamebird record; new transformers at Pahrump and	Amargosa; 40% comp in Crazy Eyes-Bob Tap line; Innovation Tie Added Figure_2 PHRMP-INNOV 230 Line	MW/% rate Rating = 2



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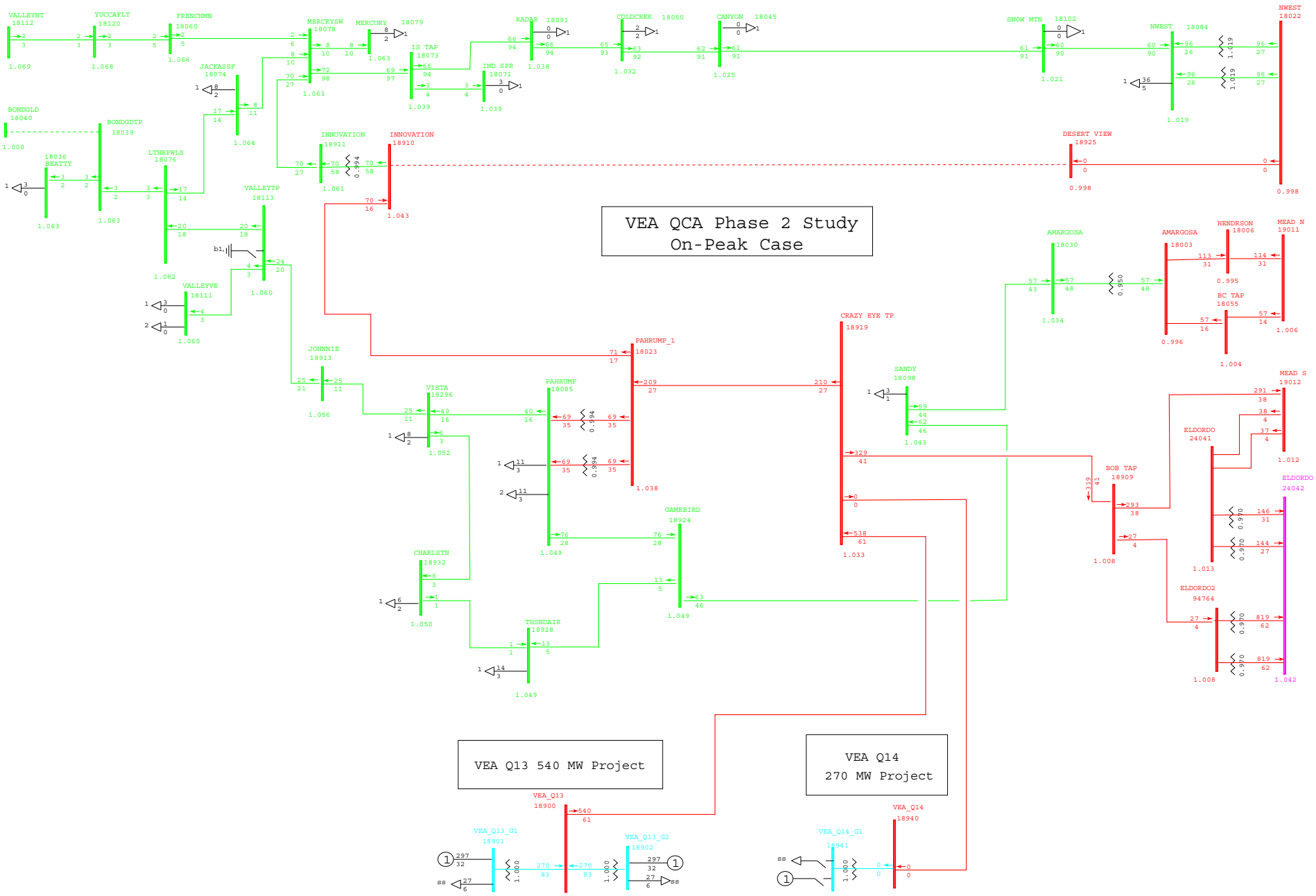

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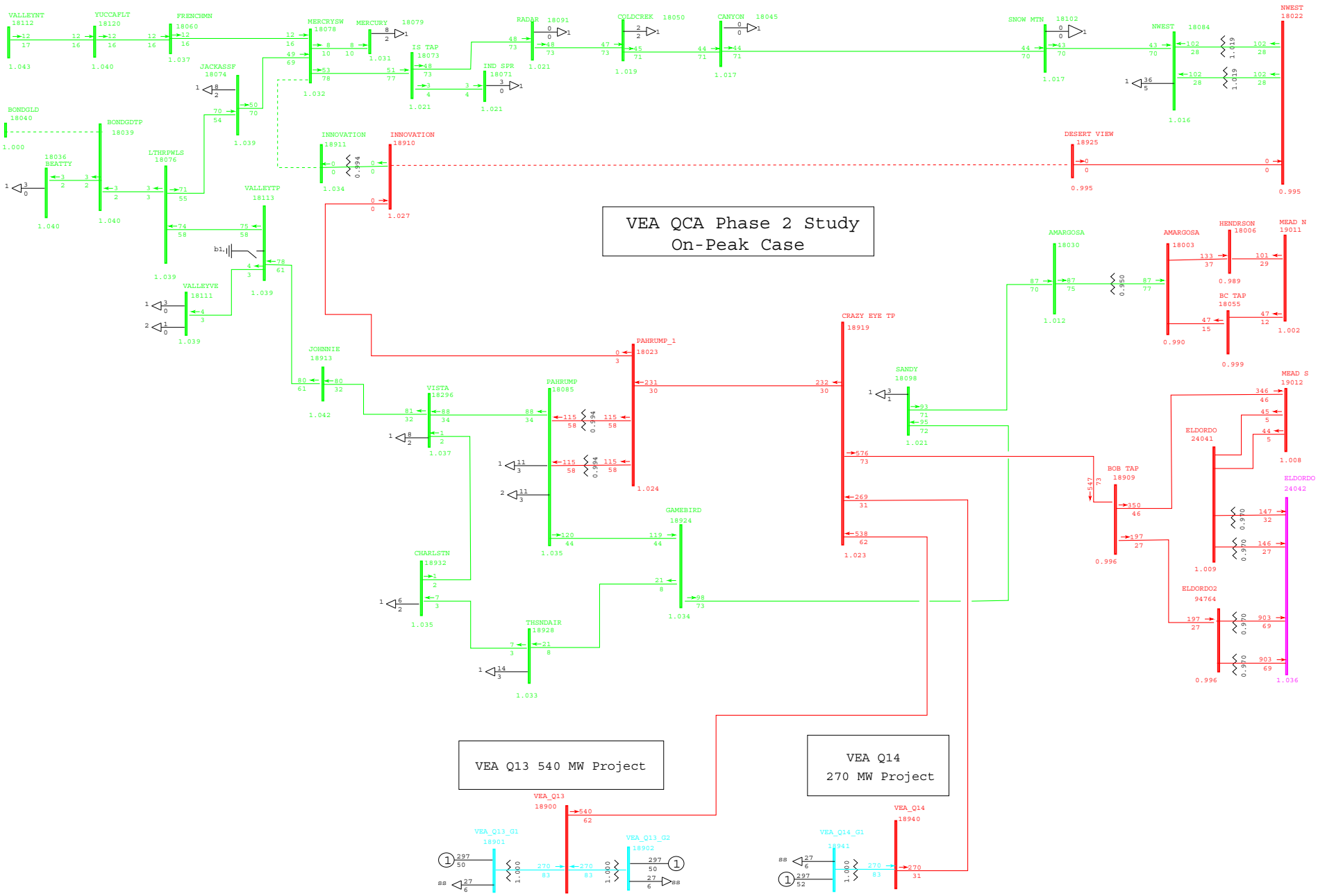

General Electric International, Inc. PSLF Program Thu Nov 01 09:57:44 2012 temp.wrk

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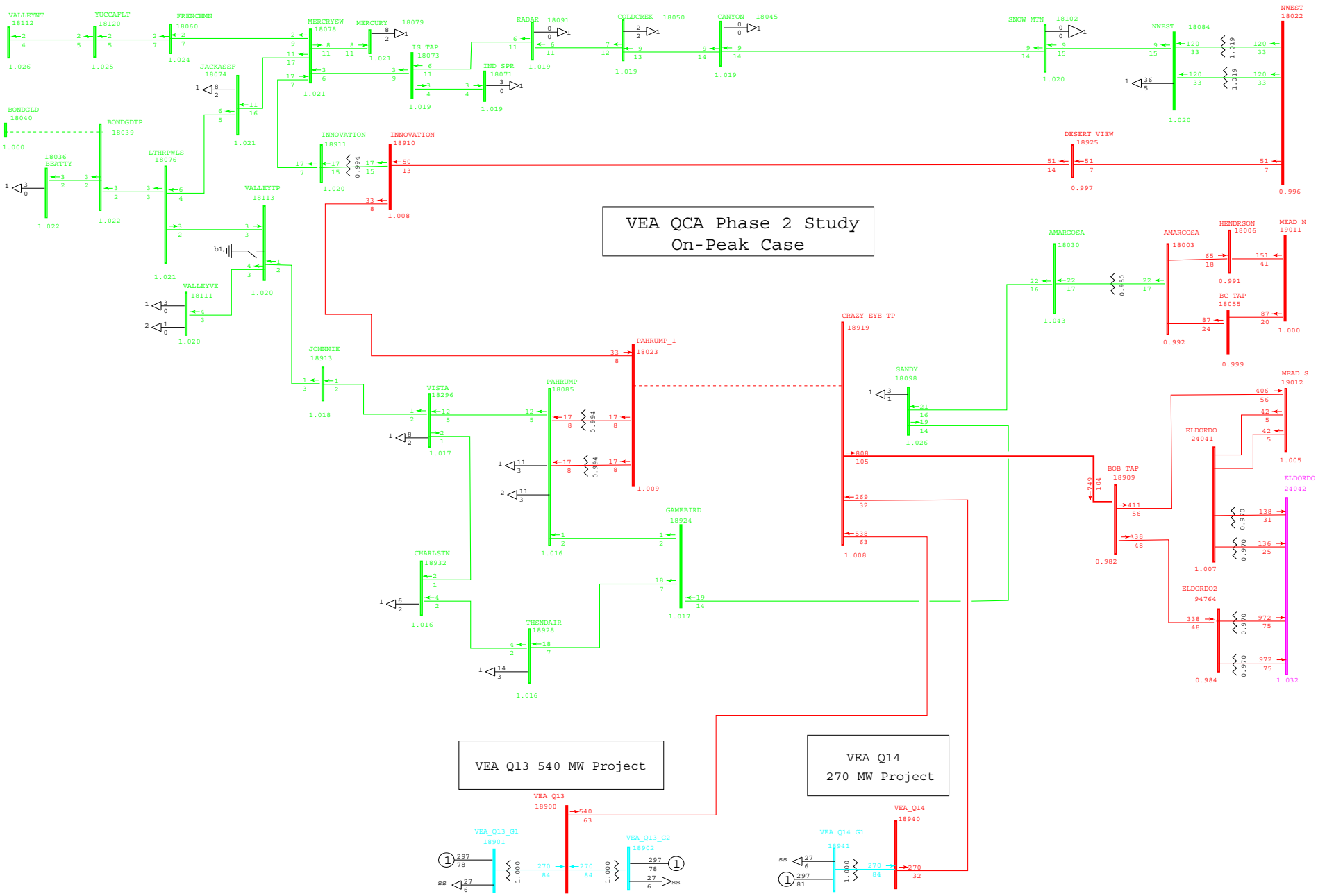

General Electric International, Inc. PSLF Program Thu Nov 01 09:57:45 2012 temp.wrk

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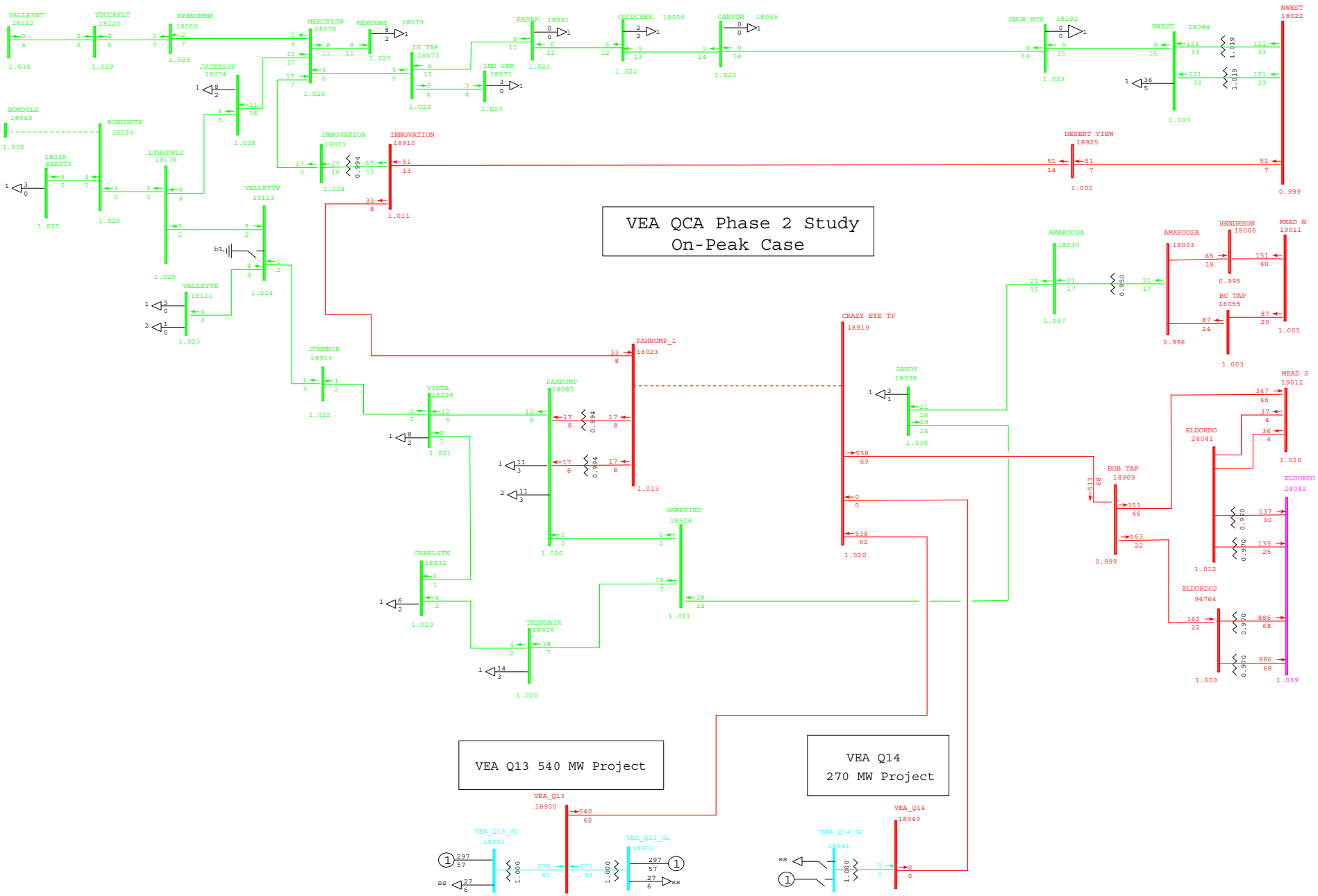

General Electric International, Inc. PSLF Program Thu Nov 01 09:57:46 2012 temp.wrk

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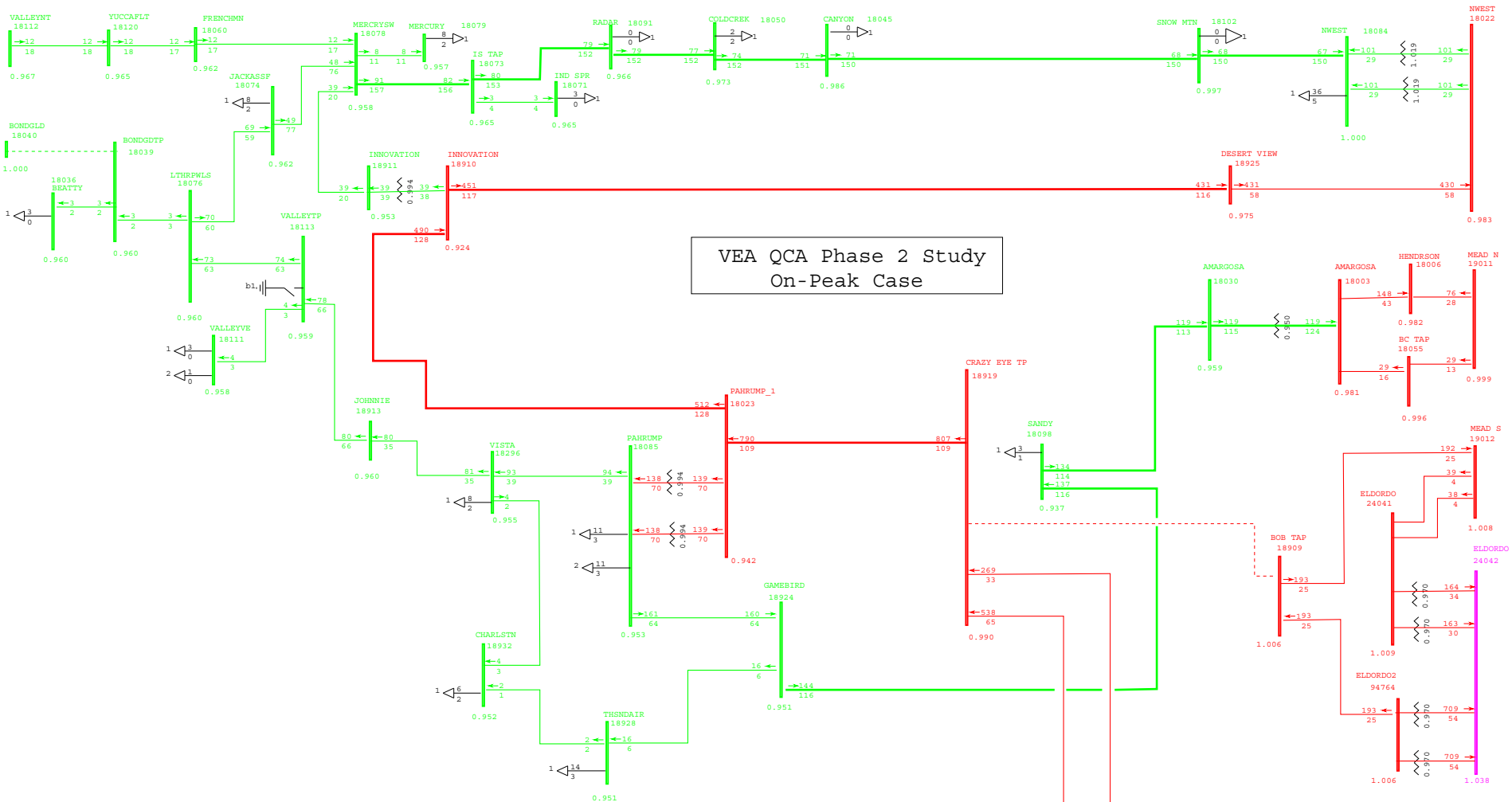

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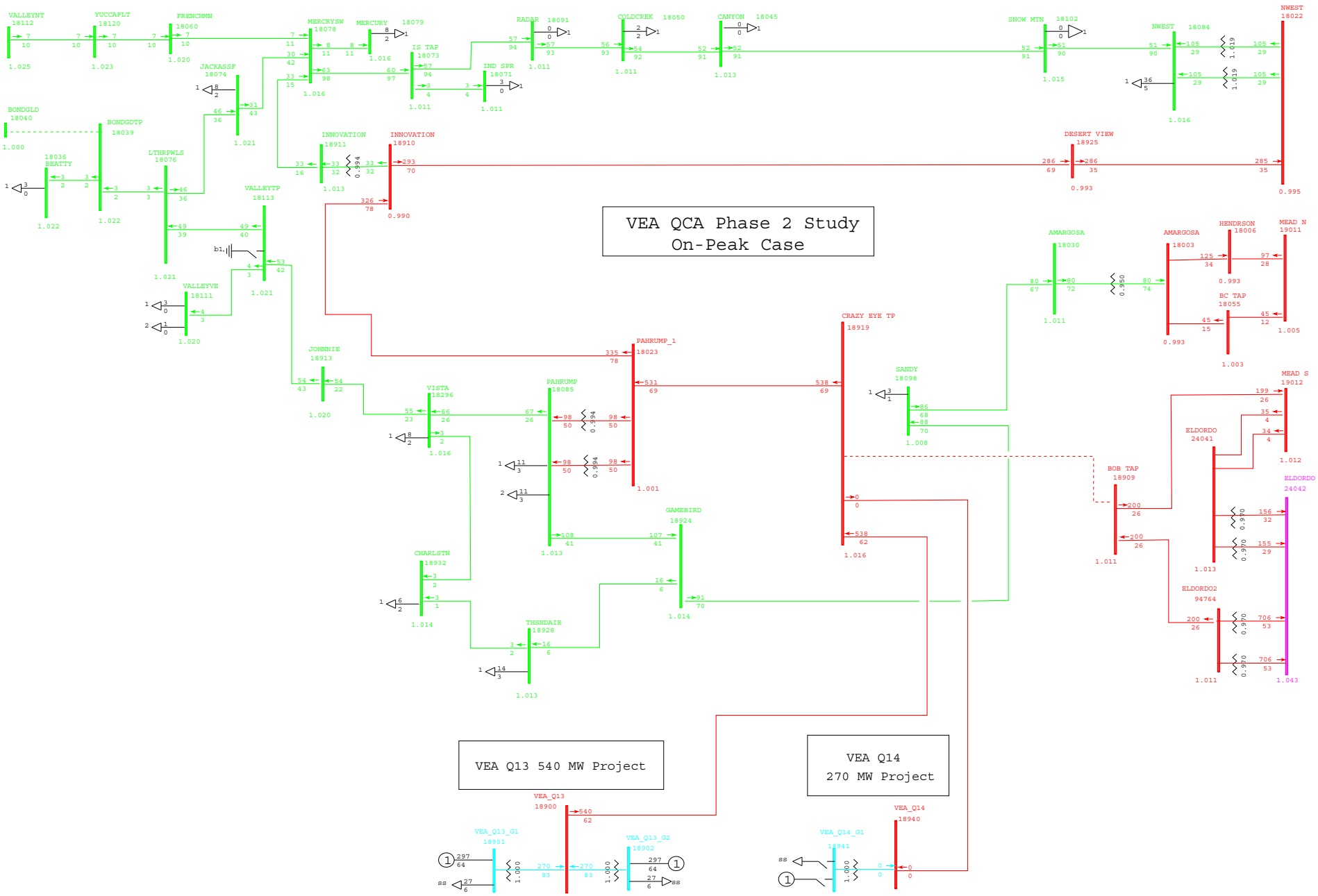

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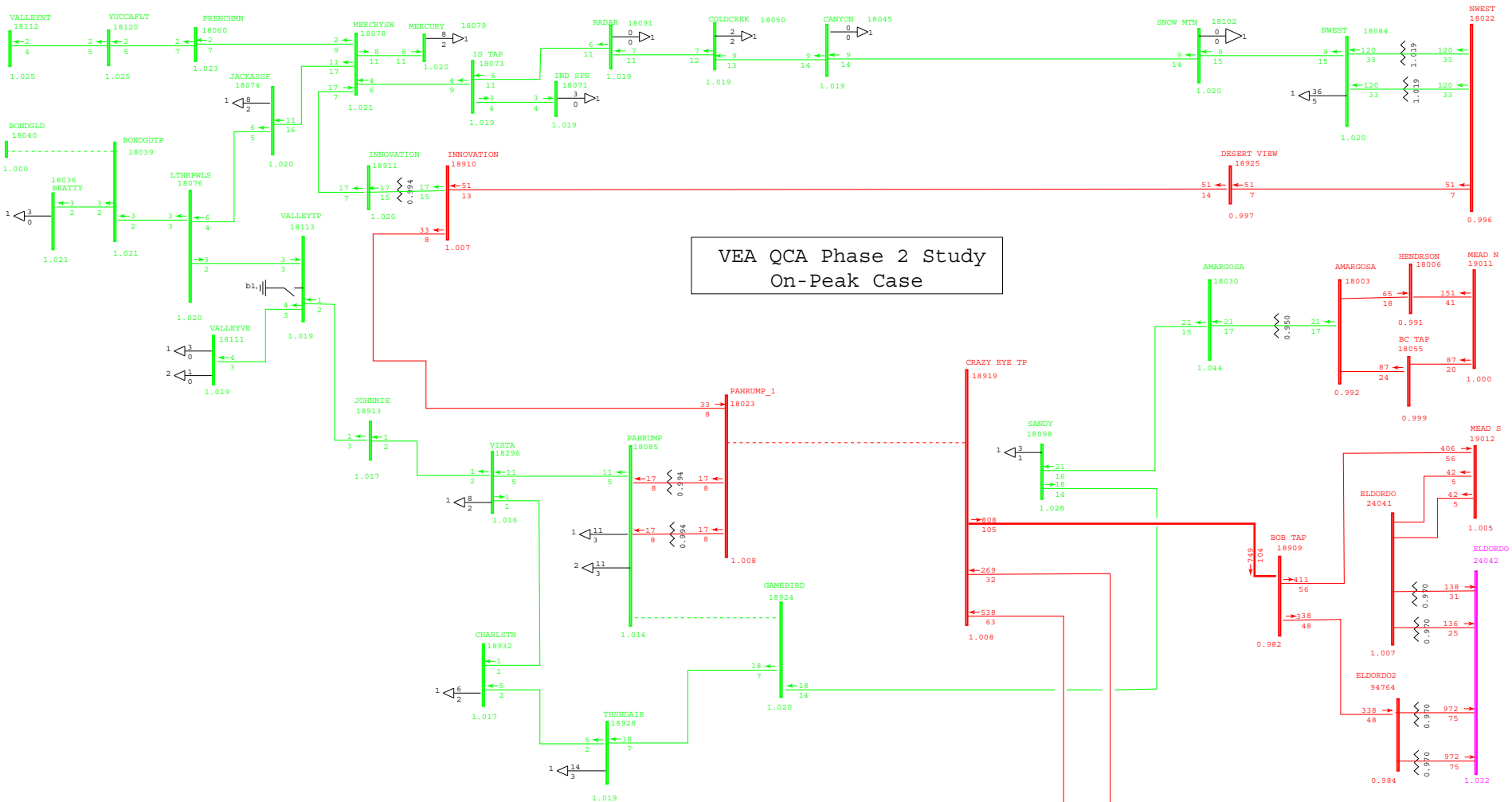
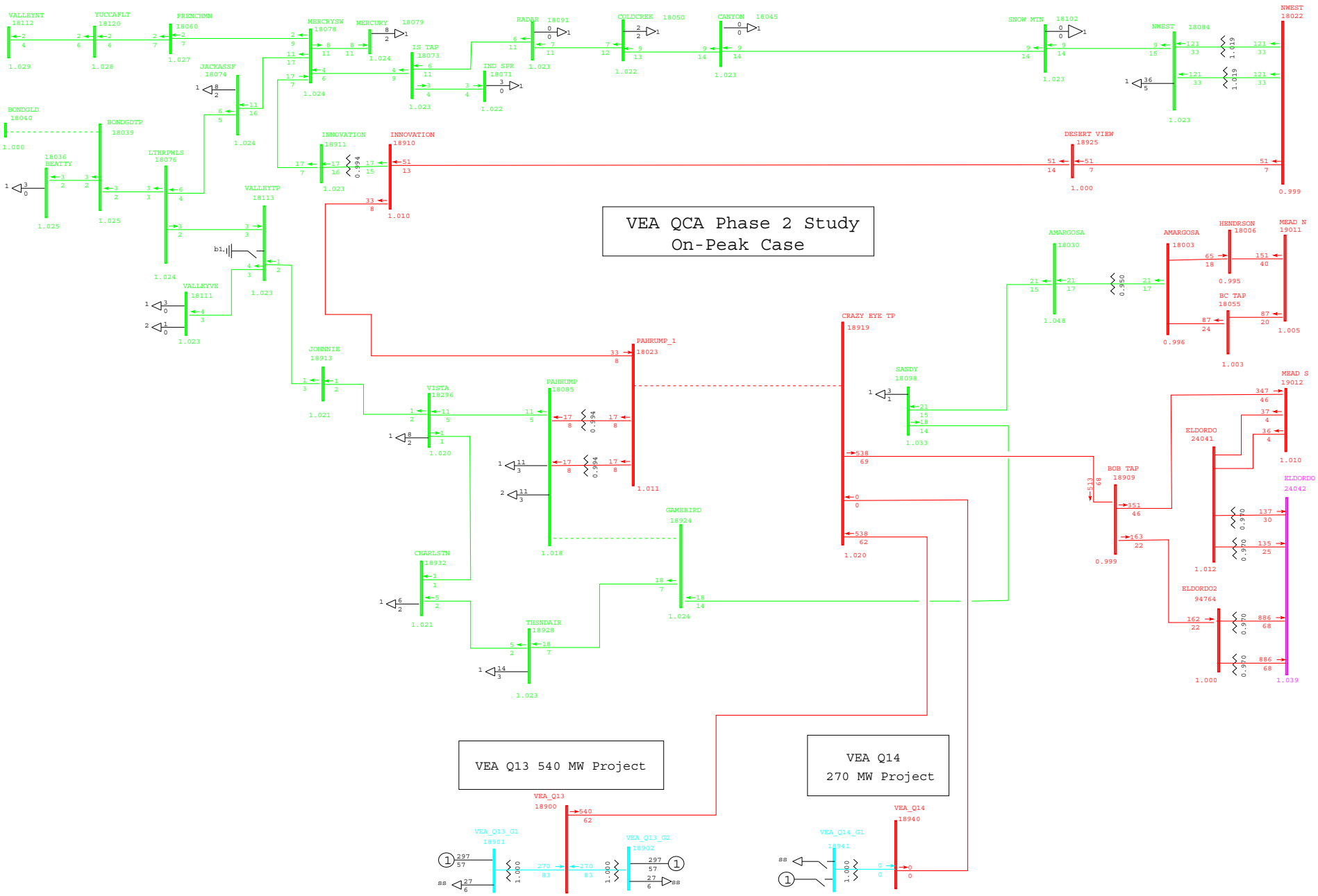


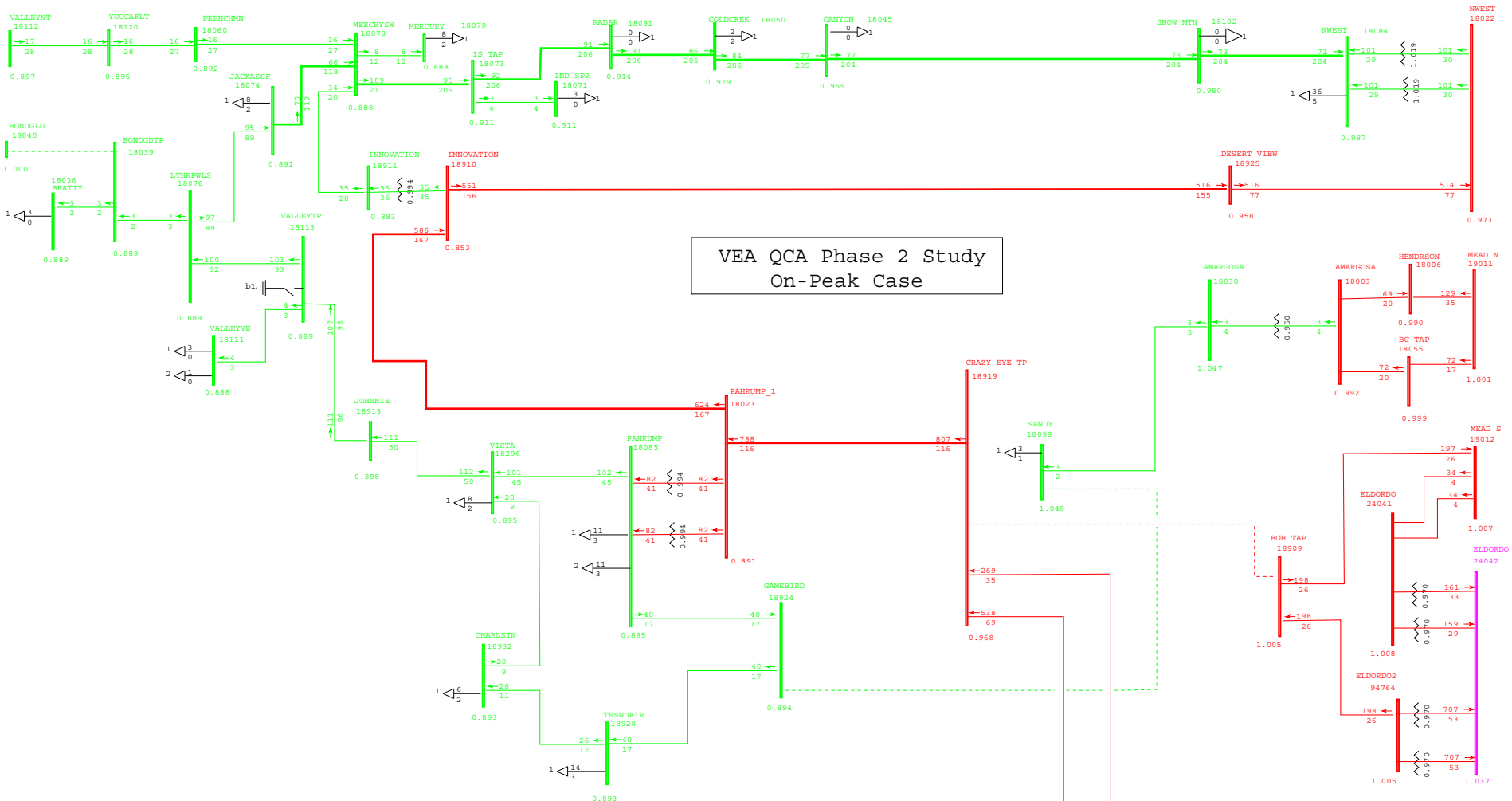
General Electric International, Inc. PSLF Program Thu Nov 01 09:57:50 2012 temp.wrk

	VEA QCA PHASE 2 OFF-PEAK CASE From CAISO/SCE EOP QC 3-4 Phase 2 Base Case. QCA Projects on-line, Pahrump-Mead and Pahrump-Gamebird record; new transformers at Pahrump and	Amargosa; 40% comp in Crazy Eyes-Bob Tap line; Innovation Tie Added Figure_10 PHRMP-CRAZY EYE TP 230 & PHRMP-GAMEBD 138	MW/% rate Rating = 2



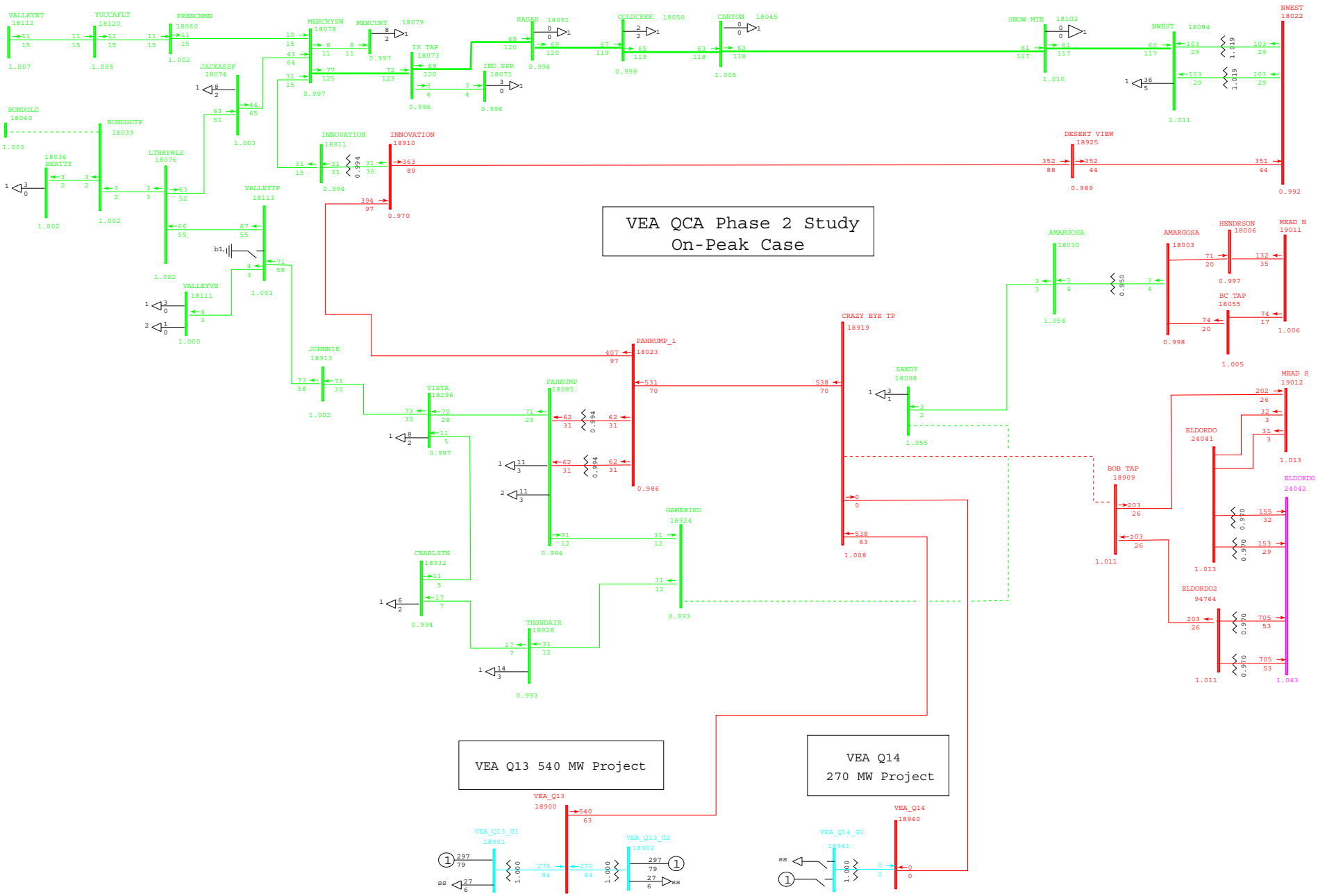
General Electric International, Inc. PSLF Program Thu Nov 01 09:57:51 2012 temp.wrk

	VEA QCA PHASE 2 OFF-PEAK CASE From CAISO/SCE EOP QC 3-4 Phase 2 Base Case. QCA Projects on-line, Pahrump-Mead and Pahrump-Gamebird record; new transformers at Pahrump and	Amargosa; 40% comp in Crazy Eyes-Bob Tap line; Innovation Tie Added Figure_11 PHRMP-CRAZY EYE TP 230 & PHRMP-GAMEBD 138 with Q14 Gen Drop	MW/% rate Rating = 2



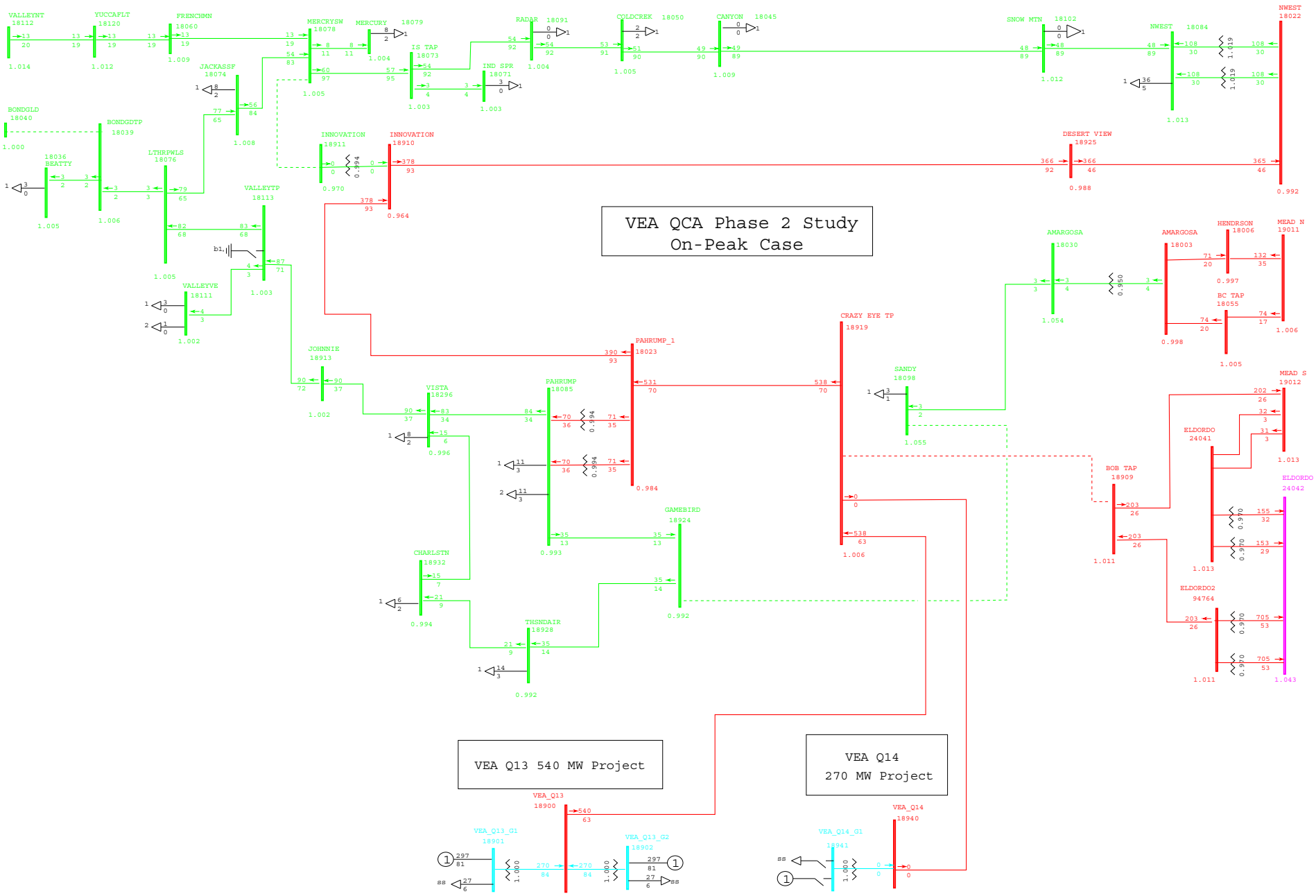
General Electric International, Inc. PSLF Program Thu Nov 01 09:57:52 2012 temp.wrk

	VEA QCA PHASE 2 OFF-PEAK CASE From CAISO/SCE EOP QC 3-4 Phase 2 Base Case. QCA Projects on-line, Pahrump-Mead and Pahrump-Gamebird record; new transformers at Pahrump and	Amargosa; 40% comp in Crazy Eyes-Bob Tap line; Innovation Tie Added Figure_12 CRAZY EYE TP-BOB TP 230 & GAMEBD-SANDY 138	MW/% rate Rating = 2



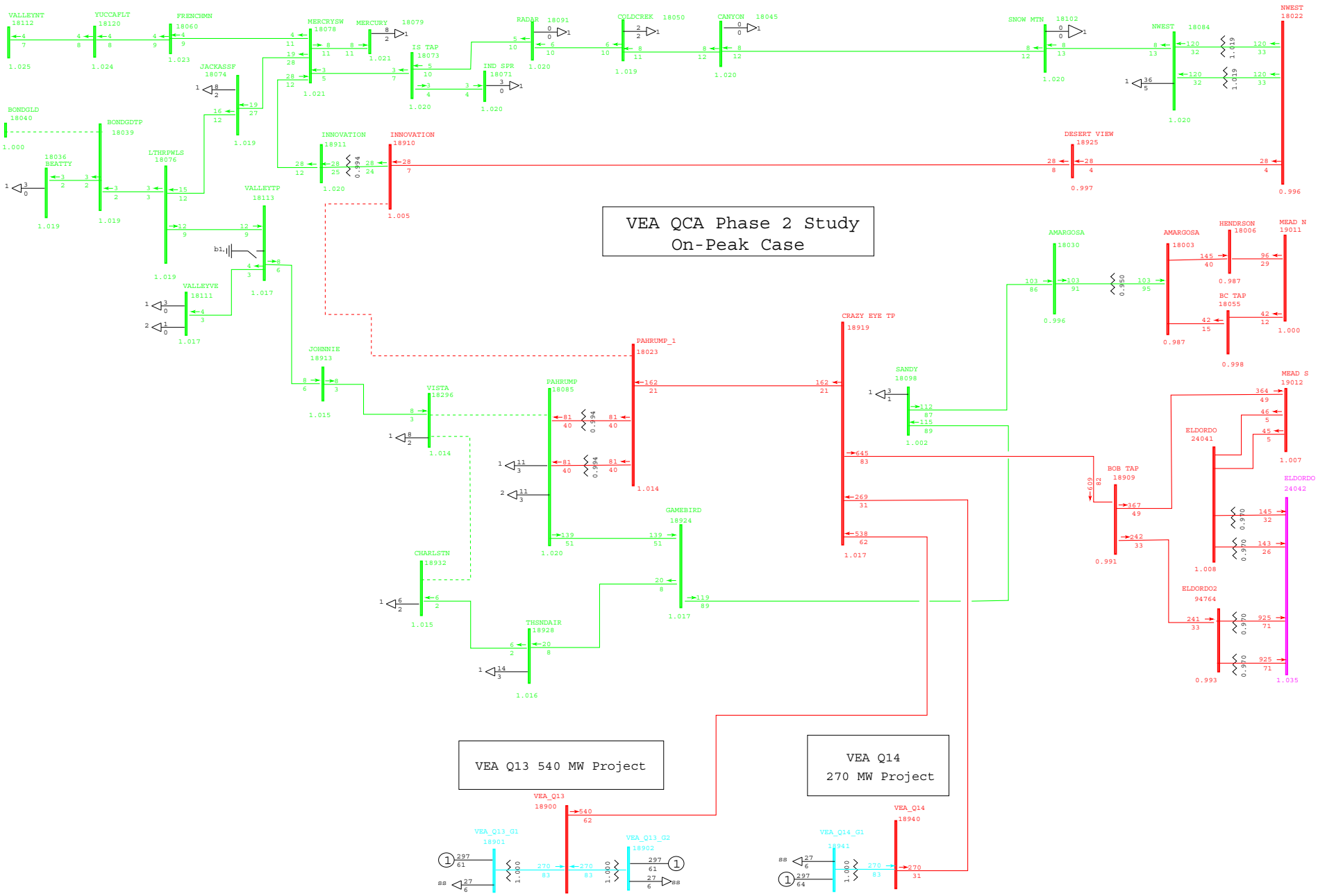
General Electric International, Inc. PSLF Program Thu Nov 01 09:57:53 2012 temp.wrk

	VEA QCA PHASE 2 OFF-PEAK CASE From CAISO/SCE EOP QC 3-4 Phase 2 Base Case. QCA Projects on-line, Pahrump-Mead and Pahrump-Gamebird record; new transformers at Pahrump and	Amargosa; 40% comp in Crazy Eyes-Bob Tap line; Innovation Tie Added Figure_13 CRAZY EYE TP-BOB TP 230 & GAMEBD-SANDY 138 with Q14 Gen Drop	MW/% rate Rating = 2



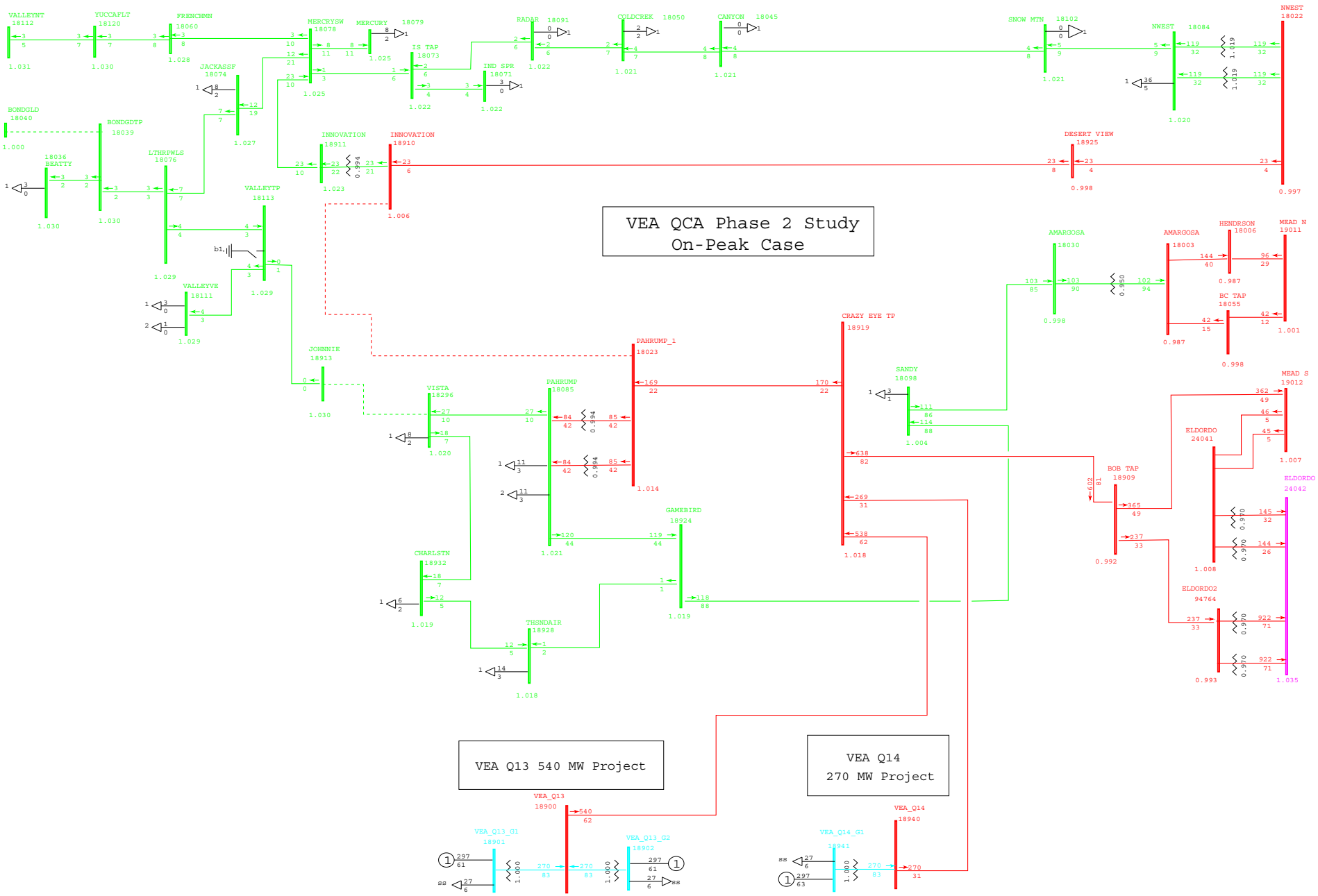
General Electric International, Inc. PSLF Program Thu Nov 01 09:57:54 2012 temp.wrk

	VEA QCA PHASE 2 OFF-PEAK CASE From CAISO/SCE EOP QC 3-4 Phase 2 Base Case. QCA Projects on-line, Pahrump-Mead and Pahrump-Gamebird record; new transformers at Pahrump and	Amargosa; 40% comp in Crazy Eyes-Bob Tap line; Innovation Tie Added Figure_14 CRZY EYE TP-BOB TP 230 & GAMEBD-SANDY 138 with INNOV 138 Line Trip &	MW/% rate Rating = 2

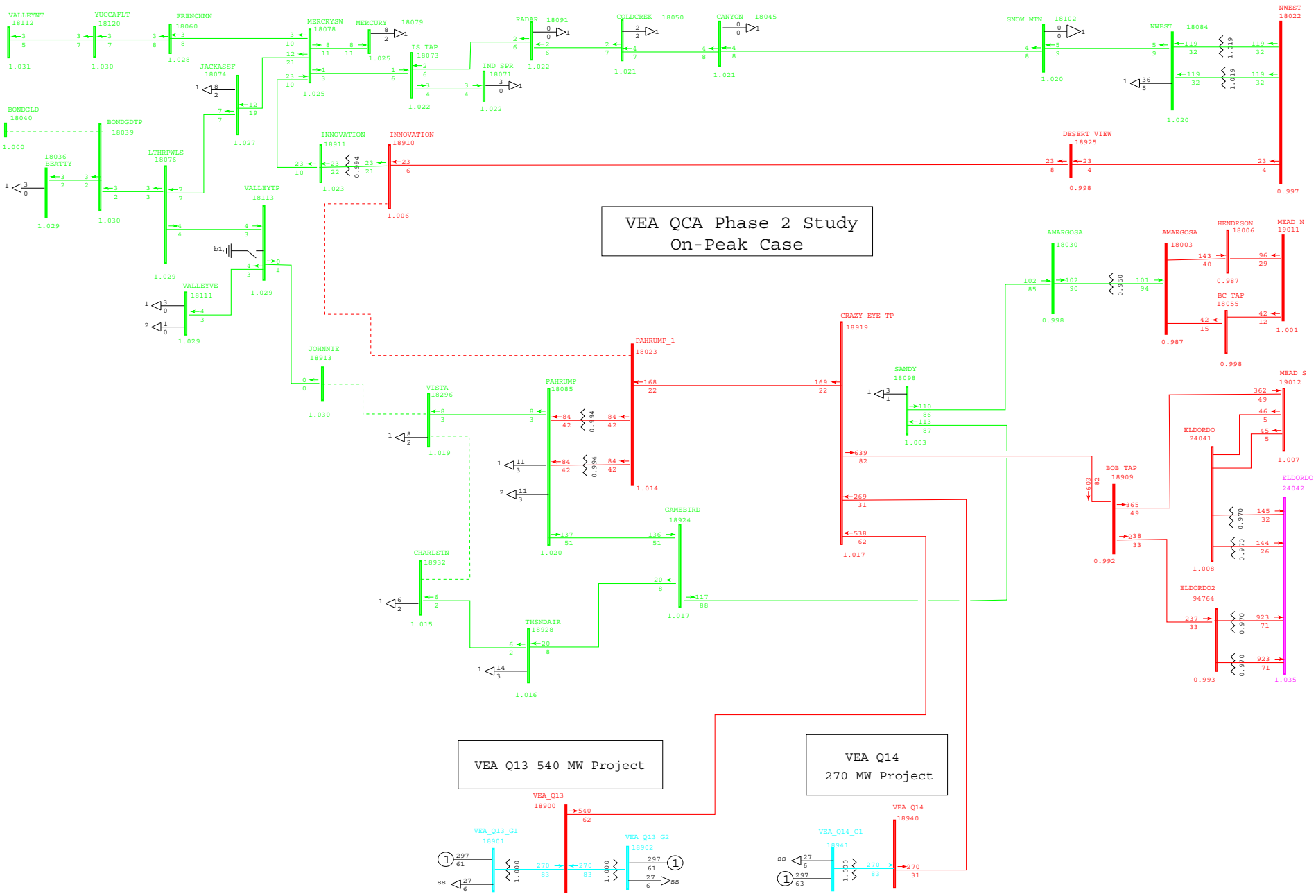


General Electric International, Inc. PSLF Program Thu Nov 01 09:57:55 2012 temp.wrk

	VEA QCA PHASE 2 OFF-PEAK CASE From CAISO/SCE EOP QC 3-4 Phase 2 Base Case. QCA Projects on-line, Pahrump-Mead and Pahrump-Gamebird record; new transformers at Pahrump and	Amargosa; 40% comp in Crazy Eyes-Bob Tap line; Innovation Tie Added Figure_15 VSTA-PHRMP38 & PHRMP-INNOV 230 & VSTA-CHAS 138	MW/% rate Rating = 2

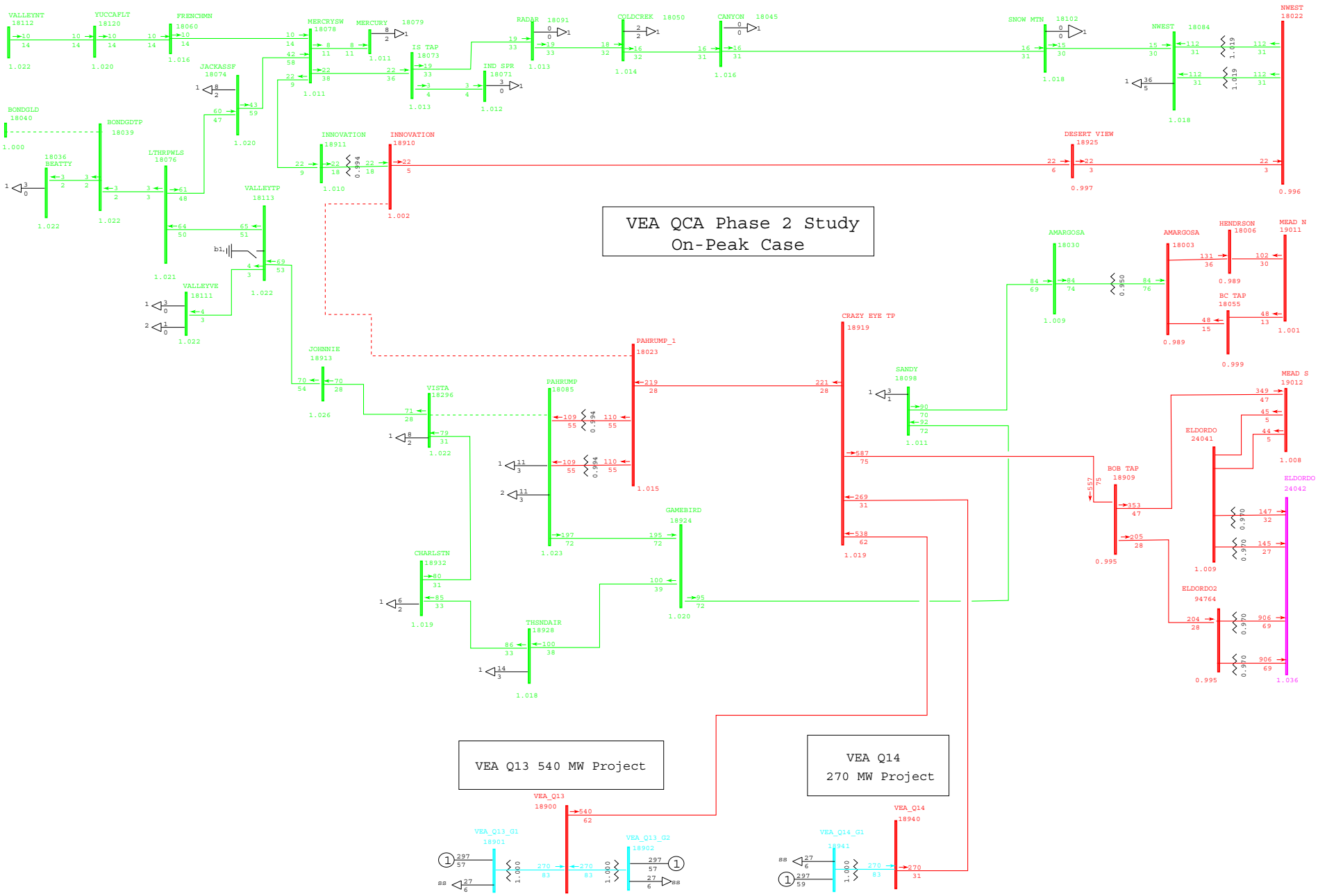


	VEA QCA PHASE 2 OFF-PEAK CASE From CAISO/SCE EOP QC 3-4 Phase 2 Base Case. QCA Projects on-line, Pahrump-Mead and Pahrump-Gamebird record; new transformers at Pahrump and	Amargosa; 40% comp in Crazy Eyes-Bob Tap line; Innovation Tie Added Figure_16 VSTA-JNNIE 138 & PHRMP-INNOV 230	MW/% rate Rating = 2



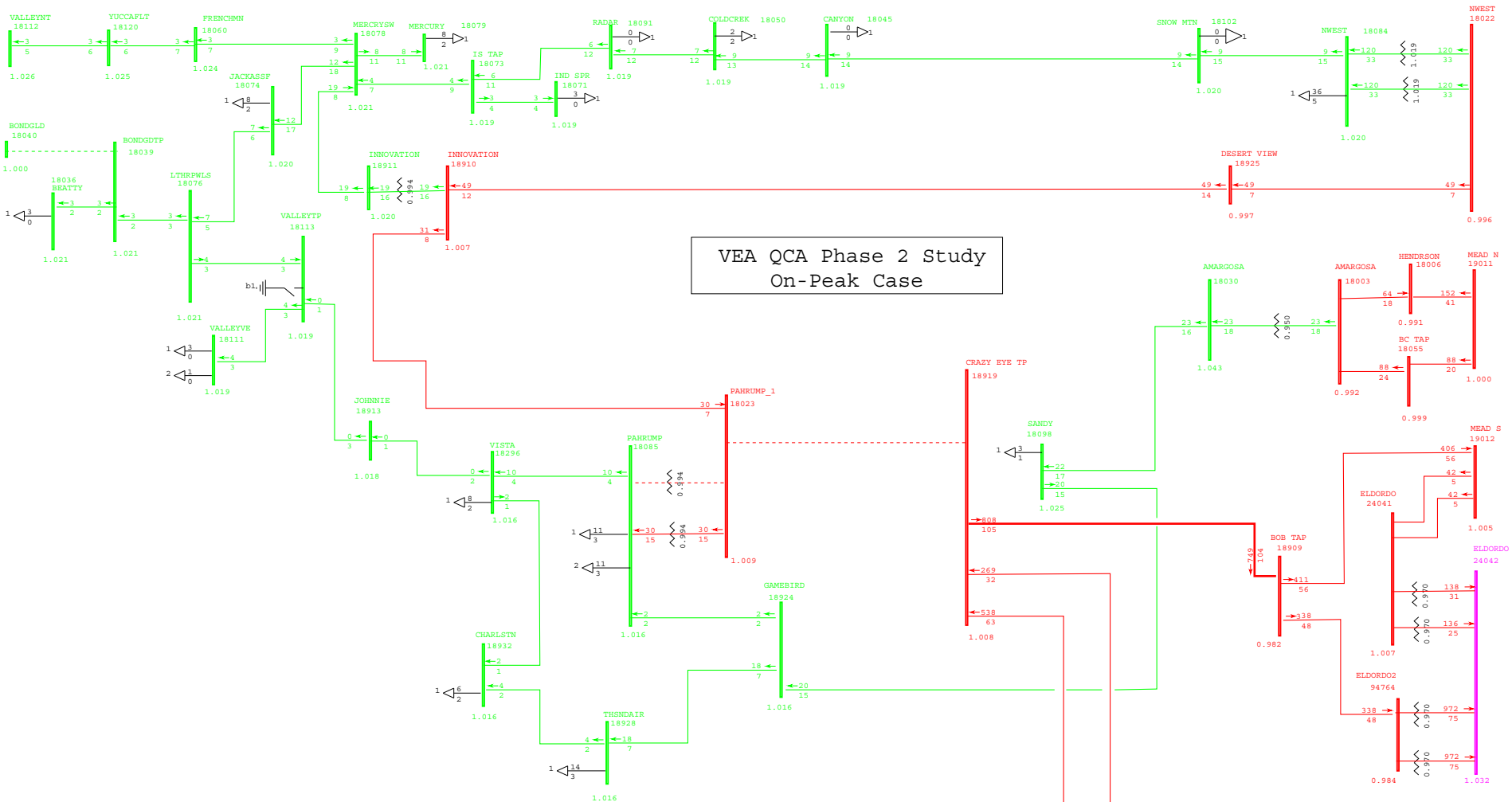
General Electric International, Inc. PSLF Program Thu Nov 01 09:57:58 2012 temp.wrk

VEA QCA PHASE 2 OFF-PEAK CASE From CAISO/SCE EOP QC 3-4 Phase 2 Base Case. QCA Projects on-line, Pahrump-Mead and Pahrump-Gamebird record; new transformers at Pahrump and	Amargosa; 40% comp in Crazy Eyes-Bob Tap line; Innovation Tie Added Figure_17 VSTA-JNNIE 138 & PHRMP-INNOV 230 & VSTA-CHAS 138	MW/% rate Rating = 2



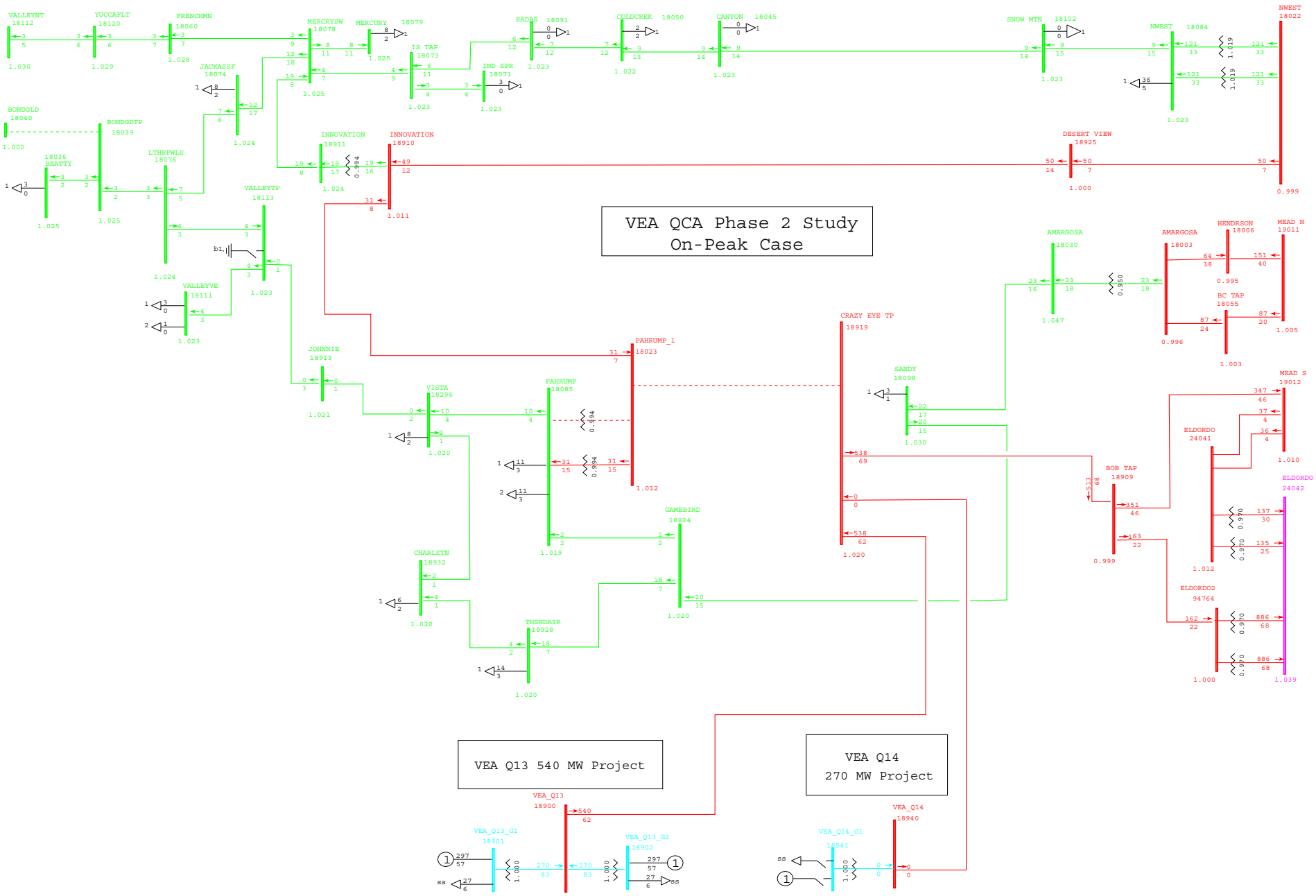
General Electric International, Inc. PSLF Program Thu Nov 01 09:57:59 2012 temp.wrk

	VEA QCA PHASE 2 OFF-PEAK CASE From CAISO/SCE EOP QC 3-4 Phase 2 Base Case. QCA Projects on-line, Pahrump-Mead and Pahrump-Gamebird record; new transformers at Pahrump and	Amargosa; 40% comp in Crazy Eyes-Bob Tap line; Innovation Tie Added Figure_18 PHRMP-VSTA 138 & PHRMP-INNOV 230	MW/% rate Rating = 2

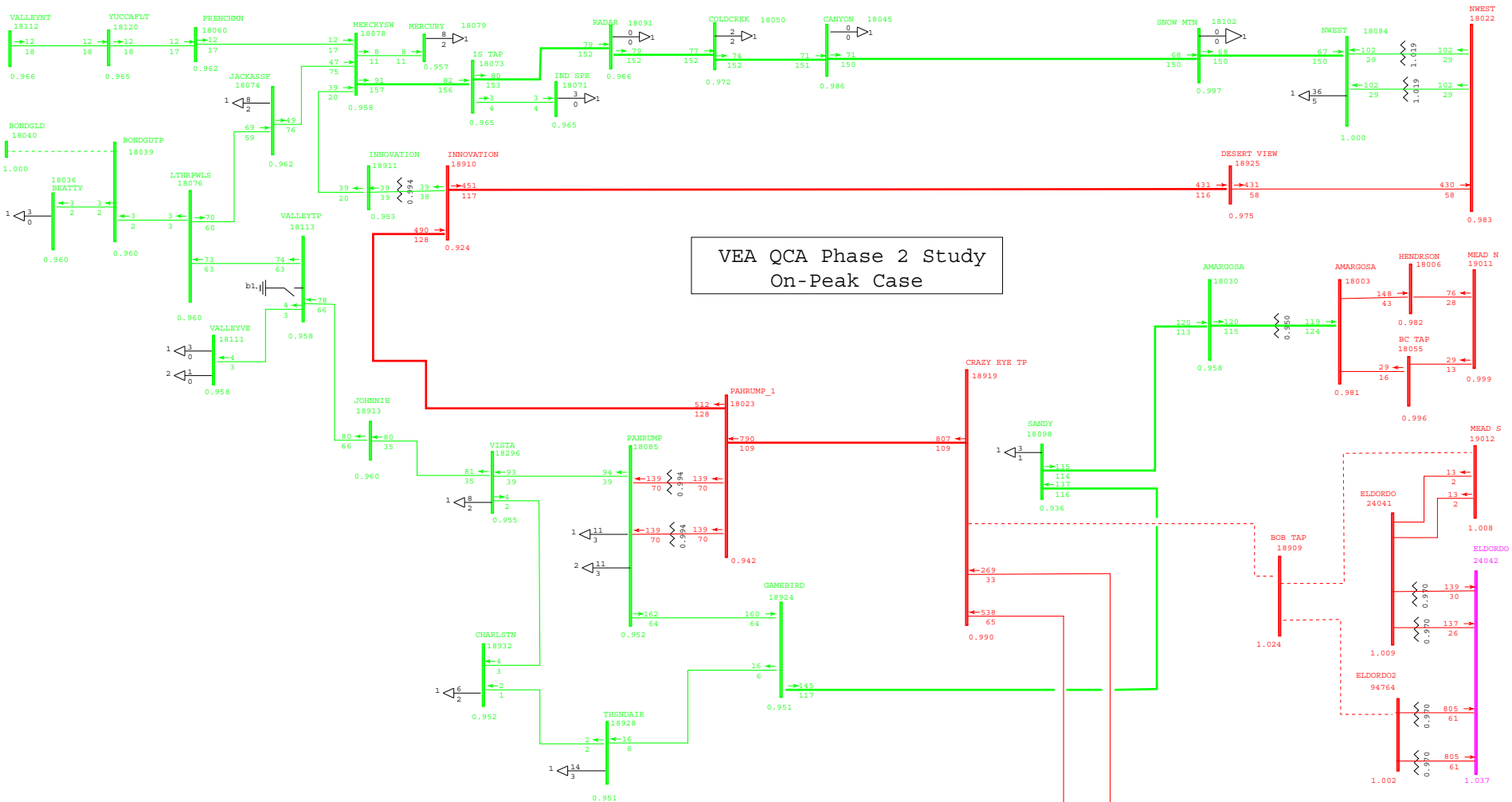


General Electric International, Inc. PSLF Program Thu Nov 01 09:58:00 2012 temp.wrk

	VEA QCA PHASE 2 OFF-PEAK CASE From CAISO/SCE EOP QC 3-4 Phase 2 Base Case. QCA Projects on-line, Pahrump-Mead and Pahrump-Gamebird record; new transformers at Pahrump and	Amargosa; 40% comp in Crazy Eyes-Bob Tap line; Innovation Tie Added Figure_19 PHRMP38/230kV Tran Bnk 1 & PHRMP-CRAZY EYE TP 230	MW/% rate Rating = 2



	VEA QCA PHASE 2 OFF-PEAK CASE From CAISO/SCE EOP QC 3-4 Phase 2 Base Case. QCA Projects on-line, Pahrump-Mead and Pahrump-Gamebird record; new transformers at Pahrump and	Amargosa; 40% comp in Crazy Eyes-Bob Tap line; Innovation Tie Added Figure_20 PHRMP38/230kV Tran Bnk 1 & PHRMP-CRAZY EYE TP 230 with Q14 Gen Drop	MW/% rate Rating = 2



General Electric International, Inc. PSLF Program Thu Nov 01 09:58:04 2012 temp.wrk

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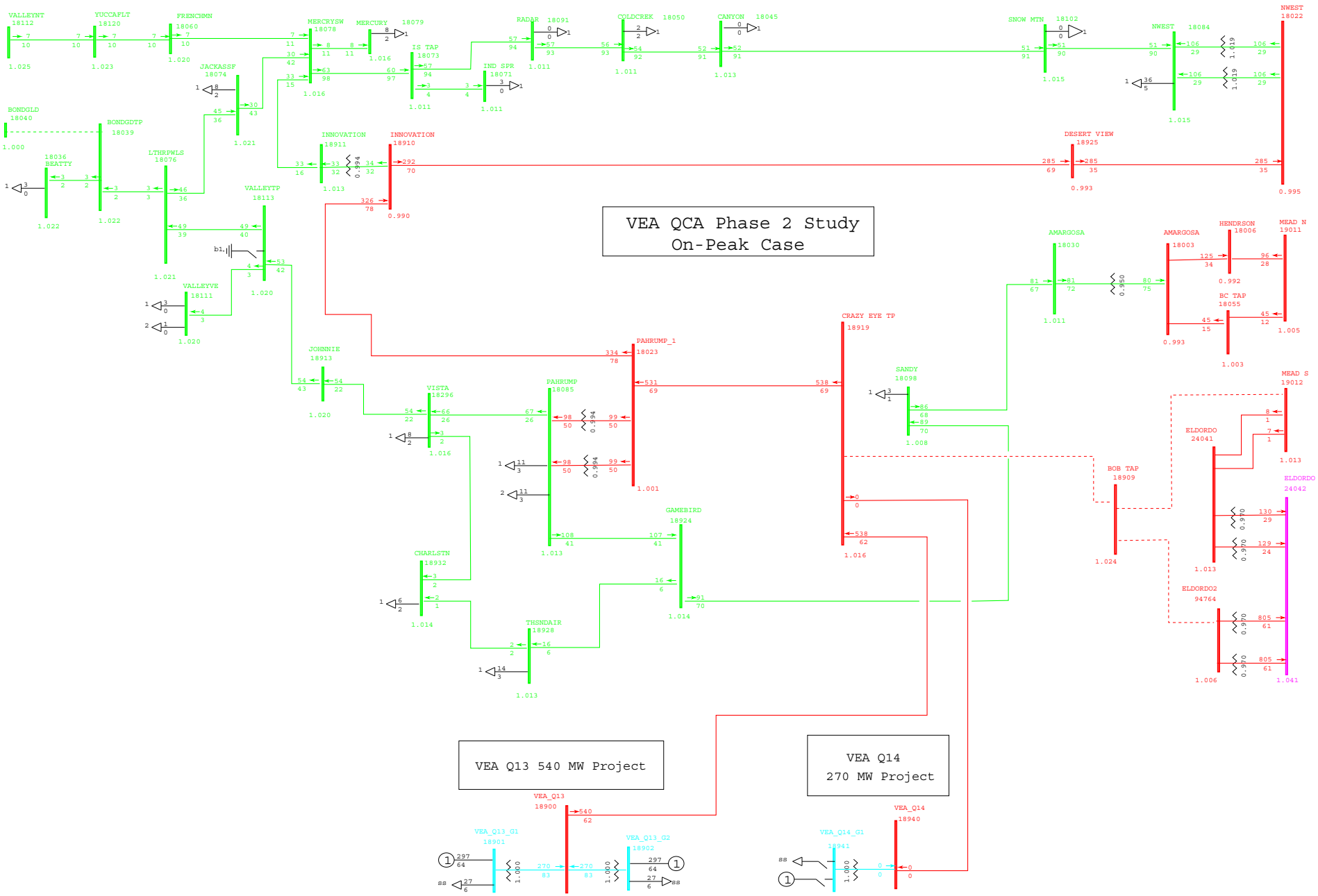


General Electric International, Inc. PSLF Program Thu Nov 01 09:58:06 2012 temp.wrk

	VEA QCA PHASE 2 OFF-PEAK CASE From CAISO/SCE EOP QC 3-4 Phase 2 Base Case. QCA Projects on-line, Pahrump-Mead and Pahrump-Gamebird record; new transformers at Pahrump and	Amargosa; 40% comp in Crazy Eyes-Bob Tap line; Innovation Tie Added Figure_22 MEAD S-BOB TP 230 & ELD2-BOB TP 230 & CRZY EYE TP-BOB TP 230 with Q1	MW/% rate Rating = 2

Appendix E

VEA Area

QCA Phase 2 Dynamic Stability Plots

VEA Area

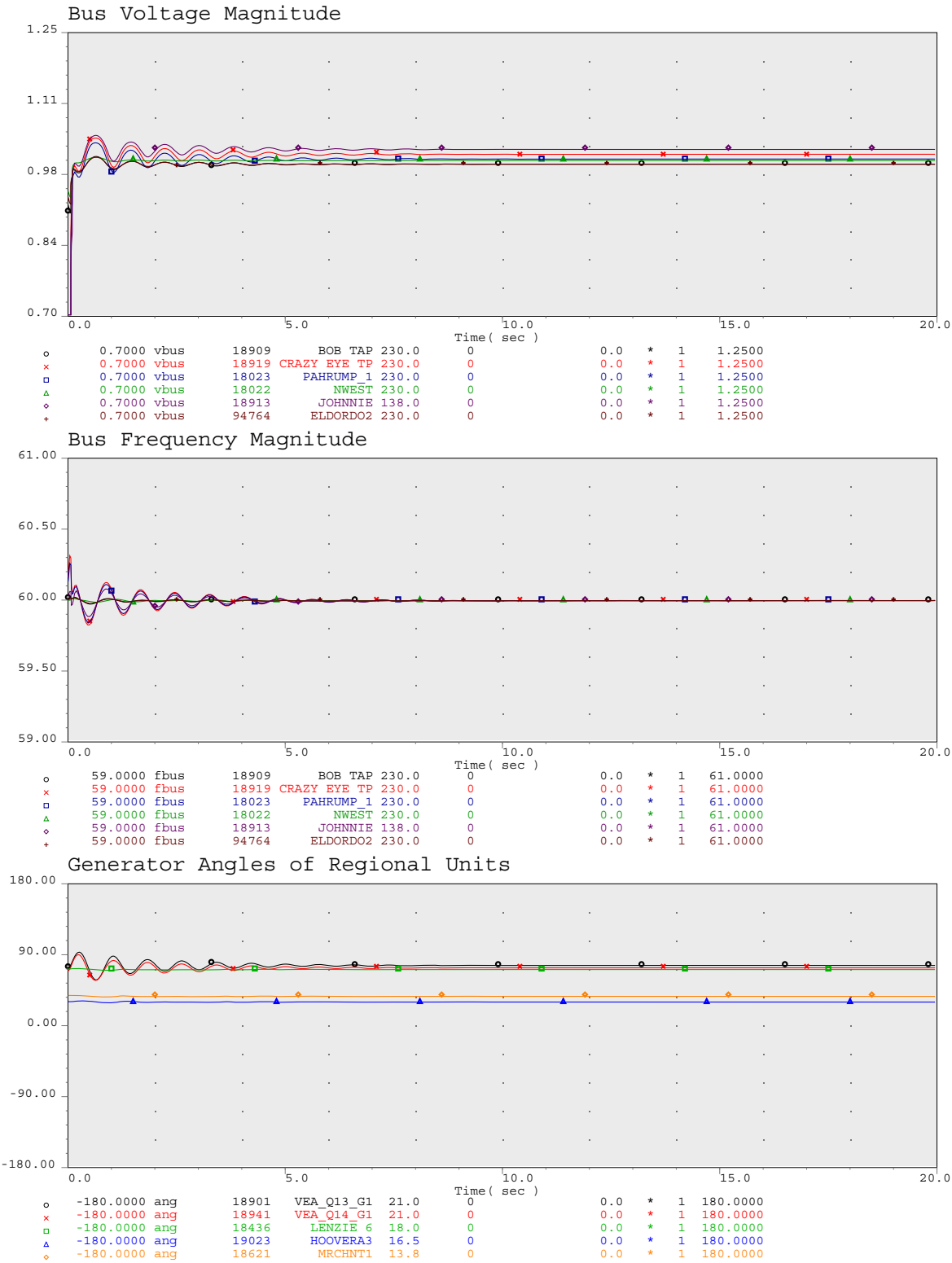
QCA Phase 2 Dynamic Stability Plots

1. Pahrump-Innovation 230kV Line SLO
2. Innovation-Desert View 230kV Line SLO
3. Innovation-Desert View 230kV Line SLO with Q14 Gen Drop
4. Innovation-Desert View 230kV Line SLO with Innovation-Mercury SW 138kV Line Trip
5. Pahrump-Crazy Eye Tap 230kV Line SLO
6. Pahrump-Crazy Eye Tap 230kV Line SLO with Q14 Gen Drop
7. Crazy Eye Tap-Bob Tap 230kV Line SLO
8. Crazy Eye Tap-Bob Tap 230kV Line with Q14 Gen Drop
9. Pahrump-Crazy Eye Tap 230kV Line & Pahrump-Gamebird 138kV Line DLO (Common Structure)
10. Pahrump-Crazy Eye Tap 230kV Line & Pahrump-Gamebird 138kV Line DLO with Q14 Gen Drop (Common Structure)
11. Crazy Eye Tap-Bob Tap 230kV Line & Gamebird-Sandy 138kV Line DLO (Common Structure)
12. Crazy Eye Tap-Bob Tap 230kV Line & Gamebird-Sandy 138kV Line DLO with Q14 Gen Drop (Common Structure)
13. Crazy Eye Tap-Bob Tap 230kV Line & Gamebird-Sandy 138kV Line DLO with Q14 Gen Drop and Innovation-Mercury SW 138kV Line Trip (Common Structure)
14. Vista-Pahrump 138kV Line & Pahrump-Innovation 230kV Line & Vista-Chas 138kV Line DLO (Common Structure)
15. Vista-Johnnie 138kV Line & Pahrump-Innovation 230kV Line DLO (Common Structure)
16. Vista- Johnnie 138kV Line & Pahrump-Innovation 230kV Line & Vista-Chas 138kV Line DLO (Common Structure)
17. Vista-Pahrump 138kV Line & Pahrump-Innovation 230kV Line DLO (Common Structure)
18. Pahrump 138/230kV Transformer Bank 1 & Pahrump-Crazy Eye Tap 230kV Line (Breaker Failure)
19. Pahrump 138/230kV Transformer Bank 1 & Pahrump-Crazy Eye Tap 230kV Line with Q14 Gen Drop (Breaker Failure)
20. Mead S-Bob Tap 230kV Line & Eldordo2-Bob Tap 230kV Line & Crazy Eye Tap-Bob Tap 230kV Line (Breaker Failure)
21. Mead S-Bob Tap 230kV Line & Eldordo2-Bob Tap 230kV Line & Crazy Eye Tap-Bob Tap 230kV Line with Q14 Gen Drop (Breaker Failure)

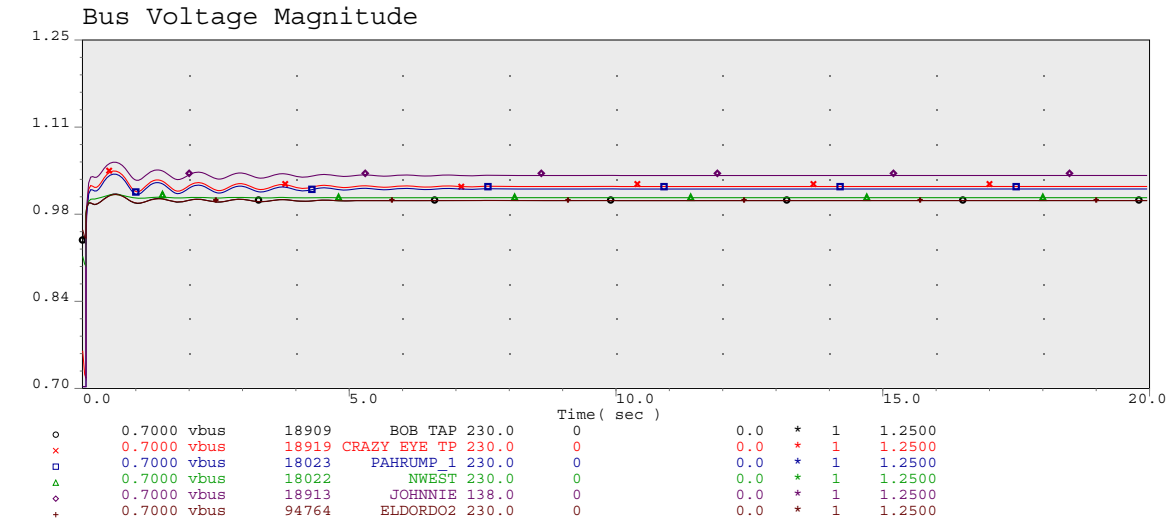
VEA Area

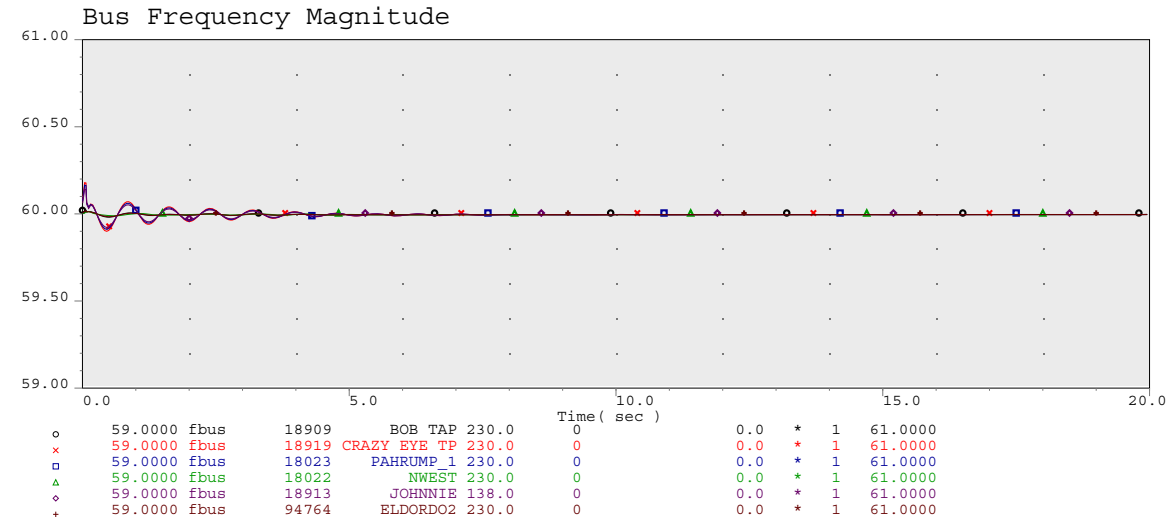
QCA Phase 2 Dynamic Stability Plots

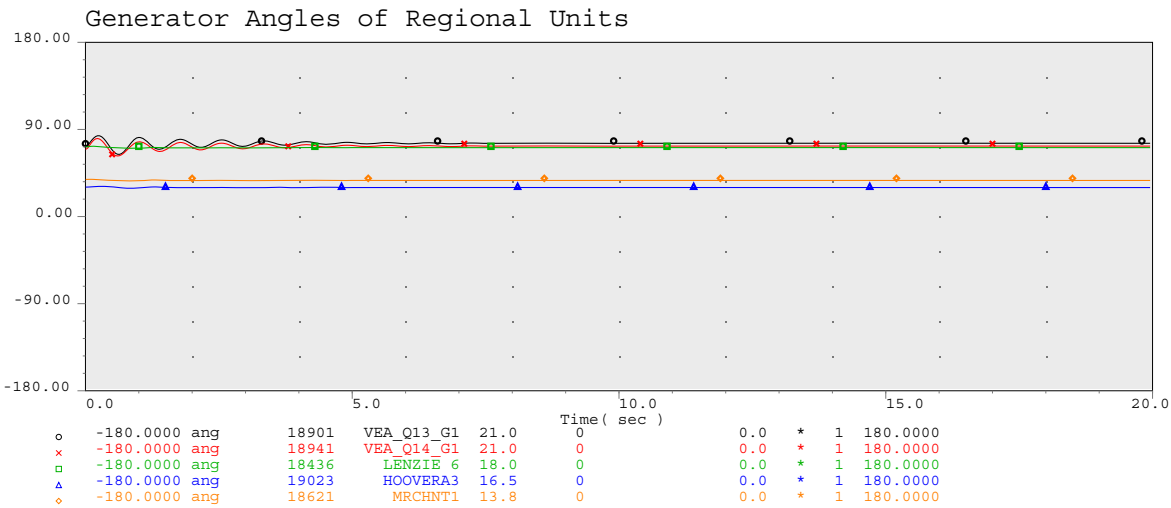
On-Peak Case



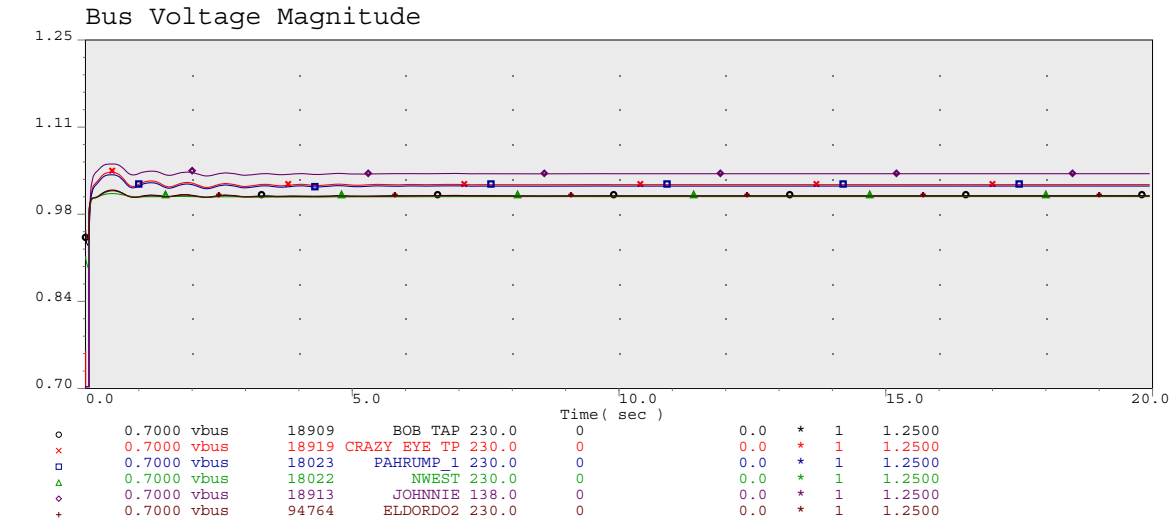
VEA QCA PHASE 2 STUDIES ON-PEAK CASE
Innovation Tie Added
Pahrump_1-INNOVATION 230kV Line Ckt 1

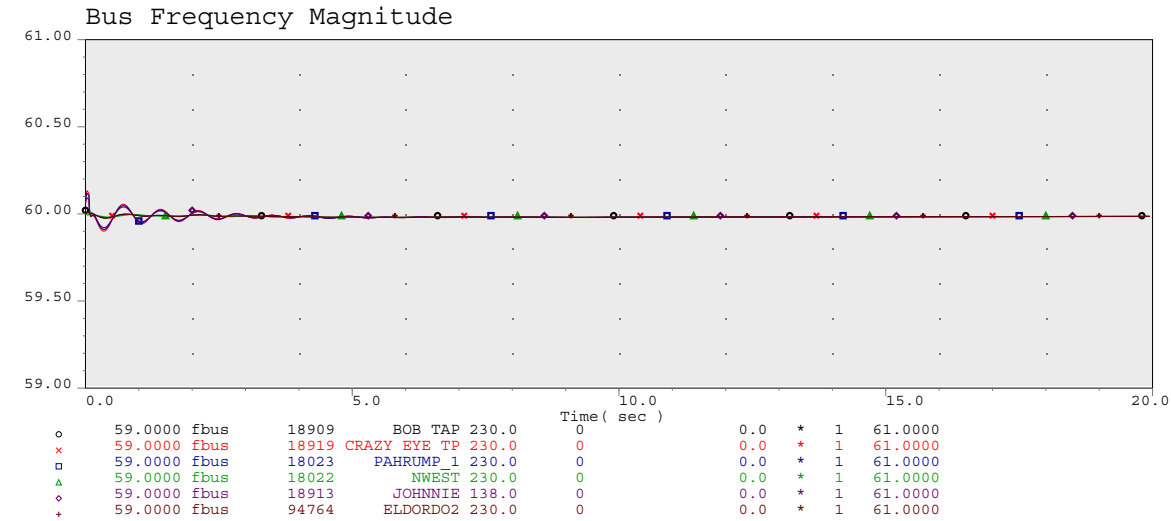


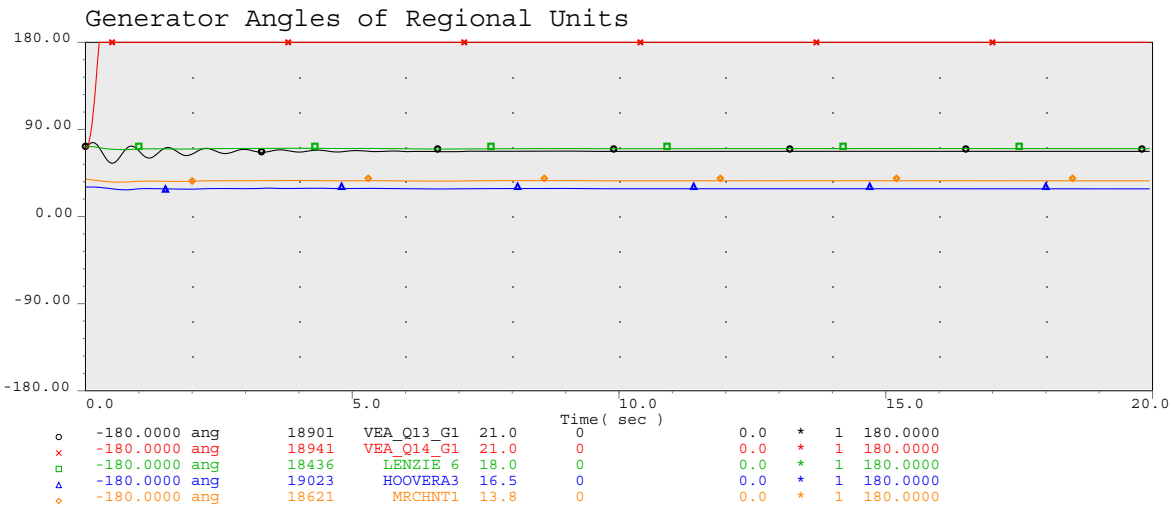




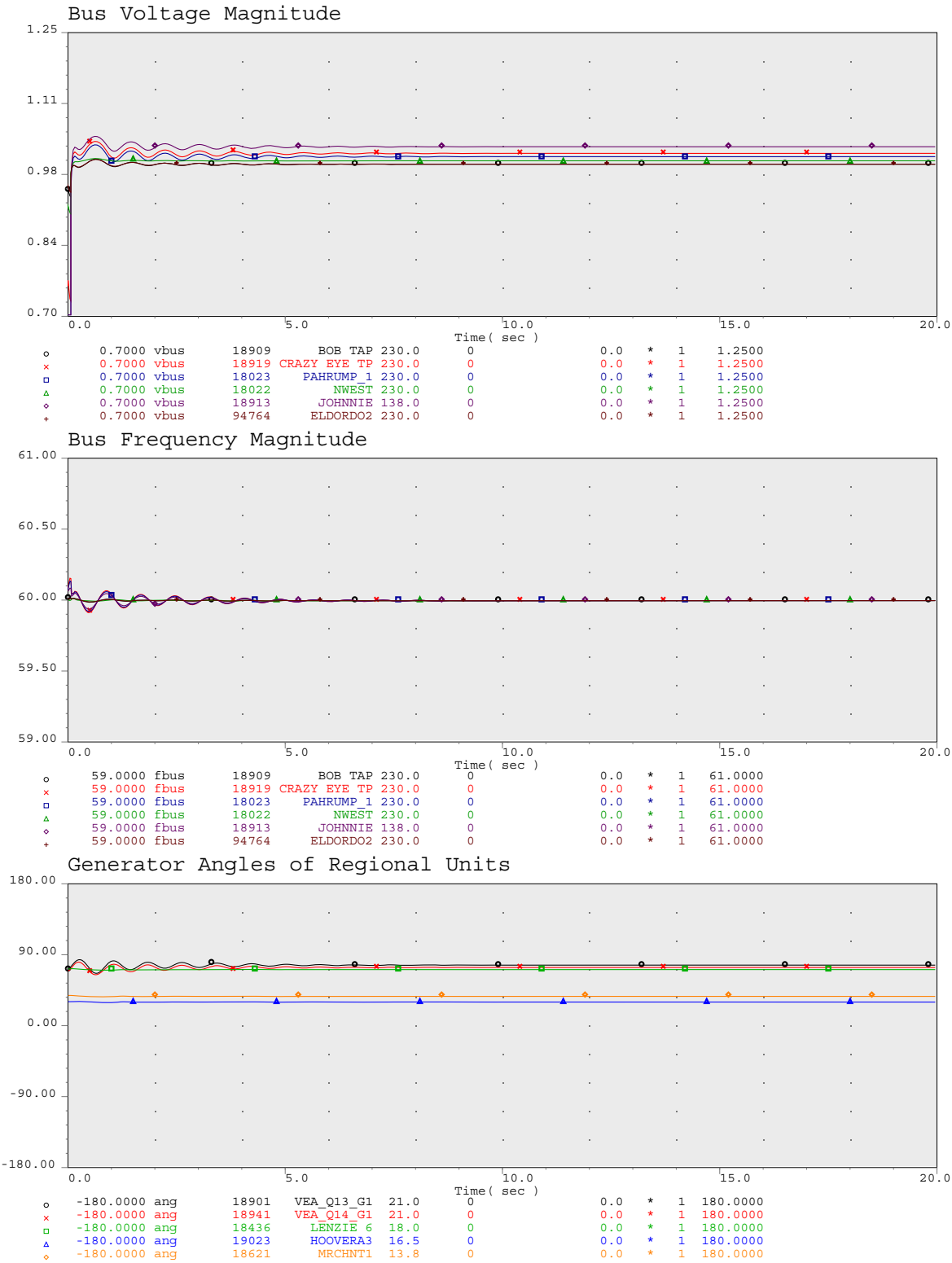
VEA QCA PHASE 2 STUDIES ON-PEAK CASE
Innovation Tie Added
Innovation-Desert View 230kV Line Ckt 1



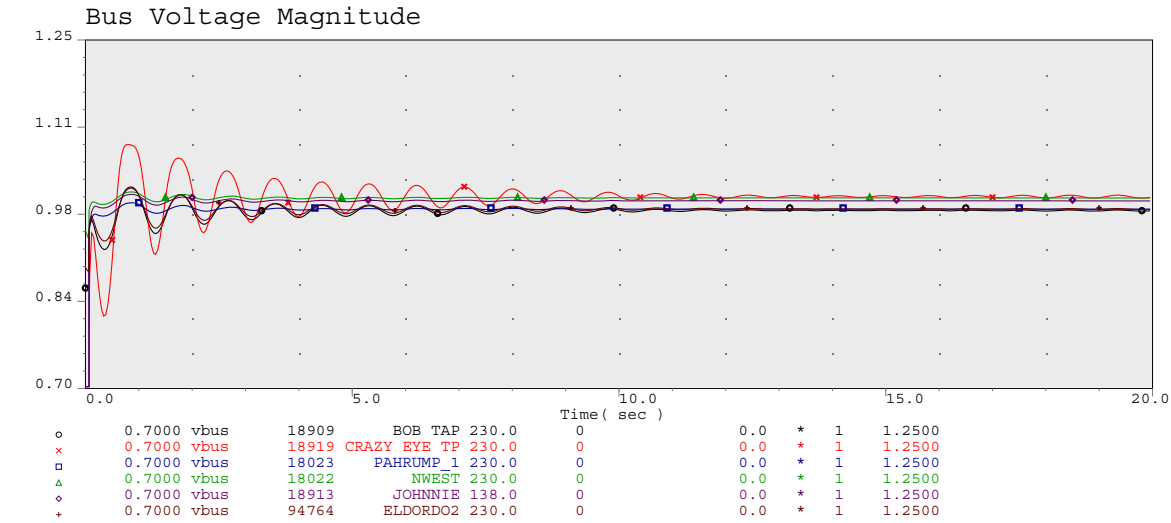


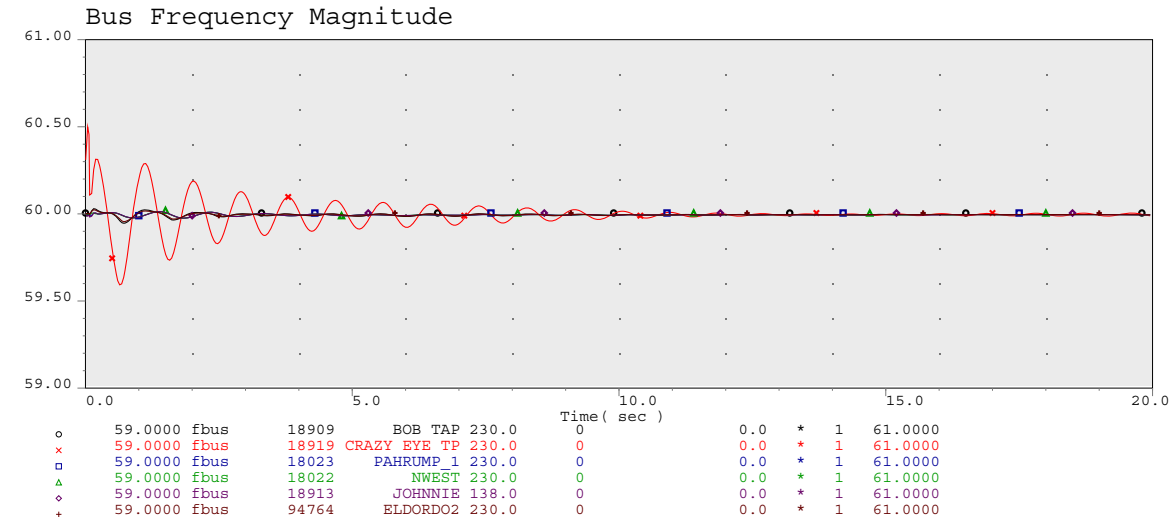


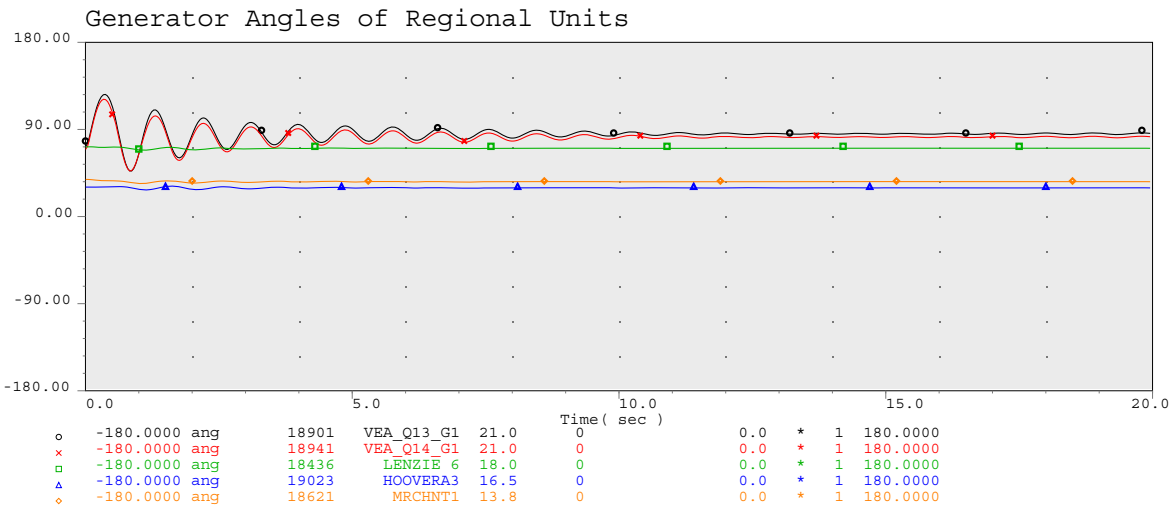
VEA QCA PHASE 2 STUDIES ON-PEAK CASE
Innovation Tie Added
Innovation-Desert View 230kV Line Ckt 1 with RAS



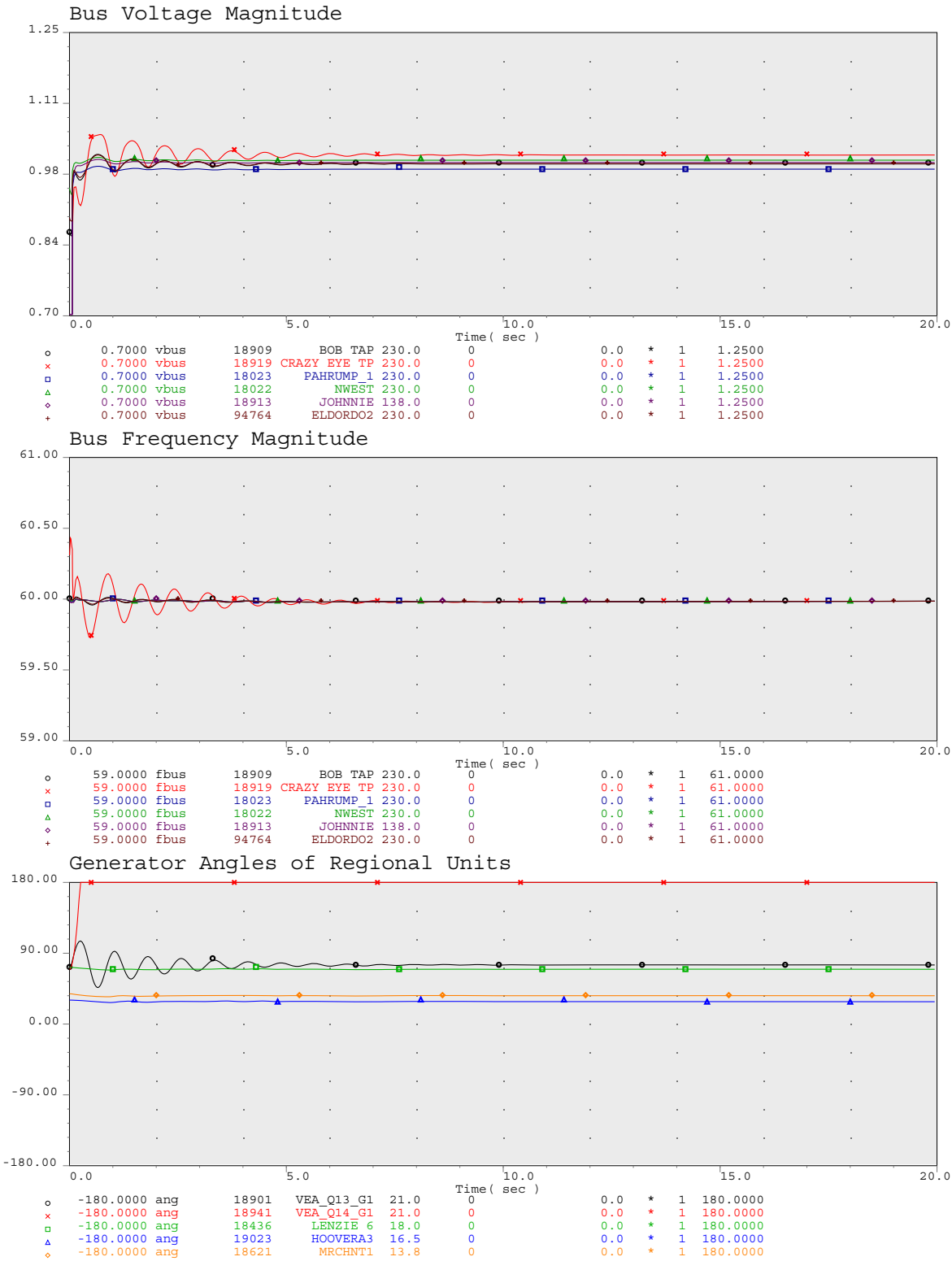
VEA QCA PHASE 2 STUDIES ON-PEAK CASE
Innovation Tie Added
Innov-DsrtVw 230kV Line Ckt 1 and Innov-McrySWT 138kV Line



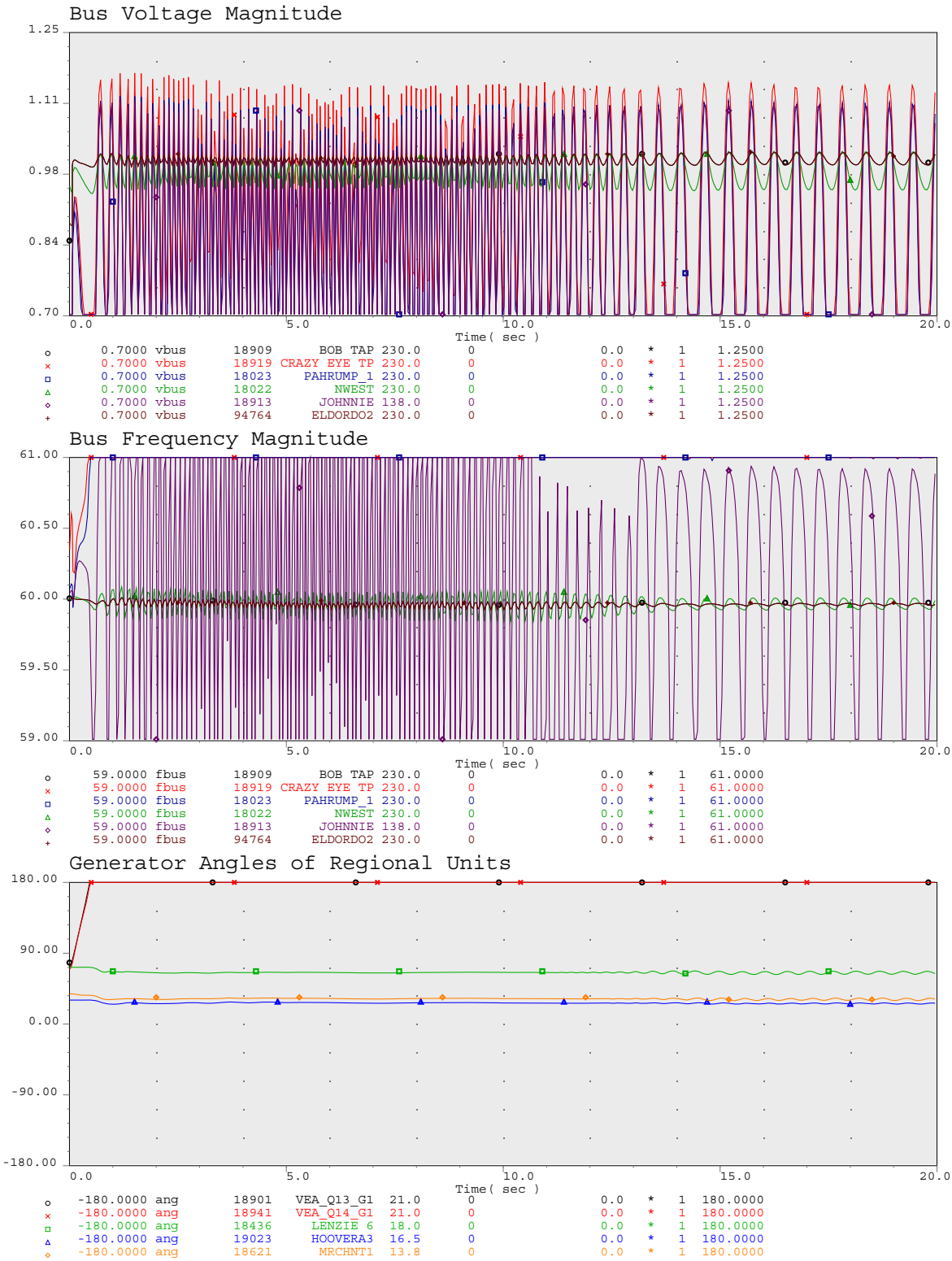




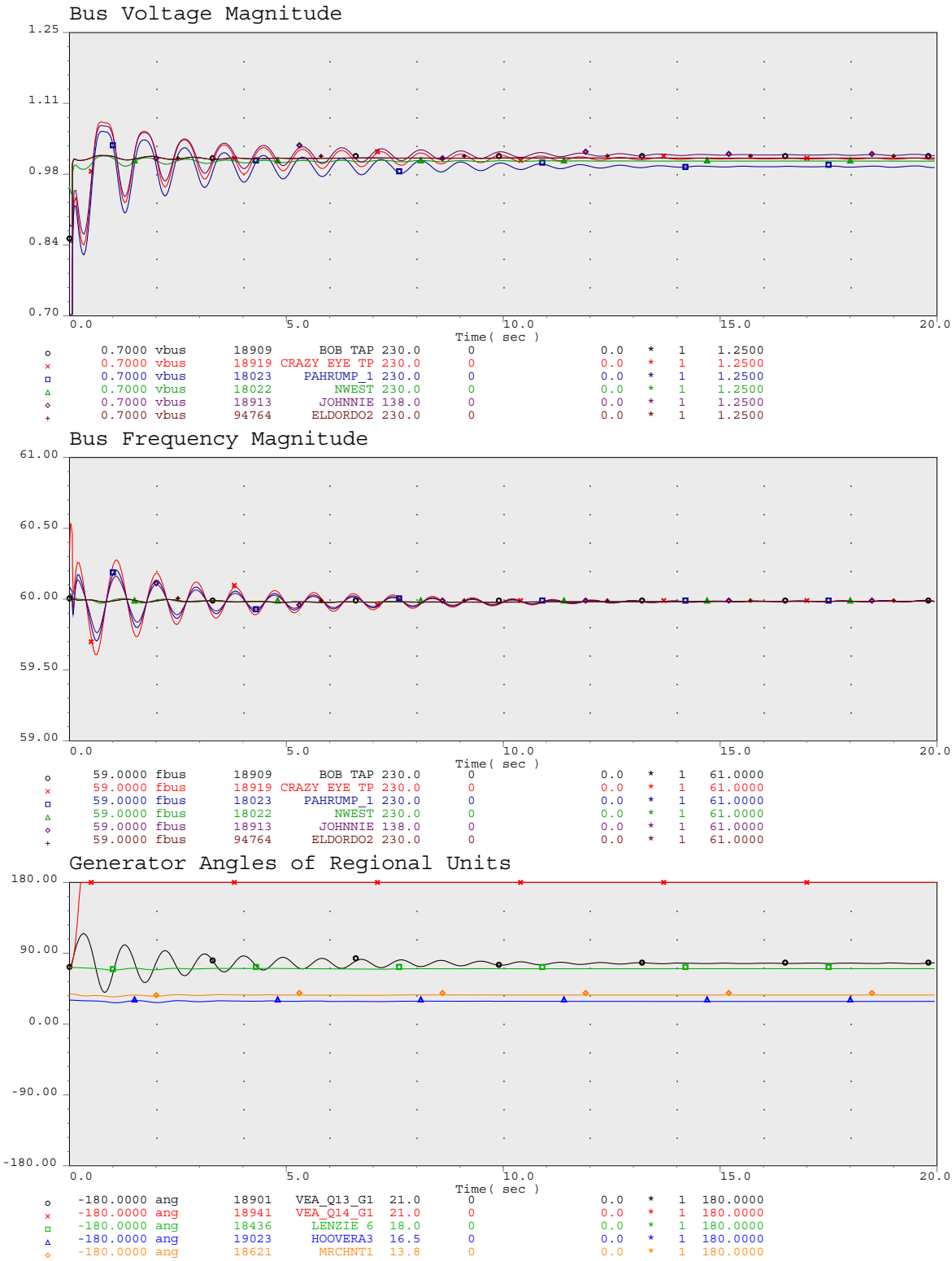
VEA QCA PHASE 2 STUDIES ON-PEAK CASE
Innovation Tie Added
Pahrump_1-Crazy Eye Tp 230kV Line Ckt 1



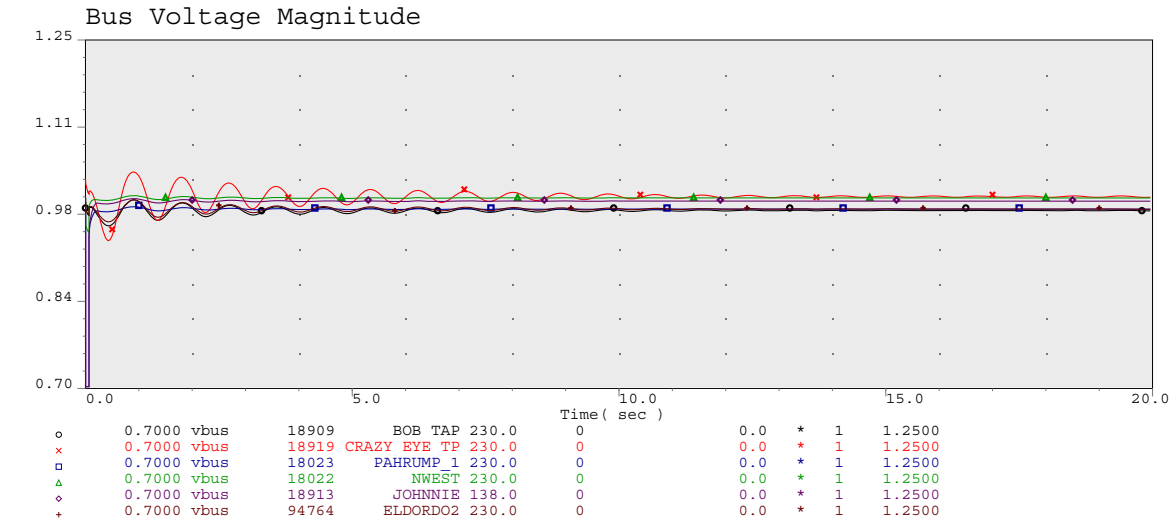
VEA QCA PHASE 2 STUDIES ON-PEAK CASE
Innovation Tie Added
Pahrump_1-Crazy Eye Tp 230kV Line Ckt 1 with RAS

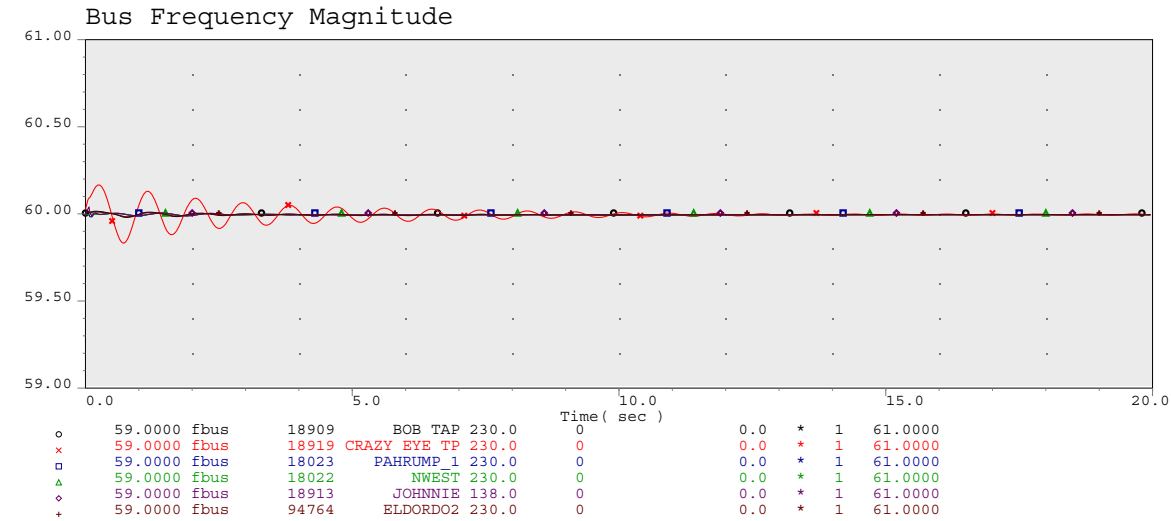


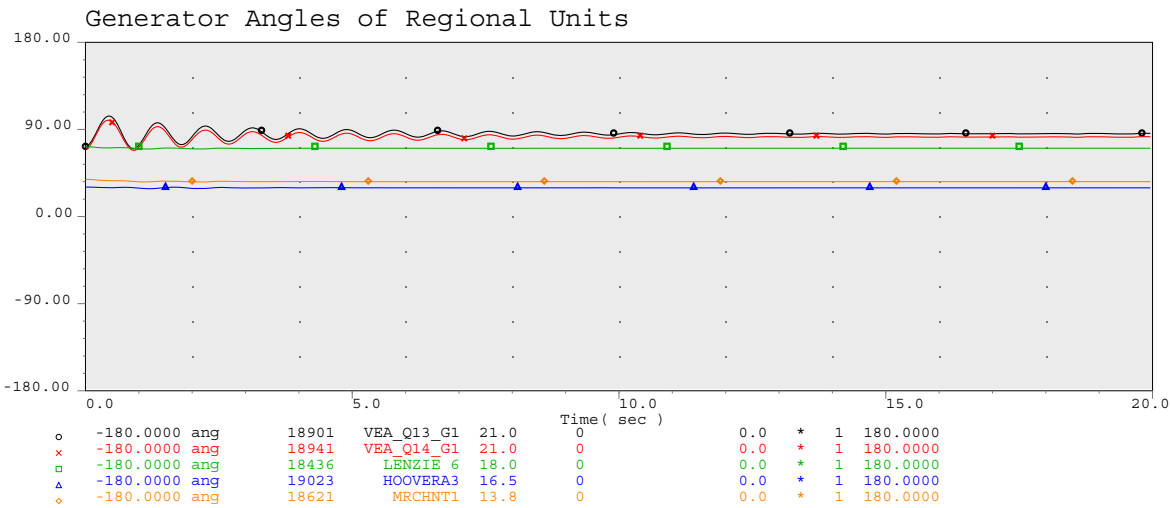
VEA QCA PHASE 2 STUDIES ON-PEAK CASE
Innovation Tie Added
Crazy Eye Tp-Bob Tap 230kV Line Ckt 1



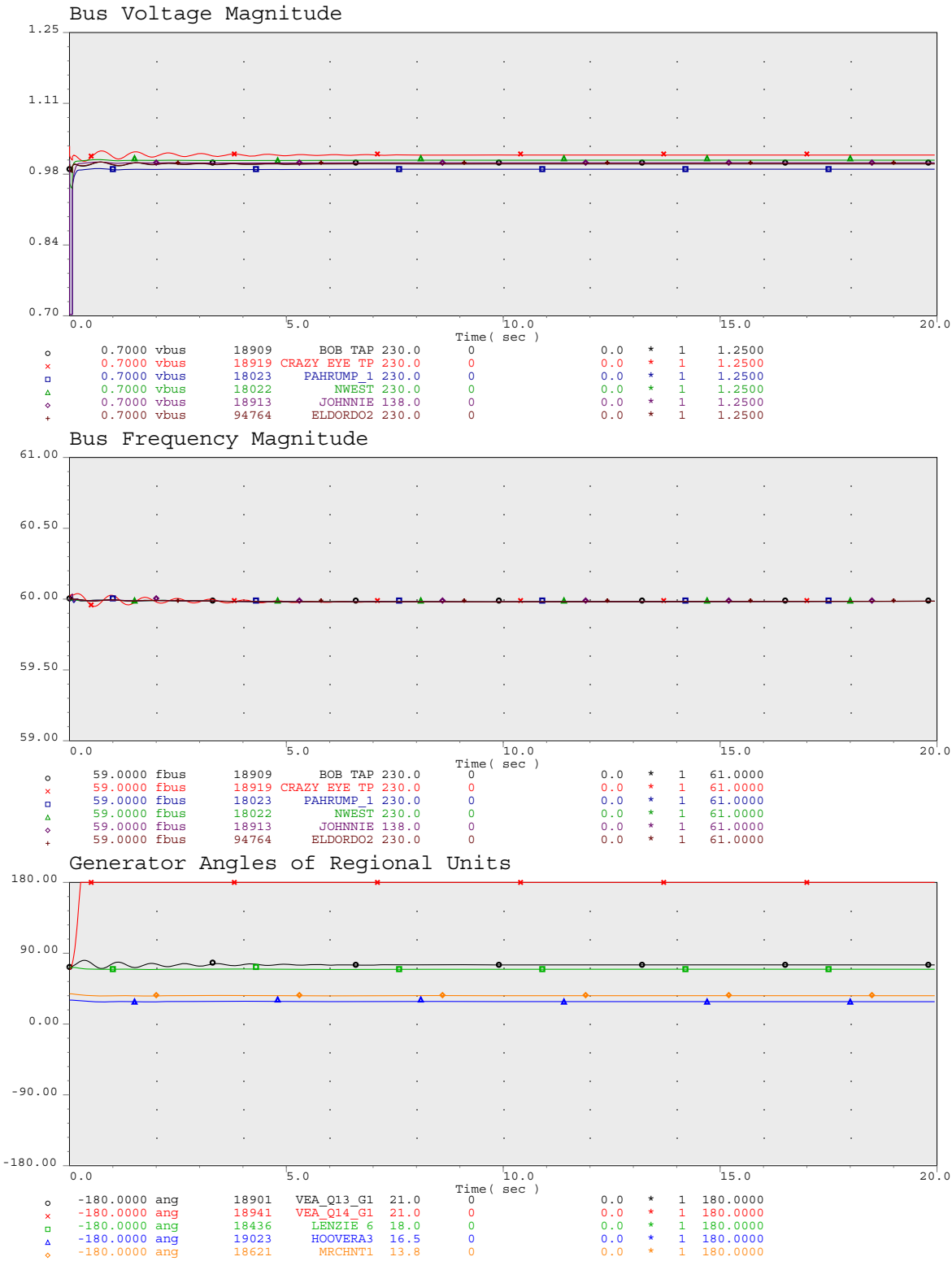
VEA QCA PHASE 2 STUDIES ON-PEAK CASE
Innovation Tie Added
Crazy Eye Tp-Bob Tap 230kV Line Ckt 1 with RAS



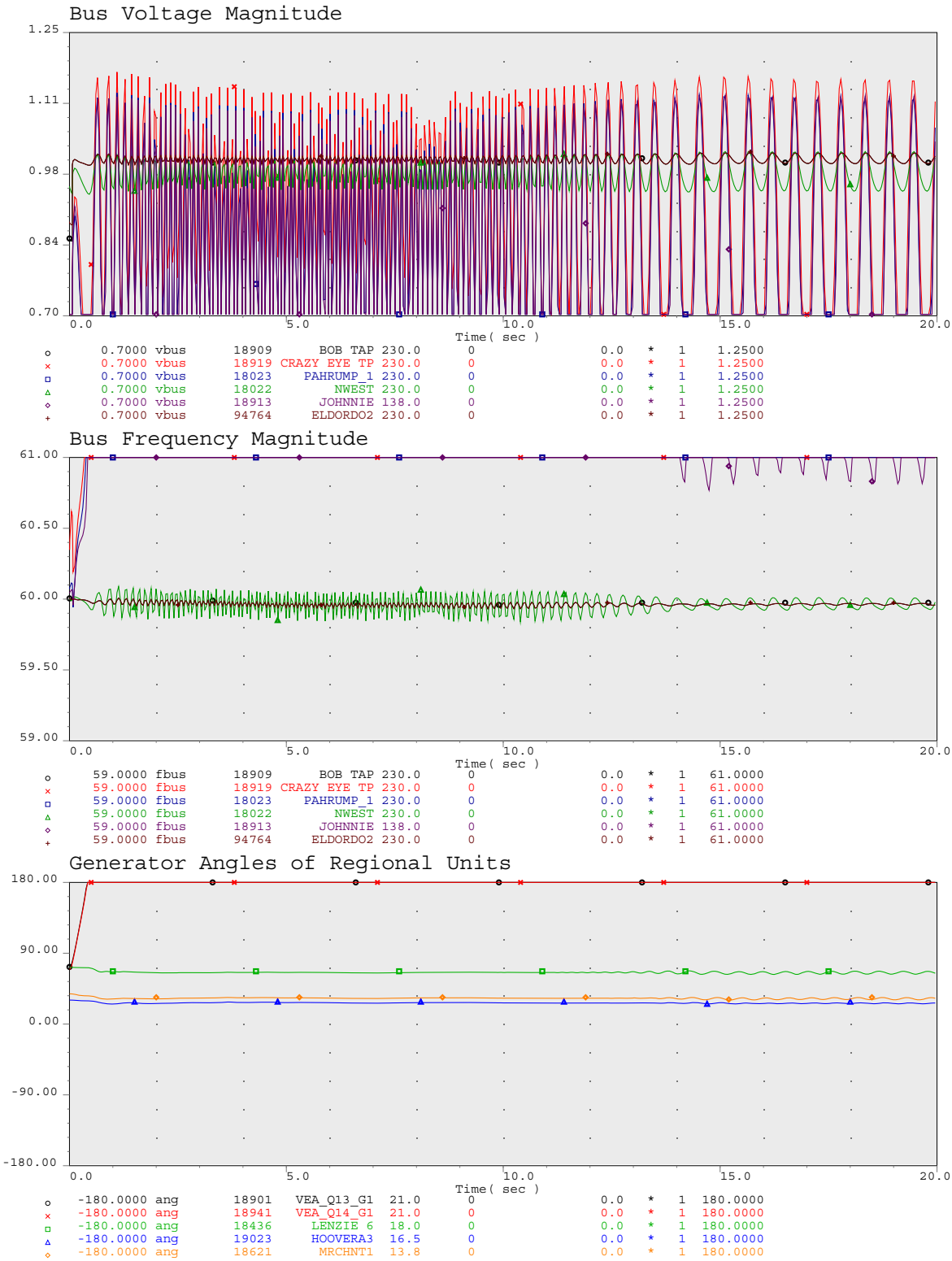




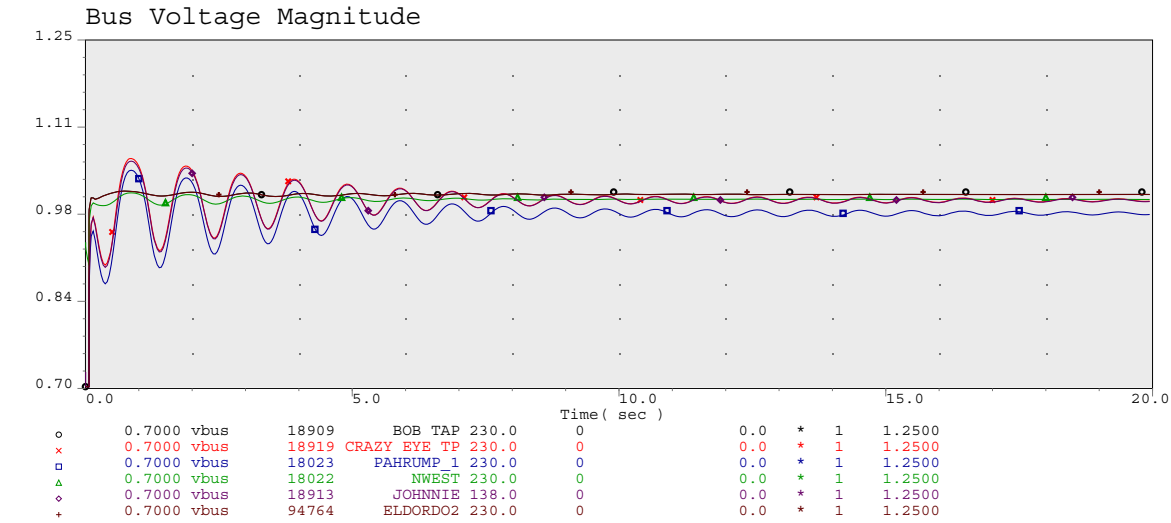
VEA QCA PHASE 2 STUDIES ON-PEAK CASE
Innovation Tie Added
Comstruc Pahrump-Crazy Eye Tp 230 & Pahrump-Gamebird 138

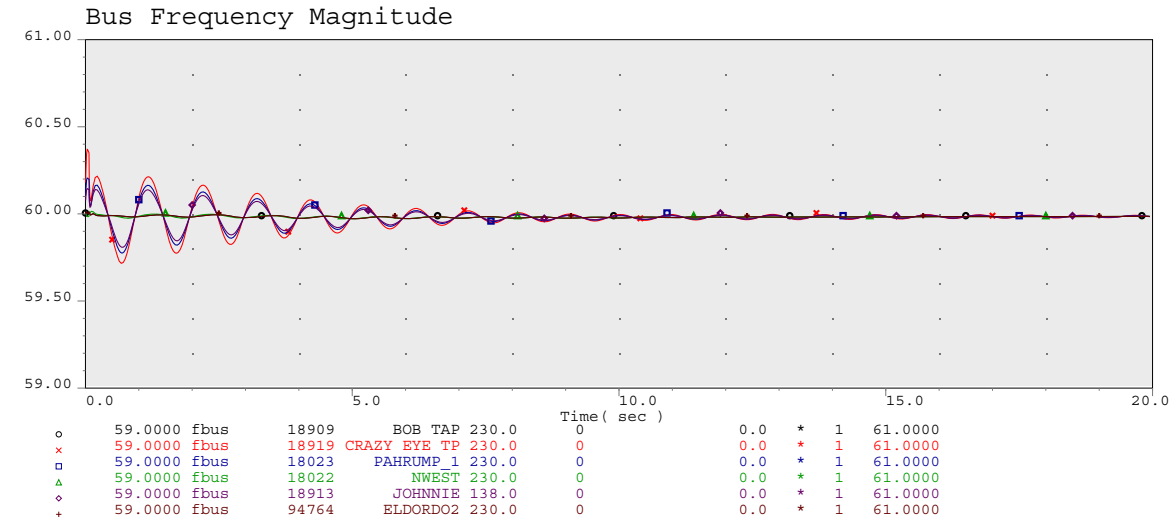


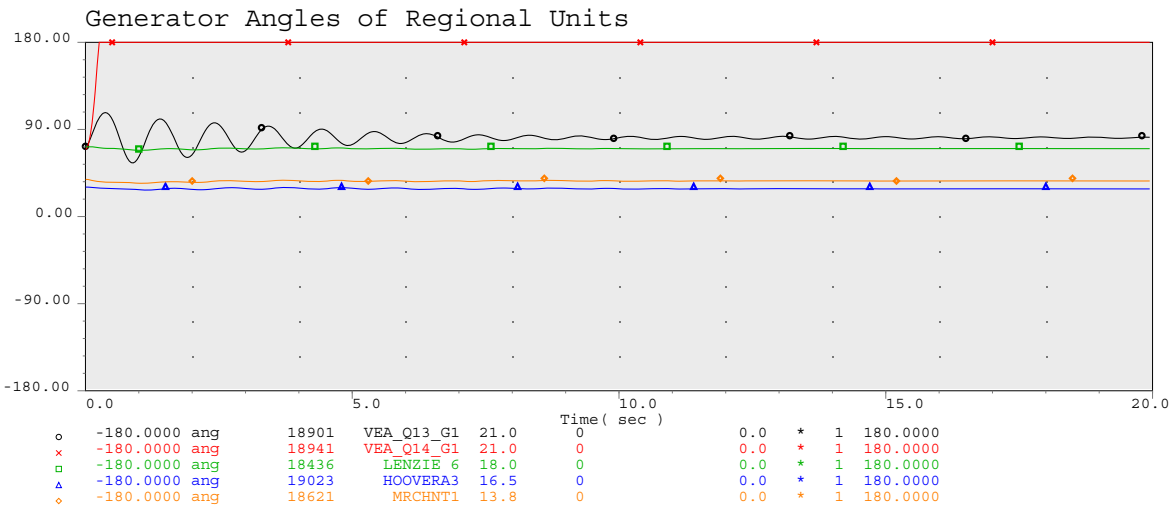
VEA QCA PHASE 2 STUDIES ON-PEAK CASE
Innovation Tie Added
Comstruc Pahrump-Crazy Eye Tp 230 & Pahrump-Gamebird 138 with RAS



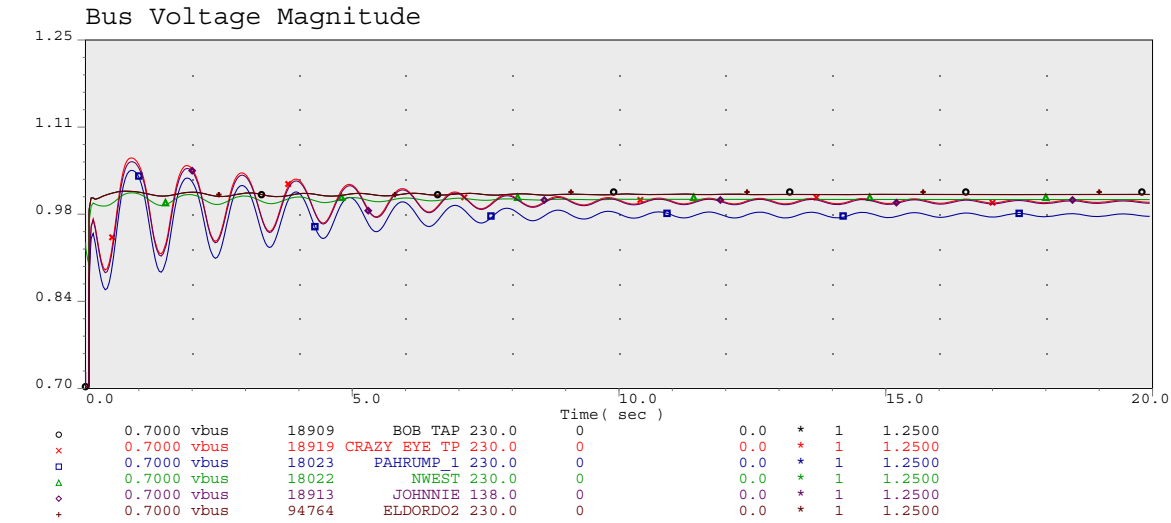
VEA QCA PHASE 2 STUDIES ON-PEAK CASE
Innovation Tie Added
Comstruc Crazy Eye Tp-Bob Tap 230 & GMBD-Sandy 138

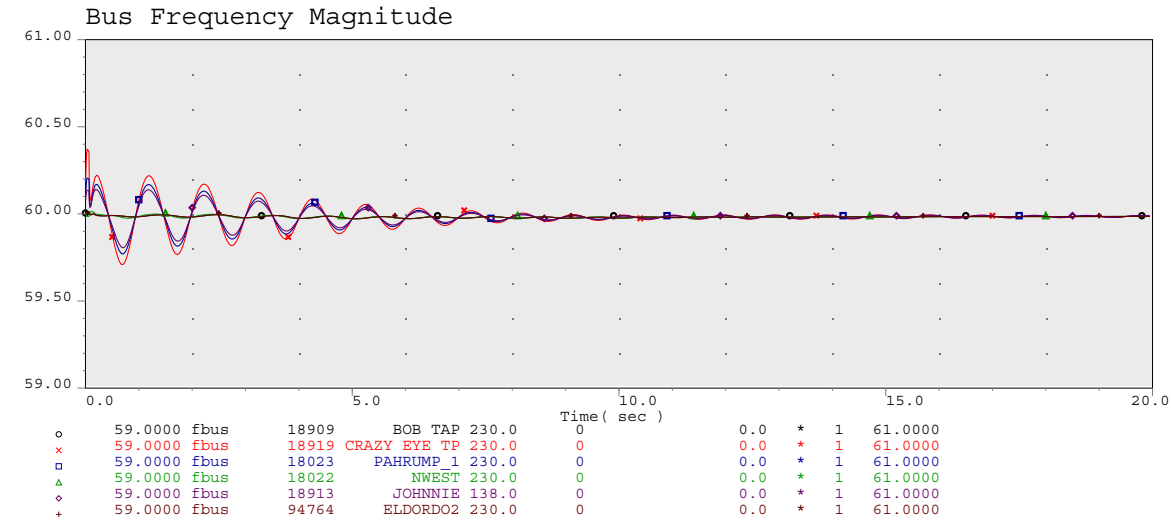


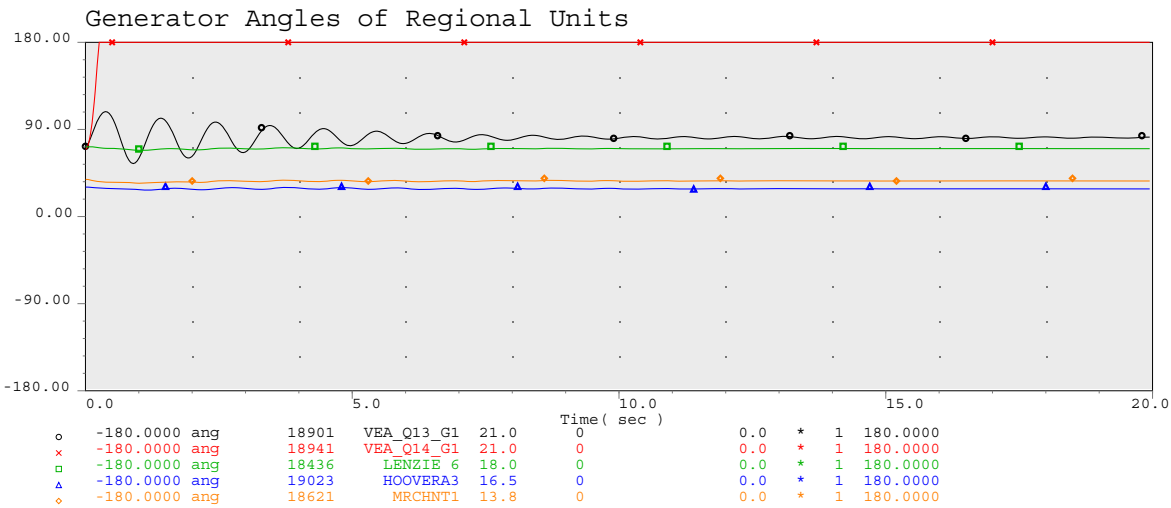




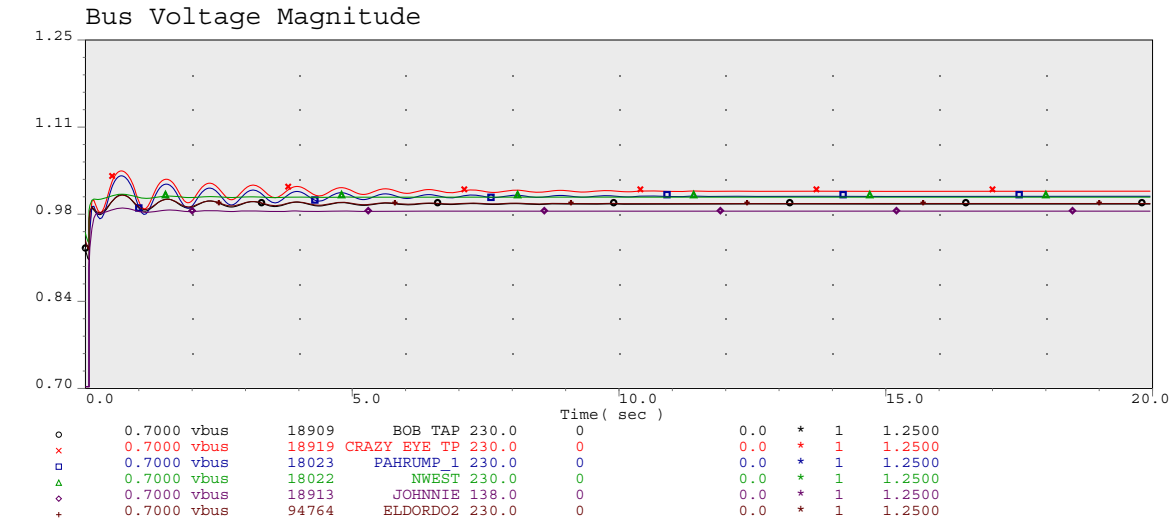
VEA QCA PHASE 2 STUDIES ON-PEAK CASE
Innovation Tie Added
Comstruc Crazy Eye Tp-Bob Tap 230 & GMBD-Sandy 138 with RAS

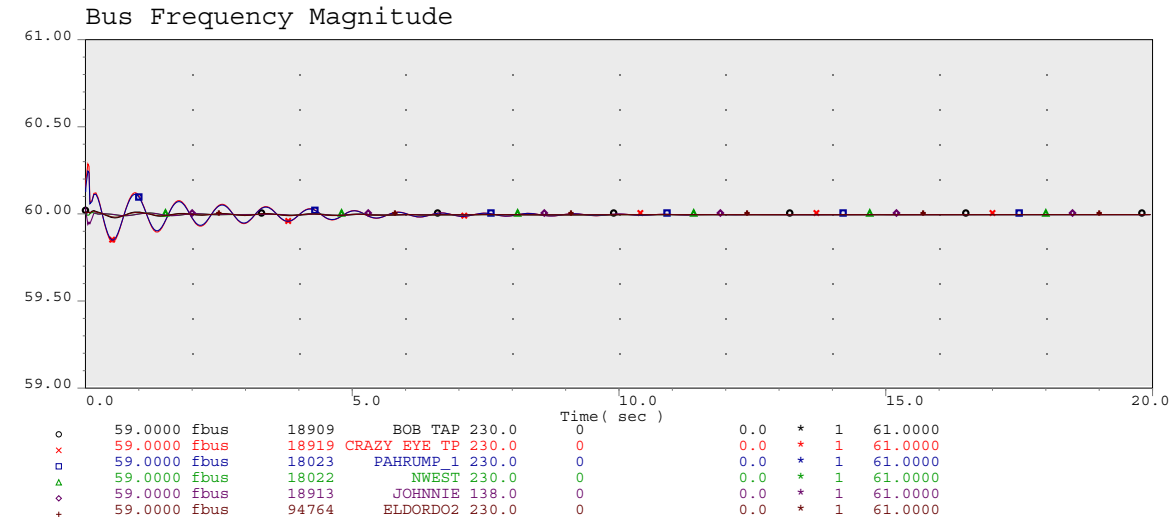


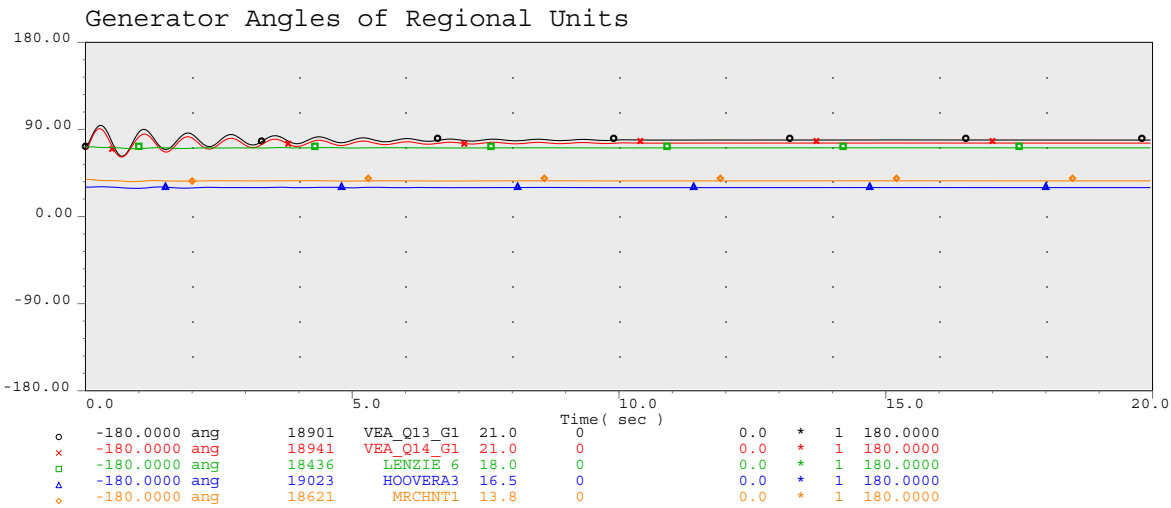




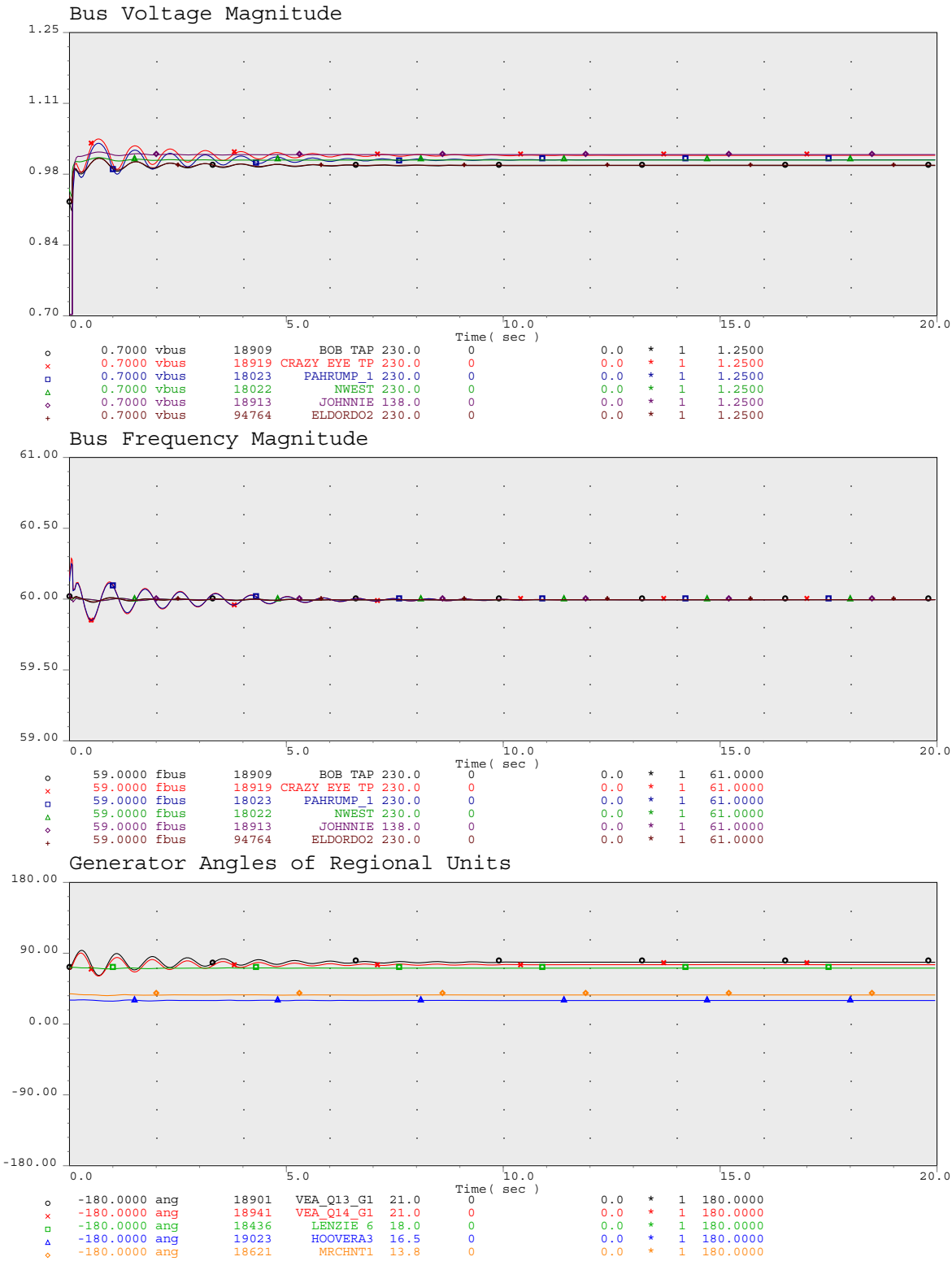
VEA QCA PHASE 2 STUDIES ON-PEAK CASE
Innovation Tie Added
Crazy Eye Tp-Bob Tap 230 & GMBD-Sandy 138 Line & Innov-McrySWT 138kV Line with



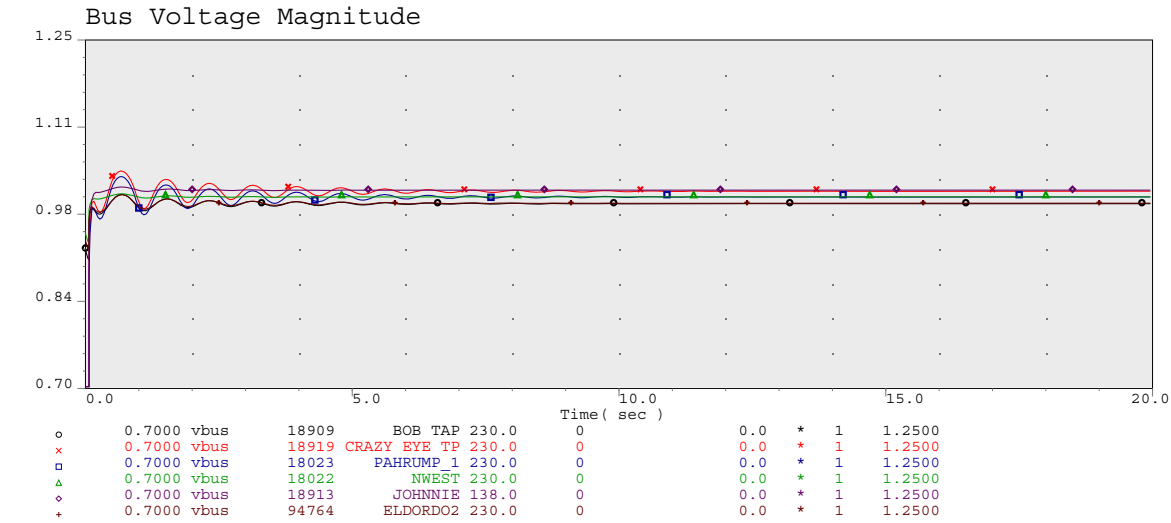


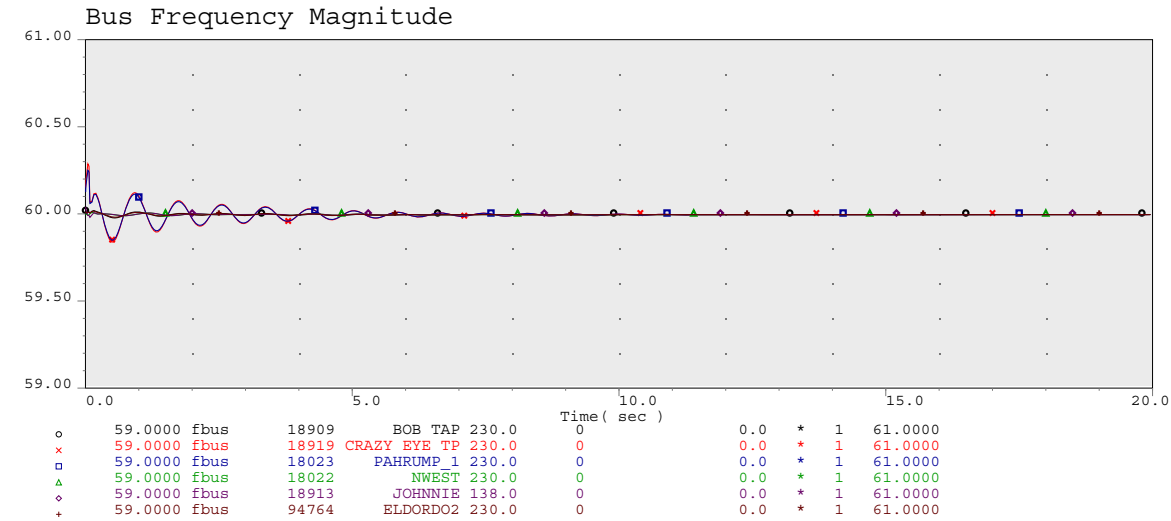


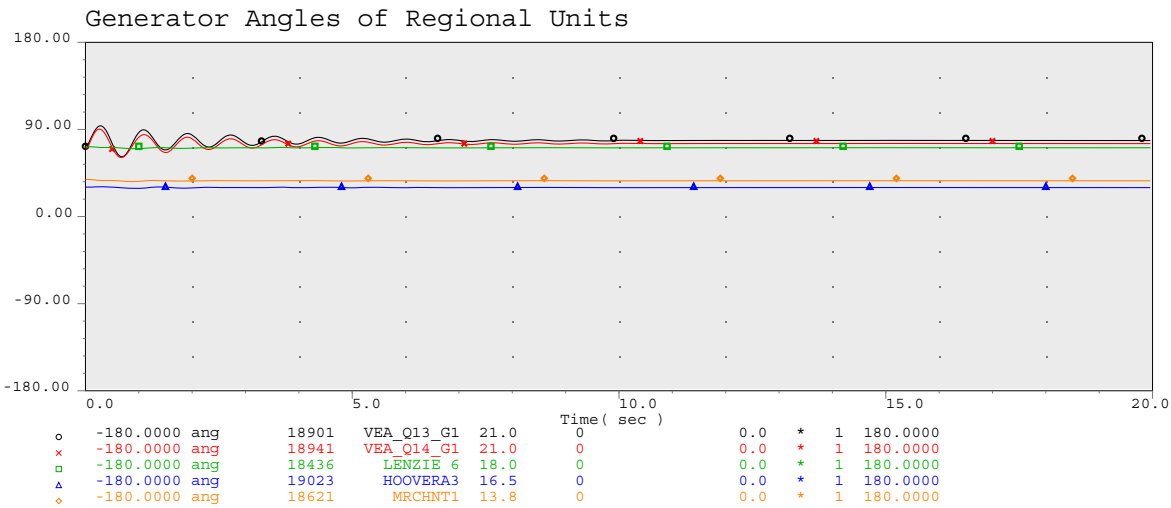
VEA QCA PHASE 2 STUDIES ON-PEAK CASE
Innovation Tie Added
Comstruc Pahrump-Vista 138 & Pahrump-Innovation 230 & Vsta-Charleston 138



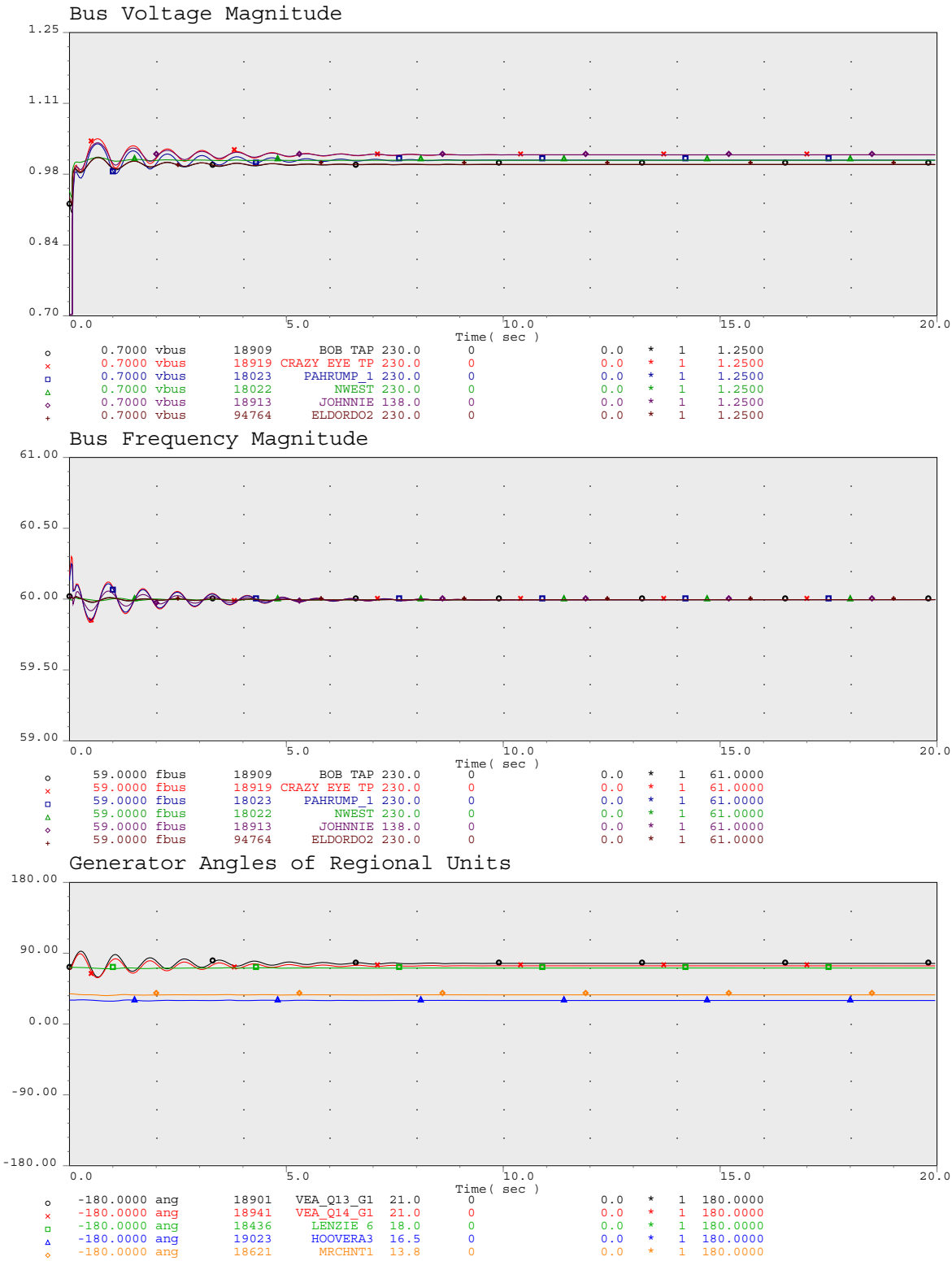
VEA QCA PHASE 2 STUDIES ON-PEAK CASE
Innovation Tie Added
Comstruc Vista-Johnnie 138 & Pahrump-Innovation 230



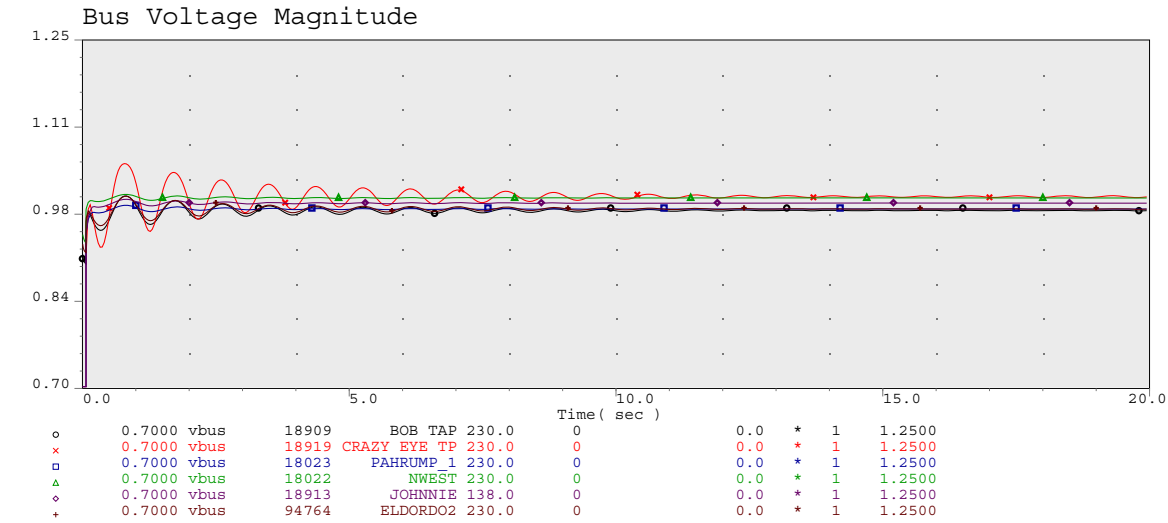


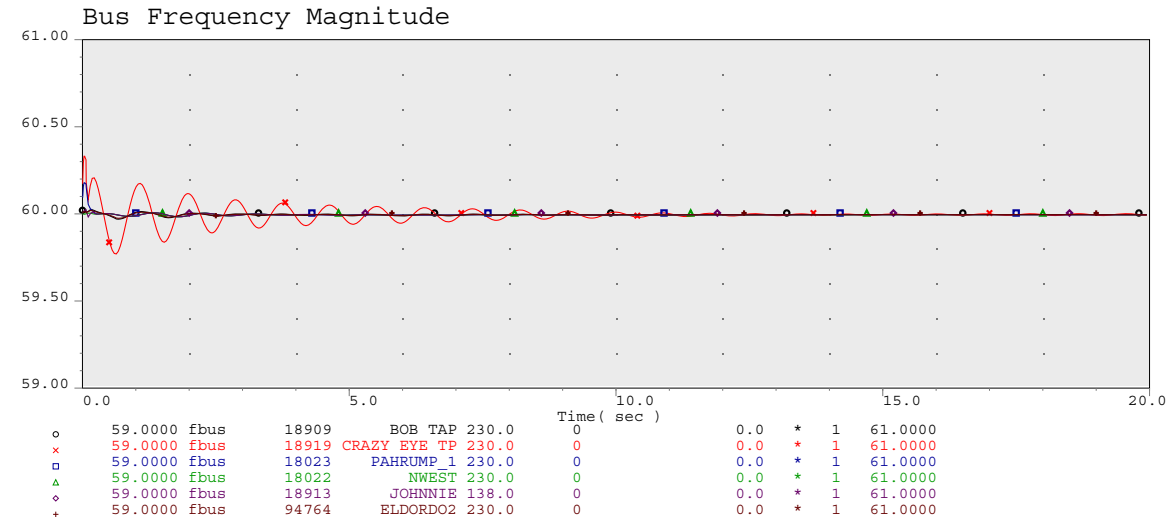


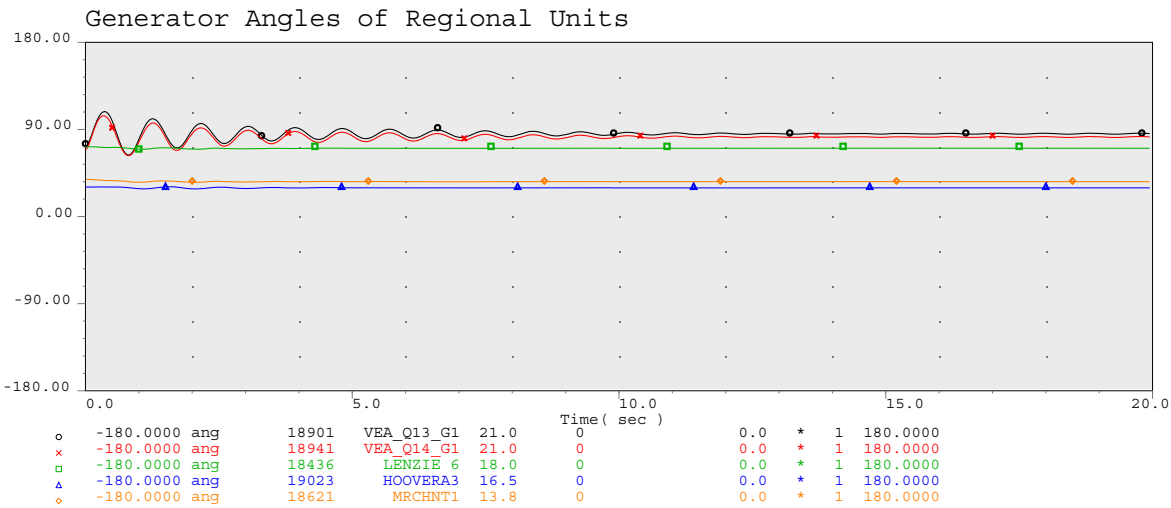
VEA QCA PHASE 2 STUDIES ON-PEAK CASE
Innovation Tie Added
Comstruc Vista-Johnnie 138 & Pahrump-Innovation 230 & Vista-Chas 138



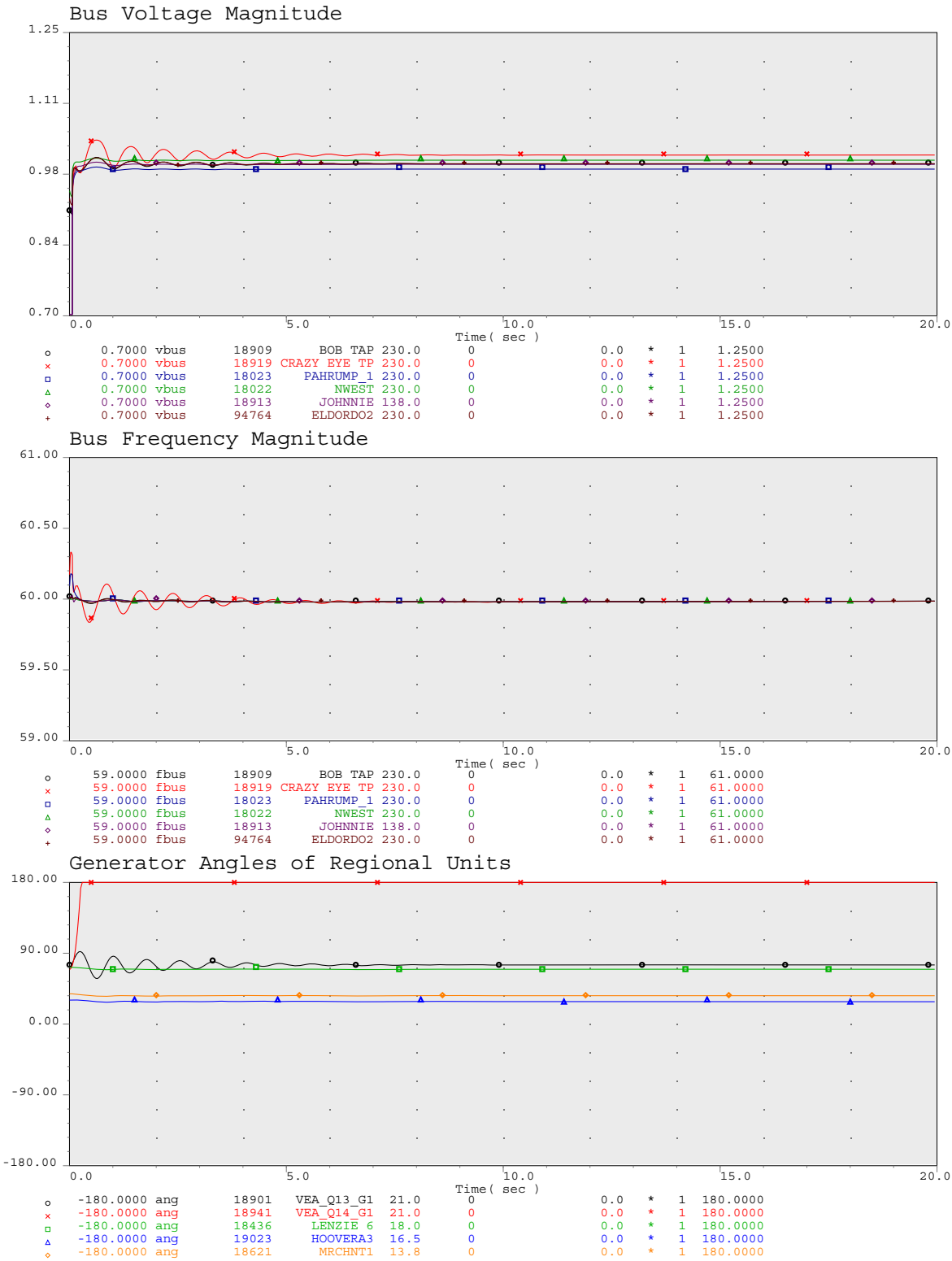
VEA QCA PHASE 2 STUDIES ON-PEAK CASE
Innovation Tie Added
Comstruc Pahrump-Vista 138 & Pahrump-Innovation 230



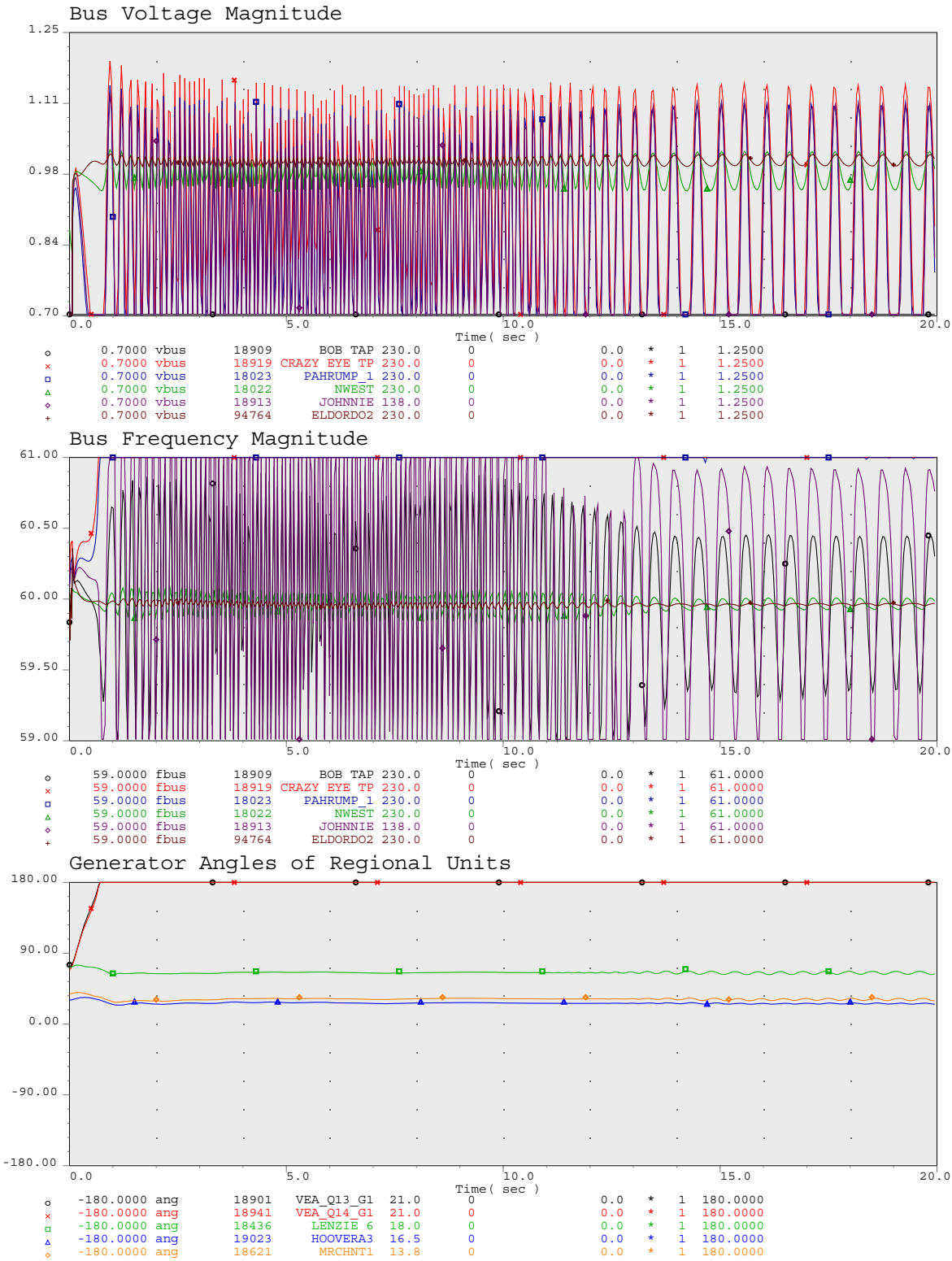




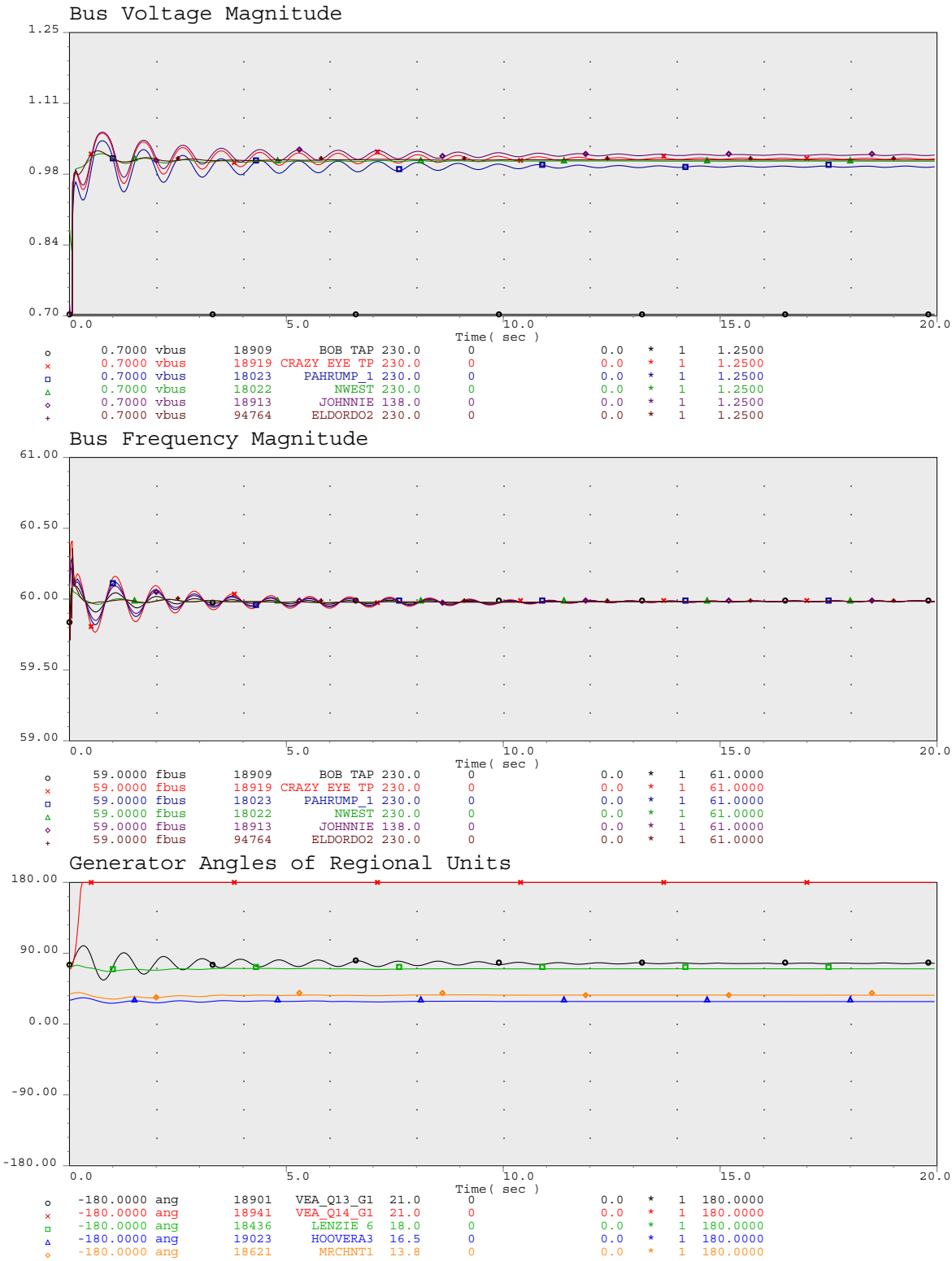
VEA QCA PHASE 2 STUDIES ON-PEAK CASE
Innovation Tie Added
Brkr Fail Pahrump 138/230Kv Tran Bnk 1 & Pahrump -Crazy Eye Tp 230



VEA QCA PHASE 2 STUDIES ON-PEAK CASE
Innovation Tie Added
Brkr Fail Pahrump 138/230Kv Tran Bnk 1 & Pahrump -Crazy Eye Tp 230 with RAS



VEA QCA PHASE 2 STUDIES ON-PEAK CASE
Innovation Tie Added
Breaker Outage Bob-CRZY & Bob-Mead & Bob-ELD 230kV

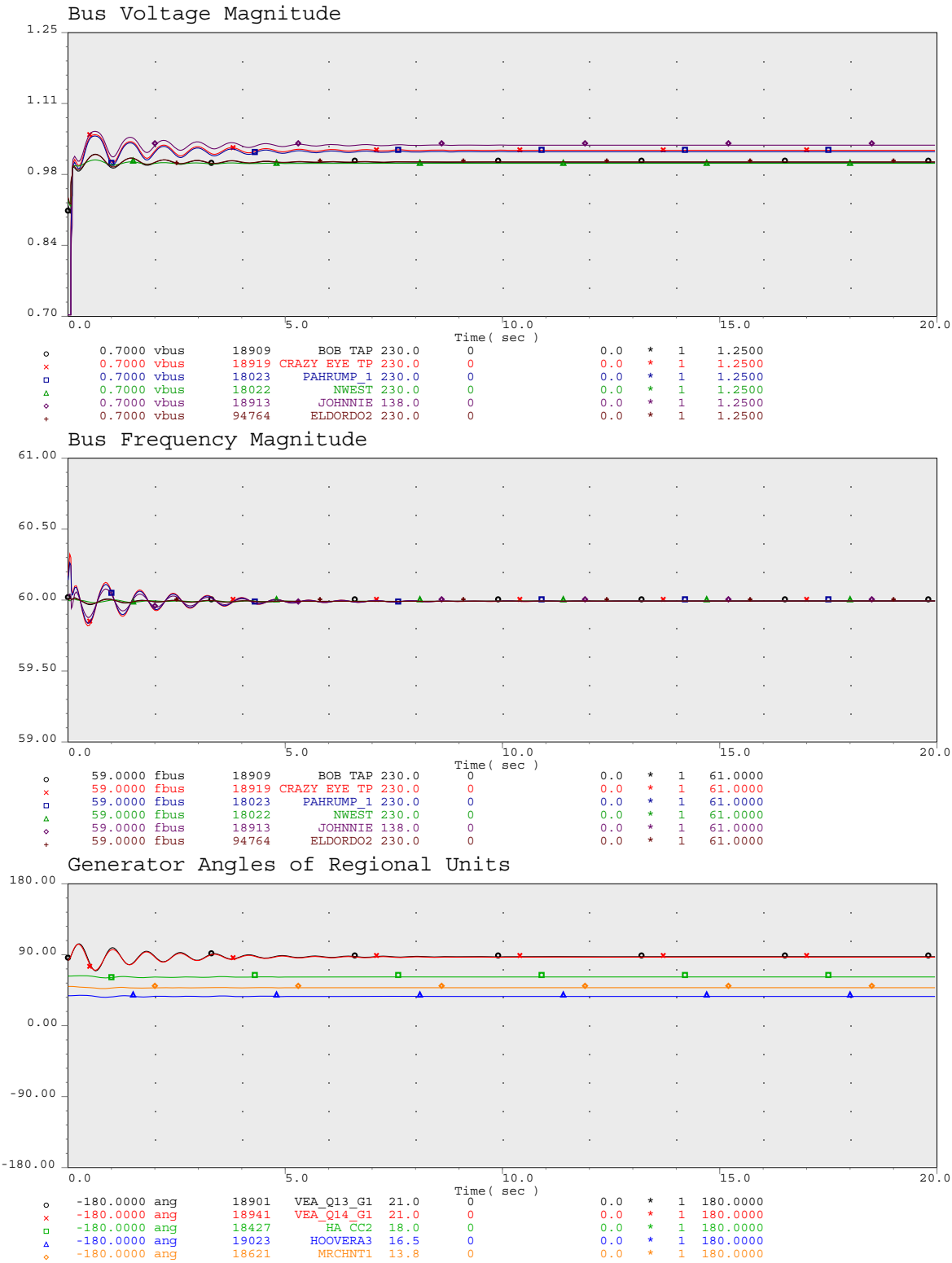


VEA QCA PHASE 2 STUDIES ON-PEAK CASE
Innovation Tie Added
Breaker Outage Bob-CRZY & Bob-Mead & Bob-ELD 230kV

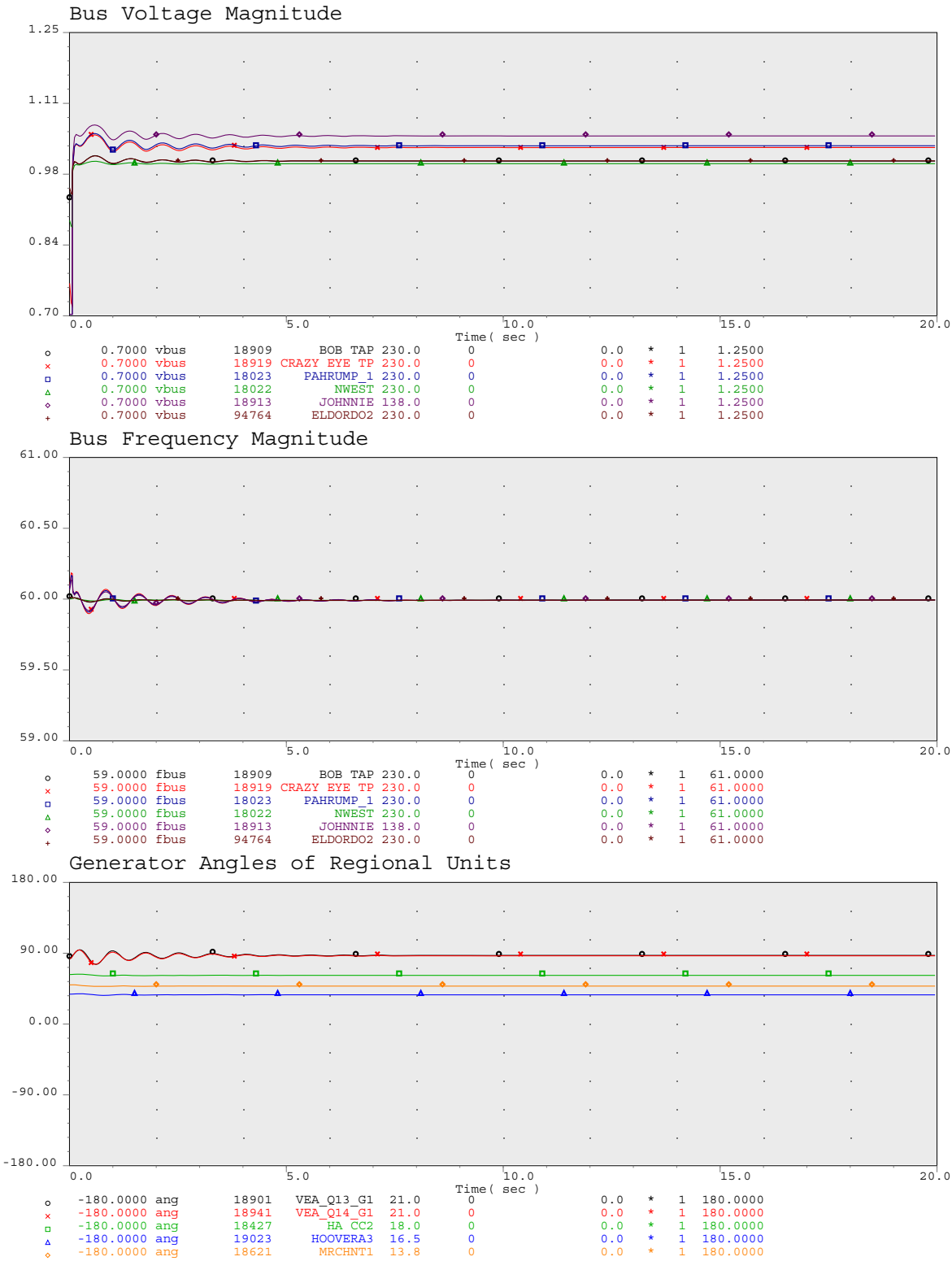
VEA Area

QCA Phase 2 Dynamic Stability Plots

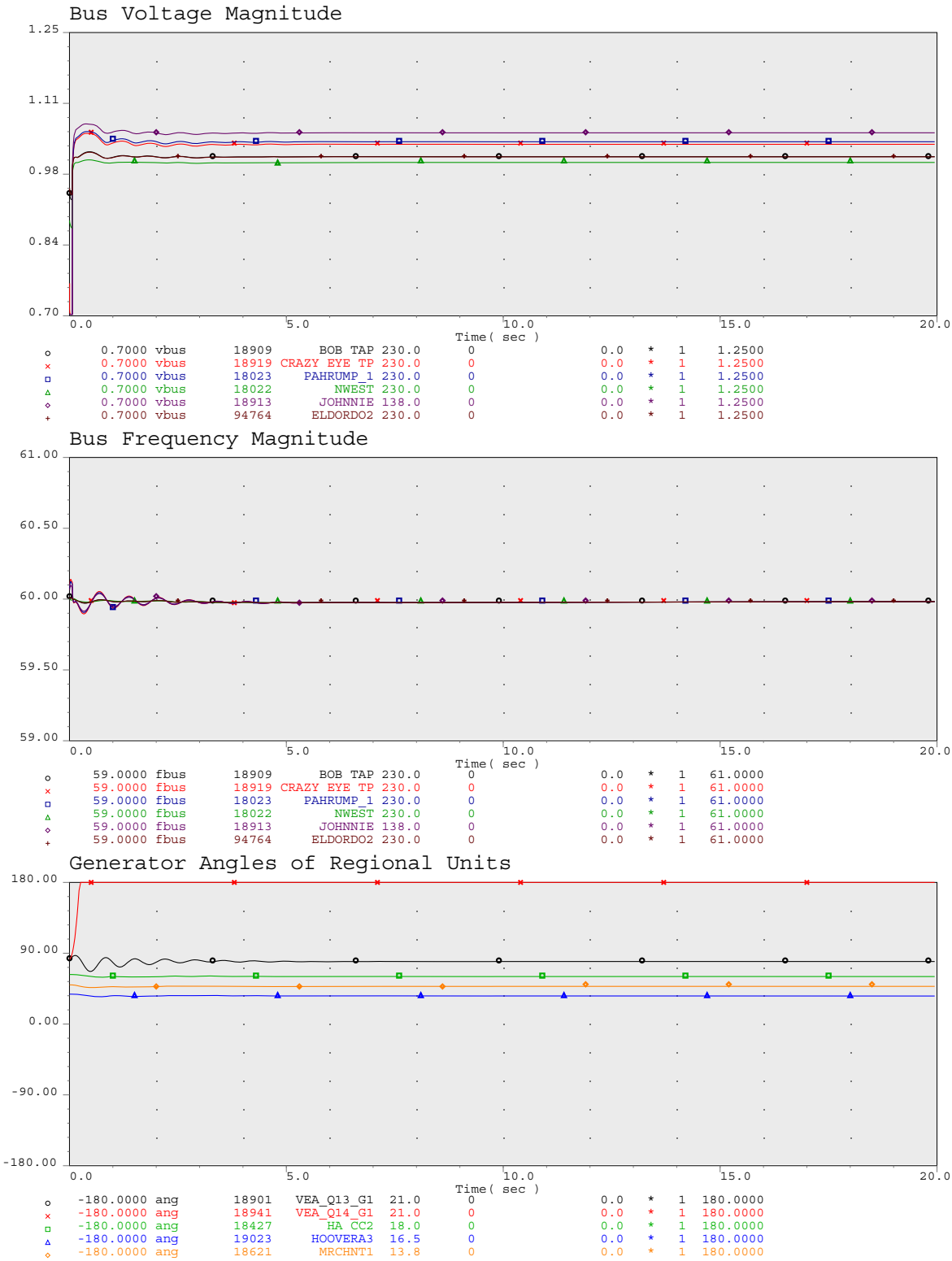
Off-Peak Case



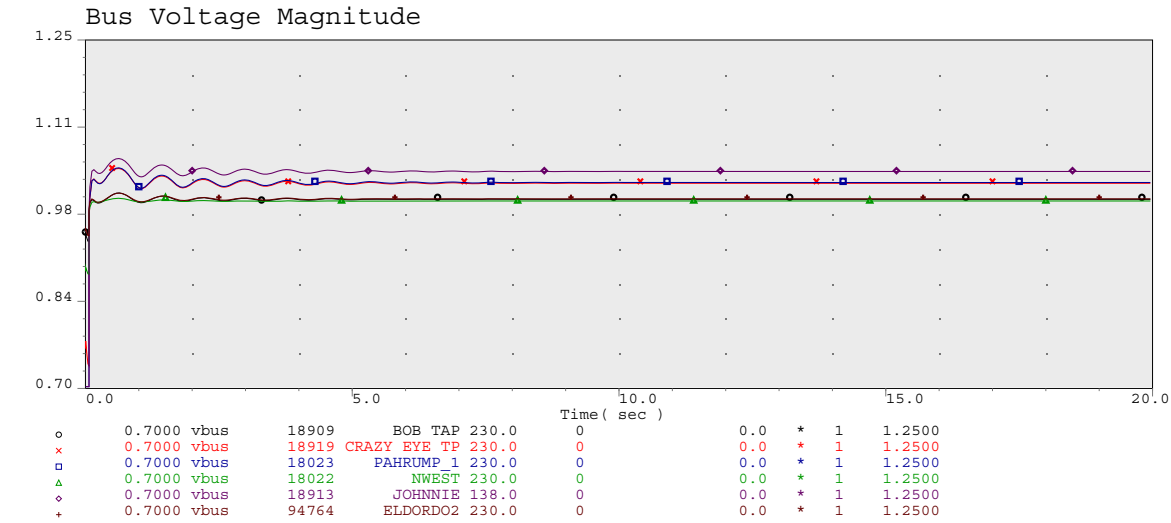
VEA QCA PHASE 2 OFF-PEAK CASE
Innovation Tie Added
Pahrump_1-INNOVATION 230kV Line Ckt 1

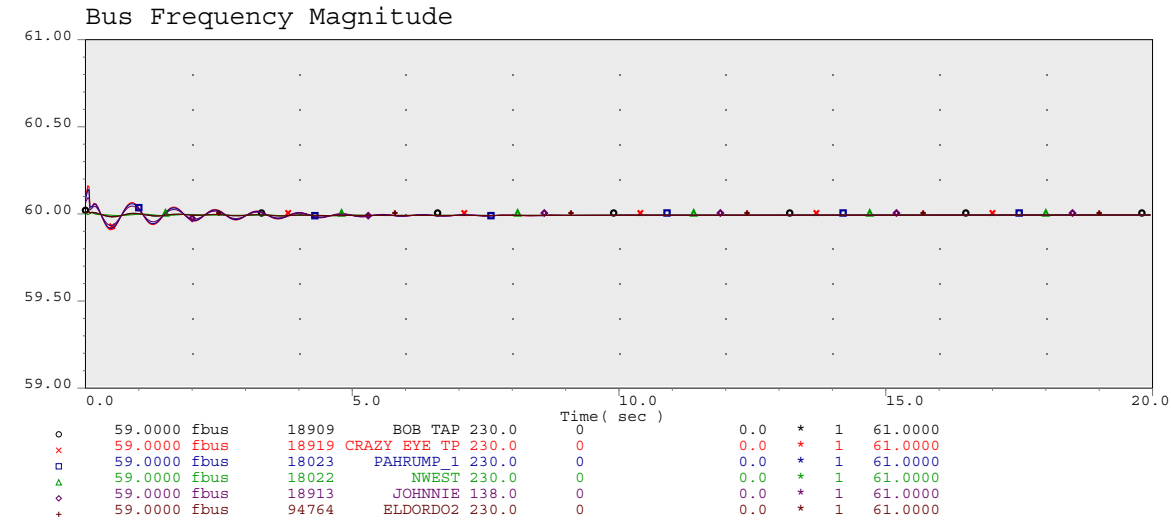


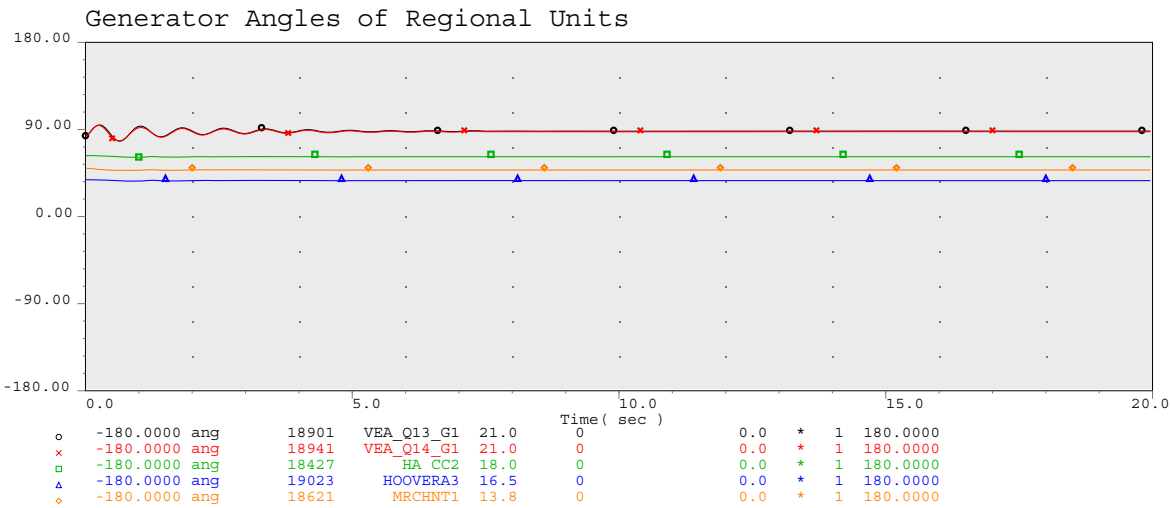
VEA QCA PHASE 2 OFF-PEAK CASE
Innovation Tie Added
Innovation-Desert View 230kV Line Ckt 1



VEA QCA PHASE 2 OFF-PEAK CASE
Innovation Tie Added
Innovation-Desert View 230kV Line Ckt 1 with RAS







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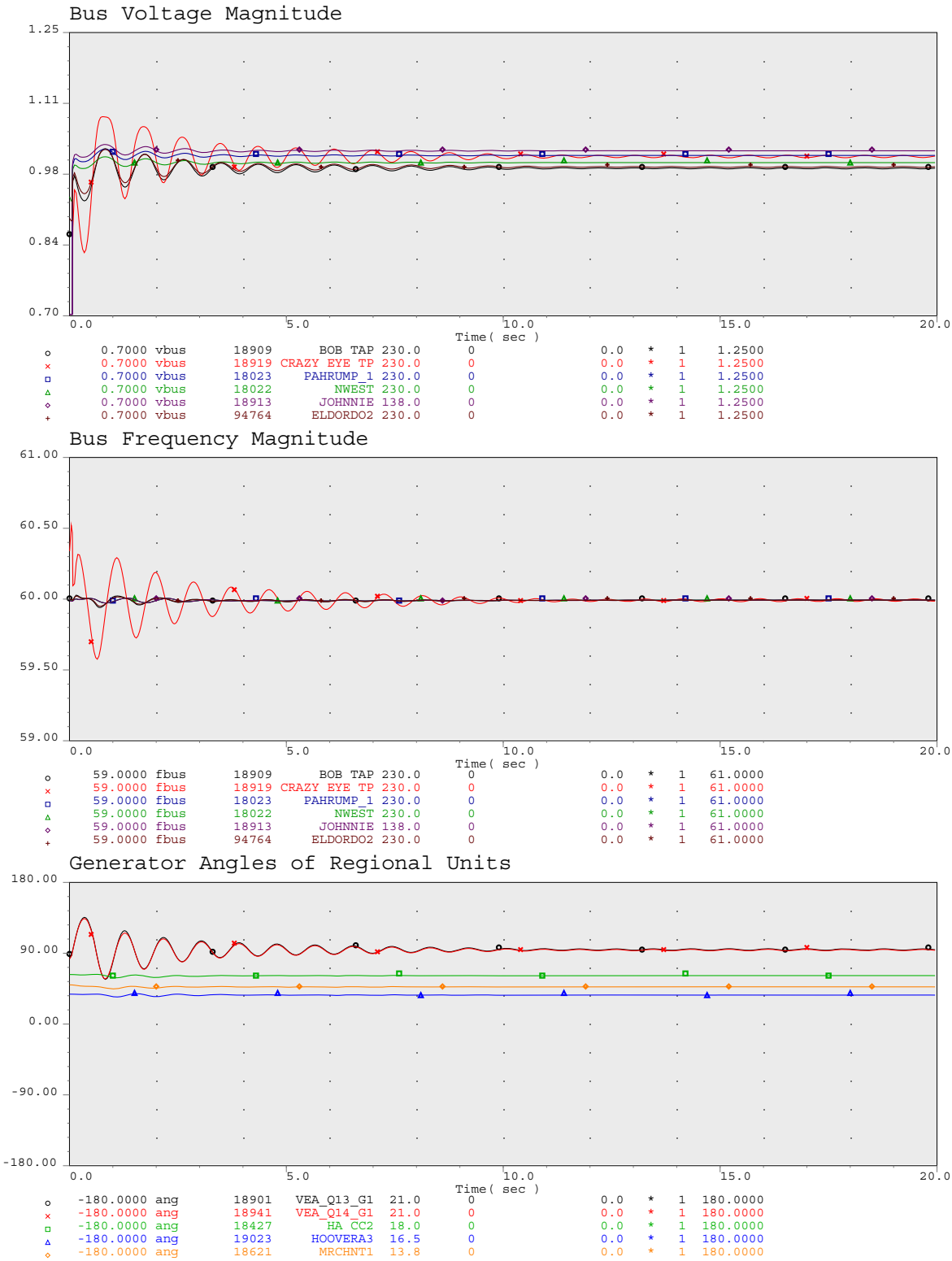
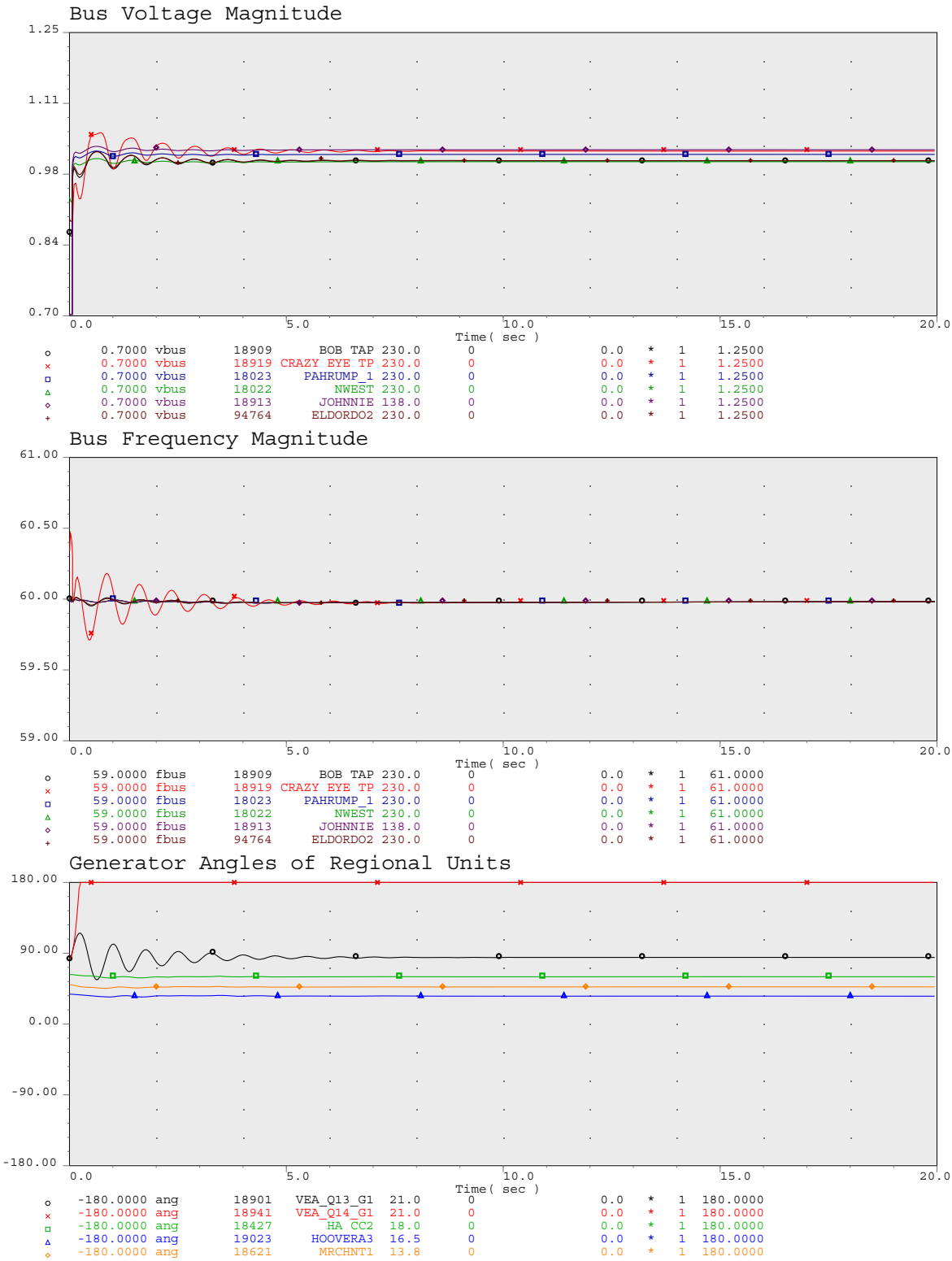
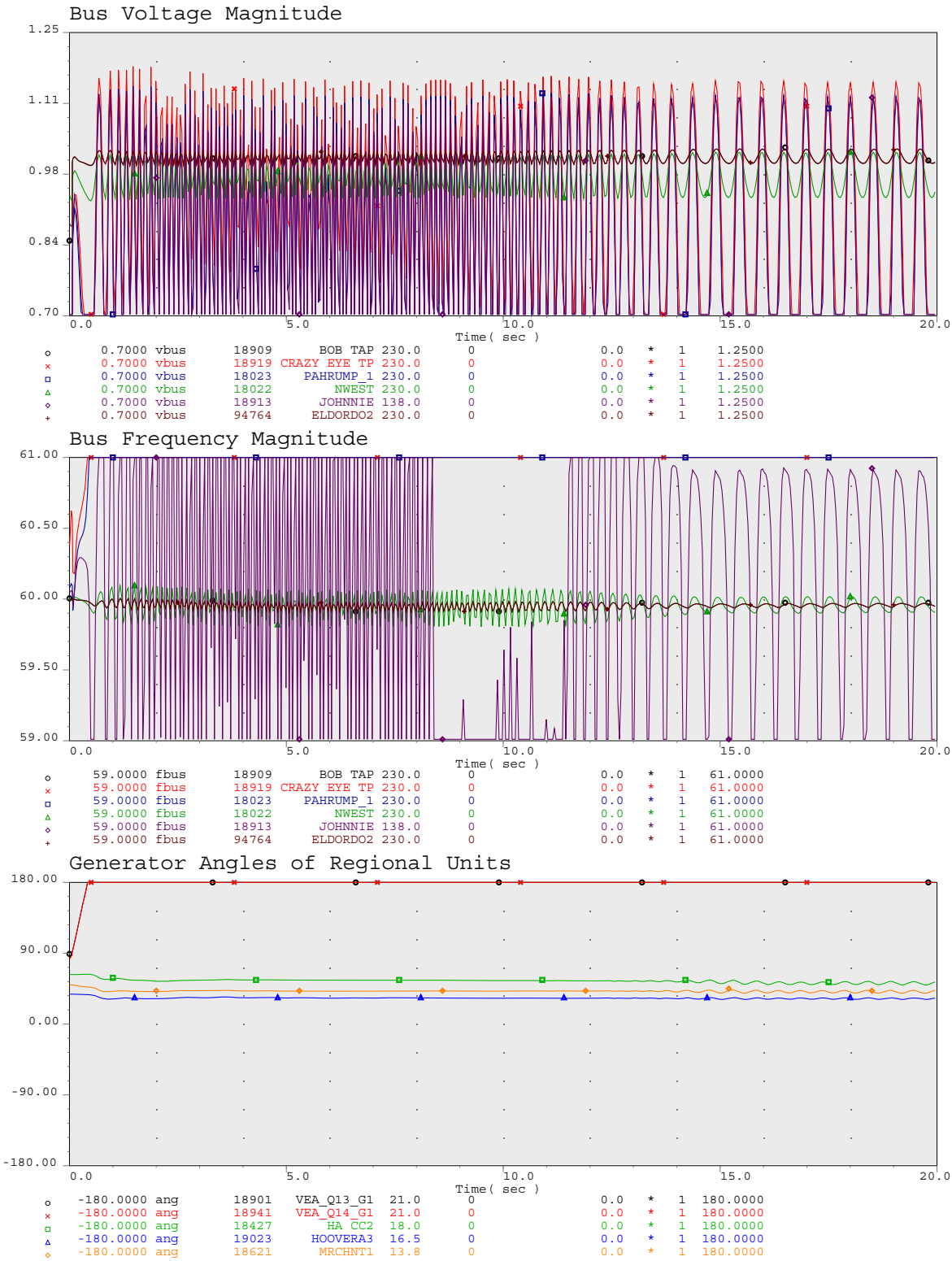
Innovation Tie Added
Innov-DsrtVw 230kV Line Ckt 1 and Innov-McrySWT 138kV Line



VEA QCA PHASE 2 OFF-PEAK CASE
Innovation Tie Added
Pahrump-Crazy Eye Tp 230kV Line Ckt 1



VEA QCA PHASE 2 OFF-PEAK CASE
Innovation Tie Added
Pahrump-Crazy Eye Tp 230kV Line Ckt 1 with RAS



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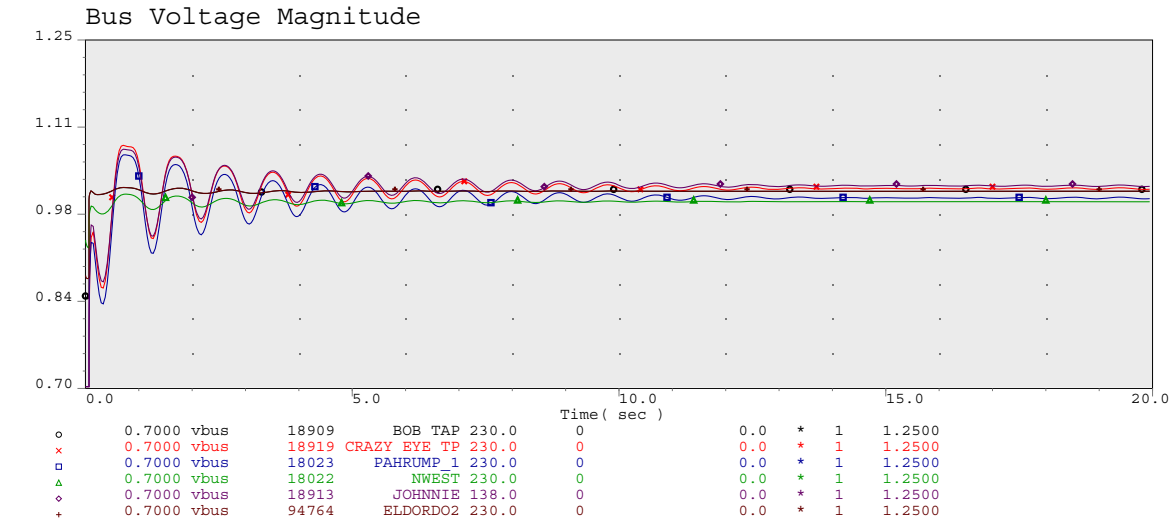
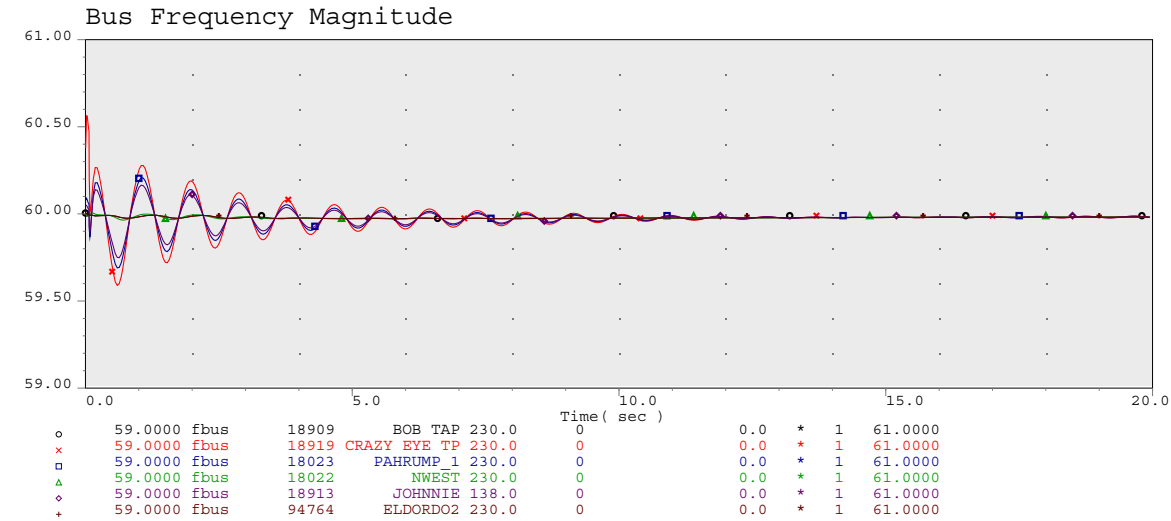
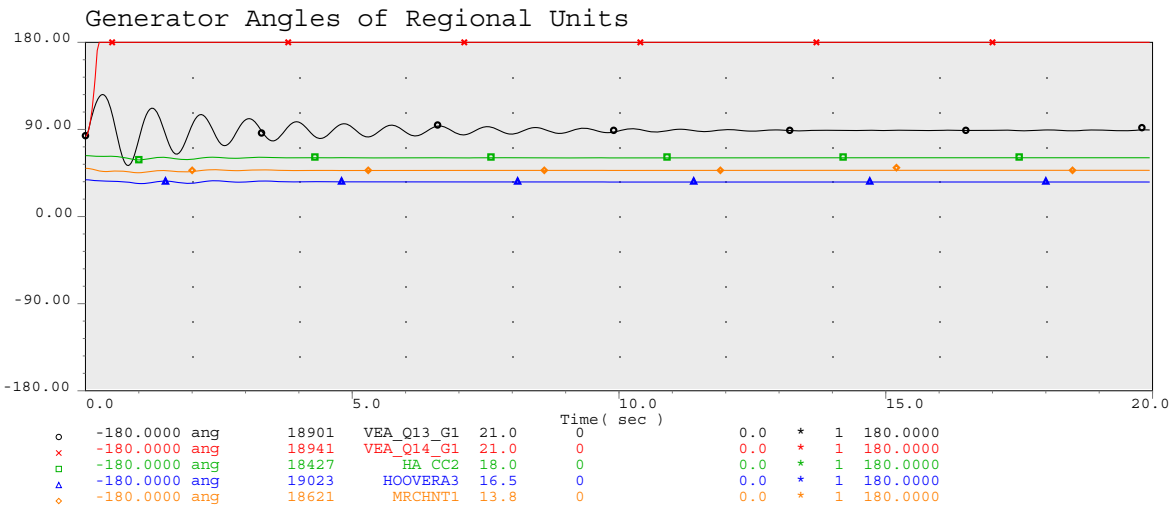
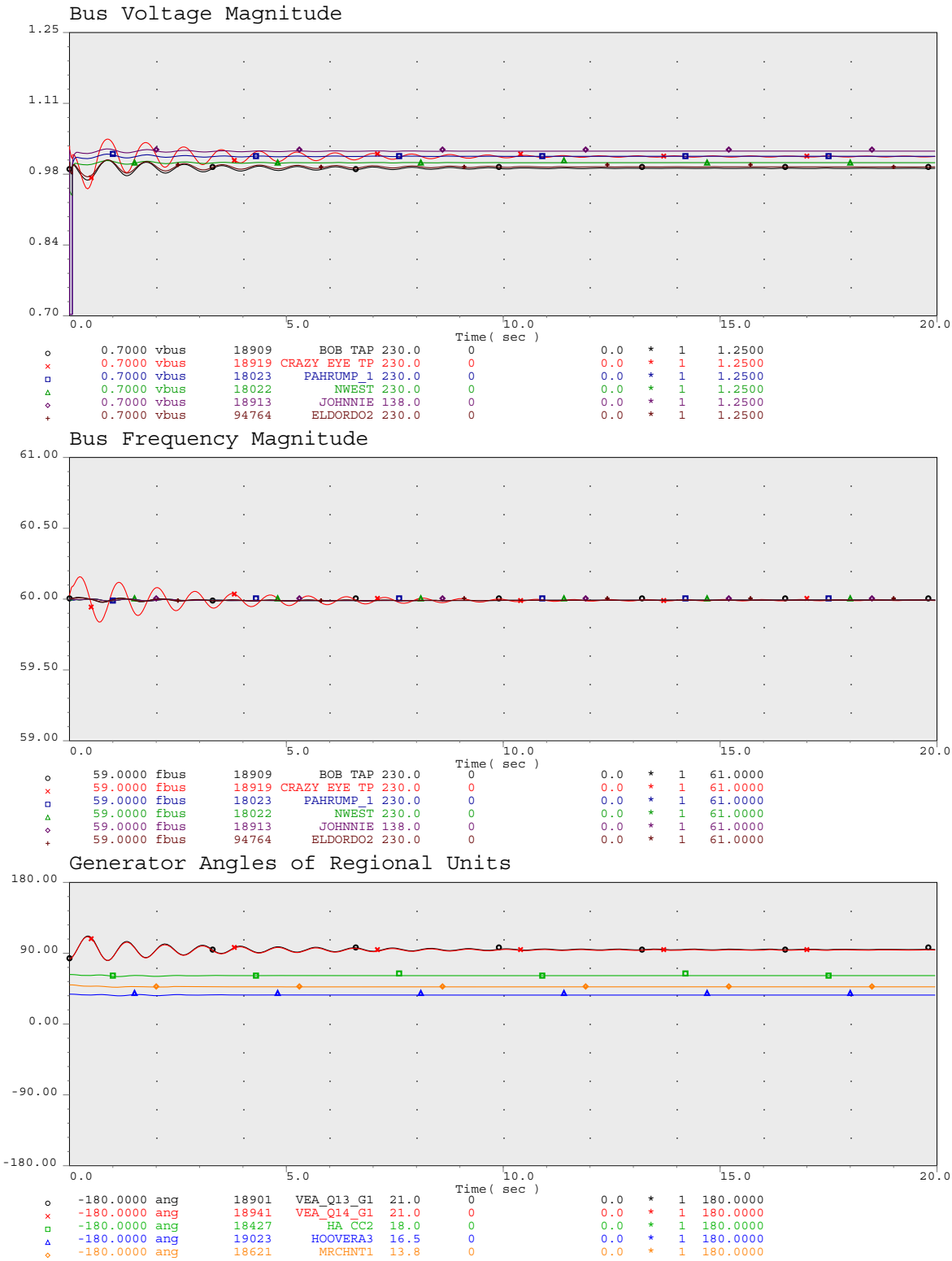
Crazy Eye Tp-Bob Tap 230kV Line Ckt 1



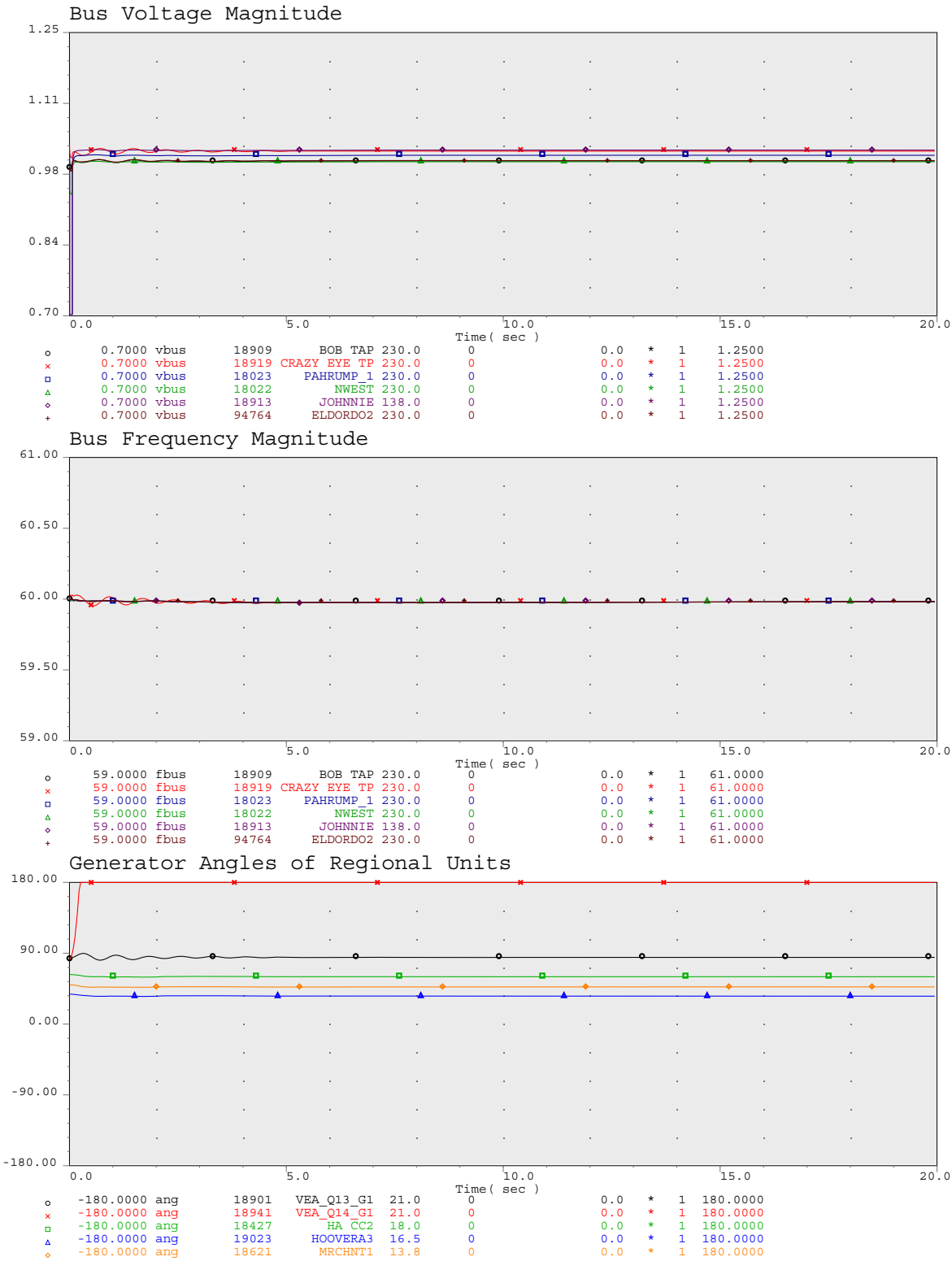




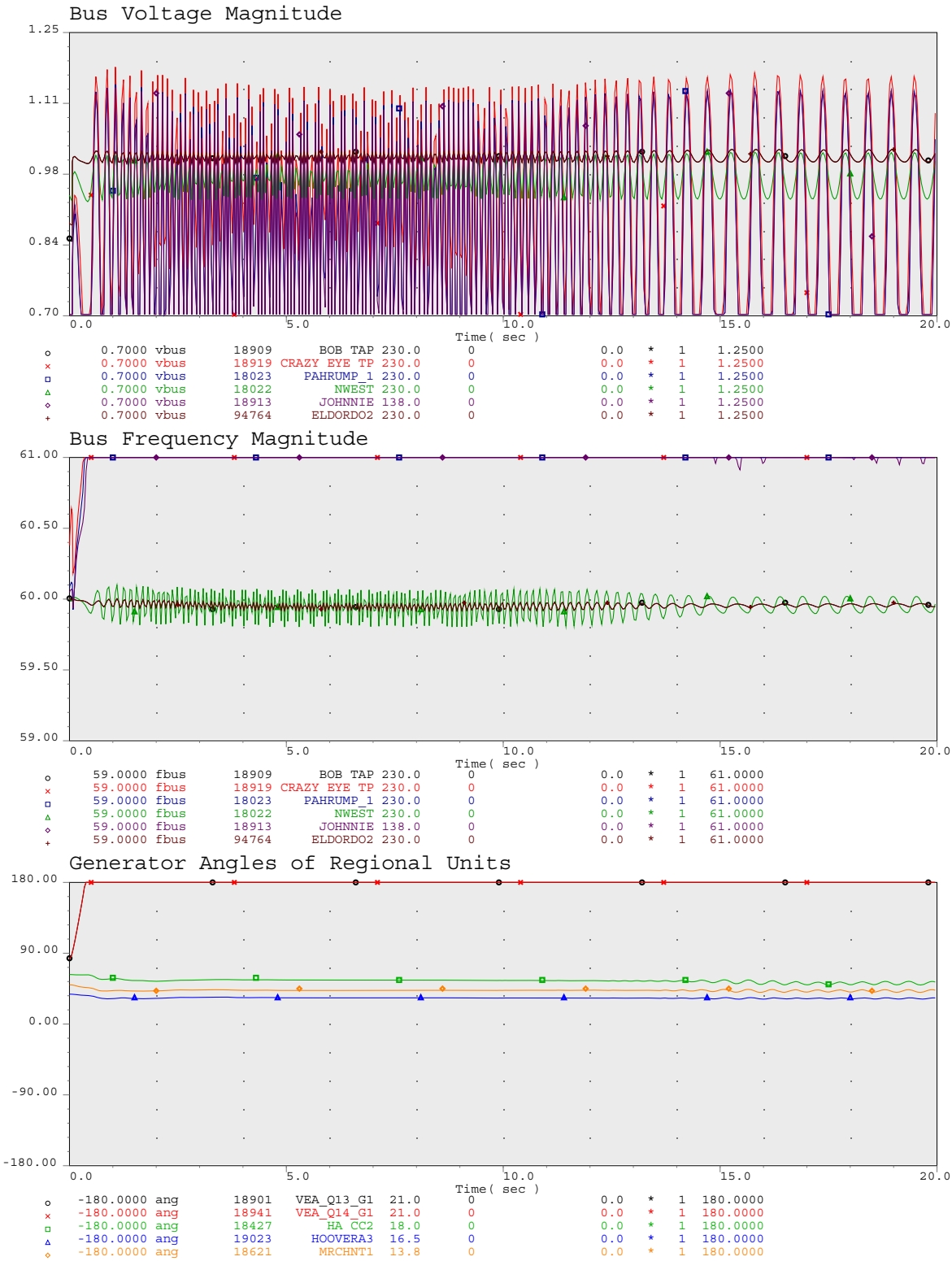
VEA QCA PHASE 2 OFF-PEAK CASE
Innovation Tie Added
Crazy Eye Tp-Bob Tap 230kV Line Ckt 1 with RAS



VEA QCA PHASE 2 OFF-PEAK CASE
Innovation Tie Added
Comstruc Pahrump-Crazy Eye Tp 230kV Line & Pahrump-Gamebird 138kV Line



VEA QCA PHASE 2 OFF-PEAK CASE
Innovation Tie Added
Comstruc Pahrump-Crazy Eye Tp 230kV Line & Pahrump-Gamebird 138kV Line with RAS



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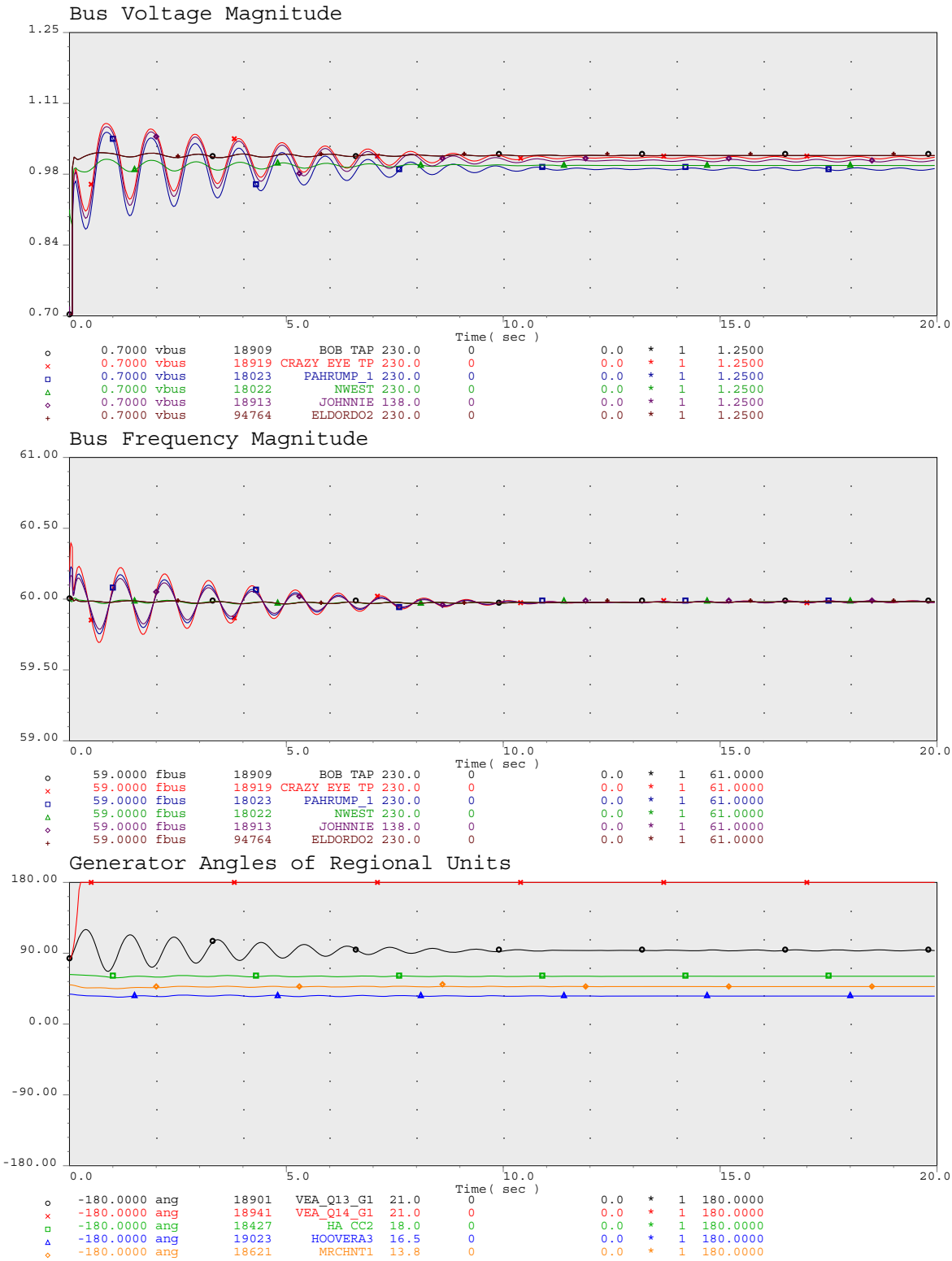
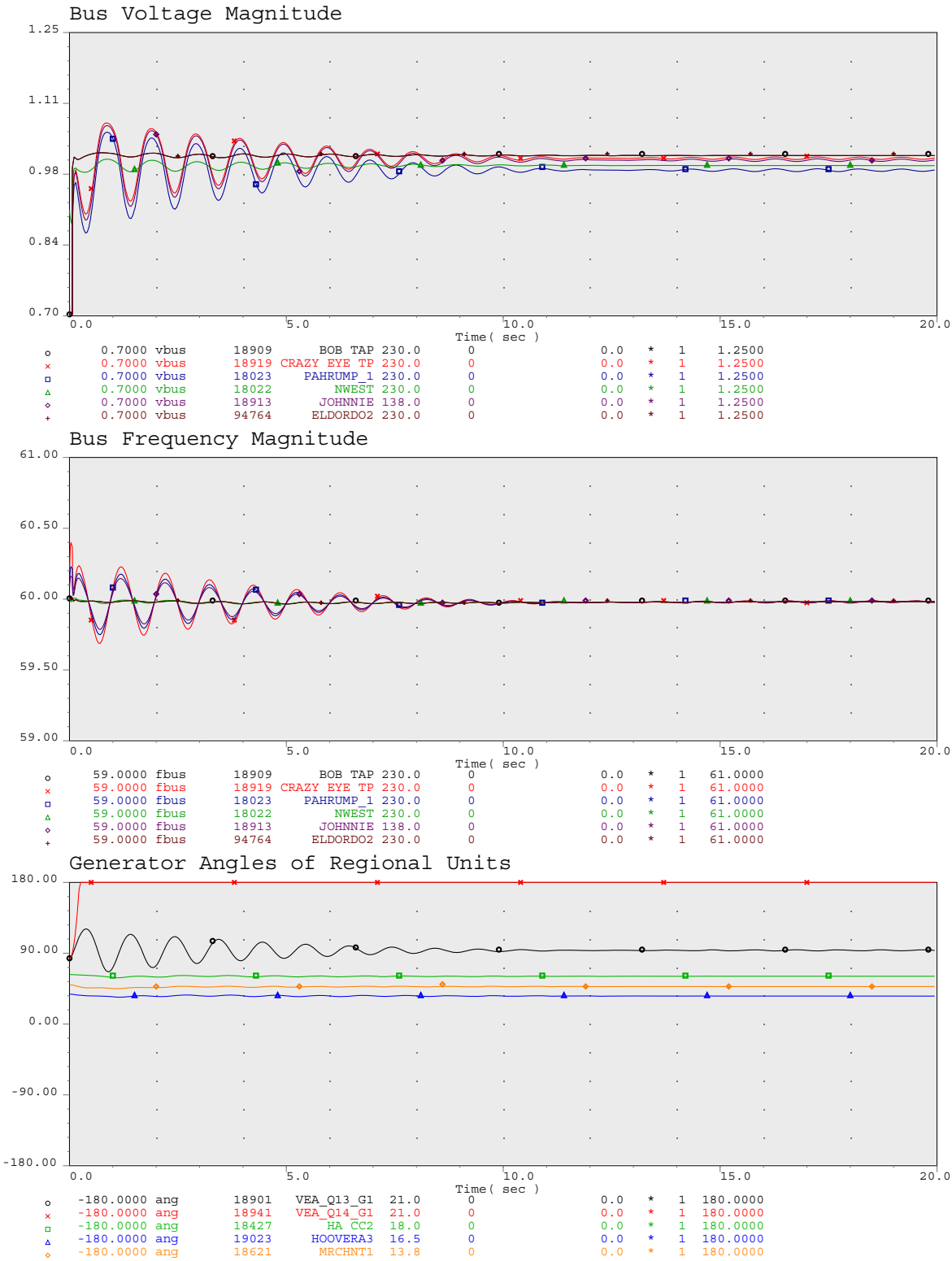
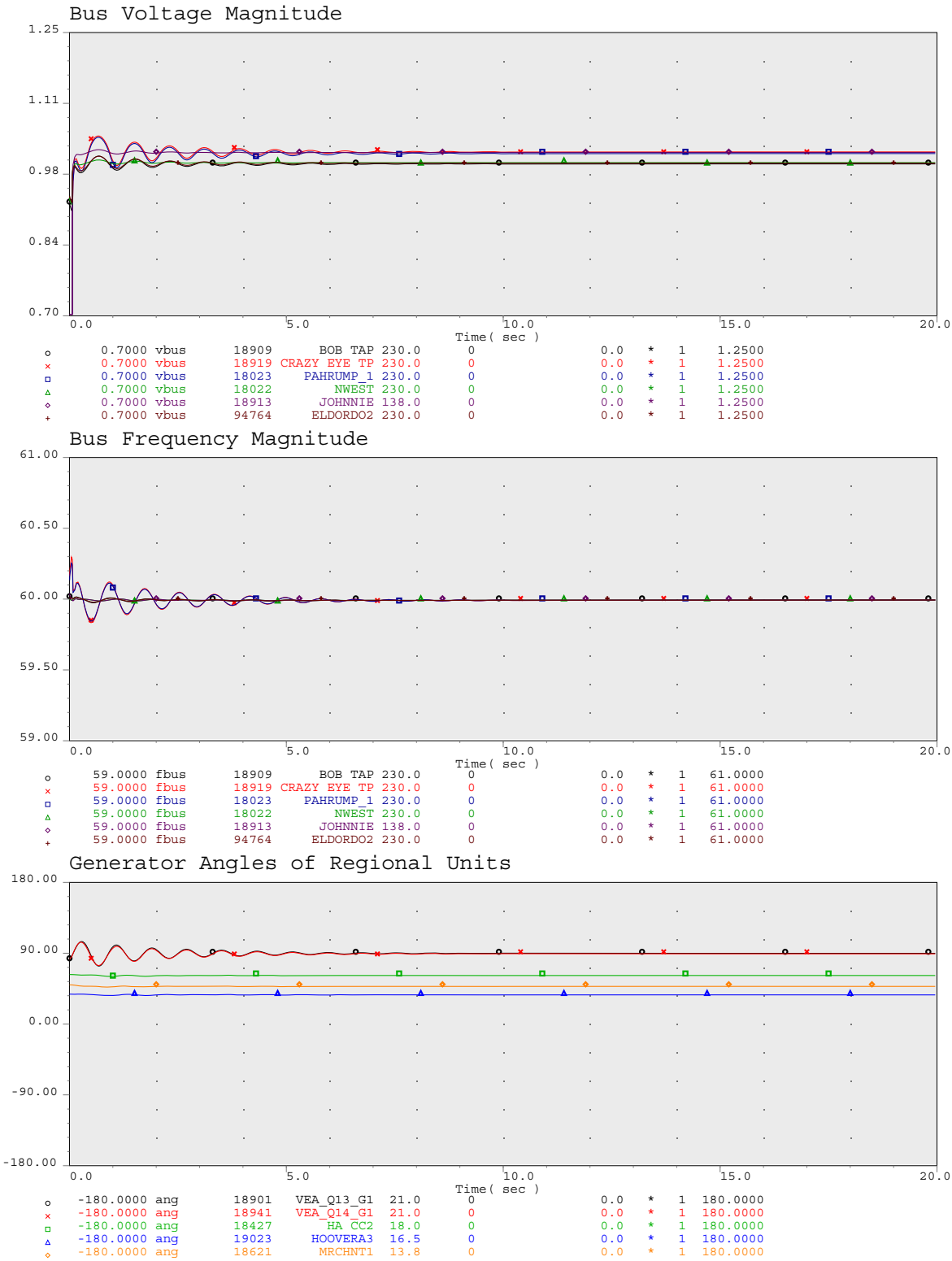
Innovation Tie Added
Comstruc Crazy Eye Tp-Bob Tap 230 & GMBD-Sandy 138



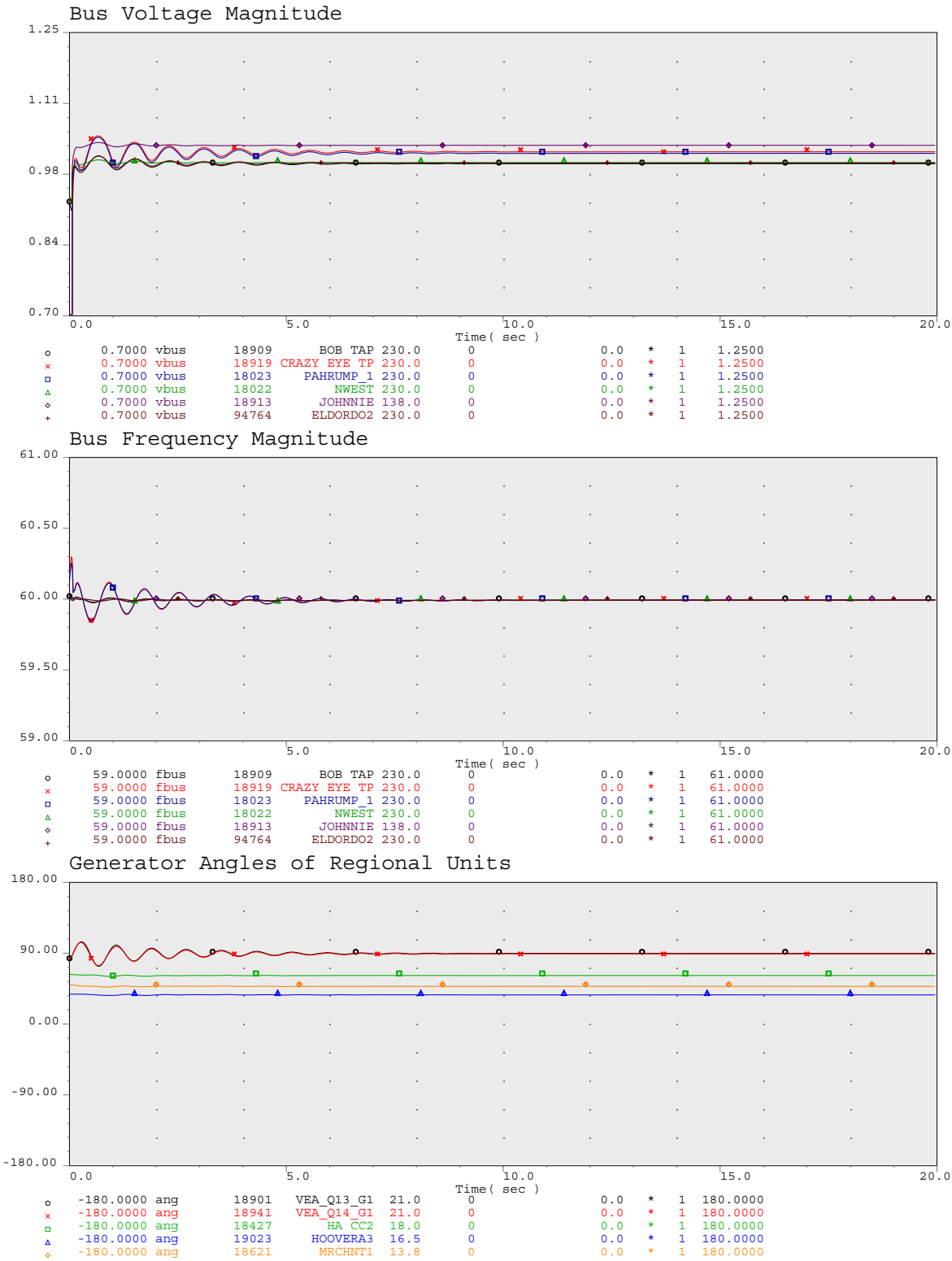
VEA QCA PHASE 2 OFF-PEAK CASE
Innovation Tie Added
Comstruc Crazy Eye Tp-Bob Tap 230 & GMBD-Sandy 138 with RAS



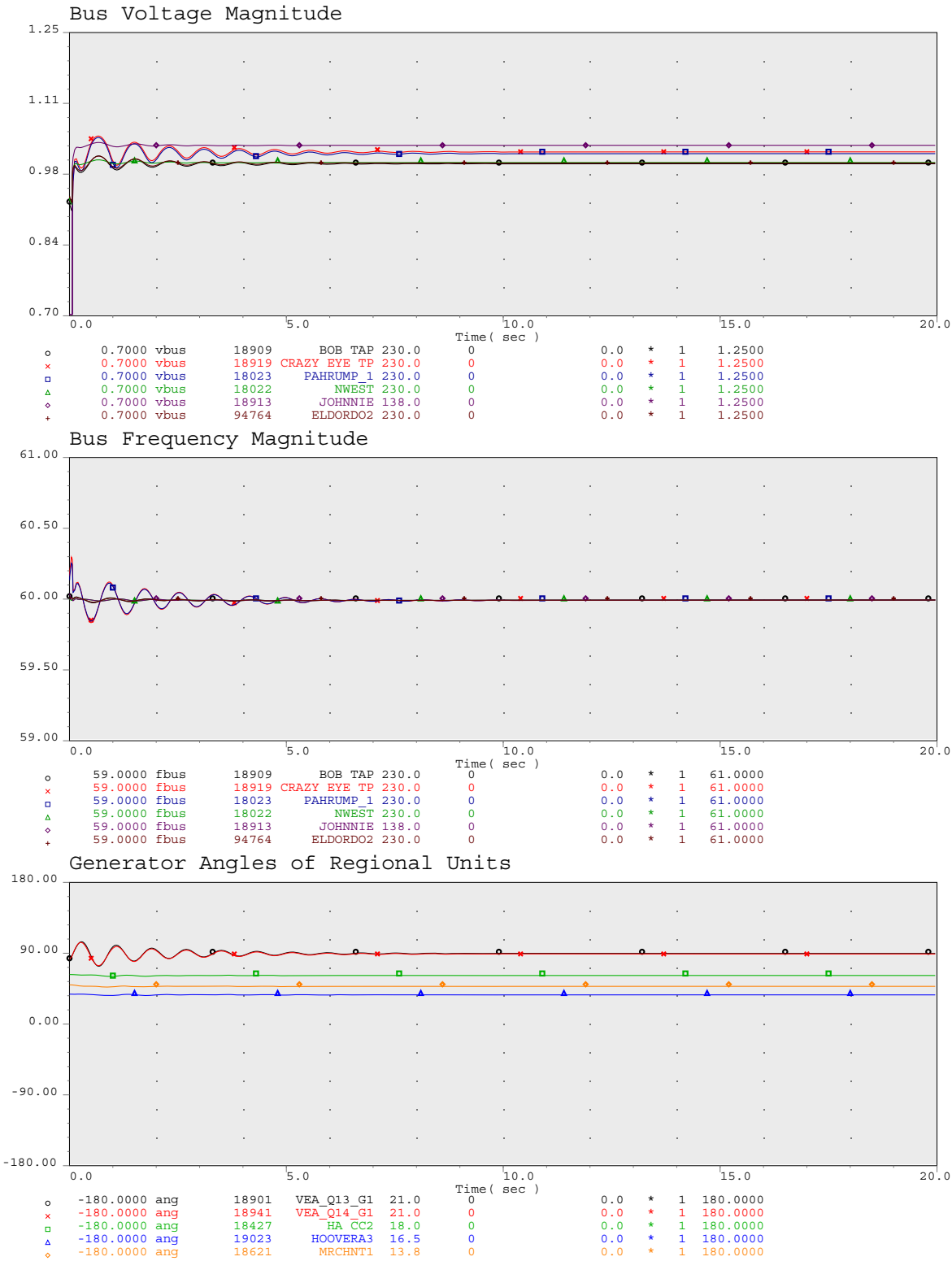
VEA QCA PHASE 2 OFF-PEAK CASE
Innovation Tie Added
Crazy Eye Tp-Bob Tap 230 & GMBD-Sandy 138 Line & Innov-McrySWT 138kV Line with



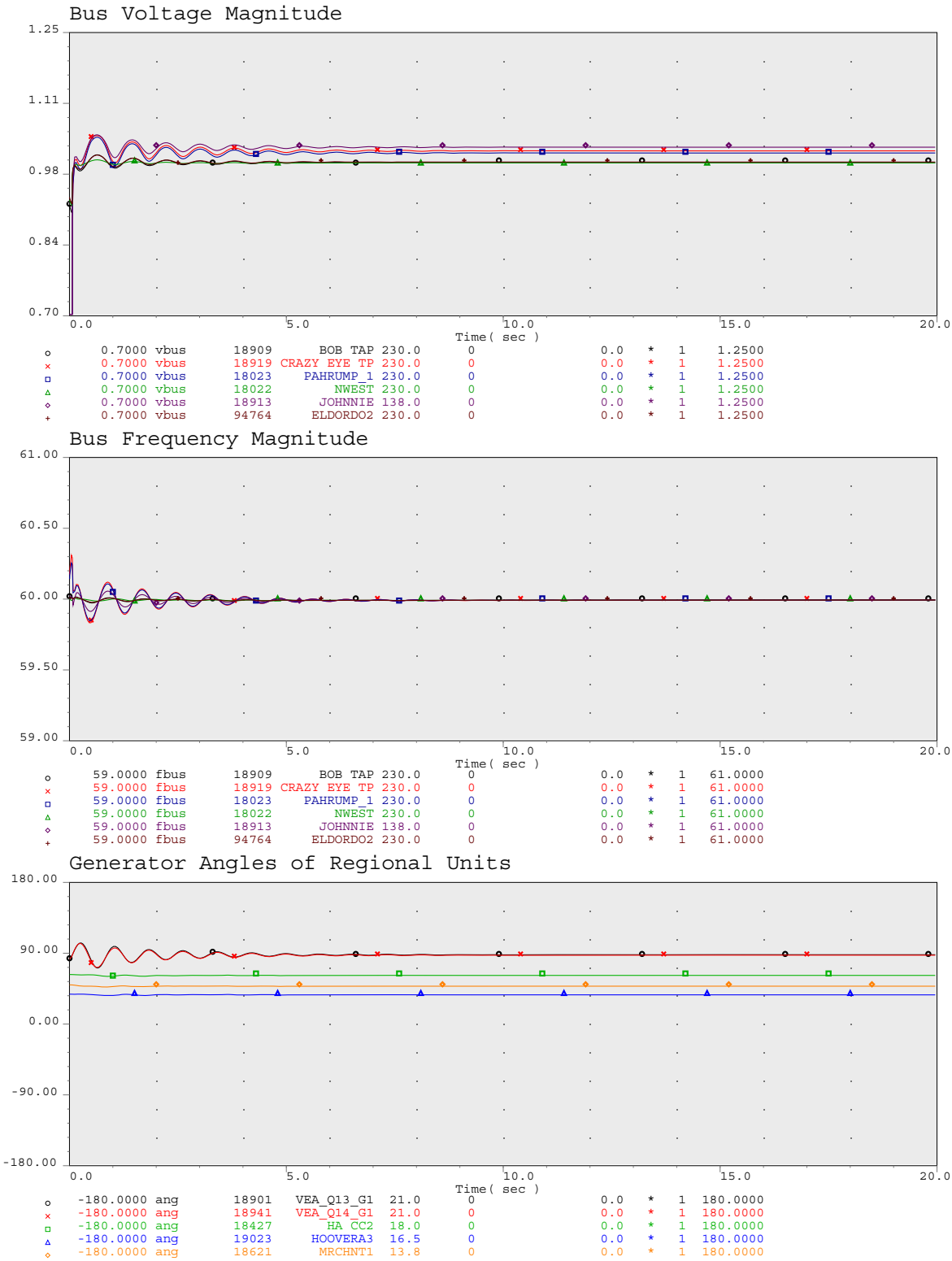
VEA QCA PHASE 2 OFF-PEAK CASE
Innovation Tie Added
Comstruc Pahrump-Vista 138 & Pahrump-Innovation 230 & Vsta-Charleston 138



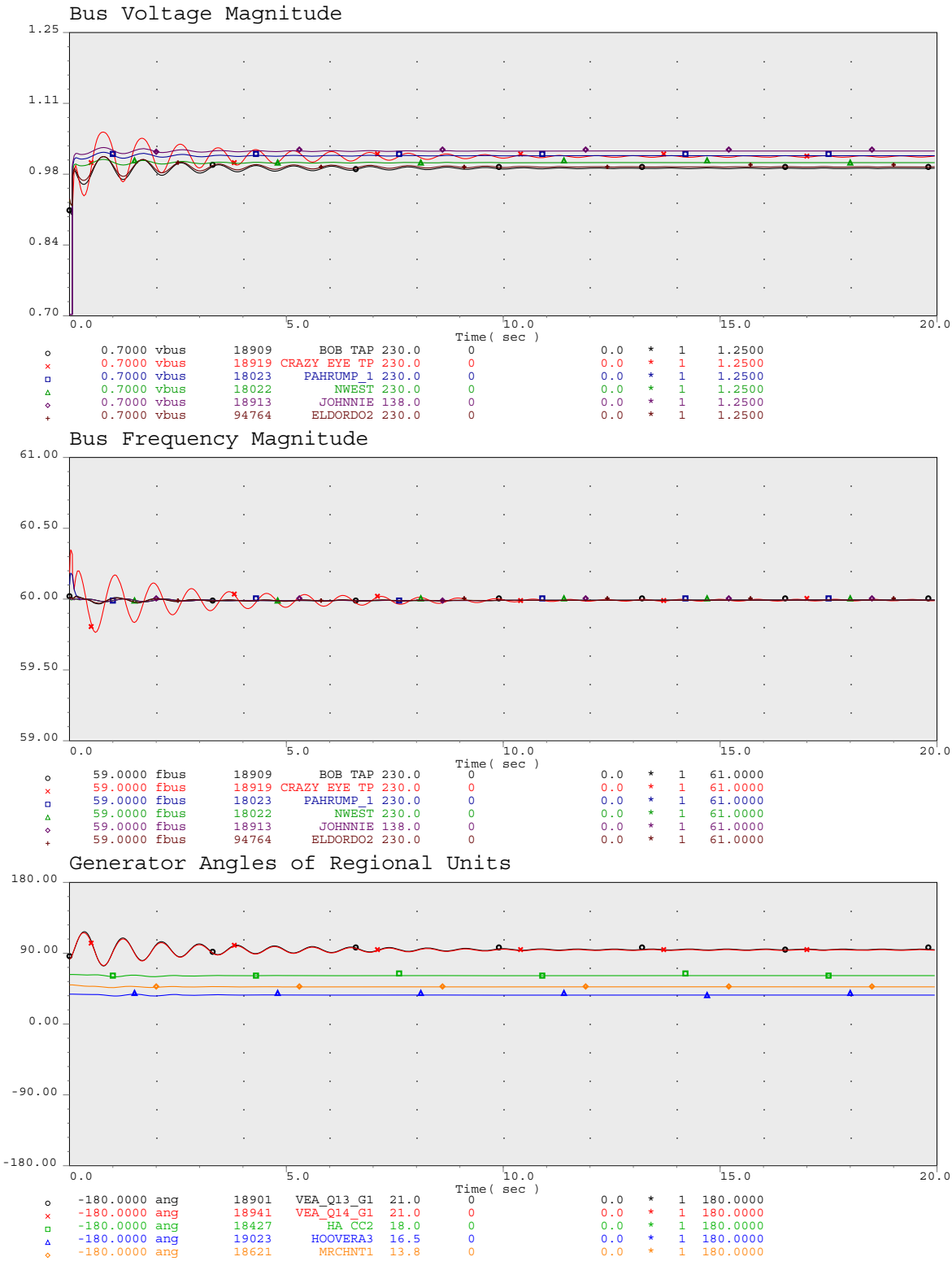
VEA QCA PHASE 2 OFF-PEAK CASE
Innovation Tie Added
Comstruc Vista-Johnnie 138 & Pahrump-Innovation 230



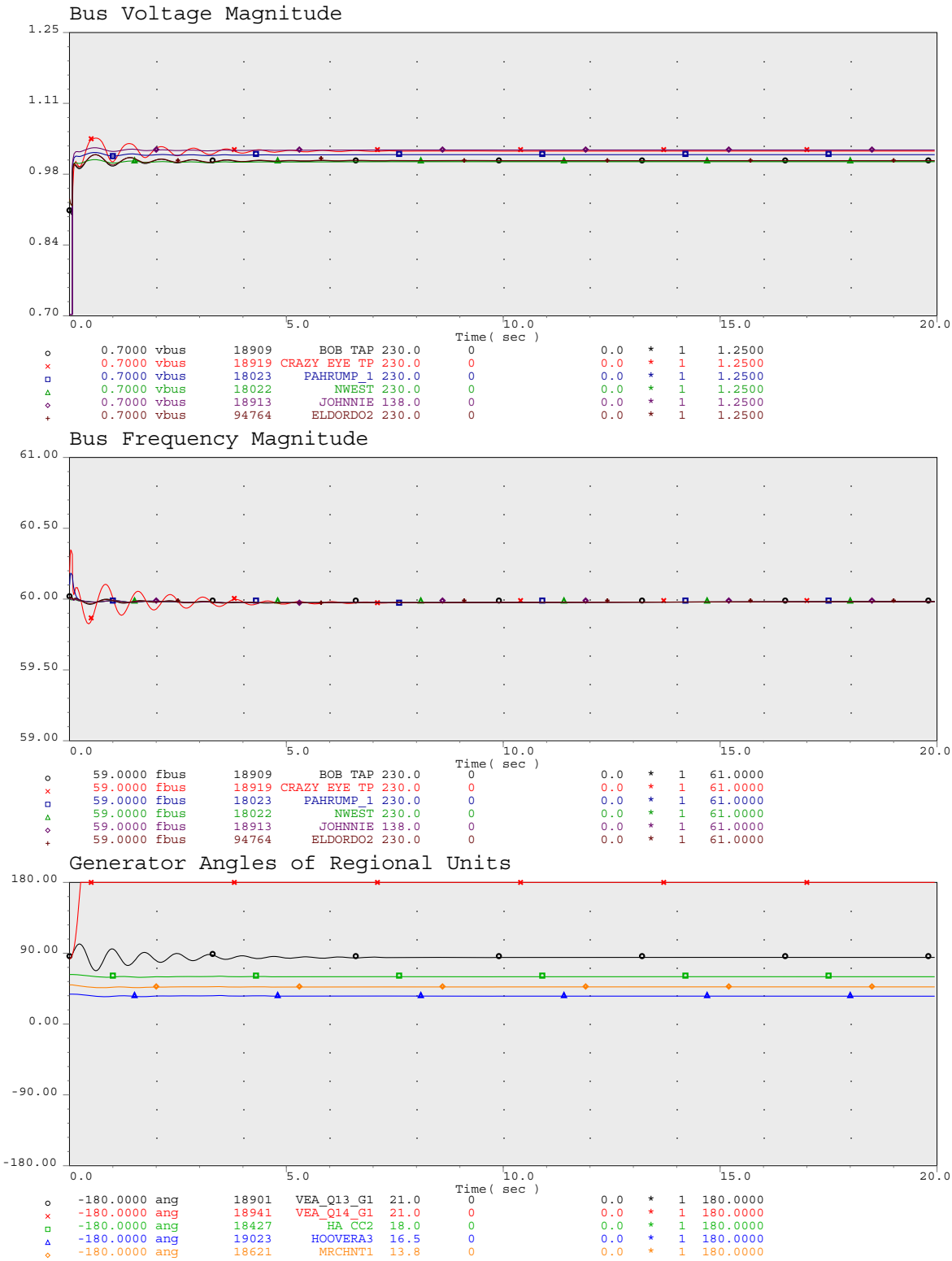
VEA QCA PHASE 2 OFF-PEAK CASE
Innovation Tie Added
Comstruc Vista-Johnnie 138 & Pahrump-Innovation 230 & Vista-Chas 138



VEA QCA PHASE 2 OFF-PEAK CASE
Innovation Tie Added
Comstruc Pahrump-Vista 138 & Pahrump-Innovation 230



VEA QCA PHASE 2 OFF-PEAK CASE
Innovation Tie Added
Brkr Fail Pahrump 138/230kV Tran Bnk 1 & Pahrump -Crazy Eye Tp 230kV Line



VEA QCA PHASE 2 OFF-PEAK CASE
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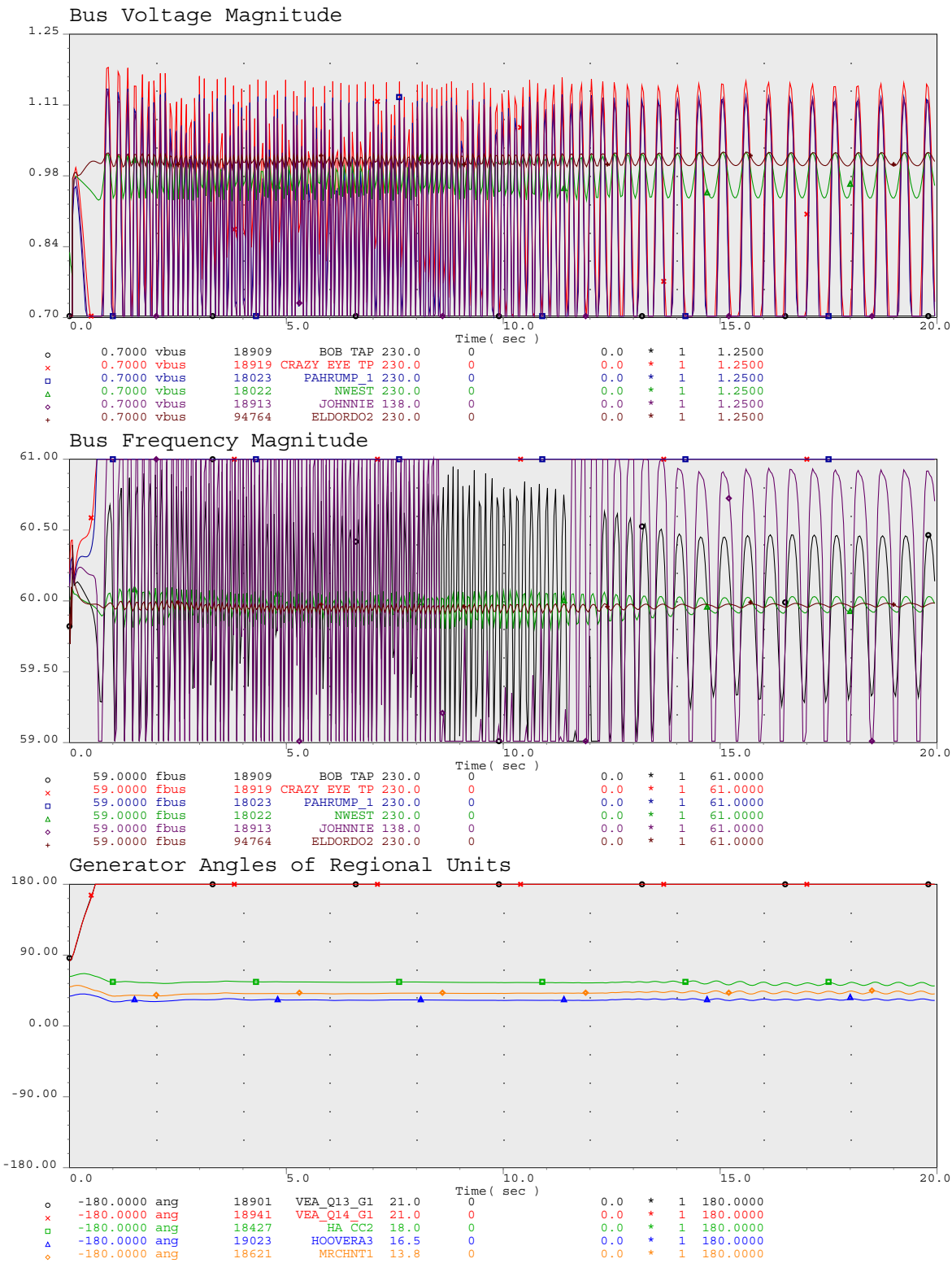
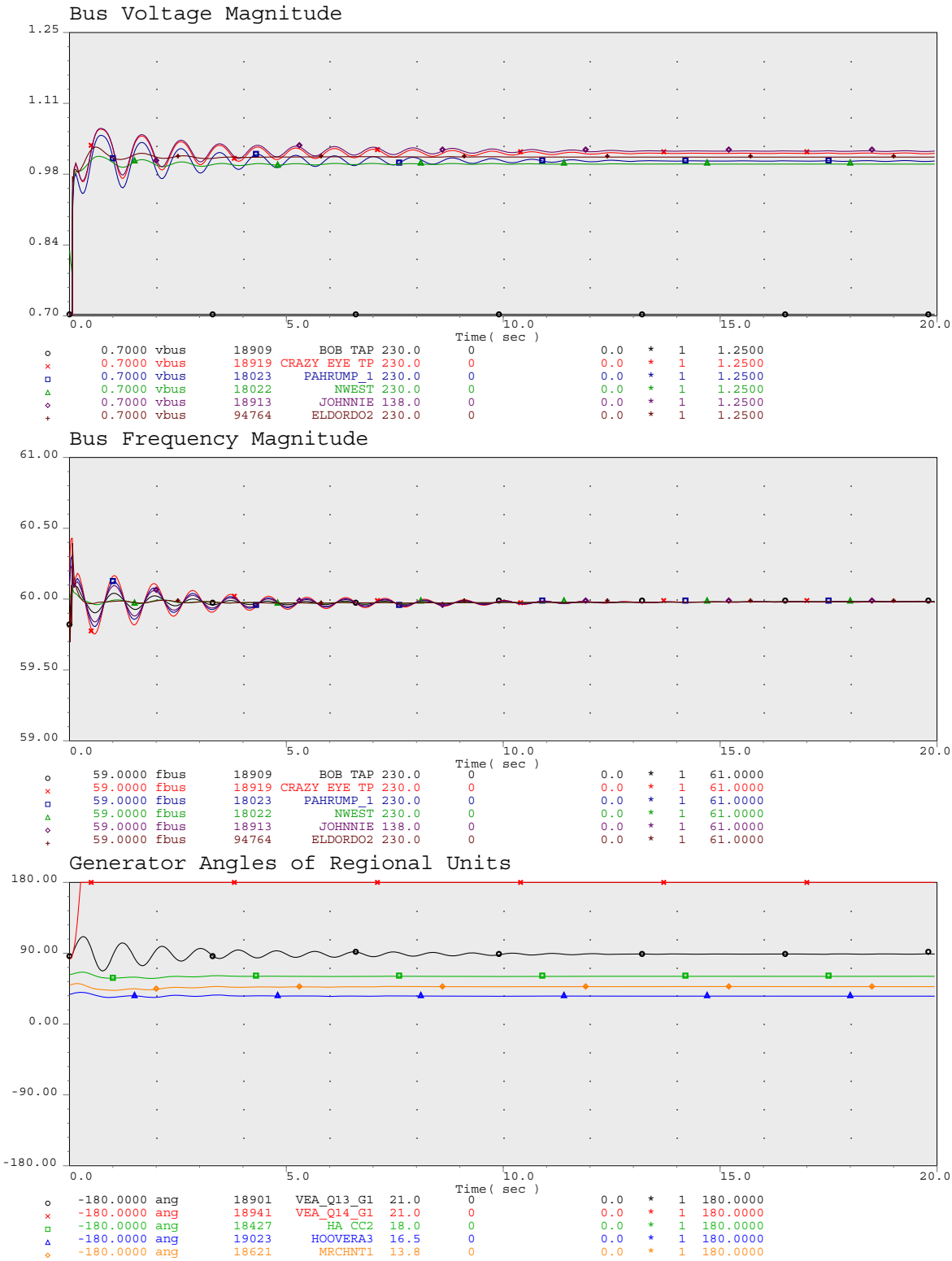
Brkr Fail Pahrump 138/230kV Tran Bnk 1 & Pahrump -Crazy Eye Tp 230kV Line with



VEA QCA PHASE 2 OFF-PEAK CASE
Innovation Tie Added
Breaker Outage Bob Tap-Crazy Eye & Bob Tap-Mead & Bob Tap-Eldorado2 230kV Lines



VEA QCA PHASE 2 OFF-PEAK CASE
Innovation Tie Added
Breaker Outage Bob Tap-Crazy Eye & Bob Tap-Mead & Bob Tap-Eldorado2 230kV Lines

Appendix F

VEA Area

QCA Phase 2 Short Circuit Calculation Study Results

Pre Case: QCA_Phase_2_Peak_Existing_Innovation_102112.sav
Post Case: QCA_Phase_2_Peak_Q13_Q14_All_Upgrades_Innovation_102212.sav

Date: 11/01/2012

				Reference		Post-Project		Change	
				Fault Current	Fault Impedance	Fault Current	Fault Impedance	Fault Current	Fault Impedance
Bus #	Bus Name	Base Volt	Fault Type	Magnitude kA	X/R	Magnitude kA	X/R	Magnitude kA	X/R
18919	CRAZY EYE SWITCH	230	3-PH	5.4	4.9	12.0	9.2	6.6	4.4
18023	PAHRUMP_1	230	3-PH	5.5	4.4	8.1	6.2	2.6	1.8
18910	INNOVATION	230	3-PH	6.4	5.0	7.1	5.8	0.8	0.8
18022	NWEST	230	3-PH	49.0	6.0	49.5	6.1	0.4	0.1
18925	DESERT VIEW	230	3-PH	27.3	6.9	27.6	7.1	0.3	0.2
18909	BOB SWITCH	230	3-PH	34.0	10.7	31.1	12.0	(2.9)	1.3
18900	VEA_Q13	230	3-PH	n/a	n/a	10.6	11.7	---	---
18940	VEA_Q14	230	3-PH	n/a	n/a	9.8	10.1	---	---
18003	AMARGOSA	230	3-PH	17.6	6.3	17.7	6.2	0.0	(0.0)
19012	MEAD S	230	3-PH	67.9	8.8	67.6	9.2	(0.3)	0.4
94764	ELDORDO2	230	3-PH	36.3	12.8	35.8	16.1	(0.5)	3.3
18085	PAHRUMP	138	3-PH	6.1	3.9	8.9	5.4	2.8	1.5
18924	GAMEBIRD	138	3-PH	5.4	3.5	7.1	4.7	1.7	1.2
18296	VISTA	138	3-PH	4.8	3.7	6.1	4.6	1.3	0.9
18928	THSNDAIR	138	3-PH	4.6	3.7	5.8	4.7	1.2	1.0
18932	CHARLSTN	138	3-PH	4.1	3.9	5.0	4.9	0.9	0.9
18913	JOHNNIE	138	3-PH	4.1	3.6	4.8	4.3	0.8	0.7
18098	SANDY	138	3-PH	3.8	3.3	4.5	3.4	0.7	0.1
18113	VALLEYTP	138	3-PH	3.4	2.8	3.8	3.0	0.3	0.2
18911	INNOVATION	138	3-PH	5.4	4.0	5.7	4.3	0.3	0.3
18076	LTHRPWLS	138	3-PH	3.4	2.6	3.7	2.7	0.3	0.1
18111	VALLEYVE	138	3-PH	2.9	2.7	3.2	2.9	0.2	0.1
18039	BONDGDTP	138	3-PH	1.9	2.8	1.9	2.9	0.1	0.1
18036	BEATTY	138	3-PH	1.7	2.9	1.8	3.0	0.1	0.1
18030	AMARGOSA	138	3-PH	4.0	6.9	5.6	8.1	1.6	1.2
18078	MERCRYSW	138	3-PH	5.2	3.3	5.5	3.5	0.3	0.2
18074	JACKASSF	138	3-PH	3.6	2.5	3.9	2.6	0.2	0.1

Visual Resources

I. Introduction

A. Names: Thomas Priestley, Ph.D., AICP/ASLA

B. Qualifications: Thomas Priestley's qualifications are as noted in his resume contained in Appendix A.

C. Prior Filings: In addition to the statements herein, this testimony includes by reference the following documents submitted in this proceeding:

- Application for Certification, Volume 1 & Volume 2, dated August 5, 2011 [Exhibit 1]
- Applicant's Data Adequacy Supplement, dated September 7, 2011 [Exhibit 2]
- Applicant's Data Response, Set 1A, dated November 16, 2011. Responses to Data Requests 32 through 37 [Exhibit 4]
- Applicant's Data Response, Set 2C, dated March 5, 2012. Responses to Data Requests 152 to 155 [Exhibit 34]
- Applicant's Data Response, Set 2E, dated May 4, 2012. Response to Data Request 188 [Exhibit 42]
- Applicant's Supplemental Data Response, Set 2 (Boiler Optimization), dated April 2, 2012. Responses to Data Requests VR-1 through VR-5 [Exhibit 46]
- Applicant's Supplemental Data Response, Set 4, dated May 11, 2012. Response to Data Request VR-6 [Exhibit 48]
- Applicant's Preliminary Staff Assessment Comments, Set 2, dated July 23, 2012 [Exhibit 70]

To the best of my knowledge, all of the facts contained in this testimony (including all referenced documents) are true and correct. To the extent this testimony contains opinions, such opinions are my own. I make these statements, and render these opinions freely and under oath for the purpose of constituting sworn testimony in this proceeding.

II. Summary of Testimony

A. Affected Environment

The project site is located on privately owned land along the California-Nevada border on the floor of the Pahrump Valley in Inyo County, California. The Pahrump Valley is characterized by an expansive arid landscape, a layer of low vegetation that is typical for the Mojave Desert province, long-distance views, and a backdrop of rugged mountains. The Nopah Range that defines the Pahrump Valley on the west, and the Kingston Mountain Range that defines the valley on the south are BLM-managed federal lands that have been designated as wilderness areas. The Spring Mountains range that defines the valley on the east encompasses an area of Forest Service lands that are managed as the Mount Charleston Recreation Area and the Spring Mountains and La Madre Wilderness Areas. The approximately 3,097 acres (4.84 square miles) of flat, privately owned lands that make up the project site are covered with desert vegetation, and are characterized by a grid-like pattern of unpaved roads 0.5 mile apart that were cut into the landscape when the area was subdivided in the 1960s with plans for residential development. The grid pattern of roadways on the project site also extends into the area of privately

owned land to the south and west of the project site. Although subdivided lands adjacent to the site are also largely undeveloped, there is a cluster of development known as Charleston View that is located on the south side of Tecopa Road, opposite the project site. In Charleston View, the development pattern consists of a mixture of wood frame structures and mobile homes that are concentrated in a two-block-wide corridor bounded by Silver Street on the west that extends seven blocks from Tecopa Road on the north to Charity Lane on the south.

In California, the area from which the project site has the potential to be seen by the greatest numbers of viewers is the corridor along Tecopa Road (sometimes referred to as the Old Spanish Trail Highway), the highway that travels across the valley from Nevada State Route (SR) 160, 8.5 miles east of the project site to the community of Tecopa, 23 miles to the west. The traffic levels on Tecopa Road are very low, averaging 258 to 275 vehicles per day, according to the most recent counts available. Tecopa Road is not a designated scenic route, and the valley lands along Tecopa Road (including the project site) have not been designated for protection as scenic resources. KOP 3 is the westbound view from Tecopa Road at a point 0.5 mile from the project site's southeastern border. It is located in front a 17.5-acre parcel fronting on Tecopa Road that is now being developed as the St. Therese Mission project. The St. Therese Mission is a private commercial development that will essentially be a columbarium complex with ancillary facilities. It is planned to include eight enclosed columbarium buildings, a chapel, a garden, restaurant, visitor's center, care-takers unit, and a meditation garden. The Mission will be promoting "Green" or environmental friendly development and the owners plan to highlight the planned Hidden Hills project as a sustainable technological advancement. This viewpoint is representative of views toward the site that will be seen by westbound travelers on Tecopa Road and by future visitors to the St. Therese Mission.

In the view from KOP 3, the project site is located on the flat valley floor lands in the middleground. The most noticeable elements in the view that existed at the time the analysis was prepared included the utility poles along Tecopa Road, the fencing and construction activity at the St. Therese Mission site, and the Nopah Mountains in the backdrop. KOP 5 is a view from eastbound Tecopa Road at a location 3.8 miles west of the project site. This is the view seen by eastbound travelers after they have driven through the gap between the Nopah and Kingston ranges, and Tecopa Road starts to travel down the slope of the foothills into the Pahrump Valley. This view provides a panorama across the Pahrump Valley, which is defined on the east by Mount Charleston and the Spring Mountains range, of which it is a part. The project site lies in the far middleground on the valley floor, which is seen as an expanse of flat, brush covered terrain.

The project site is also visible to smaller numbers of people in the cluster of development at Charleston View (also known as Calvada Springs, California). In the 2010 census, this area had a total of 34 housing units, 29 of which were occupied, and a population of 68. KOP 4 is a representative view from Charleston view, looking north across the community toward the project site. Charleston View's unpaved roads, residences, and trees dominate the foreground of the view; the flat valley lands on which the project site is located are visible in the far middleground; and the Spring Mountains and the distinctive peak of Mount Charleston define the view in the background. KOP 7 is a view from the undeveloped area to the southwest of Charleston View, along Garnett Road, 1.75 miles south of Tecopa Road. It represents a view across the valley and toward the project site from a less developed portion of the valley that would be seen by small numbers of viewers who might travel through this area on their way to and from recreational activities. This view is also generally representative of views across the valley from faint tracks through the area's landscape that may represent alignments of the Old Spanish and the Mormon Trails—historic trails that passed through this part of the Pahrump Valley in the early

to mid-19th Century. In this view, the project site is visible as a part of the flat, shrub-covered valley floor.

B. Potential Construction Related Impacts; Avoidance and Minimization Measures

Construction of the project will take place over a 29-month period. Completion of Solar Plant 1 is targeted for the second quarter of 2015 and Solar Plant 2, the third quarter of 2015. Activities during the construction period will include clearing and grading, construction of the power towers and power blocks, and assembly and installation of the heliostats.

The clearing and grading required for construction of the project will be limited. In the portions of the site in which the heliostats will be installed, which comprise a very large percentage of the site's area, most of the vegetation will be retained, but will be trimmed by a mower to a height of 12 to 18 inches to permit heliostat mirror movement. An approximate 12-foot-wide linear swath of vegetation along the entire outer edge of the solar fields will be cleared and grubbed (but not graded except as required for safe passage of vehicles) to create an internal perimeter path for installation of the tortoise exclusion and security fencing. The site maintenance roads will be cleared of vegetation, bladed, and smoothed. Temporary work areas, including laydown areas, will be cleared of vegetation only to the extent necessary and will be restored to preconstruction conditions in compliance with the construction mitigation, monitoring and restoration plan. Clearing and heavy to medium grading will take place in the areas that will be developed with the solar power tower, power block, switchyard, administration/maintenance building, and heliostat assembly building. The clearing and grading activities will require the presence on the site of mowing equipment, earth moving equipment and trucks, and will produce areas in which the vegetation has been mowed, and smaller areas in which the vegetation has been removed and the soil exposed. A number of measures have been incorporated into the construction plans to reduce the visual effects of the required clearing and grading during the construction period. These include balancing earthwork cuts and fills to the extent possible to reduce the amount of grading and the need to transport fill; applying dust suppression measures to minimize the dust generated by vehicular traffic, construction and wind on exposed surface soils; and stabilizing the surfaces of the most heavily traveled portions of the common area.

The 180-acre construction laydown and parking area will be located on the western side of the project site beyond the solar fields, within a temporary construction area. The construction trailers and various construction support facilities will also be located in this area. The laydown area will be the location where project components will be delivered and may include temporary structures that will be used for heliostat assembly and storage of heliostat components. The visibility of the structures, material, equipment, and vehicles in the laydown area to viewers off the site will be limited by the area's location at a distance of more than 1 mile from Tecopa Road at its closest point, and over 1.6 miles from the closest residence. In addition, because of the flat terrain, the views of structures, material, and equipment from these areas is likely to be limited to a substantial degree by the effect of the intervening vegetation in screening the views across the flat desert floor.

The most visible construction activity on the site will be the erection of the two, 750-foot-tall solar towers. Other activities will include insertion of metal pylons that will support the heliostats, and mounting of the heliostats on the pylons.

The primary project construction activities (i.e., the day shift) are planned to occur between 5:00 a.m. and 3:30 p.m., weekdays and Saturdays. Additional hours may be necessary to make up schedule deficiencies, or to allow for additional shifts to address potential traffic related mitigation or to complete critical construction activities (for example, pouring concrete at night during hot weather or

working around time-critical shutdowns and constraints). At times when onsite construction takes place during hours of darkness, portable lighting will be used on an as-needed basis to illuminate the areas where the construction is occurring. This lighting will be the minimum required to meet operational and safety requirements and will be shielded and directed at the areas where it is required to eliminate offsite light spill and illumination of the night sky. In addition, this lighting will be switched and will be turned on only at the times when it is needed. During the construction period, lighting will also be required at the onsite laydown area where the heliostat assembly operations will be taking place. Heliostat assembly will occur from 5:00 a.m. to 3:30 p.m. and from 6:00 p.m. to 4:30 a.m. (swing-shift) for approximately 18 months of the 29-month construction period. At nighttime, there is likely to be lighting around the outside of the heliostat assembly structure and the structure where the heliostat components are stored. However, the visibility of this lighting will be minimized by its location more than 1 mile from Tecopa Road at its closest point, and over 1.6 miles from the closest residence. In addition, because of the flat terrain, the views of these structures and the lighted operational areas around them will be screened to a large degree by the intervening desert vegetation.

Because of the relatively short construction period (29 months), and because of the measures that will be incorporated into the construction plans to minimize visual effects, the visual impacts during the construction period will be less than significant.

C. Potential Operational Related Impacts; Avoidance and Minimization

During the operational phase, the project's solar power towers, power blocks, and heliostat fields will be visible in views across the Pahrump Valley from the corridor along Tecopa Road, from Charleston View, and from other areas in the valley and surrounding landscape. Because there are no designated scenic vistas in the project area and no adopted state scenic highways, the project will not have adverse effects on views from scenic vistas or state scenic highways.

The project will be visible from the corridor along Tecopa Road (KOPs 3 and 5) and from other areas of the Pahrump Valley (KOP 7) and will change those views. However, when the changes to the views from these KOPs are looked at closely and considered in light of the relatively small number of people who see them and the fact that the views that are affected have not been identified as scenic views or provided with formal protection as scenic resources, the impacts are less than significant. The latest available traffic data provides an indicator that the numbers of viewers present in the corridor along Tecopa Road are low. These data establish that the traffic levels on Tecopa Road average 258 to 275 vehicles per day, which suggests that there are likely to be no more than approximately 138 vehicles per day traveling in each direction. When its construction is complete, it can be anticipated that the St. Therese Mission project will attract additional visitors to the area. However, when on the St. Therese Mission site, the views future visitors will experience of the solar facility are likely to be limited because the mission complex will consist of a set of structures built around courtyards, and these structures and the large numbers of trees that are proposed as part of the site's development are likely to substantially block views toward the HHSEGS site from the mission facility's outdoor spaces. In addition, to the extent that glimpses of the solar facility are seen from the mission complex, these views will be consistent with one of the themes of the St. Therese Mission complex, which is education of its visitors about green living.

In terms of public policies regarding scenic resources, it is important to note that Tecopa Road is not a designated scenic route, and the valley lands along Tecopa Road (including the project site) are not an area that Inyo County has designated for special protection of visual values. In fact, in 2011, the County designated the project site and the large area of private land around it as a Renewable Energy Overlay Zone in which large-scale wind, solar, and transmission line projects would be permitted. The County included the project site in the Overlay Zone specifically because it did not contain sensitive scenic

resources (Summary of Inyo County Renewable Solar and Wind Energy General Plan Land Use Diagram Overlay Development). While the overlay district designation has been rescinded, the designation was rescinded because of a legal challenge to the procedures under which the Overlay Zone was adopted, not because there was objection to the aesthetic effects of solar energy projects in this location.

In the view from KOP 3 (Figure 5.13-4 R1, Supplemental Data Response Set 2 [Exhibit 40]), the view from Tecopa Road in front of the site of the St. Therese Mission project, the two solar towers, one of the power blocks and related air cooled condensers, as well as the top of a portion of the heliostat field will be visible in the middleground of the view. The solar towers will add two substantial new vertical elements to the view. Although the presence of the solar towers and the other project elements will contrast with the existing landscape to some degree, their overall effect, in this landscape that is already partially modified, and which now has a moderate level of visual quality, will be to produce a moderate level of change to the view's visual quality.

KOP 5 (Figure 5.13-6 R1, Supplemental Data Response Set 2 [Exhibit 40]), represents the view from Tecopa Road traveling eastbound, 3.8 miles west of the project site. In this view, the solar power towers, power block structures, and heliostat fields will be visible across the desert landscape in the far-middleground and background on the left side of the view. Although project features will add new elements to the landscape, their presence would not dominate the view in terms of scale because of their distance from the viewpoint and the vastness of the surroundings. The solar towers would appear lower in height than the mountains in the backdrop and would not obstruct the view toward Mount Charleston.

KOP 7 (Figure DR-32-2 R2, Supplemental Data Response Set 4 [Exhibit 42]) is a view toward the project site from Garnet Road, 1.75 miles south of Tecopa Road, and 2 miles southwest of the project site. This viewpoint represents views across the Pahrump Valley from the sloping desert area to the south and west of the cluster of residences at Charleston View. This viewpoint is located at the point where Garnett Road crosses a track that travels in a northwest/southwest direction for several miles through the desert in this area and that is thought by some to be one of traces of the Old Spanish Trail, and subsequently the Mormon Trail, which passed through this portion of the Pahrump Valley in the early to mid 19th Century. Because this track is not marked in any way, and there is no signage directing visitors to it, there is no basis for assuming that this location attracts any substantial numbers of visitors whose objective is to visit the routes of the historic trails. The existing views from this area have been altered by the grid of roads that has been cut through this portion of the valley and by the presence of the development at Charleston View, which is located in the middleground of the view, on top of the portion of alignment of this northwest/southwest track located directly to the south of the project site. The solar power towers, power block structures, and heliostat fields will be visible in the low area of the valley the far-middleground of the view. The project features will add new elements to the landscape, but their presence will not dominate the view in terms of scale because of the vastness of the surroundings and the scale of the mountain backdrop. The solar towers would appear lower in height than the mountains behind them, and would not obstruct the view toward Mount Charleston.

In the area of rural residences at Charleston View, the project will change the existing character and visual quality of the view seen from this area (KOP 4, Figure 5.13-5 R1, Supplemental Data Response Set 2 [Exhibit 40]). The changes to this view have the potential to constitute a significant impact given the moderately high sensitivity of the residents of the 29 occupied dwelling units located in this area. From Charleston View, the solar power towers would be readily visible, and due to their height and proximity, the solar power towers would dominate views toward the north and would extend above the ridgeline of the Spring Mountains. The presence of the project infrastructure would add to the clutter in the views in this area, and would change the character of the background views, potentially making the

area feel less remote and more developed. One point that it is important to note though, is that in the views from Charleston View, the solar power towers will not be in the same part of the view as Mount Charleston. Thus, the solar power towers will not block or otherwise intrude upon the view of the area's signature landmark feature, for which this rural residential area is named.

With application of the mitigation measures recommended in the AFC, the impacts to the views from Charleston View would be reduced to a level that is less than significant, and the impacts on the views from the other nearby areas of the valley that are not significant would be further attenuated. The mitigation measures the Applicant has proposed to implement are:

1. Ground disturbance and soil erosion will be minimized by avoiding steep slopes and by minimizing the amount of construction and ground clearing needed for roads and staging areas. Dust suppression techniques will be employed to minimize impacts of vehicular and pedestrian traffic, construction, and wind on exposed surface soils.
2. A lighting plan that minimizes the project's nighttime light impacts will be developed and submitted to the CEC for review. Provisions included in this plan will include installation of nighttime lighting only in areas where it is required for operations or safety, use of the lowest levels of lighting consistent with operational needs and safety regulations, use of light fixtures that are hooded to direct light only to the areas where it is needed and to prevent light from spilling off of the site or up into the sky, and use of switches and motion detectors to assure that lighting is turned on only when required.
3. A color treatment plan to blend the permanent project facilities located within the common area and visible to the public into the existing setting will be developed in consultation with Inyo County and the CEC.
4. A landscape plan will be developed for the project setback area along Tecopa Road. In the portion of the setback area directly north of the Charleston View residential area, this plan will include the use of a mix of tall growing trees to provide partial screening of views toward the solar power towers from the residential area, and lower growing shrubs to screen views into the site from Tecopa Road. The plant species selected for this area will emphasize species with low water needs that are aesthetically compatible with the landscape setting. In the remainder of the setback area along Tecopa Road, the emphasis will be on use of native shrubs with low water requirements that are planted in an informal, naturalistic pattern to provide partial screening of views into the project site. The landscape plan will be submitted to Inyo County and the CEC for review.
5. To reduce and mitigate for the changes to the views toward the project site seen from Charleston View (KOP 4), two measures will be implemented:
    a. The Applicant will make provisions for a one-time program to plant trees on the properties of any Charleston View property owner residing in an existing approved residence who indicate an interest in having them. The intent is to plant the trees in locations that will screen views looking toward the solar power towers from the residences on the property and from the property's primary outdoor living areas. The applicant will employ a professional arborist to identify a list of species that are well adapted to the local conditions and which have characteristics that provide effective screening of views. The tree species selected will avoid invasive exotic species as indentified by the USDA and Invasive Species Council of California (ISCC). The applicant will provide any Charleston View property owner residing in an existing approved residence who is interested in participating in this program with a credit to a local landscape contractor contracted to implement this program. The

contractor will work with residents to select up to eight trees from this list of species provided by the arborist and will assist the residents in indentifying appropriate locations for their installation. The contractor will provide the trees and will plant them for the property owner. The trees planted no larger than the equivalent of a 15-gallon standard nursery size. The property owner will be responsible for making the provisions for tree irrigation. Tree planting is a one-time opportunity for eligible property owners in Charleston View. Once installed, irrigation and maintenance of the trees will be the responsibility of the property owner and the project owner shall have no further responsibility.

b. To mitigate for the potential visual impact the solar power towers may add to a portion of the view from Charleston View, the Applicant will assist with a one-time cleanup program within the Charleston View rural residential subdivision. This cleanup program will entail the Applicant making provisions to assist property owners residing in an existing approved residence with cleanup of their properties by providing free hauling and disposal of unwanted debris.

D. Summary of Compliance with Applicable LORS

The project site is located on private lands in Inyo County that are subject to the provisions of the Inyo County Code and the Inyo County General Plan. Policies and goals of the Inyo County General Plan (Inyo County, 2001) that are applicable to visual resources were identified in the Conservation and Open Space Element and are summarized in Table VIS-1 below. This is a version of the LORs table that had appeared in the AFC that has been revised to delete references to the Inyo County Solar and Renewable General Plan Amendment No. 2010-03, which has been rescinded. No Inyo County Code ordinances were found that would be applicable to visual resources aspects of this project.

TABLE VIS-1
Conformity of HHSEGS with the Inyo County General Plan

Provision	Conformity?
Conservation/Open Space Element	
Goal VIS-1: Preserve and protect resources throughout the County that contribute to a unique visual experience for visitors and quality of life for County residents.	Yes. The project site is not located on lands that are designated as scenic resources in the plan.
Policy VIS-1.3: Man-made slopes should be treated to reflect natural hillside conditions in the surrounding area.	Yes. The project site plans indicate that the project features will be located entirely on flat topography and will create few man-made slopes. The only slopes that are likely to be created will be the slopes of small berms around the power block and small berms that might be needed for storm water protection. The slopes of these berms will be treated to blend with the surrounding landscape.
Policy VIS-1.6: The County shall require that all outdoor light fixtures including street lighting, externally illuminated signs, advertising displays, and billboards use low-energy, shielded light fixtures which direct light downward (i.e., lighting shall not emit higher than a horizontal level) and which are fully shielded. Where public safety would not be compromised, the County shall encourage the use of low-pressure sodium lighting for all outdoor light fixtures.	Yes. For any nighttime construction that is necessary, lighting will be used that is limited to meet safety requirements and the needs of the tasks, and will incorporate shielding to direct the lighting onsite to minimize offsite light or glare. For operational lighting, all lights will be fully shielded and directed to the specific areas where the lighting is required. Where consistent with safety and operational needs, low-pressure sodium lamps will be specified. Wherever possible, operational lights will be operated with switches or motion detectors, allowing them to remain unilluminated at most times to further minimize the amount of light potentially visible offsite.

Source: Inyo County, 2001.

E. Summary of the Potential Cumulative Impacts

HHSEGS would contribute to cumulative impacts on visual resources in the Pahrump Valley to the extent that it would increase the amount of visible development and contribute to a loss of rural and natural character. To assess cumulative impacts, the visual impacts of the project must be considered in conjunction with those of nearby existing and reasonably foreseeable future projects.

The immediate project vicinity is currently a relatively undeveloped area. Development is limited to Charleston View where there is a cluster of residential development that occupies about 0.2 square mile, and an unpaved road grid that was cut into the surrounding desert when the Wiley Ranch was subdivided in the 1960s. HHSEGS, which would occupy 5.1 square miles of this subdivided ranch land and would contain two solar power towers that are approximately 750 feet tall, would appear larger than the existing development in terms of both its vertical and horizontal scales. The only reasonably foreseeable project in the immediate project vicinity that is in the project viewshed and on the California side of the border is the St. Therese Mission project, which would be 0.5 mile southeast of the project site and consist of a 17.5-acre commercial columbarium development featuring eight enclosed columbarium structures, a chapel, meditation garden, visitor's center, restaurant, and onsite caretaker home. This project will be located immediately adjacent to the Tecopa Road where it will be readily visible to all travelers on the highway, as well as residents of Charleston View. It will have the effect of creating a highly developed node within the highway corridor that would contribute to a small reduction of the area's overall rural, natural-appearing character for a very low number of viewers.

To attenuate the visual impacts of the HHSEGS project and to ensure that they will be less than significant, the Applicant has proposed the following mitigation measures:

- Minimization of ground disturbance and soil erosion, and implementation of dust suppression measures.
- Implementation of lighting measures during construction and plant operations that will restrict lighting to the minimum required for operations and safety, will require use of switches and sensors so the lights are illuminated only when required, and will make use of lighting fixtures that are hooded to avoid glare and light spill off the site or into the sky.
- Development and implementation of a color treatment plan that will help to blend the proposed permanent facilities located within the common area and visible to the public into the setting
- Development and implementation of a landscape plan for the setback area along Tecopa Road that will provide partial screening of views into the site from Tecopa Road and more substantial screening for views of views toward the site from the Charleston View residential area.
- Implementation of a one-time program to plant trees on the properties of any participating Charleston View property owner residing in an existing approved residence in locations that will screen views looking toward the solar power towers from the residence on the property and from the property's primary outdoor living areas.
- Implementation of a one-time cleanup program within the Charleston View rural residential subdivision to mitigate for the potential visual impact of the solar power towers will add to a portion of the view from Charleston View. This cleanup program will entail the Applicant making provisions to assist property owners residing in an existing approved residence with cleanup of their properties by providing free hauling and disposal of unwanted debris.

III. Response to Certain Issues Raised in the FSA

The FSA concludes that the project will have a significant adverse and unmitigable visual impact on views from six out of the seven Key Observation Points that were evaluated and alleges that the project would have significant impacts on other viewpoints that did not receive full analysis. The Applicant's testimony, on the other hand, demonstrates that these impacts are either less-than-significant or can be mitigated to a level that is less than significant with the measures summarized above.

There are very important differences in the way that the Staff and the Applicant characterize the visual sensitivity of the setting and the visual impacts of the solar power towers. The key question is whether the solar power towers substantially degrade the visual environment. One of the factors leading to the Staff's findings of significant visual impacts is its overstatement of the visual effects of the solar boilers. This overstatement of the visual effects of the boilers is undoubtedly a product of the fact that is difficult to convey the visual effects of the glowing boilers in a simulation, and Staff had to use its imagination rather than direct experience to estimate how brightly the boilers would appear to glow and how this glow would affect the project's visual setting. Clearly, more information and insight is needed to make proper judgments about the appearance of the boilers and their effects. If a picture is worth a thousand words, then it would be worth a million words for the Committee to see for itself whether a solar power tower will substantially degrade the visual environment. The Committee, the Staff and other parties are encouraged to go and view the Chevron Solar to Steam Demonstration Project in Coalinga, which can be seen from public roads in the vicinity of the project. The plant uses BSE's proprietary technology. The size and luminance of the solar receiver is comparable to the HHSEGs project. I believe that first-hand observation of the Coalinga plant will be more informative than expert testimony on the actual impacts of the towers and receivers at various distances, and will provide a more grounded basis for putting the visual issues into perspective.

Response to the FSA

The Applicant provided 11 general comments on the Visual Resources section of the PSA. The FSA failed to incorporate any of these comments in the analysis. Therefore, these general comments are equally applicable to the FSA. In addition, the Applicant also provided more than 70 specific comments. While the FSA does respond to some of these comments, in other instances the FSA merely notes the comment or states that the Staff disagrees, without explaining the reason for disagreeing. In summary, the FSA contains a number of fatal flaws which exaggerate the visual importance and sensitivity of the setting and the degree of adverse visual change the project would create, leading to incorrect conclusions that the impacts of the project would be significant, and that these impacts cannot be mitigated to levels that are less than significant.

The most serious flaws that remain in the FSA Visual Resources analysis and lead it to reach incorrect conclusions are summarized below.

A. The FSA Visual Resources section pays insufficient attention to the policies that establish the context for evaluating the project area landscape's relative importance and sensitivity as a visual resource.

1. Review of BLM and Inyo County policies indicate that they consider the project site and surrounding area as a place where visual change would be appropriate and would not significantly or adversely impact critical scenic resource values. The BLM's Land Management Plan has assigned the federal lands that lie immediately adjacent to east side of the site a Visual Resource Management (VRM) classification of IV that permits a high-level of visual change.

2. The project site and the lands that surround it on the west and south are privately owned lands that are under the jurisdiction of Inyo County. The Inyo County General Plan does not designate the project site or the area around it as scenic resources and includes no specific provisions to protect the scenic qualities of these lands.

3. Inyo County, in a July 28, 2009 letter to BLM for the Programmatic Environmental Impact Statement (PEIS) Solar Energy Scoping Process, stated that there are "private, undeveloped lands in the Charleston View area (south and west of Pahrump, Nevada) that would be excellent land on which to locate solar production as well as support operations for solar development both in lnyo County and Nevada." Furthermore, in 2011, the County designated the project site and a large area around it as a Renewable Energy Overlay Zone in which large-scale wind, solar, and transmission line projects would be permitted. The County included the project site in the Overlay Zone specifically because it did not contain sensitive scenic resources (Summary of Inyo County Renewable Solar and Wind Energy General Plan Land Use Diagram Overlay Development). While the overlay district designation has been rescinded, the designation was rescinded because of a legal challenge to the procedures under which the Overlay Zone was adopted, not because there was objection to the aesthetic effects of solar energy projects in this location.

B. The FSA Visual Resources section places too much emphasis on the scenic values of areas that are not in the viewshed.

One of the first steps in preparing a visual impact assessment is to identify the project viewshed, that is, the area from which the project has the potential to be seen. Once this step has been undertaken, the analysis can be focused very specifically on the area of potential project visibility. This is what was done in preparing the AFC, and the results of this analysis were presented on AFC Figure 5.13-1, and later on Figure DR 32-1 submitted in response to Data Request 32 (Set 1A). As a part of the comprehensive set of information that these figures convey about the area's landscape features and the relationship of the project site to them, there is a clear identification of the portions of the area where the project's tallest features (the solar towers) would and would not be visible. This delineation of the portions of the surrounding landscape in which the project has the potential to be seen made it possible to limit the characterization of the visual conditions in the project setting only to the area in which the project would have any potential of having an effect. In preparing the FSA, Staff generally disregarded this delineation of the areas in which the project would have the potential to be visible, and thus have an effect. For example, the discussion of the visual quality of the regional setting makes reference to Visual Resources Figures 1, 2, 3, and 4, which indicate the locations of trails, recreation and wilderness areas in the project vicinity (FSA Figure 1); historic trails in the project vicinity (FSA Figure 2); BLM Visual Resource Inventory (VRI) classifications (FSA Figure 3); and BLM Visual Resource Management (VRM) classifications. These figures do not include an overlay that indicates the portions of the area shown on the maps from which the project would have the potential to be visible. As a result, many of the areas and features of presumed visual sensitivity shown on the figures and mentioned in the analysis based on them lie outside of the area in which the project would have any likelihood of having any kind of a visual effect. This then leads to erroneous impressions and conclusions about the visual quality and importance of the landscape that the project could affect. To provide a basis for developing a correct understanding of the relationship of the project site to its landscape setting, I had versions of FSA Visual Resources Figures 1, 2, 3 and 4 prepared that include the viewshed overlay and concentric circles that indicate distance zones from the solar towers, and which focus in on the area within the project viewshed from which the project has the potential to be readily noticeable. These figures are attached to my testimony as Figures VR-1, 2, 3, and 4.

For example, the discussions related to FSA Visual Resources Figure 1 make much of the wilderness areas and the national recreation area identified on this map that encompasses a large region, but does not point out that from most of the area shown on the map, the project would not be visible, and that from the small subset of wilderness areas and the national recreation area from which the project might be visible, visibility would be restricted to only the portions of those areas that overlook the Pahrump Valley. Figure VR-1, which identifies the limits of area from which the project has the potential to be seen, and focuses in on the area from which the solar towers have a reasonable likelihood of being visible, confirms this assessment. There is a similar issue with FSA Visual Resources Figure 2, which indicates a number of the assumed (but not verified) alignments of the Old Spanish Trail. Approximately a quarter of the mileage of the trail segments shown lie in areas where the project would have no potential of being seen, but because the viewshed is not indicated, the reader would have no way of knowing this. In addition, many of the trail segments shown on this map are located at distances that are far from the proposed project, where the project's visibility and potential importance in the view has the potential to be low. This assessment can be confirmed by reviewing Figure VR-2.

FSA Visual Resources Figure 3indicates the VRI classifications that the BLM assigned to the BLM lands in the area the map figure encompasses. The VRI classes indicate the BLM's assessment of the existing visual quality of each area of the landscape (but these classes do not represent management prescriptions). Only approximately one fourth of the area shown on this map would lie within the area from which the project could have the potential to be visible, and much of the land with the highest classifications (Class I and II) lies outside the project viewshed. However, there is no way to know this because the viewshed is not indicated. As a result, the reader is given the erroneous impression that much of the land in the project area is visually sensitive. The text of the analysis reinforces the misleading impression that the map figure gives. It states that:

> Nearly 50 percent of the land shown in Figure 3 is Class I, areas of the highest scenic quality and viewer sensitivity. These Class I areas extend beyond the boundaries of the wilderness areas. The Class II areas are seen in both mountains and valleys adjacent to Class I areas and on the Pahrump Valley floor. Class III areas appear to be the smallest component of the areas shown in the figure. Class IV are found mostly in the Pahrump Valley. The figure demonstrates that, according to the BLM rating system, there is a generally a high degree of scenic quality in the vicinity of the project site.(FSA p. 4.12-4)

This discussion fails to distinguish between the area from which the project might be visible and thus might potentially affect in some way, and areas from which the project would not be visible, and on which it would have absolutely no effects. If this distinction were made, the conclusions would have to be quite different. First of all, although 50 percent of the land shown on the figure may be Class I land, most of this is in areas where the project will be not be visible. In the actual project viewshed, not only will the percentage of Class I land be considerably smaller, most of it will be located in the outer regions of the viewshed, further from the project site. A correct interpretation of the VRI data would be that the lands in the immediate vicinity of the project site consist of a mix of private lands that are not under BLM jurisdiction and have no VRI rating, and lands with a lower (Class III and IV) VRI ratings, with an area of VRI class III lands on the mesa area to the east of the state line. Figure VR-3, which identifies the limits of area from which the project has the potential to be seen and focuses in on the area from which the solar towers have a reasonable likelihood of being visible confirms this assessment.

FSA Visual Resources Figure 4, which indicates VRM classifications, and the discussion related to it have issues that are similar to those of FSA Visual Resources Figure 3. As is the case with FSA Visual Resources Figure 3, from most of the area encompassed by the FSA Figure 4 map, the project will not be visible. Although this map identifies large areas as VRM Class I and II, which are managed to prevent visual

change (Class I) or to limit it strictly (Class II), most of these lands are in areas from which the project would not be visible. Had the viewshed boundaries been superimposed on this map, it would be clear that within the area from which the project has the potential to be visible, most of the BLM lands in the vicinity of the project site are designated as VRM Class III and IV lands on which substantial visual change is permitted, and that the more restrictive Class I and II classifications are further from the project site, at the fringes of the viewshed. This assessment can be confirmed by review of Figure VR-4.

Text related to FSA Visual Resource Figures 3 and 4 states:

> The two figures clearly illustrate the high degree of scenic quality that exists with the viewshed of the proposed project site. (FSA, p. 4.12-5)

This assertion is not supported by FSA Visual Resource Figures 3 and 4. First, because the boundaries of the viewshed are not indicated on these figures, these figures do not indicate what the conditions are within the project viewshed. Secondly, if the viewshed boundary were to be superimposed on these figures, as has been done on Figures VR-3 and 4, a different picture would emerge. Within the project viewshed, the preponderance of the lands within the viewshed and in close proximity to the project site have classifications that indicate lower levels of visual quality and land management policies that permit higher levels of visual change, while the lands with higher levels of visual quality tend to be in the outer areas of the view.

C. The FSA attributes too much importance to the views of and from the portions of the wilderness areas and national recreation areas in the project viewshed:

1. The Wilderness Act 1964, Public Law 88-577 (16 U.S. C. 1131-1136) provides no special protections to lands outside the Wilderness areas, either in terms of protection of views from those outside areas toward the Wilderness areas or in terms of the views from the Wilderness areas into the areas around them. For this reason, it is not valid to assume that viewers in Wilderness areas should have a presumption that the views they see from the Wilderness of lands in the surrounding region should be free of development. It is worth noting that the Wilderness areas in the project analysis area all currently overlook areas where there is already some level of development, and that many of the valley lands visible from these Wilderness areas are ones where BLM Resource Management Plans and local government LORS permit further development, irrespective of the fact that they may be visible from Wilderness areas nearby.
2. Given that the Wilderness Act provides no special protection for views from Wilderness areas, there is no legal basis for assuming that any view from a Wilderness area constitutes a “scenic vista.”
3. The FSA does not include an identification of the portions of these Wilderness and National Recreation Areas that are located within the project’s viewshed. Maps that the Applicant filed with the CEC depict the areas from which the project will and will not be visible and indicate that from much of the Wilderness land in the project vicinity, the project will not be visible.
4. The FSA does not sufficiently weigh the fact that the numbers of people using the Wilderness areas, in the project vicinity is small. In addition, the FSA does not take into account the fact that in the portions of the Wilderness from which the project has the potential to be visible, there are no trails or staging areas that would encourage visitor use. If the viewshed delineation had been superimposed on maps of the Wilderness areas, along

with the locations of wilderness staging areas, trails, public use areas, and major points of interest in these Wilderness areas, there would be a basis for assessing whether the portions of the Wilderness areas located within the project viewshed are even likely to be visited. Based on observations made in the field, it would appear that the portions of the Wilderness areas within the project viewshed do not include any of these features that would be likely to encourage public visitation.

5. Like the Wilderness areas, the legislation establishing the Spring Mountains National Recreation Area (103rd Congress 1st Session, H.R. 63, Spring Mountains National Recreation Area Act) includes no goals or policies to protect views of, or from, this area. As a result, there is no legal basis for the FSA to assume that viewers in this recreation area should have an expectation that views from this area into the surrounding landscape should be pristine or that views from this recreation area necessarily constitute "scenic vistas." It should be noted that the mountains on which this recreation area is located overlook and provide views of both Las Vegas and Pahrump, where there are substantial levels of development. From most of the recreation area, the project would not be visible, and to the extent to which the project could be seen, it would be a tiny element in the overall view because the project would be seen from a distance of 10, or considerably more, miles. In the FSA, this reality has been confirmed by a simulation of a view from the Spring Mountains National Recreation Area that Staff prepared and presented on FSA Visual Resources Figure 26. In evaluating this simulation, Staff stated that, "Staff has determined that, while the project would be visible from this location, the distance and atmospheric interference would lessen the visual impacts to less than significant." (FSA, p. 4.12-29) Staff also states, "Staff appreciates the opportunity to review this viewpoint and finds that the impacts on visual resources would be less than significant from this location." (FSA, p. 4.12-29) Unfortunately, the implications of this empirical analysis of project impacts on views from the Spring Mountain Wilderness Area have not been fully reflected in the Staff's analysis. The analysis of project impacts on scenic vistas, for example, suggests that views from surrounding "scenic resources" a class that according the FSA includes the Spring Mountains National Recreation Area would be "significantly impacted" (FSA p 4.12-16)

D. The FSA attributes significant adverse impacts from locations that were not subject to KOP analysis.

For example, at page 4.12-17 the FSA finds that construction traffic would have a significant adverse visual impact because it "would introduce activity into the views not currently seen." This conclusion is not supported by actual KOP analysis, but is based on an undefined location that is presumably directly at the entrance of the project.

E. The FSA pncorrectly finds temporary construction impacts to be significant.

The discussion of construction traffic at page 4.12-17 discussed in the paragraph above indicates that "Construction-related truck traffic (that) would be entering and leaving the project by way of what is now known as Topaz Street" would have significant impacts. This finding that construction traffic would constitute a significant adverse visual impact is unprecedented and lacks the support of objective analysis. Among the factors that this assertion does not take into account are that this traffic will be temporary, occurring only during some portions of the 29-month construction period, and will be intermittent in nature. There is no description of the numbers and kinds of vehicles that will be entering the site, their appearance, and how the presence of these vehicles would "substantially degrade the existing visual character or quality of the site and its surroundings".

The FSA also asserts that the construction of the power towers would have significant impacts on views from all vantage points and that in addition, construction of the other components of the project would have significant impacts on views from KOP 5. These assertions are not substantiated by analysis, and are inconsistent with the well established principle in CEQA practice that impacts that are temporary are less than significant.

F. The FSA fails to properly recognize that for many viewers, the proposed project may be a feature of positive visual interest and may be considered to have aesthetically attractive qualities.

Solar electric generating facilities using the solar tower technology have a striking visual appearance that people have the potential to find interesting, aesthetically attractive, and a positive feature of the landscape. Evidence of this is provided by the public response to the Albengoa PS-10 and PS-20 solar towers near Seville, Spain. Photographs of this facility are now in widespread circulation[1], and many of these photographs are artistic in nature, highlighting the tower, the heliostat arrays, and in particular, the appearance of the project under "tee pee" effect conditions. The tee pee effect is created when under certain atmospheric conditions, the sunlight reflected from a solar tower project's heliostats create visible rays of light in the atmosphere that appear to be streaming down from the solar receiver tower, creating a tent-like effect. The many dramatic images now seen depicting the Spanish solar towers with streaming rays of light appear to present these solar towers in positive aesthetic terms, as positive elements of energy infrastructure that has an ethereal beauty. In California, the analysis in the FSA for the Ivanpah project correctly observed that the tenting effect that at times could be created by the visible light rays could contribute to a high level of visual unity in the view, which some viewers might find attractive (Ivanpah FSA , p. 6.12-15). The precedent set by the images of the Spanish solar towers and the Ivanpah FSA's findings about the positive visual effects of the project suggest that at Hidden Hills the project could be perceived as a positive visual feature of the view—particularly when the tenting effect is present. In addition, it is possible that HHSEGS will attract visitors who wish to see it and to capture it in photographs, especially at times when the tenting is visible.

Further evidence of the potential aesthetic appeal of solar tower projects in the California desert landscape is provided by the current public interest in the Ivanpah project that is now under construction. Although construction of the Ivanpah project is not yet complete, it has already been photographed extensively, the photographs are in wide circulation, and in a number of cases, the photographs have been artistic in nature. Examples include the visually striking photographs included in articles that have appeared in the Los Angeles Times[2] (September 20, 2012) and the Smithsonian[3] (November 2012) .

There is precedent for large-scale infrastructure projects whose aesthetic effects were an issue of concern during their planning stages to ultimately be perceived as positive elements of the landscape. San Francisco's Golden Gate Bridge is a case in point. At the time the construction of the bridge was under consideration, there was substantial opposition, some of it based on aesthetic grounds.[4] For example, one of the anti-bridge ads was headlined "The Golden Gate is One of Nature's Perfect Pictures

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[1] A search of Fickr, using the search terms "Spain", "solar" and "tower" produced 245 images, many of which featured the Albengoa solar towers as dramatically beautiful elements of the landscape: http://www.flickr.com/search/?w=all&q=Spain+Solar+tower&m=text#page=0

[2] LA Times Available online: http://www.latimes.com/news/local/la-me-bigsolar-20120921,0,7995250.story?page=1

[3] Available online at: http://www.smithsonianmag.com/science-nature/take-a-look-at-the-worlds-largest-solar-thermal-farm-175642351.html

[4] John King, Golden Gate Bridge - Construction and Indignation, San Francisco Chronicle, May 13, 2012: http://www.sfgate.com/bayarea/place/article/Golden-Gate-Bridge-construction-and-indignation-3554707.php

– Let's Not Disfigure It."[5] Although the design of the Golden Gate Bridge was highly utilitarian, with limited consideration of aesthetics[6], after its construction, the bridge became a landmark, and has been perceived as enhancing the drama of the Golden Gate. For example, the bridge has been referred to as "a man-made object whose 'soaring grace enhances the beauty of its natural setting', and the largest work of art in history."[7] The bridge is now said to be the most photographed bridge in the world.[8] In a 1972 interview conducted with the UC Berkeley Regional History Office, Ansel Adams stated: "I remember thousands of people fought the Golden Gate Bridge. My mother used to think that it was 'just terrible, ruining the Gate.' Well the bridge is up. I personally don't think it was so bad. I think it's a very majestic structure."[9] In a more recent development, as part of the celebration of the Golden Gate Bridge's 75th birthday, scientists at the University of California Berkeley's Space Science Laboratory designed a system of heliostats that were installed on the tops of the bridge's towers to flash the reflected sun "like a lit candle."[10] The mirrors were in operation from May 27, 2012 through the end of September, 2012. The mirrors had a computerized control system that made it possible to reflect a beam of light almost anywhere in the Bay Area. While the mirrors were in place, Bay Area residents could go to a web site where they could reserve a time for the heliostats to direct a light "far greater than any artificial spotlight" directly toward them.[11] Many Bay Area residents appear to have taken advantage of this opportunity to see these points of light in the landscape, and the comments and photographs many of them posted can be seen on the installation's Solar Beacon web site.[12] Once the interpretive center Staff has called for in FSA COC VIS-6 is in operation, Inyo County residents will also have an opportunity to observe and appreciate the sight of solar beacons.

G. The FSA wrongly concludes that the aviation safety lighting will have a significant adverse visual impact.

The aviation safety lighting mandated by the Federal Aviation Administration consists of flashing red lights mounted on the tops and at several points on the sides of the solar towers. From viewpoints in the project area, the aviation safety lights will be visible in a very small sector of the 360-degree view of the night sky, leaving most of the sky unaffected. Because of their red color and design, in the small portion of the night sky in which these lights will be visible, they will appear as small points of flashing red light.

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[5] Advertisement in the San Francisco Examiner, November 1, 1930: http://www.sfgate.com/bayarea/place/article/Golden-Gate-Bridge-construction-and-indignation-3554707.php#photo-2931082

[6] In an article reviewing bridge aesthetic issues, Matthew Dresden notes that "The Golden Gate Bridge's website would have you believe that a great deal of thought went into the design of the bridge. This is true, of course, but little of that thought was geared toward aesthetics. " p.12) Of the final design that was adopted, Dresden points out that: "Strauss' alternative design, a less expensive, clean-lined suspension bridge – the design that ultimately came to be built – was the result of economic necessity, rather than a quest for beauty. In other words, the Golden Gate Bridge was designed to be the cheapest, most simple bridge possible." (p13) He further notes that in the brochure that promoted the bond issue requiring voter approval to fund the bridge, "Not one word addressed the design or appearance of the bridge" p. 13. Matthew Dresden, Must a Bridge Be Beautiful Too? Access, Number 28, Spring 2006, pp.10-17: http://www.uctc.net/access/28/Access%2028%20-%2003%20-%20Must%20a%20Bridge%20Be%20Beautiful%20Too.pdf

[7] Dresden, ibid.

[8] A search of Flickr using the term "Golden Gate Bridge" produced 453,373 results:

[9] Cited in King, ibid.

[10] Robert Sanders, Mirrors provide candles for Golden Gate Bridge's 75th birthday. Press Release, May 25, 2012: http://newscenter.berkeley.edu/2012/05/25/artist-and-space-scientists-celebrate-golden-gate-bridge-anniversary-with-solar-bridge/

[11] Bryce Nesbit, Last week for personalized Golden Gate Light Show, El Cerrito Patch, September 23, 2012: http://elcerrito.patch.com/articles/last-week-for-golden-gate-bridge-light-show

[12] http://solarbeacon.org/?page_id=394

They will have little to no effect on ambient lighting conditions in the area around them. In addition, they will have no detectable effect on the relative darkness of the night sky and thus will have no effect on the viewer's ability to see the stars and planets. These conclusions are supported by observations of similar aviation safety lighting installed on countless wind turbines and electric transmission line structures throughout the southern California desert region, which indicates that this kind of lighting has no noticeable effect on ambient lighting in the vicinity of the structures on which they are mounted and play no detectable role in illuminating the sky. In addition, with implementation of Condition of Certification VIS-7, which will bring about planting of trees around residences in Charleston View, there will be increased screening of views toward the solar towers from the residences in this area, reducing, if not eliminating views of the aviation safety lighting that might otherwise be seen by viewers in this area.

In the case of the Ivanpah solar project, whose design uses three solar towers, each of which will be outfitted with the required FAA aviation safety lighting, the Commissioners found in their decision that the potential visual impact of this project's aviation safety lighting is not significant (Ivanpah Electric Generating System, Commission Decision, September 2010, Visual Resources, p. 27).

IV. Applicant's Proposed Findings of Fact

Based on the evidence, the Applicant finds and concludes as follows:

1. The project will be located on privately owned lands that have been previously subdivided and developed with a grid of unpaved roads. The project site is flat and does not include features of recognized scenic importance.

2. The project site is located in an area of Inyo County for which the County has not adopted any specific policies or plans for protection of the landscape.

3. In 2011 Inyo County designated the project site and a large area around it as Renewable Energy Overlay zone in which in which large-scale wind, solar, and transmission line projects would be permitted. The County included the project site in the Overlay Zone specifically because it did not contain sensitive scenic resources. The overlay district designation has been rescinded, but this repeal was due to a legal challenge to the procedures under which the Overlay Zone was adopted, not an objection to the aesthetic effects of solar energy projects in this location.

4. The visual sensitivity of the lands that immediately surround the project site is low. On its western and southern borders, the site is surrounded by private lands, and as is the case for the project site itself, Inyo County has not adopted any specific landscape protection policies for them. The lands that border the project to the east are managed by the BLM, which has adopted a Visual Resource Management (VRM) Class IV designation for them, which permits a high degree of visual modification.

6. Although the viewshed located within 10 miles of the solar towers includes portions of the Pahrump Valley and Nopah Wilderness Areas, the Wilderness status of these areas has no bearing on the potential significance of the project's visual effects. The Wilderness Act provides no special protection for views from Wilderness areas; as a consequence, there is no legal basis for assuming that a view from a Wilderness area constitutes a "scenic vista" or necessarily has a high degree of visual sensitivity.

7. The project is not adjacent to a designated scenic highway.

9. The numbers of potential viewers in areas near the project are relatively small, consisting of the occupants of the no more than 275 vehicles per day that travel on Tecopa Road through the project area, the 68 residents of Charleston View, and the unknown but likely to be small numbers of visitors on the nearby public lands. In the future, the project may be visible to people who visit the Saint Therese Mission, which is now under development. For visitors within the Mission complex, views toward the project facilities will be substantially screened by buildings and landscaping.

10. For some residents and visitors, the project, and particularly the solar towers, have the potential to become a point of positive visual interest.

11. The project's potential impacts on visual resources were analyzed from seven defined Key Observation Points (KOPs) at representative locations surrounding the project site in both California and Nevada. At six of the KOPs, (1, 2, 3, 5, 6, and 7,) the impacts would be less than significant. At KOP 4, the impacts have the potential to be significant, but these can be reduced to a level that is less than significant with implementation of the applicant's proposed mitigation measures.

12. There would be no significant adverse impacts in California to visual resources resulting from the HHSEGS linears, which are located in Nevada.

13. The impacts of the project's temporary construction activities on visual resources would be less than significant, and mitigation of these impacts is not required.

14. With implementation of the lighting design measures proposed in the AFC, the impacts of the project lighting would be less than significant.

15. The luminosity of the solar boilers located on the tops of the two solar towers would be similar to the luminosity of the solar boiler that can be seen in operation at the Shell Solar to Steam Demonstration Project in Coalinga, and their visual impact would be less than significant, except in views from the nearby Charleston View residential area (KOP 4), where the impacts will be reduced to a less than significant level through implementation of proposed mitigation measures.

16. The project would comply with Inyo County laws, regulations and standards regarding project design, scenic views and other requirements related to Visual Resources.

17. The project is generally in compliance with applicable Nevada LORS. The Nevada LORS are not applicable to the project.

V. Proposed Licensing Conditions

The Applicant submitted specific comments on the licensing conditions proposed in the PSA. The FSA did not respond to these comments, nor explain, much less justify, why the Applicant's comments were not acceptable.

VIS-1: Surface Treatment of Project Structures and Buildings

The Applicant supports the overall intent of VIS-1 to ensure the use of appropriate color treatment to optimize the integration of the project into its landscape setting. However, the Applicant objects to the provision that the concrete power towers be painted or tinted and insists that it be removed from this Condition of Certification. The natural gray of the concrete towers will provide a lightly textured, neutral

colored surface with a low level of reflectivity, which will relate well with its context, particularly in views in which it is seen against the sky. Therefore, please revise VIS-1 as follows:

VIS-1 The surfaces of the solar towers will retain the natural gray color of the concrete from which they are constructed, with the exception of a ring of white paint that will be applied to the area just below the solar boilers to protect the concrete. However, the~~The~~ project owner shall treat the surfaces of all of the other permanent project structures and buildings located at the power block or within the common area and visible to the public such that a) their colors minimize visual intrusion by blending with the landscape or by providing architectural interest; b) their colors and finishes do not create excessive glare; and c) their colors and finishes are consistent with local policies and ordinances. Surface color treatment shall include painting ~~or tinting~~ of ~~power towers,~~ stacks, dry cooling structures, tanks, heliostat structures and other features in earth tone colors and values to blend in with the surrounding mountains and desert vegetation. Colors shall be chosen from palettes of color available from the manufacturers of the project's equipment that are similar to or consistent with the colors on BLM's Standard Environmental Colors. The colors selected should be ~~and~~ pre-tested in the field to the extent feasible. Any transmission line poles and conductors associated with the project in California shall be non-specular and non-reflective, and the insulators shall be non-reflective and non-refractive.

Verification: At least 90 days prior to specifying to the vendor the colors and finishes of the first structures or buildings that are surface treated during manufacture, the project owner shall submit the proposed treatment plan to the CPM for review and approval and simultaneously to Inyo County for review and comment. If the CPM determines that the plan requires revision, the project owner shall provide to the CPM a plan with the specified revision(s) for review and approval by the CPM before any treatment is applied. Any modifications to the treatment plan must be submitted to the CPM for review and approval.

Prior to the start of commercial operation, the project owner shall notify the CPM that surface treatment of all listed structures and buildings has been completed and is ready for inspection and shall submit one set of electronic color photographs from the same key observation points identified in (c) ~~above~~ below.

The project owner shall submit for CPM review and approval, a specific surface treatment plan that would satisfy these requirements. The treatment plan shall include:

a.) a description of the overall rationale for the proposed surface treatment, including the selection of the proposed color(s) and finishes, including the photographic results of field testing;

b.) a list of each major project structure, building, tank, pipe, and wall; and fencing, specifying the color(s) and finish proposed for each. Colors must be identified by vendor, name, finish and number; or according to a universal designation system;

c.) one set of 11" x 17" color photo simulations at life size scale of the treatment proposed for use on project structures, including structures treated during manufacture, from representative points of view, Key Observation Points 3 and 5, (Visual Resources Figure 20b and 22b of the Staff Assessment) or color-rendered elevation drawings on 18" x 24" minimum sheet size;

d.) color samples on color card or painted steel;

e.) a specific schedule for completion of the treatment; and

f.) a procedure to ensure proper treatment maintenance for the life of the project.

The project owner shall not specify to the vendors the treatment of any buildings or structures treated during manufacture, or perform the final treatment on any buildings or structures treated in the field, until the project owner receives notification of approval of the treatment plan by the CPM. Subsequent modifications to the treatment plan are prohibited without CPM approval.

~~**Verification:** At least 90 days prior to specifying to the vendor the colors and finishes of the first structures or buildings that are surface treated during manufacture, the project owner shall submit the proposed treatment plan to the CPM for review and approval and simultaneously to Inyo County for review and comment. If the CPM determines that the plan requires revision, the project owner shall provide to the CPM a plan with the specified revision(s) for review and approval by the CPM before any treatment is applied. Any modifications to the treatment plan must be submitted to the CPM for review and approval.~~

~~Prior to the start of commercial operation, the project owner shall notify the CPM that surface treatment of all listed structures and buildings has been completed and are ready for inspection and shall submit one set of electronic color photographs from the same key observation points identified in (c) above.~~

The project owner shall provide a status report regarding surface treatment maintenance in the Annual Compliance Report. The report shall specify a): the condition of the surfaces of all structures and buildings at the end of the reporting year; b) maintenance activities that occurred during the reporting year; and c) the schedule of maintenance activities for the next year.

VIS-2: Landscape Improvements, Permanent Fencing and Screening

As drafted, VIS-2 calls for more landscaping than is necessary to respond to the project's specific effects on critical viewing areas. This Condition needs to be revised in a number of ways:

1. Limit landscaping to the southern perimeter of the site, along Tecopa Road/Old Spanish Trail Highway and delete the requirement for landscaping along the project's eastern and western boundaries. Because there are few, if any, viewers in close proximity to the eastern and western boundaries of the site, landscaping along these perimeters of the site would add little mitigation value. In addition, the establishment of unnecessary landscaping along these perimeters would create other issues, including increasing the project's overall water use and placing alien plant species in areas adjacent to native plant communities that the FSA characterizes as being largely intact.
2. The FSA's glint and glare analysis (Appendix VR-2) establishes that the heliostats will be programmed "such that reflectivity would never be directed toward ground level viewers located outside the of the project site" and that "[l]ocations on the ground outside of the footprint of the plant will not receive any direct reflections of sunlight." Given the fact that there will be no ground-level reflections, there is no need for fence slats, or continuous thick landscaping to screen glint and glare emanating from the heliostats. Besides being unnecessary, this screening would be aesthetically counterproductive, adding additional solid forms to the near-foreground views from Tecopa Road and creating a high sense of enclosure along the road corridor. In addition, this screening would eliminate the potential for those driving by to catch

glimpses of views into the facility. Because the project is likely to become a feature of interest to those traveling through the area, completely blocking the views from Tecopa Road into the project would be inconsistent with the goal of providing the traveling public the opportunity to see, understand, and appreciate the facility and would be at cross purposes with VIS-6.

Therefore, VIS-2 should be revised as follows:

VIS-2 The project owner shall provide landscaping that responds to the concerns and preferences of local residents and Inyo County. To achieve this objective, the project owner shall develop a plan for the treatment of the frontage along Tecopa Road/Old Spanish Trail Highway in consultation with Inyo County. In developing this plan, considerations that should be taken into account include ~~reduces the visibility of the power plant structures and is in accordance~~ achieving conformity with local policies~~,~~ and mitigating the project's effects on views from Tecopa Road/Old Spanish Trail Highway and from the area of concentrated development in Charleston View.

Verification: ~~Consideration should be given to placing T~~trees and other vegetation shall be placed along the facility's southern boundary~~ies~~, in conformance with the Conceptual Landscape Plan, Figures VR-1a, b and c, in ~~the 11-AFC-02~~ AFC Supplement A. ~~In addition, the project owner shall provide screening plantings along the property borders on the west and east. The objective shall be to create landscape screening of sufficient density and height to screen the power plant structures to the greatest feasible extent within the shortest feasible time from adjacent properties.~~ In the short strip along the north side of Tecopa Road/Old Spanish Trail Highway directly north of the most heavily developed portion of Charleston View, ~~consideration should be given to the implementation of the landscape plan~~ indicated in Conceptual Landscape Plan Figure VR-1b with the objective of providing a~~n attractive project border and substantial~~ landscaping screening of non-tower project facilities in views from the adjacent street. ~~nearby Charleston View residences and streets.~~ In the remaining areas of the project's southern perimeter along Tecopa Road, ~~consideration should be given to adapting the~~ landscape plan indicated in Figure VR-1a and implementing it with the goal of creating a~~n attractive, visually interesting border~~ landscape buffer along Tecopa Road. While this landscape border may provide partial screening of views into the project site, it is not intended to provide full screening. Selected plants ~~shall~~ would be drawn from the plant list the Applicant filed on Conceptual Landscape Plan Figure VR-1c, and should avoid invasive exotic species as indentified by the USDA[13] and Invasive Species Council of California (ISCC)[14]. ~~Landscape plantings and other elements must meet the requirements of the applicable General Plan and Zoning Regulations of Inyo County and any site development standards associated with those regulations.~~

~~The landscape plan shall also include the permanent perimeter fencing. In order to minimize the dangerous effects of glint and glare on passing motorists and on visitors to the St. Therese Mission, a solid wall of sufficient height to screen the view of the heliostat mirrored surfaces shall be included. All chain link or wind fencing shall include neutral-colored privacy slats to screen views of the interior. Concertina razor wire or similar security obstacles shall only be installed on the interiors of the fencing and shall not be visible from the exterior.~~

[13] NRCS Invasive Species Policy, Invasive Species Executive Order 13112, Invasive and Noxious Weeds, California State Listed Noxious Weeds.

[14] **The California Invasive Species List,** Presented on April 21, 2010 by the California Invasive Species Advisory Committee (CISAC) to the Invasive Species Council of California (ISCC).

The project owner shall submit to the CPM for review and approval and simultaneously to Inyo County for review and comment a Landscape Documentation Package whose proper implementation will satisfy these requirements and the requirements of the Water Efficient Landscape Ordinance (WELO).

The landscape plan shall be submitted to the CPM for review and approval and simultaneously to Inyo County for review and comment at least 90 days prior to installation. If the CPM determines that the plan requires revision, the project owner shall provide to the CPM and simultaneously to Inyo County a revised plan for review and approval by the CPM. The submittal shall include 3 printed sets of full-size plans (not to exceed 24" x 36"), 3 sets of 11" x 17" reductions and a digital copy in PDF format.

The plan shall include:

a.) a detailed Landscape Design Plan, at a reasonable scale (1"=40' maximum). ~~The plan shall demonstrate how the~~ objectives defined by Inyo County~~requirements stated above shall be met.~~ The plan shall provide a detailed installation schedule demonstrating installation of as much of the landscaping prior to plant operation. ~~as early in the construction process as is feasible in coordination with project construction~~. The Landscape Design Plan shall include a Planting Plan with Plant List (prepared by a qualified landscape architect familiar with local growing conditions) of proposed species, specifying installation sizes, growth rates, expected time to maturity, expected size at five years and at maturity, spacing, number, availability, and a discussion of the suitability of the plants for the site conditions and mitigation objectives, with the objective of providing the widest possible range of species from which to choose; specifications for groundcover, top-dressing of planting areas and weed abatement measures. Existing vegetation (if any) shall be noted on the Landscape Plan. ~~The Landscape Design Plan shall specify all materials to be used for interior roads, walks, parking areas and hardscape materials (i.e. gravel) to be placed in areas that are not paved or planted, and exterior fencing or walls.~~

b.) an Irrigation Plan in compliance with the Water Efficient Landscape Ordinance. The plan shall include the following: complete Irrigation Design Plan, specifying system components and locations, and shall include the Water Efficient Landscape Worksheet.

c.) maintenance procedures, including any needed temporary irrigation, and a plan for routine annual or semi-annual debris removal for the life of the project; and

d.) a procedure for monitoring and replacement of unsuccessful plantings for the life of the project.

The plan shall not be implemented until the project owner receives final approval from the CPM.

~~**Verification:** The landscape plan shall be submitted to the CPM for review and approval and simultaneously to Inyo County for review and comment at least 90 days prior to installation. If the CPM determines that the plan requires revision, the project owner shall provide to the CPM and simultaneously to Inyo County a revised plan for review and approval by the CPM. The submittal shall include 3 printed sets of full-size plans (not to exceed 24" x 36"), 3 sets of 11" x 17" reductions and a digital copy in PDF format.~~

Planting must occur during the first optimal planting season following site mobilization. The project owner shall simultaneously notify the CPM ~~and Inyo County~~ within seven days after completing installation of the landscape plan., ~~that the site is ready for inspection. A report to~~

~~the CPM describing how the completed landscape meets the conditions of VIS-2 shall be submitted in conjunction with the inspection~~.

The project owner shall report landscape maintenance activities, including replacement of dead or dying vegetation, for the previous year of operation in each Annual Compliance Report.

VIS-3: Permanent Exterior Lighting

The Applicant supports the intent of VIS-3 to ensure the night lighting installed at the project site is the minimum needed to meet operational and safety requirements and that it is designed in a way that minimizes light spill into the surrounding area or into the sky. Several minor changes to the language are requested to account for the need for FAA-required aviation safety lighting and ensure a prompt review of the lighting plan that the Applicant submits. Therefore, please revise VIS-3 as follows:

VIS-3 To the extent feasible, consistent with safety and security considerations, the project owner shall design and install all permanent exterior lighting such that:

a.) lamps and reflectors are not visible from beyond the project site, including any off-site security buffer areas;

b.) lighting does not cause excessive reflected glare;

c.) direct lighting does not illuminate the nighttime sky; except as required for FAA aircraft safety lighting;

d.) illumination of the project and its immediate vicinity is minimized, and

e.) the plan complies with local policies and ordinances.

Verification: At least 90 days prior to ordering any permanent exterior lighting, the project owner shall submit to the ~~contact~~ CPM the construction and operations project lighting plans. ~~to discuss the documentation required in the lighting mitigation plan~~. At least 60 days prior to ordering any permanent exterior lighting, the project owner shall submit to the CPM for review and approval and simultaneously to Inyo County for review and comment a lighting ~~mitigation~~ plan. Review comments on the plan are to be provided to the Applicant within 10 days of submission. If the CPM determines that the plan requires revision, the project owner shall provide to the CPM a revised plan for review and approval by the CPM. The submittal shall include three printed sets of full-size plans (not to exceed 24 x 36 inches), three sets of 11- x 17-inch reductions and a digital copy in PDF format. The project owner shall not order any exterior lighting until receiving CPM approval of the lighting ~~mitigation~~ plan.

The project owner shall submit to the CPM for review and approval and simultaneously to Inyo County for review and comment a lighting ~~mitigation~~ plan that includes the following:

a.) Location and direction of light fixtures shall take the lighting ~~mitigation~~ requirements into account;

b.) Lighting design shall consider setbacks of project features from the site boundary to aid in satisfying the lighting mitigation requirements;

c.) Lighting shall incorporate fixture hoods/shielding, with light directed downward or toward the area to be illuminated;

d.) Light fixtures that are visible from beyond the project boundary shall have cutoff angles that are sufficient to prevent lamps and reflectors from being visible beyond the project boundary, except where necessary for security;

e.) All lighting shall be of minimum necessary brightness consistent with operational safety and security;

f.) Lights in high illumination areas not occupied on a continuous basis (such as maintenance platforms) shall have (in addition to hoods) switches, timer switches, or motion detectors so that the lights operate only when the area is occupied and

g.) Statement of conformance with all federal, state and local statutes and regulations related to dark skies or glare, including, but not limited to, ~~the Inyo County General Plan~~.

~~**Verification:** At least 90 days prior to ordering any permanent exterior lighting, the project owner shall contact the CPM to discuss the documentation required in the lighting mitigation plan. At least 60 days prior to ordering any permanent exterior lighting, the project owner shall submit to the CPM for review and approval and simultaneously to Inyo County for review and comment a lighting mitigation plan. If the CPM determines that the plan requires revision, the project owner shall provide to the CPM a revised plan for review and approval by the CPM. The submittal shall include 3 printed sets of full-size plans (not to exceed 24" x 36"), 3 sets of 11" x 17" reductions and a digital copy in PDF format. The project owner shall not order any exterior lighting until receiving CPM approval of the lighting mitigation plan.~~

Prior to commercial operation, the project owner shall notify the CPM that the lighting has been completed and is ready for inspection. If after inspection the CPM notifies the project owner that modifications to the lighting are needed, within 30 days of receiving that notification the project owner shall implement the modifications and notify the CPM that the modifications have been completed and are ready for inspection.

Within 48 hours of receiving a <u>legitimate</u> lighting complaint, the project owner shall provide the CPM with a complaint resolution form report as specified in the Compliance General Conditions including a proposal to resolve the complaint, and a schedule for ~~implementation~~ <u>resolution</u>. The project owner shall notify the CPM within 48 hours after ~~completing implementation of the proposal~~resolution. A copy of the complaint resolution form report shall be submitted to the CPM within 30 days.

VIS-4: Construction Fencing

At the considerably smaller sites of conventional gas-fired power plants, particularly if they are being developed in more developed and visually sensitive settings, there can often be a rationale for providing screening of the site during the construction period. However, in the flat landscape along Tecopa Road, where existing roadside vegetation will provide a measure of screening of views into the site, and where the most extensive construction activities will be taking place at the two sets of power towers and power blocks, which will be located 0.5 and 1.75 miles from the road at their closest points, the justification for installation of construction screening fencing is not strong. The Applicant requests that this Condition be eliminated.

VIS-5: Construction Lighting

The Applicant supports the objective of VIS-5 to ensure the night lighting required during the construction period is the minimum needed to meet operational and safety requirements and that it is designed and deployed in a way that minimizes light spill into the surrounding area and into the sky. The Applicant requests a minor change to the language to ensure that efforts to attenuate the construction lighting are feasible and practical and do not conflict with safety requirements. The provision calling for screening to prevent construction light from shining into Charleston View should be deleted because it is unnecessary. The screening is not needed because of the provisions to limit the amount and intensity of

lighting, to keep it turned off when not needed, and to ensure that it is directed specifically to the places where it is required will all minimize the potential for light to spill off the site and into Charleston View during the construction period. The areas of the project site where there will be the greatest need for construction lighting will be at the Unit 2 solar tower and power block, located 0.5 mile from the northern edge of Charleston View, the common area, located 1 mile from the edge of Charleston View, and the Unit 1 solar tower and power block located 1.8 miles from Charleston View. The potential for onsite construction lighting to have any effect on lighting conditions in Charleston view will be minimized by the distance of these areas of most intense construction activity from Charleston View. given the rapid rate at which light intensity decreases with distance.[15] . Revise VIS-5 as follows:

VIS-5 The project owner shall ensure that lighting for construction of the power plant is deployed in a manner that minimizes potential night lighting impacts, as follows:

a.) all lighting shall be of minimum necessary brightness consistent with worker safety and security;

b.) all fixed position lighting shall be shielded or hooded, to the extent feasible given safety and security concerns, and directed downward toward the area to be illuminated to ~~prevent~~ minimize direct illumination of the night sky and direct light trespass (direct light extending outside the boundaries of the power plant site or the site of construction of ancillary facilities, including any security related boundaries);

c.) ~~screening shall be provided to effectively prevent nighttime construction lighting from shining toward Charleston View;~~ and

d.) wherever feasible~~, safe~~ and not needed for security or safety, lighting shall be kept off when not in use.

e.) FAA and required security lighting shall be included on all construction structures per regulations.

Verification: Within seven days after the first use of construction lighting, the project owner shall notify ~~and~~ the CPM that the lighting is ready for inspection. If the CPM requires modifications to the lighting, within 15 days of receiving that notification, the project owner shall implement the necessary modifications and notify the CPM that the modifications have been completed.

Within 48 hours of receiving a legitimate lighting complaint, the project owner shall provide the CPM with a complaint resolution form report as specified in the General Conditions section including a proposal to resolve the complaint, and a schedule for ~~implementation~~ resolution. The project owner shall notify the CPM within 48 hours after completing ~~implementation~~ resolution of the proposal. A copy of the complaint resolution form report shall be included in the subsequent Monthly Compliance Report following complaint resolution.

[15] The intensity of light decreases at a rate related to the square of the distance between the light source and the receptor. For an explanation of this inverse square law of decreasing light intensity, see the definition of illuminance on page 5 of the Holophane "Fundamentals of Lighting" manual available at: http://www.holophane.com/education/fund_pdf/HL-862.pdf.

VIS-6: Scenic Resources Interpretative Area

The request for VIS-6 is an acknowledgment of the fact that the project will become a feature of positive visual interest in the project area landscape. While the Applicant accepts, in concept, the idea of providing an interpretative area in the vicinity of the project, it is important that the condition is not unduly prescriptive regarding the location or content of the area. The interpretative area may be an outdoor facility, or might be constructed in conjunction with other visitor facilities in the Charleston View area. Moreover, while the interpretative materials should include a visual resource element, it may be helpful to place this visual element in a broader context relative to the history and culture of the area, and in the context of the technology and resource benefits of the project. Therefore, VIS-6, if adopted, should be revised as follows:

~~Scenic Resources Interpretative Area~~

~~**VIS-6** The project owner shall provide an Interpretive Area with parking and interpretive panels highlighting the views of wilderness areas and landforms in the project vicinity. A detailed plan shall be developed and shall include visitor interpretation of visual resource highlights which have been adversely impacted by the introduction of the project.~~

~~**Verification:** A conceptual plan for the Scenic Resources Interpretative Area located within the project vicinity in Inyo County shall be submitted to the CPM for review and approval within 180 days of receipt of a license to construct and operate HHSEGS. Following CPM approval of the conceptual plan, detailed plans for the interpretive area shall be submitted to the CPM for review and approval, and to Inyo County for review and comment 90 days prior to completion of the HHSEGS project. Plan details shall include:~~

~~a.) Site plan clearly indicating primary project components and location;~~

~~b.) Landscape plan, including visitor area surface treatments~~

~~c.) Irrigation plan;~~

~~d.) Parking area plan indicating lighting (if any), parking striping, ingress and egress;~~

~~e.) Material finishes and details for all components;~~

~~f.) Design plans for interpretive panels and displays, which take into consideration the following visual resource aspects:~~

- ~~Identification of the wilderness and national recreation areas and the major landscape features in the vicinity of the project site (i.e. wilderness areas, mountain ranges, named peaks and other landforms, including, at a minimum, Mount Charleston and the Spring Mountains, Nopah Peak and the Nopah Wilderness Area, Emigrant Pass, the South Nopah Wilderness Area and Pahrump Dry Lake). In addition to a description of the formation of these landforms and their geologic history, information shall include a discussion of the significance of these features from a Native American perspective and as landmarks and waypoints relative to the Old Spanish Trail - Mormon Ro~~
- ~~Introduction to the solar electric technology in use at HHSEGS site.~~
- ~~Pointers to the interpretive resources provided for in CUL-10.~~

~~g.) The plan shall include a maintenance plan and schedule for the duration of the project.~~

~~If the Scenic Resources Interpretive Area is located within the project boundaries, a-b-c-d-e-f above may be incorporated into the landscape plans required in **VIS-2** and lighting plans required in **VIS-3**.~~

~~The Scenic Resources Interpretive Area shall be installed within 90 days of completion of the HHSEGS or in conjunction with landscape and lighting as required by **VIS-2** and **VIS-3** if located on the project site. The project owner shall simultaneously notify the CPM and Inyo County within seven days after completing installation of the interpretive area plan that the site is ready for inspection. A report to the CPM describing how the completed interpretative area meets the conditions of **VIS-6** shall be submitted in conjunction with the inspection.~~

~~The project owner shall report maintenance activities for the previous year of operation in each Annual Compliance Report.~~

VIS-6 The project owner shall provide an Interpretive Area in the project vicinity.

Verification: A conceptual plan for the Scenic Resources Interpretative Area located within the project vicinity in Inyo County shall be submitted to the CPM for review and approval at least 120 days prior to the start of commercial operation of the first solar plant. Following CPM approval of the conceptual plan, detailed plans for the interpretive area shall be submitted to the CPM for review and approval, and to Inyo County for review and comment. Plan details shall include:

a.) Site plan clearly indicating primary project components and location;

b.) Landscape plan, including visitor area surface treatments

c.) Irrigation plan, if applicable;

d.) Parking area plan, if applicable, indicating lighting (if any), parking striping, ingress and egress;

e.) Material finishes and details for all components;

f.) Design plans for interpretive panels and displays,

g.) The plan shall include a maintenance plan and schedule for the duration of the project.

If the ~~Scenic Resources~~ Interpretive Area is located within the project boundaries, a-b-c-d-e-f above may be incorporated into the landscape plans required in **VIS-2** and lighting plans required in **VIS-3**.

The ~~Scenic Resources~~ Interpretive Area shall be installed within 90 days of completion of the HHSEGS or in conjunction with landscape and lighting as required by **VIS-2** and **VIS-3** if located on the project site. The project owner shall simultaneously notify the CPM and Inyo County within seven days after completing installation of the interpretive area plan that the site is ready for inspection. A report to the CPM describing how the completed interpretative area meets the conditions of **VIS-6** shall be submitted in conjunction with the inspection.

The project owner shall report maintenance activities for the previous year of operation in each Annual Compliance Report.

VIS-7: Charleston View Tree Plantings

Because VIS-7 is a mitigation measure that the Applicant proposed, it is a Condition whose objectives the Applicant supports fully. To make this Condition more practical to implement, the Applicant is recommending that the trees be provided and planted by a local landscape contractor. The Applicant

also wants to clarify that this program is limited to properties with approved residences on them and that the property owners are responsible for making provisions for irrigating the trees. Revise VIS-7 as follows:

VIS-7 The project owner shall make provisions to plant trees on the properties of any property owner in Charleston View residing in an approved existing residence that indicates an interest in having them. The intent is to plant the trees in locations that will screen views looking toward the solar power towers from the existing approved residences on the property and from the property's primary outdoor living areas. This shall be available to the residents and property owners (so long as the property is used as a residence) for the ~~life of the project~~ first 2 years of project operation. The project owner shall meet the following requirements:

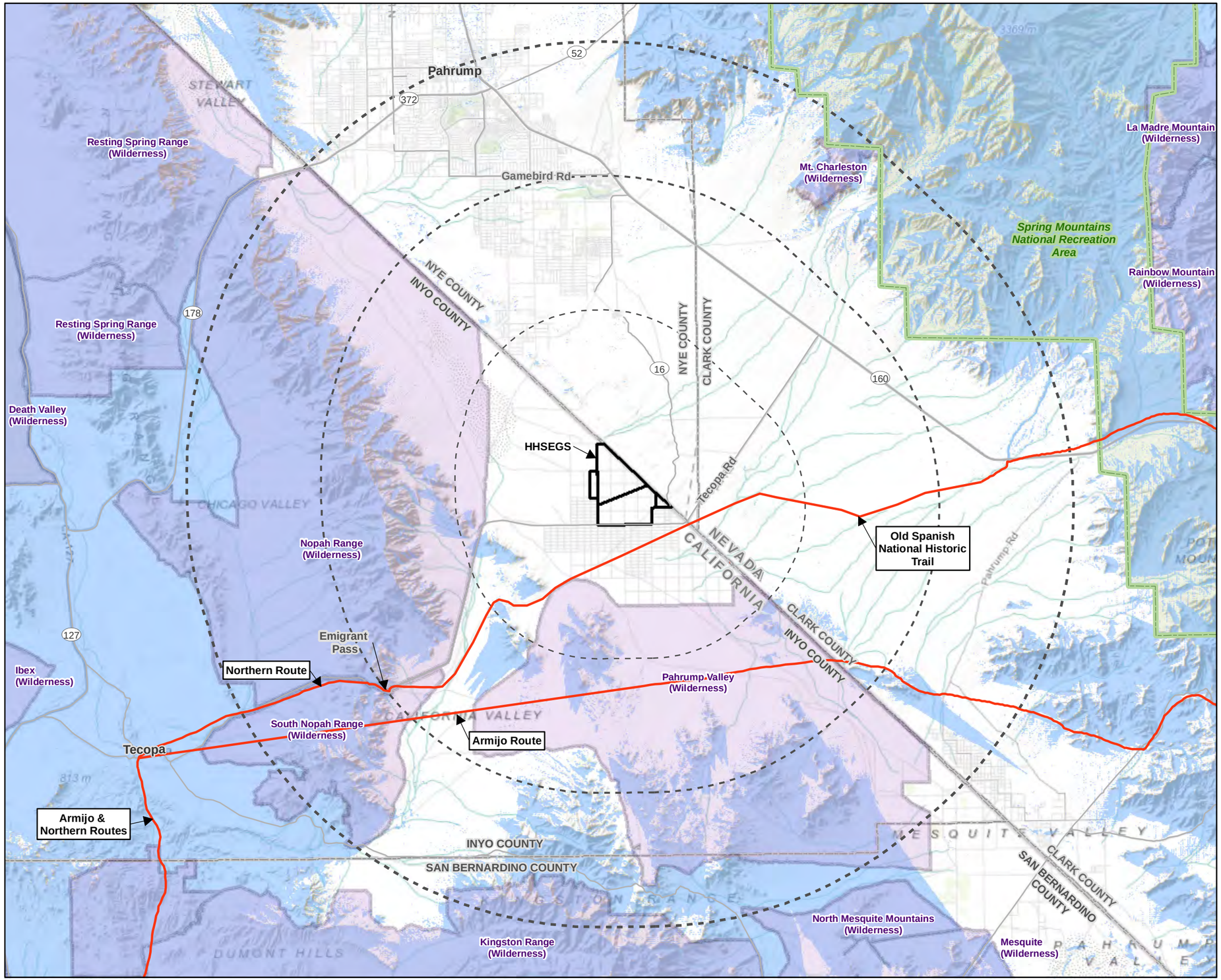
a.) The project owner shall employ a professional arborist to identify a list of species that are well adapted to the local conditions and which have characteristics that provide effective screening of views. Selected plants shall avoid invasive exotic species as indentified by the USDA and Invasive Species Council of California (ISCC). (See **VIS-2**)

b.) ~~The arborist shall work with residents to select up to eight trees from this list of species and will assist the residents in indentifying appropriate locations for their installation. The project owner will take responsibility for purchasing and installing the trees, which shall be the equivalent of a 15-gallon standard nursery size.~~ The project owner shall provide any property owner of Charleston View residing in an existing approved residence who is interested in participating in this program with a credit to a local landscape contractor contracted to implement this program. The contractor shall work with residents to select up to eight trees from this list of species provided by the arborist and will assist the residents in indentifying appropriate locations for their installation. The contractor will provide the trees and will plant them for the property owner. The trees planted shall be the equivalent of a 15-gallon standard nursery size. The property owner will be responsible for making the provisions for tree irrigation. Tree planting is a one-time opportunity for eligible property owners in Charleston View. Once installed, irrigation and maintenance of the trees will be the responsibility of the property owner and the project owner shall have no further responsibility.

Verification: Within 120 days ~~of beginning construction~~ after project operations begin~~,~~ the project owner shall contact eligible property owners in Charleston View and the CPM by registered mail to notify them of the tree planting program. The project owner shall provide in the Monthly Compliance Report a summary of the program, including the following:

a.) parcel numbers of property owners contacted;
b.) actions taken to ensure property owners fully understand the program;
c.) list of installations by parcel number;
d.) quantity and species installed on each parcel;
e.) documentation of any property owner who declined to participate by parcel number.

Figures



VICINITY MAP

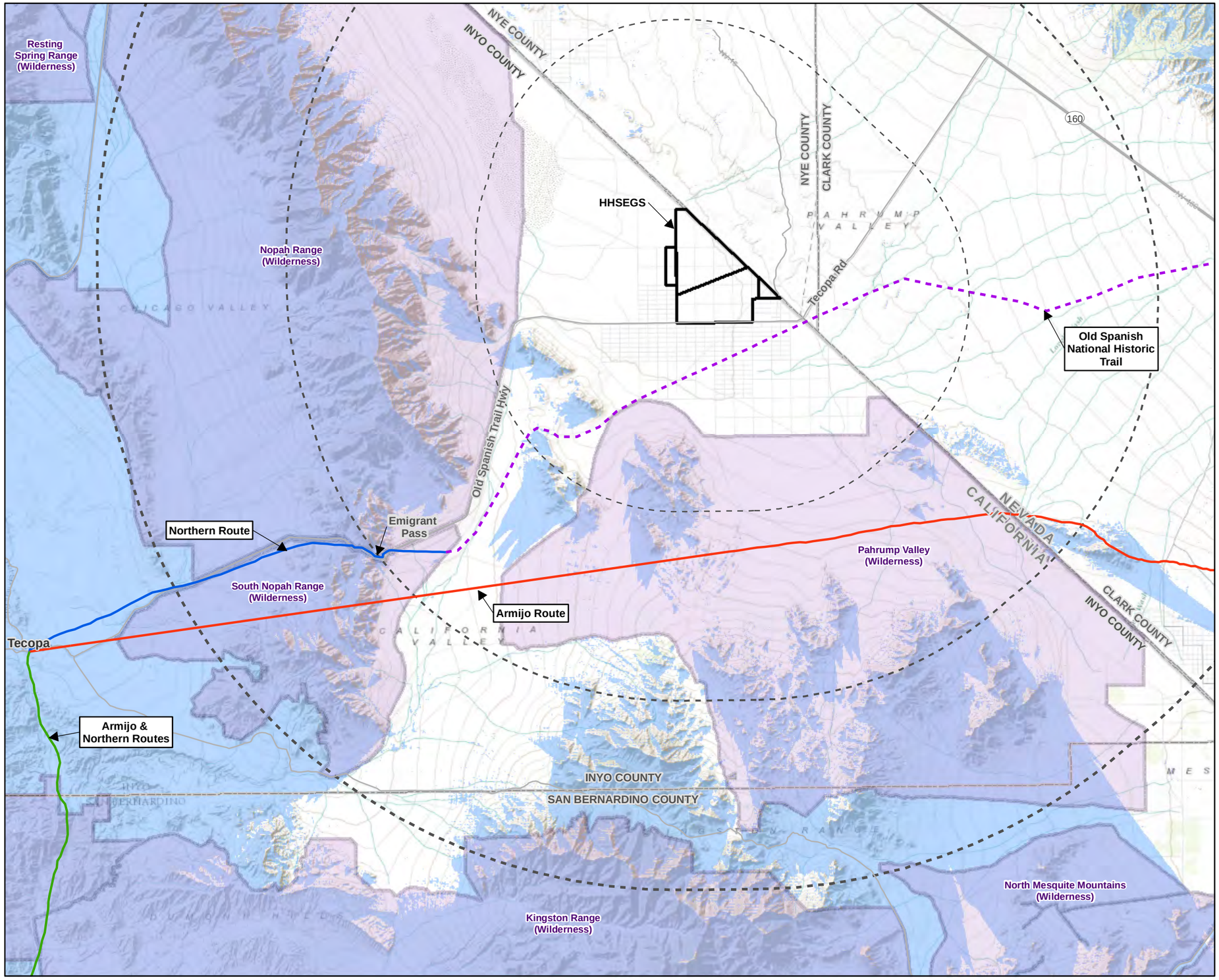
LEGEND

- Project Boundary
- 5-mile Radius from Project Site
- 10-mile Radius from Project Site
- 15-mile Radius from Project Site
- Areas from Which the Solar Towers Will Not Be Visible
- Old Spanish National Trail (Approximate)
- Wilderness Areas
- National Recreation Areas
- State/County Boundary

N

0 2 4
Miles

FIGURE VR-1
Trails, Recreation Areas, and Wilderness Areas in the Project Vicinity
Hidden Hills Solar Electric Generating System



LEGEND

- Project Boundary
- 5-mile Radius from Project Site
- 10-mile Radius from Project Site
- 15-mile Radius from Project Site
- Areas from Which the Solar Towers Will Not Be Visible

Old Spanish National Trail Routes (Approximate)

- Armijo and Northern Routes
- Armijo Route
- Northern Route
- Old Spanish Trail - DeLorme Atlas

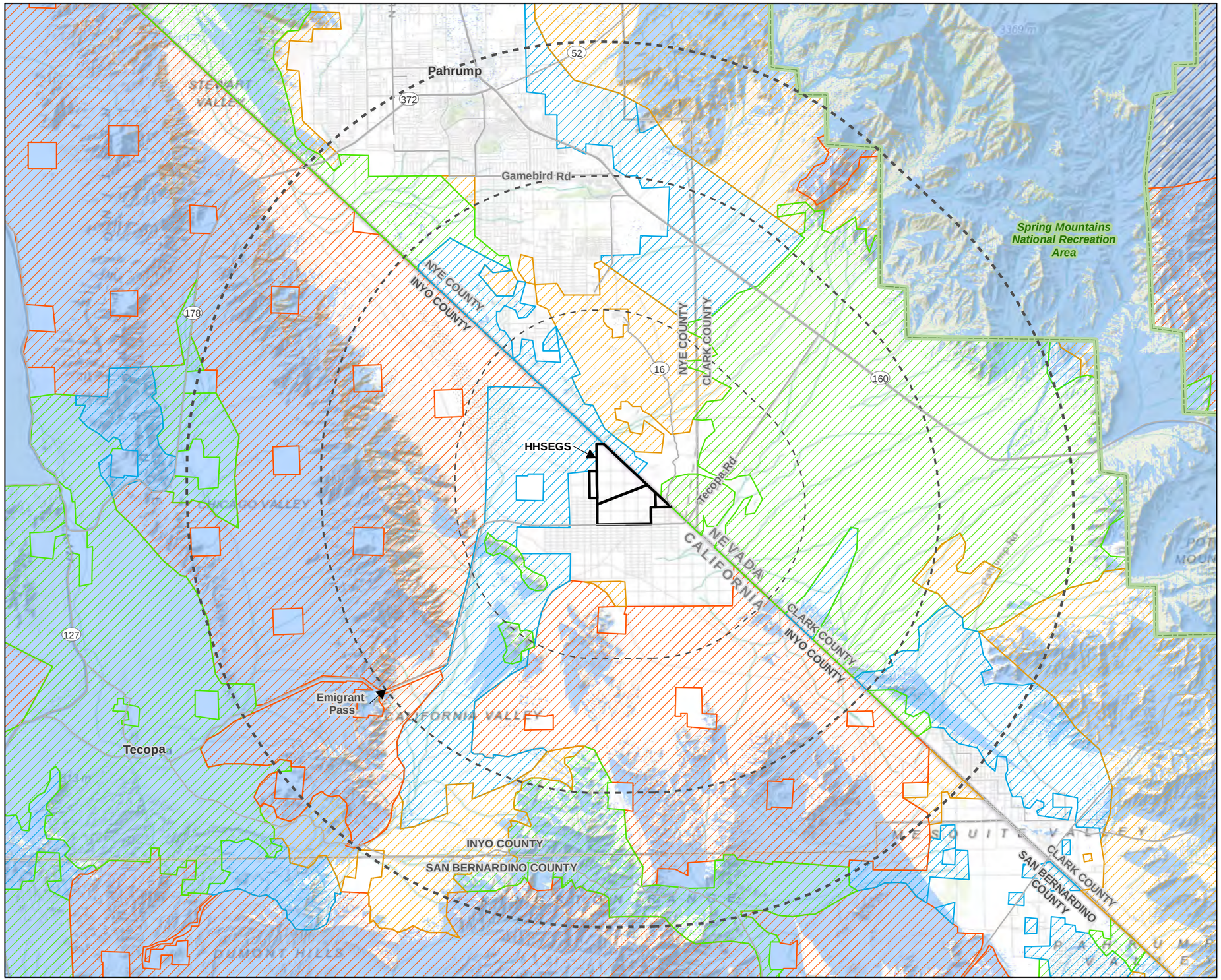
- Wilderness Areas
- State/County Boundary

N

0 2 4
Miles

FIGURE VR-2
Historic Trails in the Project Vicinity
Hidden Hills Solar Electric Generating System

CH2MHILL



LEGEND

- Project Boundary
- 5-mile Radius from Project Site
- 10-mile Radius from Project Site
- 15-mile Radius from Project Site
- Areas from Which the Solar Towers Will Not Be Visible
- National Recreation Areas

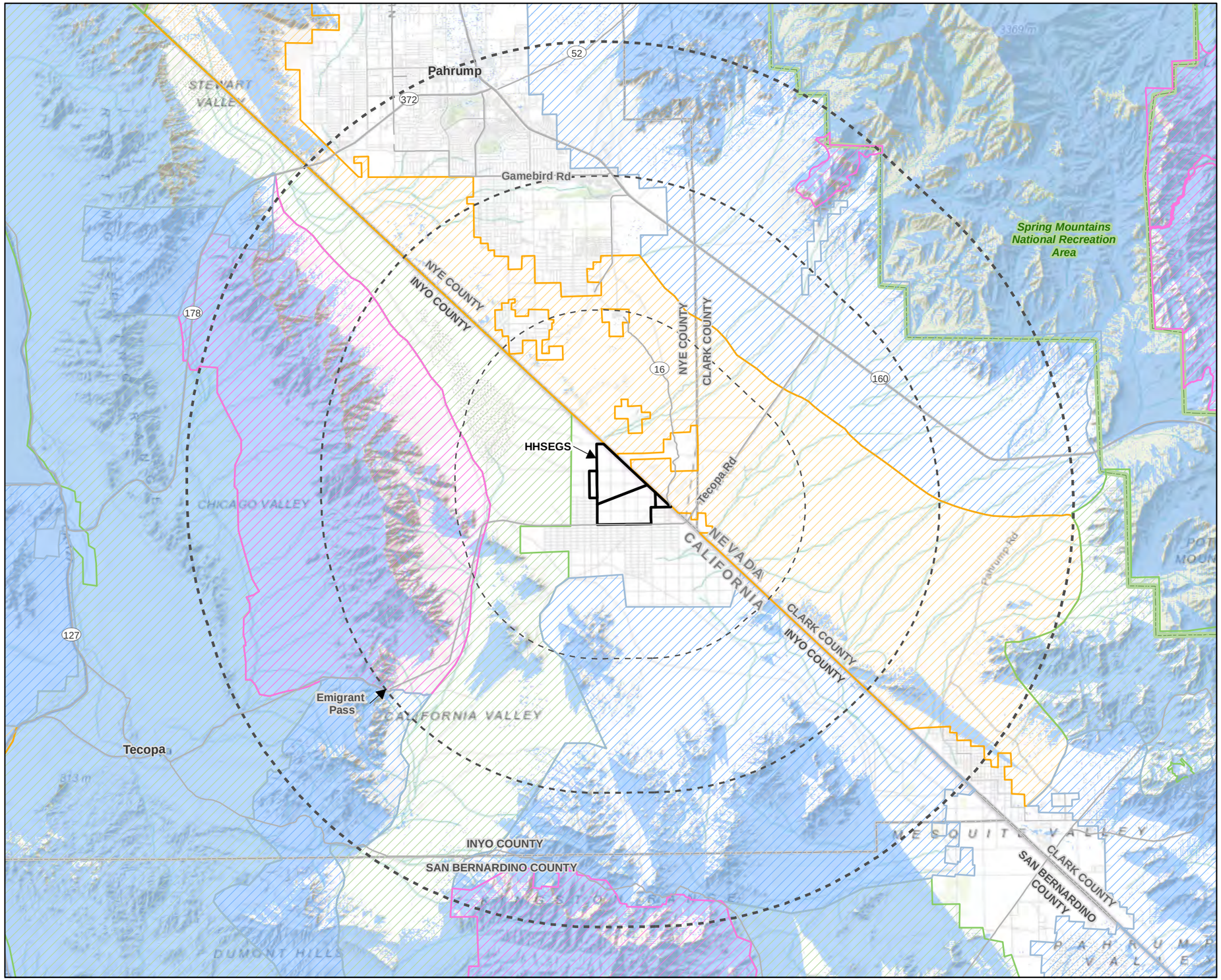
Visual Resource Inventory (VRI) Classes

- I
- II
- III
- IV
- Unknown

N

0 2 4
Miles

FIGURE VR-3
BLM Visual Resource Inventory (VRI) Classifications in the Project Vicinity
Hidden Hills Solar Electric Generating System



LEGEND

- Project Boundary
- 5-mile Radius from Project Site
- 10-mile Radius from Project Site
- 15-mile Radius from Project Site
- Areas from Which the Solar Towers Will Not Be Visible
- National Recreation Areas

Visual Resource Management (VRM) Classes

- I
- II
- III
- IV

N

0 2 4
Miles

FIGURE VR-4
BLM Visual Resource Management (VRM) Classifications in the Project Vicinity
Hidden Hills Solar Electric Generating System

Waste Management

I. Introduction

A. Names: Channing Haskell, P.E. and Karen Parker

B. Qualifications: The panel's qualifications are as noted in their resumes contained in Appendix A.

C. Prior Filings: In addition to the statements herein, this testimony includes by reference the following documents submitted in this proceeding:

- Application for Certification, Volume 1 & Volume 2, dated August 5, 2011 [Exhibit 1]
- Applicant's Data Response, Set 1A, dated November 16, 2011. Response to Data Request 38 [Exhibit 4]
- Applicant's Data Response, Set 1D, dated January 6, 2012. Response to Data Request 135 [Exhibit 21]
- Applicant's Data Response, Set 1D-2, dated January 20, 2012. Response to Data Request 135 [Exhibit 22]
- Applicant's Data Response, Set 1D-4, dated February 24, 2012. Response to Data Request 135 [Exhibit 24]
- Applicant's Supplemental Data Response Set 2, Boiler Optimization, dated April 2, 2012 [Exhibit 46]
- Applicant's Preliminary Staff Assessment Comments, Set 2, dated July 23, 2012. [Exhibit 70]

To the best of our knowledge, all of the facts contained in this testimony (including all referenced documents) are true and correct. To the extent this testimony contains opinions, such opinions are our own. We make these statements, and render these opinions freely and under oath for the purpose of constituting sworn testimony in this proceeding.

II. Summary of Testimony

A. Affected Environment

The project site will be located in southern California, directly on the Nevada border, south of the city of Pahrump, Nevada. The project will be located on private land in unincorporated Inyo County.

A Phase I Environmental Site Assessment (ESA) was performed at the project site by Ninyo and Moore in May 2011 in accordance with the ASTM Standard E 1527-05, Standard Practice for Environmental Site Assessments. The results of the ESA were summarized in the AFC and a copy of the ESA report dated July 5, 2012 was attached to the AFC as Appendix 5.14A. The report stated that review of environmental databases and records indicated that there are no facilities located on the project site and/or in the vicinity of the site that have handled hazardous materials or petroleum products, nor have any facilities reported releases of these materials (Ninyo and Moore, 2011). As a result of the assessment, no recognized environmental conditions were identified at the project site.

No industrial or commercial activities are currently being performed onsite. There are no existing buildings or structures requiring demolition prior to construction of the proposed facility; therefore,

no issues such as the presence of asbestos-containing building materials or lead-based paint are expected to arise during construction.

B. Potential Construction Related Impacts; Avoidance and Minimization Measures

Wastewater, solid nonhazardous waste, and hazardous liquid and solid wastes will be generated at the HHSEGS site during facility construction and operation. Nonhazardous materials will be used whenever possible to minimize the quantity of hazardous waste generated.

Nonhazardous solid waste generated during construction will be collected in onsite dumpsters and taken to the Apex Regional Landfill or another local or regional landfill. Recyclable materials will be segregated and transported by construction contractors or other private haulers to an area recycling facility.

The types of waste and their estimated quantities are summarized in Table 5.14-2 of the AFC (Exhibit 1]. A preliminary list of disposal and recycling facilities was provided in Table 5.14-4 of the AFC; this list was updated in February 2012 (Data Response Set 1D-4, Table 5.14-4R3 [Exhibit 24]). Adequate capacity exists for offsite recycling and disposal of nonhazardous and hazardous waste.

Wastewater generated during construction will include sanitary waste and could include hydrostatic testing water, wash water, concrete washout water, and storm water runoff. Hydrostatic test water and other construction wastewater will be collected and tested for proper waste classification to aid in determining an appropriate disposal method. Sanitary waste will be collected in portable, self-contained toilets that will be serviced routinely by a licensed sanitary waste service provider.

The construction contractor will be considered the generator of hazardous construction waste and will be responsible for proper handling of hazardous waste in compliance with all applicable federal, state, and local laws and regulations, including licensing, personnel training, accumulation limits and times, and reporting and recordkeeping. The hazardous waste will be collected in satellite accumulation containers near the points of generation. It will be moved daily to the contractor's 90-day hazardous waste storage area, located at the site construction laydown area. The waste will be removed from the site by a certified hazardous waste collection company and delivered to an authorized hazardous waste management facility, prior to expiration of the 90-day storage limit.

C. Potential Operational Related Impacts; Avoidance and Minimization Measures

During HHSEGS operation, the primary waste generated will be nonhazardous liquid, primarily wastewater, and solid waste. However, varying quantities of both solid and liquid hazardous waste will also be generated periodically. Nonhazardous and hazardous wastes that potentially would be generated at the facility are summarized in Table 5.14-3 of the AFC.

No industrial sewer tie-in is available at the site so wastewater will be collected for treatment and reuse onsite. Process wastewater will be recycled for reuse as steam boiler makeup water, mirror washing water, and other facility processes to the extent feasible. Water from facility drainage (equipment wash water, equipment leakage, and drainage from facility equipment areas) will be passed through an oil/water separator and then treated by an onsite thermal treatment system. Thermal evaporators will reduce the volume of wastewater that cannot be recycled back into the process. Reject from the thermal evaporators will be collected in a tank for disposal at an offsite commercial disposal facility. Although not anticipated, it is possible that some or all wastewater may be determined hazardous waste after design of the wastewater process has been finalized for the project. Regardless of whether the wastewater is nonhazardous or hazardous, there is adequate

recycling and disposal capacity in both California and Nevada to dispose of the waste generated by the HHSEGS project. Approximately 90 percent of the wastewater will be reused in the process.

Storm water runoff will be directed to an onsite infiltration/retention area and will be managed in accordance with the project's storm water management plan as described in Section 5.15 of the AFC, Water Resources. The generation of nonhazardous wastewater will be minimized through water conservation and reuse measures.

Sanitary wastewater from sinks, toilets, and other sanitary facilities will be collected and discharged to an onsite septic tank with overflow into a leach field. The septic tank system will be serviced as needed by a sanitary service provider.

The handling and management of waste generated by HHSEGS will follow the hierarchical approach of source reduction, recycling, treatment, and disposal. The first priority will be to reduce the quantity of waste generated through pollution-prevention methods (e.g., high-efficiency cleaning methods). The next level of waste management will involve the reuse or recycle of wastes (e.g., used oil recycling). For wastes that cannot be recycled, treatment will be used, if possible, to make the waste nonhazardous (e.g., neutralization). Finally, offsite disposal will be used to dispose of residual wastes that cannot be reused, recycled, or treated.

D. Summary of Compliance with Applicable LORS

Waste handling at HHSEGS will be governed by federal, state, and local laws. Applicable laws and regulations address proper waste handling, storage, and disposal practices to protect the environment from contamination and protect facility workers and the surrounding community from exposure to both nonhazardous and hazardous waste. In addition, to reduce the amount of waste disposed of by landfill in compliance with State requirements, Inyo County has a local construction and demolition (C&D) debris diversion ordinance to achieve the objective of diversion of construction waste from landfills. The LORS applicable to waste handling at the HHSEGS facility are summarized in Table 5.14-1 of the AFC. The project will comply with all applicable LORS.

E. Summary of the Potential Cumulative Impacts

The HHSEGS facility will generate nonhazardous solid waste that will add to the total waste generated in Inyo County, California. However, there is adequate recycling and landfill capacity in both California and Nevada to recycle and dispose of the waste generated by the HHSEGS project, whether nonhazardous or hazardous. It is estimated that the plant will generate approximately 280 tons of solid waste during construction and about 240 tons a year from operations. Compared to the total amount of solid waste landfilled in Inyo County in the year 2010 of 18,068 tons (total reported through three quarters of 2010; 2009 total was 16,194 tons) and Clark County landfill capacity of 1,360,000,000 tons, HHSEGS's contribution will represent less than 1 percent of total waste disposal capacity in Clark County and less than 1.5 percent of the total waste disposal capacity in Inyo County (CalRecycle, 2011b and SWMA, 2011). Therefore, the impact of the project on solid waste recycling and disposal capacity is not significant. The increased demand on solid waste recycling and disposal capacity by the HHSEGS would not result in significant cumulative waste management impacts.

III. Response to Certain Issues Raised in the FSA

According to a conversation with Eddie Ridenour of the Southern Nevada Health District, Solid Waste Management, on February 8, 2012, Class III landfills are not the only landfills allowed to accept industrial solid waste. A Class III disposal site is defined as a disposal site that accepts only

industrial waste (not municipal waste). Therefore, the designation is too limiting and the following changes should be made:

FSA page 4.13-8, 1st paragraph, 2nd sentence, Setting, Proposed Project: Suggest that "Class III" be removed from the description of a Nevada landfill licensed to accept waste. The sentence should read: "Waste would be recycled where practical, and non-recyclable waste would be deposited in a Nevada ~~Class III~~ landfill licensed to accept such waste."

FSA page 4.13-11, 3rd paragraph, 4th sentence, Direct/Indirect Impacts and Mitigation, Construction Impacts and Mitigation, Non-hazardous Wastes: Suggest that "Class III" be removed from the description of a Nevada landfill, as described above.

FSA page 4.13-15, 3rd paragraph, 7th sentence, Impact on Existing Waste Disposal Facilities, Non-hazardous Wastes: Suggest that "Class III" be removed from the description of a Nevada landfill, as described above.

IV. Proposed Licensing Conditions

The FSA for the project proposes 6 Conditions of Certification for this subject matter. We agree with the Conditions of Certification set forth in the FSA pertaining to this subject, except as set forth below.

CONDITION WASTE-5

As drafted, this Condition includes a detailed description of the contents of documentation that will be required should any unauthorized releases of hazardous substances, hazardous materials, or hazardous wastes occur at the project site during construction or operation. The Applicant suggests that the details be included in the Verification to provide more flexibility to change the required elements of the documentation should the need arise in the future. CONDITION WASTE-5 should be revised as follows:

1. Pages 4.13-25, WASTE-5: Please move the Verification to the start of the second paragraph:

   WASTE-5 The project owner shall ensure that all spills or releases of hazardous substances, hazardous materials, or hazardous waste are documented and cleaned up and that wastes generated from the release/spill are properly managed and disposed of in accordance with all applicable federal, state, and local requirements.

   Verification: The project owner shall document management of all unauthorized releases and spills of hazardous substances, hazardous materials, or hazardous wastes that are in excess of EPA's reportable quantities (RQ), that occur on the project property or related linear facilities during construction and on the property during operation. The documentation shall include, at a minimum, the following information:

   - location of release;
   - date and time of release;
   - reason for release;
   - volume released;
   - how release was managed and material cleaned up;
   - amount of contaminated soil and/or cleanup wastes generated;
   - if the release was reported;
   - to whom the release was reported;

- release corrective action and cleanup requirements placed by regulating agencies;
- level of cleanup achieved;
- actions taken to prevent a similar release or spill; and
- disposition of any hazardous wastes and/or contaminated soils and materials that may have been generated by the release.

~~Verification:~~A copy of the unauthorized release/spill documentation shall be provided to the CPM within 30 days of the date the release was discovered.

Water Supply

I. Introduction

A. Names: Tim Thompson, Dr. John Jansen, Michael Rojansky, Dr. Geof Spaulding, and Matt Franck

B. Qualifications: The panel's qualifications are as noted in their resumes contained in Appendix A.

C. Prior Filings: In addition to the statements herein, this testimony includes by reference the following documents submitted in this proceeding:

- Application for Certification, Volume 1 & Volume 2, dated August 5, 2011 [Exhibit 1]
- Applicant's Data Adequacy Supplement, dated September 7, 2011 [Exhibit 2]
- Applicant's Data Response, Set 1A, dated November 16, 2011. Responses to Data Requests 39 through 50 [Exhibit 4]
- Applicant's Data Response, Set 1A-2, dated March 30, 2012. Response to Data Request 40[Exhibit 6]
- Applicant's Data Response, Set 2A, dated February 9, 2012. Responses to Data Requests 141 through 143 [Exhibit 28]
- Applicant's Data Response, Set 2A-2, dated March 8, 2012. Response to Data Request 141 [Exhibit 29]
- Applicant's Data Response, Set 2A-3, dated March 30, 2012. Response to Data Request 141 [Exhibit 30]
- Applicant's Data Response, Set 2A-4, dated October 5, 2012. Response to Data Request 141 [Exhibit 31]
- Applicants Supplemental Data Response, Set 1A, dated December 30, 2011. Response to Data Request WR-1 [Exhibit 45]
- Applicant's Supplemental Data Response, Set 2, Boiler Optimization Plan and Design Change, dated April 2, 2012. Response to Data Request PD-1 [Exhibit 46]
- Applicant's Preliminary Staff Assessment Comments, Set 2, dated July 23, 2012 [Exhibit 70]

To the best of our knowledge, all of the facts contained in this testimony (including all referenced documents) are true and correct. To the extent this testimony contains opinions, such opinions are our own. We make these statements, and render these opinions freely and under oath for the purpose of constituting sworn testimony in this proceeding.

II. Summary of Testimony

To save water in the site's desert environment, the HHSEGS project will use dry-cooling. Dry cooling is an "avoidance" measure. Dry cooling greatly reduces the potential water use for the HHSEGS project, especially compared to wet cooled projects in the desert that have been approved by the Commission. Based on the proposed system design and the use of dry cooling, a maximum supply of 140 acre-feet per year (ac-ft/yr) is all that is needed. As discussed in detail in Sections II and III below, the groundwater modeling information provided by the Applicant, including extensive modeling efforts, demonstrate that the project will not have a significant effect on groundwater resources or water supplies. The pumping tests conducted demonstrate that (a) water levels in the aquifer around the HHSEGS wells in the Valley Fill Aquifer stabilize after a short period and do not continue to decline with continued pumping, (b) the drawdown that would be associated with HHSEGS pumping extends less than 1,500 feet from the wells and (c) no drawdown will occur beyond the site boundaries.

Despite this lack of impact, given the importance of water issues in the desert, the Applicant has also committed to offset project water usage at a 1:1 ratio by the retirement of water rights up-gradient in Nevada. This 1:1 retirement will result in a net benefit to the aquifer, since the project's net water usage is expected to be less than the maximum 140 afy of rights retired.

As demonstrated in the proposed revisions to Water Supply-4, the Applicant is committed to protecting other groundwater users in basin and has proposed a rigorous groundwater monitoring plan in the revised Water Supply-4.

If project groundwater monitoring shows that project-related pumping has the potential to have an adverse effect on other water users, the project will implement a series of measures, including the deepening of existing wells to ensure that other, existing water users are not affected by project groundwater use. The project will also compensate any existing well owners if project groundwater use should lower groundwater levels and increase pumping costs.

The Applicant has also proposed to install a monitoring well array and to analyze the monitoring results using appropriate engineering methods that will identify the project's potential drawdown impacts in the context of other sources of groundwater drawdown. Responses to measured project-related groundwater impacts, if any, are related to specific, reasonable drawdown triggers and include feasible measures that are commensurate with the substantial evidence showing that significant project-related groundwater impacts are highly unlikely to occur.

A. Affected Environment

An evaluation of the hydrogeology and water resources related to the proposed facility was prepared based on available information summarized in Exhibit 1 (see AFC Appendix 5.15D). Additional information was developed based on a series of aquifer tests (Exhibits 27 and 28), which helped confirm aquifer characteristics such as transmissivity, storage coefficient, and boundary conditions.

The Pahrump Valley has two aquifer systems: a Lower Carbonate aquifer and the Valley Fill aquifer. All of the wells in the area tap the Valley Fill aquifer which is accessible to wells several hundred feet in depth. The Valley Fill aquifer is the target groundwater supply source for the project. A perennial basin yield of 19,000 acre-feet per year is discussed in AFC Appendix 5.15D [Exhibit 1] based on U.S. Geological Survey (USGS) studies. Beginning in the 1950s, basin perennial yield was grossly exceeded, which continued until the late 1980s. Pumping then declined and remained slightly above the basin yield from about 1980 to 2000. Pumping has since declined to near the basin perennial

yield in the 2000s due to reduced agricultural demand. However, groundwater levels are still declining in the basin, and are projected to continue to decline in the future.

B. Potential Construction Related Impacts; Avoidance and Minimization Measures

Construction activities are expected to require approximately 288 acre-feet of water per year over the 30-month construction period. Based on the results of the aquifer pump tests (see Exhibit 28), sufficient groundwater will be available to meet this short-term demand. Water level drawdown in the aquifer from project pumping is not expected to extend beyond the site boundary. No avoidance and minimization measures are required.

C. Potential Operational Related Impacts; Avoidance and Minimization Measures

Project operations are expected to require a maximum of up to 140 acre-feet of water per year. This level of water use is extremely low relative to the generation capacity of the proposed project, and actual project water demand is likely to be lower than 140 acre-feet per year. The available well data indicates that the aquifer is currently capable of supporting the domestic water needs of the area. The new pumping at the project site is expected to produce additional drawdown in the vicinity of the project's pumping wells but drawdown is not likely to occur beyond the project boundaries. There is not expected to be a measurable loss in production or significant increase in pumping costs for private wells in the area.

Based on the results of the aquifer tests (see Exhibits 27 and 28), sufficient groundwater is available to meet this long-term demand. Water level drawdown in the aquifer from project pumping is not expected to extend beyond the site boundary. Consequently, project pumping is not expected to have an impact on groundwater-dependent vegetation (see Exhibit 4). Therefore, no avoidance and minimization measures are necessary.

D. Summary of Compliance with Applicable LORS

A groundwater well permit application for domestic water supply will be submitted to the Inyo County Environmental Health Services Department for review and comment and to the CPM for review and approval.

E. Summary of the Potential Cumulative Impacts

Other projects may require water for construction activities, but are not likely to result in a long-term groundwater supply needs or impacts to groundwater. All of the cumulative projects are not expected to affect overall groundwater recharge in the Pahrump Valley.The historic water level data provided by Nye County indicates that water levels west of the State Line Fault system have been relatively stable over the last 10 years. Barring unforeseen changes in the pumping pattern in the valley, it is unlikely that regional pumping could substantially impact the aquifer at the project site.

III. Response to Certain Issues Raised in the FSA

A. General Comments on the FSA

1. The FSA selected aquifer properties (primarily the 'transmissivity'[1], storage coefficient, and boundary conditions) that are extremely conservative and non-representative in every case.

1 Transmissivity is a function of the hydraulic conductivity and thickness of the sediments that constitute the aquifer from which the groundwater is pumped. Hydraulic conductivity, in turn, describes the ease with which the water can move through the pore spaces between the sand grains of the aquifer.

By using properties at the extreme end of each range, the FSA introduces a compounding bias that has a multiplicative effect and results in a predicted drawdown that is grossly skewed compared to (a) empirical data collected during on-site testing and (b) estimates using average or most likely values.

2. The conditions recommended in the FSA are based on estimates of drawdown from project pumping that greatly exceed the response that was observed by pumping tests. A conservative bias is understandable to protect sensitive biological resources . However, using overly conservative assumptions produces an unrealistic and physically impossible conceptual prediction of the regional drawdown. The project's permit conditions as developed in the FSA are based on these estimates and are unreasonable and impractical based on demonstrated aquifer responses to proposed project pumping.
3. The mitigations section in the FSA (Water Supply-4, part D) does not account for the fact that groundwater levels have been declining in the aquifer for decades and that project water demand is low compared to other groundwater users in the basin such as irrigation or large residential developments. It is unreasonable to include any potential project shut down requirements in the project's conditions of certification, particularly based on minute water level change in an area where groundwater level variability in response to natural factors and groundwater pumping by other users greatly exceeds the proposed threshold.

B. Specific Comments on the FSA

1. The monitoring program, trigger levels, and mitigation proposed for the private well monitoring appears to be reasonable and protective of existing groundwater users.
2. The Water Supply 1 condition, which requires mitigation of 288 acre feet per year of construction period water use, is impractical and unnecessary. The construction pumping is a short-term use and will only have short duration impacts over a small area of the aquifer that is fully within to the project site. It is unnecessary because the duration of construction pumping is limited to approximately 30 months and site data demonstrates that no offsite drawdown will occur in this time frame. No other wells or groundwater-dependent vegetation are present within the portion of the aquifer that will be affected by construction pumping.
3. The 0.5 ft of groundwater decline used to trigger mitigation is too small to be reliably detected above background water level variability and correlates to changes in groundwater levels in general, and at the groundwater dependent vegetation and spring identified in the FSA, that are insignificant. Specific technical documentation and illustrations are provided to demonstrate the infeasibility of utilizing the trigger level in the FSA.
4. The mitigation plan proposed in the FSA requires project pumping to be reduced or terminated if trigger levels associated with water level changes are reached. Other forms of mitigation are likely to be more effective in restoring water levels and protecting the groundwater dependent vegetation should project pumping have any unanticipated effects.
5. The water quality monitoring program is based on unreasonable and technically insupportable over-estimates of project-related drawdown. Reduced levels of sampling will accomplish the objectives of the program.
6. The subsidence monitoring program is also based on unreasonable and technically insupportable over-estimates of project-related drawdown. Groundwater level monitoring demonstrates that project related drawdown, using conservative, appropriate assumptions

that are based on actual test data, demonstrate that the subsidence monitoring program should be revised.

C. Comments on FSA Analysis

The following section provides specific comments on the FSA's treatment of water supply issues:

- The FSA's overly conservative approach is inappropriate, given the site-specific information provided during these proceedings which adequately characterize the aquifer and how it will react to HHSEGS's water use. (See Section C.1. below)
- Analysis of aquifer geometry and regional water level data confirms that the State Line Fault system is a barrier to groundwater flow and therefore disconnects variations groundwater conditions on the southwest side (where HHSEGS site is located) from the northeast side (where Stump Spring and other groundwater related resources exist) of the fault. (See Section C.2 below)
- Aquifer geochemistry confirms that the water supply for the Nevada-based resources are from a different source relative to those present on the HHSEGS site. (See Section C.3 below)
- Analysis of the groundwater system demonstrates that the HHSEGS Valley Fill aquifer is semi-confined, allowing for greater recharge of the aquifer than the FSA assumes. (See Section C.4 below)
- The pumping tests conducted demonstrate that (a) water levels in the aquifer around the HHSEGS wells in the Valley Fill Aquifer stabilize after a short period and do not continue to decline as the well continues to pump, (b) the drawdown associated with HHSEGS pumping extends less than 1,500 feet from the wells and (c) no drawdown will occur beyond the site boundaries. (See Section C.5 below)
- The FSA "Trigger Levels" for mitigation are infeasible because natural variations in background water levels make it impossible to use the existing well data to reliably predict the response of the new monitoring wells and it is therefore impossible to support the assertion that projected related drawdown can be detected above natural variations at 0.5 ft. (See Section C.6 below)
- Because the FSA's recommendations would place the burden of proof on the Applicant to demonstrate the drawdown decline was from other causes, the Applicant proposes to modify the water level data evaluation method, including using the Distance Drawdown Method and Filtering methods described in detail below, to ensure that observed water level declines can be definitively determined to be caused by project related drawdown at the northeastern property boundary. (See Section C.7 below)

The revised Water Supply-4 proposes a two-tiered groundwater monitoring and mitigation with appropriate trigger levels (See Section C.8 below).

1. The FSA's conservative approach is inappropriate, given the site-specific information provided during these proceedings, characterizing the aquifer and how it will react to HHSEGS's water use.

The FSA uses overly conservative estimates to make predictions of project impacts to be protective of the groundwater dependent vegetation and neighboring groundwater users. We agree that the project must not cause significant drawdown that impacts vegetation or other groundwater users.

As described below, analysis of the empirical data collected from pumping tests at the site and water quality results from water samples collected at wells and springs in the area provide substantial evidence that the proposed project pumping of 140 acre-feet per year (an average pumping rate of 45 gallons per minute each at the two primary production wells planned for the facility) will have no drawdown effects off of the site.

The FSA uses aquifer properties, primarily the transmissivity of the aquifer sediments, storage coefficient, and boundary conditions, that are, in every case, overly conservative and non-representative of actual site conditions. Consequently, the FSA analysis includes systematic errors that improperly bias the results. These errors have a multiplicative effect and result in predictions that are insupportable compared with estimates that are based on justifiable, yet still conservative parameters.

The FSA analysis appears to have been based on information that is outdated and that does not incorporate the empirical well test results that HHSEGS has provided to the Commission. The FSA analysis must be revised to reflect the data and information developed over the past year during various technical investigations at the site, including the following:

1. Three extended aquifer tests have been performed on three different wells using multiple monitoring wells for each test, including one test of 14 days duration.
2. The geometry of the aquifer has been measured using geophysical well logging on pre-existing and new project wells.
3. Isotopic and geochemical analysis has been used to "fingerprint" the sources of water for the Valley Fill aquifer as present at the HHSEGS site and at the Stump Spring Monitoring Well, and at Stump Spring.
4. Water level hydrographs of wells have been used to characterize the hydraulic properties of the State Line Fault system.
5. Additional analysis has been conducted using previous research (including work by Nye County, USGS, BLM and others) and site data.

The data that have been obtained from these studies are all consistent with regional data that have been developed by multiple researchers over several decades. The available data provide a conceptual model of the site's groundwater conditions that fits the regional setting of the site and is consistent with the accepted understanding of the groundwater basin. The Valley Fill aquifer that would be used by the HHSEGS project is currently well-defined and well-understood. The FSA analysis is fundamentally flawed because it does not include the best available empirical evidence of the local and regional aquifer system and uses arbitrary assumptions and generates results that are not consistent with existing observations. As a result, the FSA analytical predictions are not scientifically reliable nor defensible.

2. Evaluation of aquifer geometry and flow characteristics confirms that the Stateline Fault System is a flow barrier, separating the HHSEGS site from the water related resources on the Nevada side of the border.

Figure 1 is a cross-section across the upper portion of the Valley Fill aquifer that extends across most of the groundwater basin from west of the project area to east of the State Line Fault system. The thickness of the aquifer zone has been defined by deploying gamma ray geophysical logs[2] in existing

[2] **Gamma ray logging** is a method of measuring naturally occurring gamma radiation to characterize the rock or sediment in a borehole or drill hole. The gamma ray log, like other types of well logging, is produced by lowering a specialized instrument down the well and

wells and new wells drilled on the project site. The gamma logs show that the main aquifer unit west of the fault zone consists of a sandy unit approximately 200 feet thick at a depth of about 100 to 350 feet. The sandy unit is laterally continuous with a clay layer separating an upper and a lower sand unit.

Figure 2 is a detailed cross section in the vicinity of Well 3B on the project site. The geophysical well logs and driller's logs of the well drilled on the project site indicate that the upper portion of the aquifer is finer grained and the lower sand unit is the most permeable zone of the aquifer. The deeper units consist of finer grained silt and clay with thin zones of permeable sand, which is consistent with regional geologic reports. The water level data was taken from water level measurements in the wells and regional geologic maps. The water levels in the aquifer drop across the fault zones in a step-wise fashion indicating that the faults restrict the flow of groundwater through the aquifer.

Water levels on the east side of the fault, east of the HHSEGS site, form a distinct mound above water levels in the adjacent portions of the aquifer. This demonstrates that groundwater levels on the east side of the fault, and where groundwater dependent vegetation has been identified in the FSA, is supported by artesian flow from deeper groundwater units that causes localized mounds of shallow groundwater. As a result, the data show that the groundwater levels that support groundwater dependent vegetation to the east of the fault system are not at all dependent on the regional water level elevations and, in particular, groundwater levels in the Valley Fill aquifer located to the west of the fault. Groundwater levels that support the groundwater dependent vegetation are instead dependent on artesian flow "mounding" produced by the fault system's barrier effect. It is the higher head in the deeper units and the vertical migration along the faults that forms the groundwater mounds that supports mesquite and other groundwater dependent vegetation to the east of the fault barrier.

The proximity of these mounds to the faults indicates that the flow is associated with vertical up-welling along the faults in response to being laterally-restricted by the low horizontal permeability of the faults. This observation is consistent with the regional understanding of faults acting as flow barriers that are associated with springs and groundwater discharge zones. Similar associations of springs, faults and groundwater dependent vegetation occur in Ash Meadows, Las Vegas springs, Tule Springs, Corn Creek Springs, and Indian Springs. Figure 3 illustrates how the USGS characterized the groundwater mounding on the east side of the fault (Harrill, 1986).

recording gamma radiation variation with depth. The instrument records the total radiation (emitted by the naturally-occurring elements potassium, thorium). Shales which often contain potassium as part of their clay content, and also tend to absorb uranium and thorium will tend to have a higher gamma-ray signature than more sand rich geologic layers. Because gamma logs can be run in cased boreholes, we have run these logs in both the pre-existing and new wells on and near the Hidden Hills site to establish a common dataset to allow correlation of the strata penetrated by the various wells.

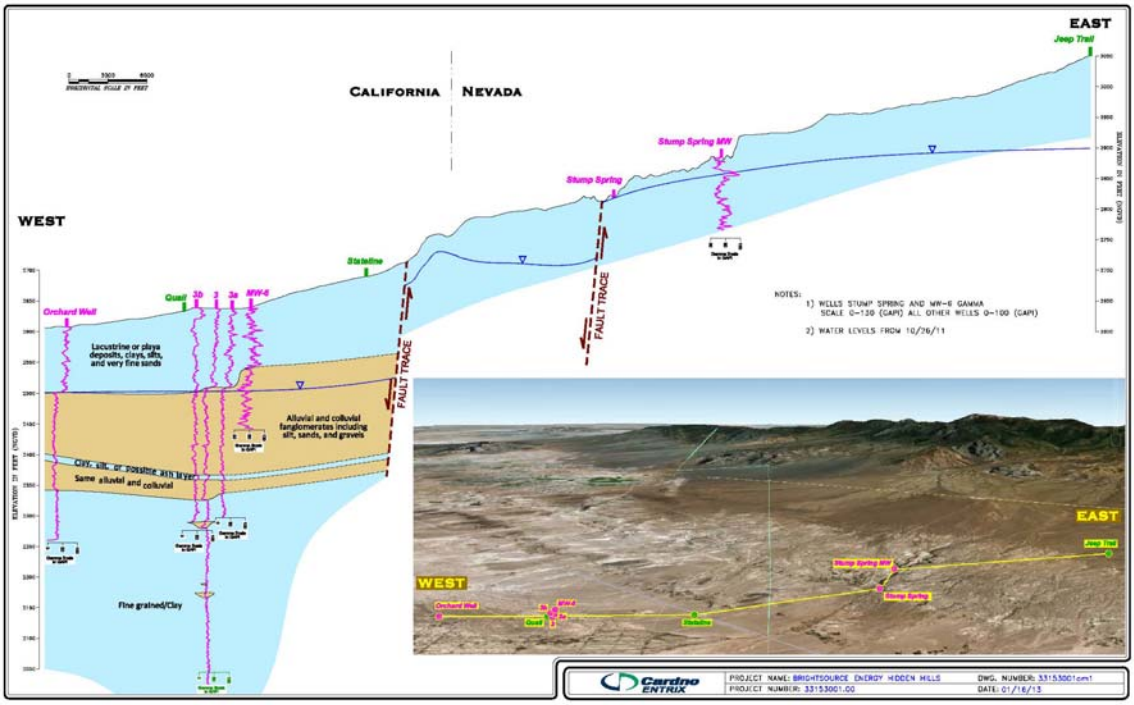


Figure 1. Geologic cross-section across the southern portion Pahrump Valley groundwater basin.

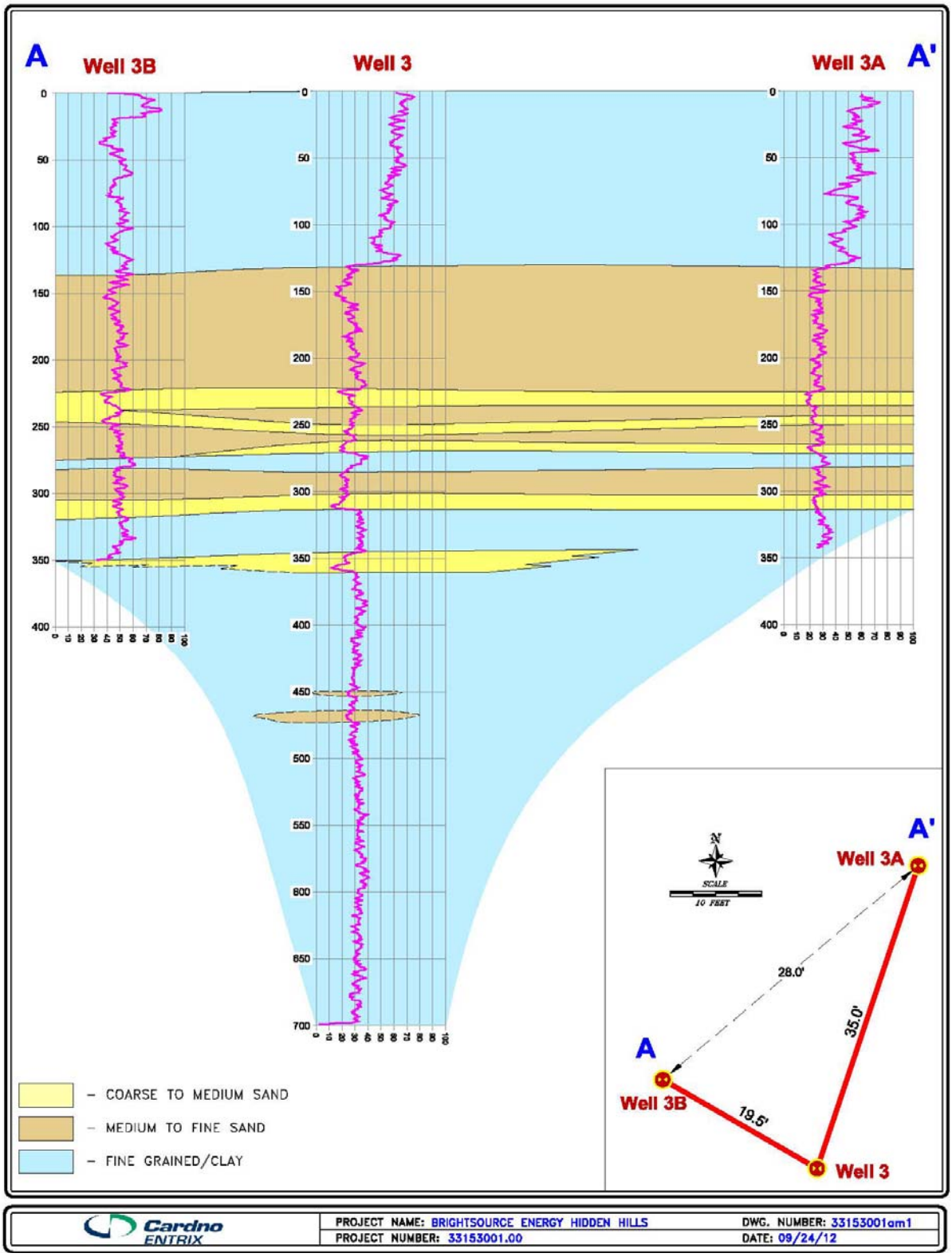


Figure 2. Detailed cross-section in the vicinity of Well 3B.

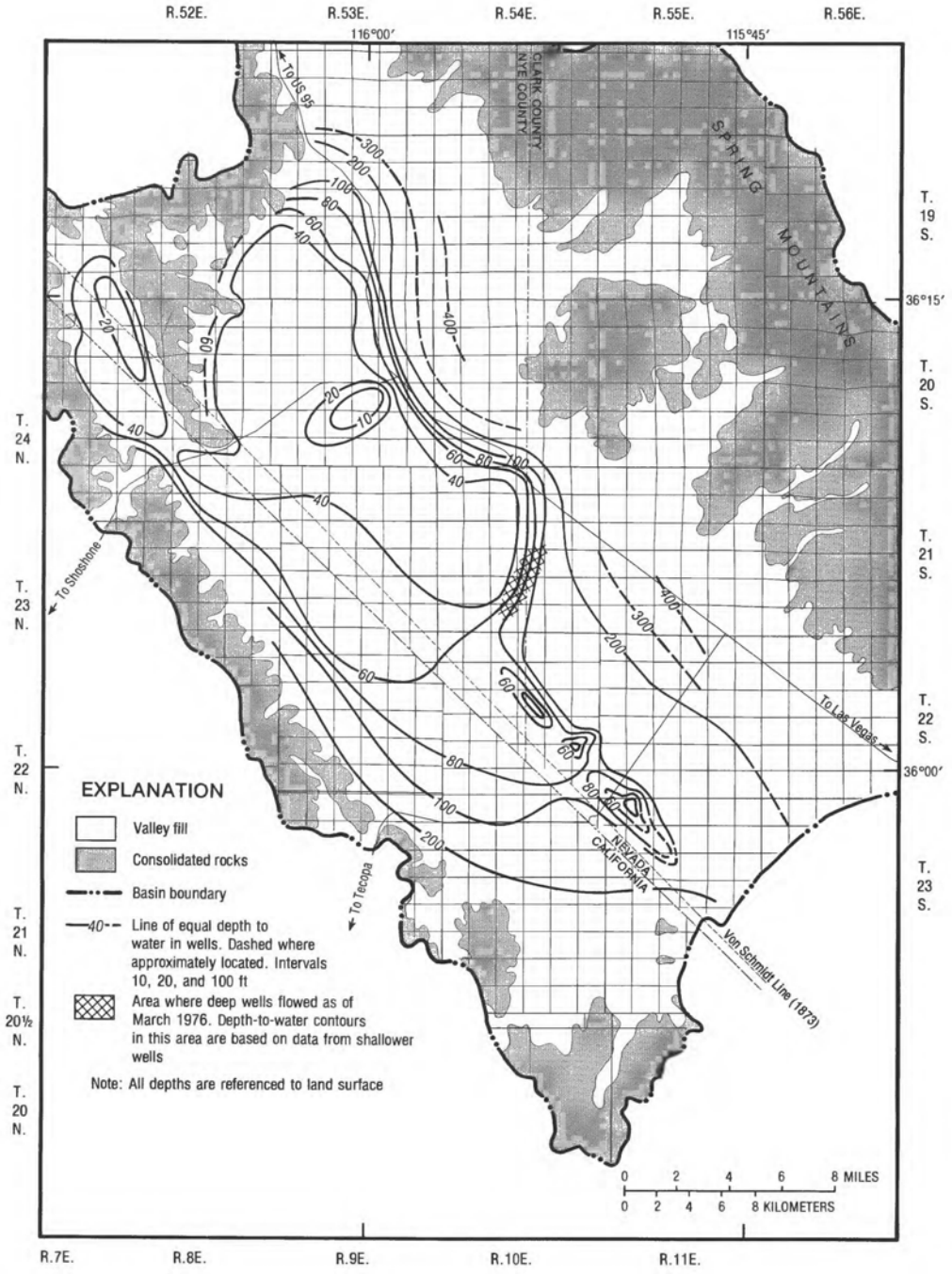


Figure 3. Depth to groundwater map for Pahrump Valley (Harrill, 1986). This figure demonstrates the “mounding” of water in the Stump Spring area caused by the Stateline Fault System acting as a physical barrier to groundwater flow.

3. Geochemical data confirm that the groundwater supplies for the HHSEGS project and the Nevada-based resources are from different sources.

Water samples were collected from each pumping well on the project site, from the Stump Spring Monitoring Well and from Stump Spring. (Well locations are shown on an inset map in Figure 1 above.) The samples were analyzed for major ions and stable isotopes. Groundwater samples that came from a common recharge source and traveled along a similar flow path typically display similar chemical properties. Groundwater samples that came from different sources of recharge or followed different flow paths through and aquifer typically display dissimilar chemical properties.

Figure 4 is a series of 'Stiff Plots'[3] illustrating the basic chemical characteristics of water samples collected from both on-site and nearby wells and from Stump Spring. These plots are useful because they allow easy visual comparison of the geochemical characteristics of water samples. Water samples with similar chemical composition produce similar looking polygons in terms of their shape and relative size and proportions. Water samples that are dissimilar produce dissimilar looking polygons. The plots demonstrate that Well 3, Well 3B and the Stump Spring Monitoring Well (sampled twice), which are all completed in the upper portion of the Valley Fill aquifer, all have very similar water quality. The water from Stump Spring has distinctly different water quality with much higher concentrations of the major ions. This suggests the water in Stump Spring comes from a different source and has traveled a longer flow path through the aquifer that has allowed it to dissolve more minerals from the aquifer. The Orchard Well has water of intermediate quality suggesting it may be a mixture of the two water sources, which may be in part associated with its depth of approximately 1,000 feet.

Another method of evaluating the provenance of groundwater collected from different locations is to analyze water samples to determine concentration of two key indicators isotopes: oxygen-18 and deuterium. The results are typically plotted as shown on Figure 5 to compare against the so-called Groundwater Mean Meteoric Water Line (GMWL). The GMWL defines the ratio between oxygen-18 enrichment and deuterium enrichment that occurs in recent precipitation. Water samples that plot on or near this line are considered to be relatively young and derived from recently recharged water. Water samples that plot to the right of this line indicate water that is enriched in oxygen-18 and/or deuterium, which indicates the water has traveled along a deeper flow path through the aquifer, is associated with higher temperatures and/or was subjected to evaporation. The wells all plot on or near the line, indicating the water is from recent recharge.

The results from Stump Spring plot far to the right of the line, indicating its water is derived from a different source area, has migrated along a deeper flow path and/or was subjected to higher temperatures. This indicates that the water produced by Stump Spring is different from the water in the Valley Fill aquifer, and it is consistent with the concept of groundwater rising from deeper flow zones along the fault adjacent to Stump Spring.

[3] A Stiff plot is a graphical representation of chemical analyses, first developed by H.A. Stiff in 1951. It is widely used by hydrogeologists and geochemists to display the major ion composition of a water sample. A polygonal shape is created from four parallel horizontal axes extending on either side of a vertical zero axis. Cations are plotted in milli-equivalents per liter on the left side of the zero axis, one to each horizontal axis, and anions are plotted on the right side. Stiff patterns are useful in making a rapid visual comparison between water from different sources.

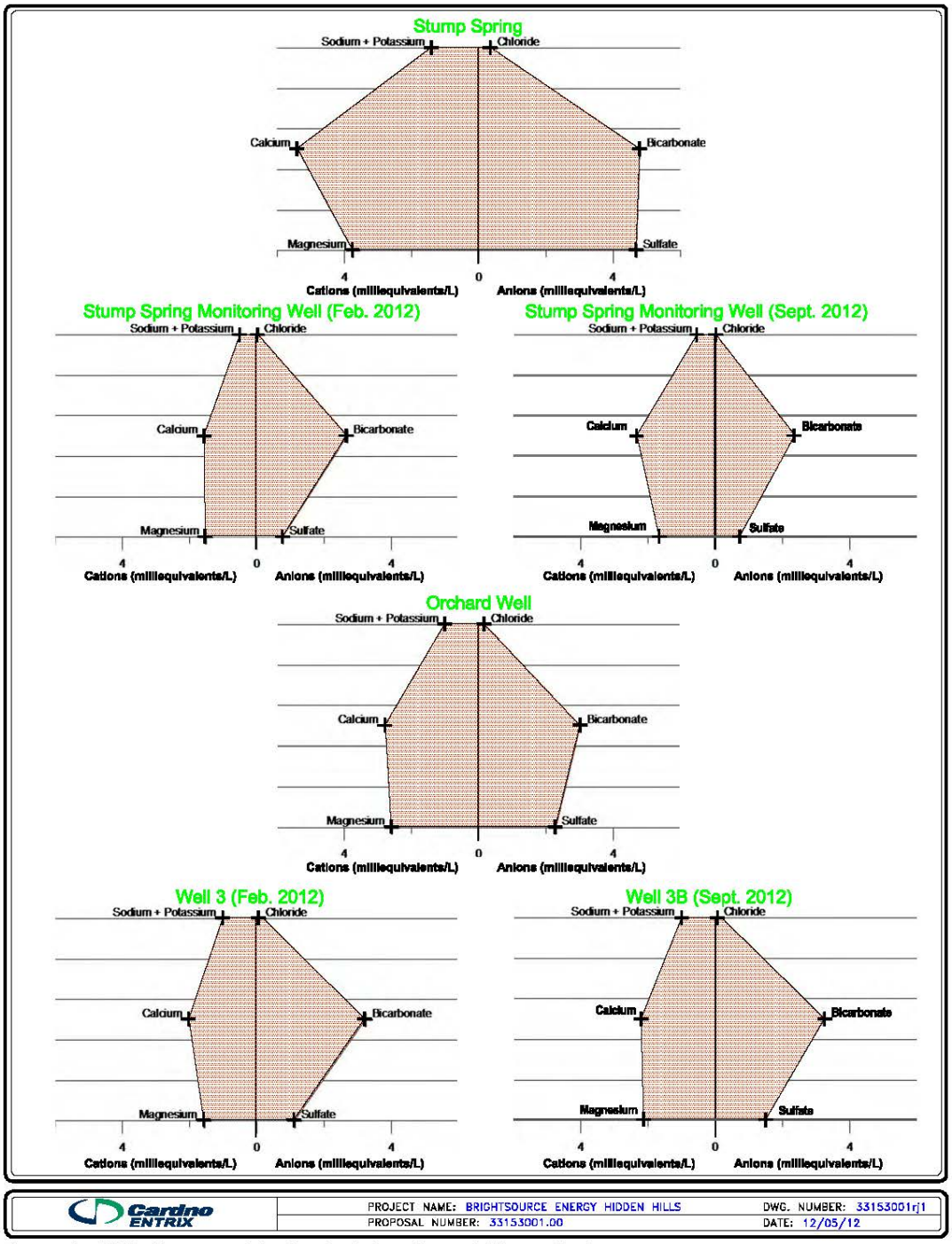


Figure 4. Stiff Plot of water samples from on site wells and from Stump Spring and Stump Spring monitoring well which demonstrates that groundwater at the HHSEGS site and the Nevada-based Stump Spring are from different sources.

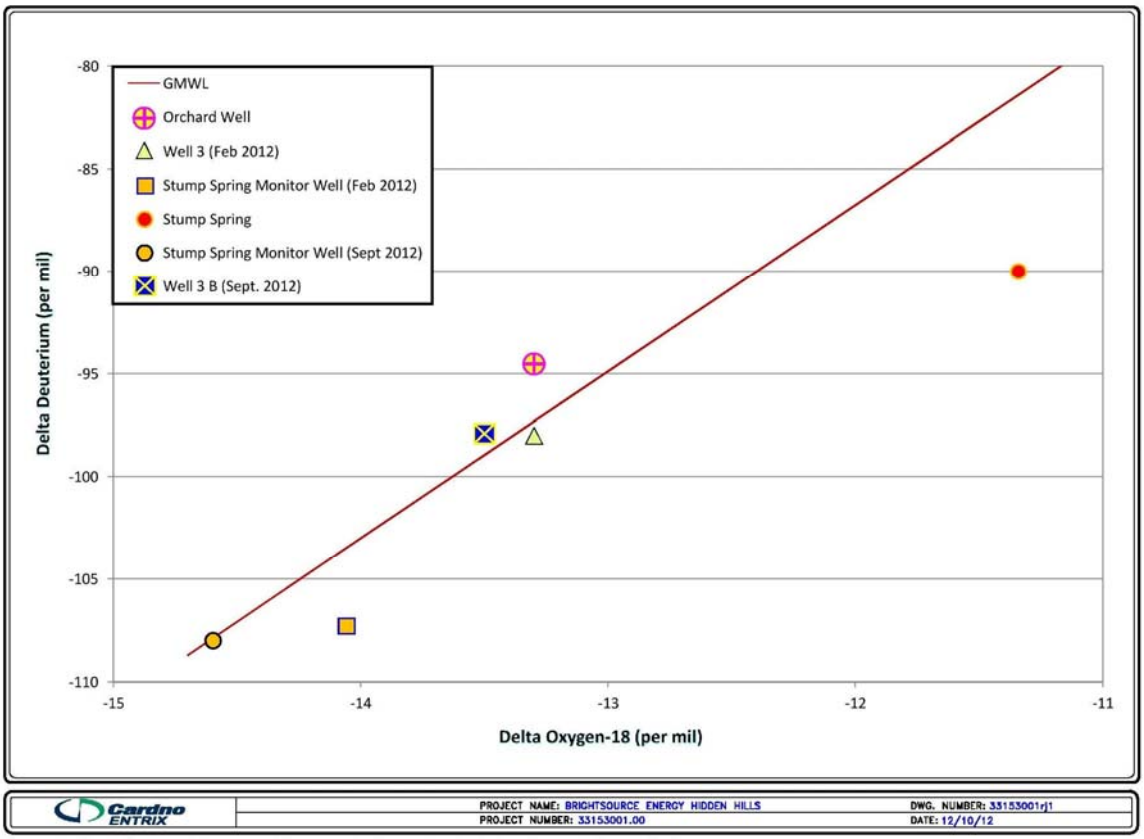


Figure 5. Deuterium and Oxygen-18 concentration of water samples indicating that the Stump Spring water is different from the water in the Valley Fill aquifer. This is consistent with the concept of groundwater rising from deeper flow zones along the fault adjacent to Stump Spring.

These geochemical data confirm that the groundwater supplies for the HHSEGS project and the Nevada-based resources are from different sources, due largely to the barrier effect of the State Line Fault system.

4. The Valley Fill aquifer is semi-confined, allowing for greater recharge of the aquifer than the FSA assumes and the State Line Fault acts as a horizontal flow barrier in the aquifer.

Collectively, aquifer geometry, water level and geochemical data establish a consistent conceptual model. The Valley Fill aquifer to the west of the fault that would be used by the project is primarily recharged in the eastern portion of the basin from runoff from the Spring Mountains. The hydrographs of wells in the basin indicate that the aquifer also receives recharge within the basin from surface precipitation or overland flow down the washes during wet periods. One such recharge event is clearly evident in 2005 where water levels in the aquifer rose abruptly by several feet to several tens of feet across the basin in response to wetter than average conditions.

Groundwater flows in a southwest direction in the southern part of the basin. The fault zone creates barriers to flow that causes the groundwater levels to drop in a stepwise fashion across the faults. The faults also form conduits for vertical flow from deeper flow zones to rise to the surface and create mounds on the water table and to form features such as Stump Spring. Because these mounds are largely driven by vertical flow along faults from deeper zones fed from the northeast, they are not directly impacted by local pumping from the shallow part of the aquifer, particularly

pumping on the down-gradient, or southwest, side of the faults. The faults also limit the lateral propagation of drawdown from pumping, such as the large cone of depression associated with the developed portion of the Pahrump Valley north of the project area. The FSA improperly fails to consider many important elements of this flow system, such as the flow restriction of the faults and the local recharge to the shallow aquifer. This results in scientifically insupportable analytical conclusions that are not consistent with known and documented conditions and, in some cases, physically impossible outcomes.

The FSA also assumes that the aquifer is fully confined. This would mean that the aquifer is sealed by impermeable layers above and below the aquifer and does not allow recharge derived from surface flows in the area. This assumption is clearly not supported by site data. Figure 6 is a plot of the variations of water level over time in six wells monitored by Nye County. The upper three wells are on the west side of the fault zone along the southern edge of the site. The lower three wells are on the east side of the fault and east of the HHSEGS site.

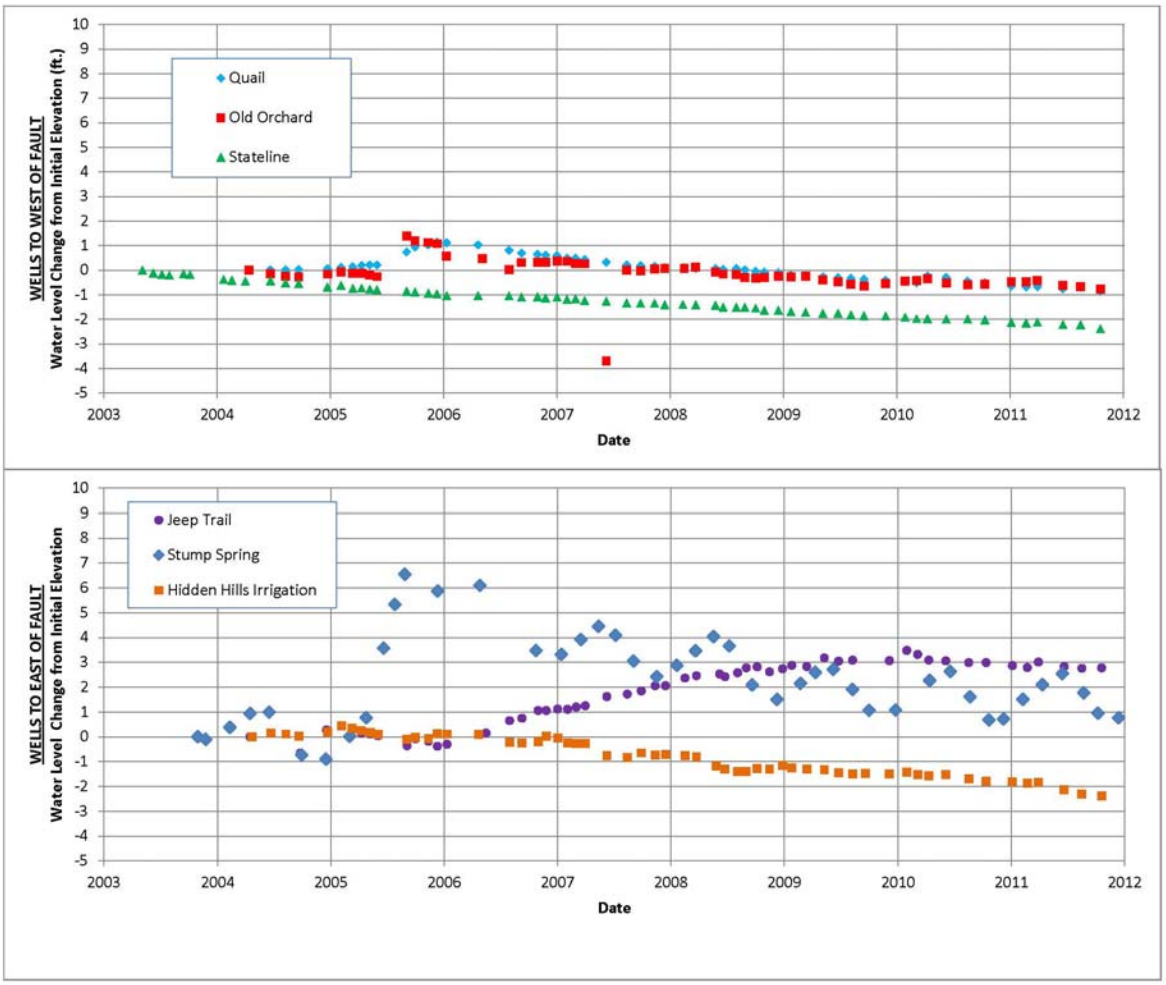


Figure 6. Hydrographs of wells in southern Pahrump Valley groundwater basin and near Hidden Hills site. Data provided by Nye County.

The hydrographs of the Quail, Old Orchard[4], and Stump Spring monitoring wells show distinct contemporaneous recharge events in response to local precipitation in 2005. The Jeep Trail Well shows a more gradual recharge trend beginning a few months after the response in the other wells. The State Line and Hidden Hills Irrigation wells do not show significant responses to the same recharge events. If the aquifer were fully confined, recharge could only occur along the eastern margin of the basin and recharge pulses would propagate laterally from east to west across the basin in a regular and predictable pattern. The hydrograph data clearly demonstrate that recharge occurs in an irregular pattern through the basin and on both sides of the fault. The magnitude of the recharge varies based on topography and soil type, but the contemporaneous recharge events could only occur from surface water moving vertically through the unsaturated portion of the sediment and directly recharging the aquifer locally. The recharge event data further demonstrate that the fine-grained units above the aquifer are not impermeable and do not establish fully confined aquifer conditions.

In summary, the analysis of regional conditions using available site-specific data demonstrates that the Valley Fill aquifer is semi-confined, allowing for greater recharge of the aquifer than the FSA assumes and confirms that the State Line Fault acts as a horizontal flow barrier in the aquifer.

5. The pumping tests demonstrate that (a) water levels in the aquifer around the HHSEGS wells in the Valley Fill aquifer stabilize after a short period and do not continue to decline as the well continues to pump, (b) the drawdown potentially associated with HHSEGS pumping would extend less than 1,500 feet from the wells and (c) no drawdown will occur beyond the site boundaries.

The Applicant has conducted three pumping tests on the site. Two wells were pumped at the same time in February 2012 and a third well was pumped in August of 2012. The results of these tests were described in two reports submitted to the Commission. The change in water level versus time while pumping was monitored in several monitoring wells around the pumping wells in all three tests. The monitoring data produced time vs. drawdown plots that are diagnostic of the flow patterns in the aquifer in response to the pumping.

Figure 7 is a time vs. drawdown plot from Well 3 in the August 2012 pump test (note that both the x and y axes are in logarithmic scale, which is the standard practice for these types of plots). Well 3 fully penetrates the aquifer and is located about 30 feet from Well 3B, the pumping well. Well 3B was pumped at 45 gpm, the planned pumping rate for each of the two main project production wells, for a period of 14 days. The water levels in the Well 3 dropped approximately 8 feet in the first day (1,440 minutes) of pumping and then remained stable for the remaining 13 days of pumping. The plot clearly indicates that water levels in the aquifer near the well stabilize after a short period and do not continue to decline as the well continues to pump.

The aquifer reached steady state conditions during this constant rate test as the cone of depression created by the pumping well captured enough regional flow within the aquifer and also induced enough recharge from the finer grained units above and below the aquifer to replace the water that was being pumped out. In marked contrast, the FSA assumes that water levels in the aquifer never stabilize and the cone of depression would continue to grow as long as the well is pumped. These

[4] The 'Old Orchard' is an existing irrigation well present on the HHSEGS property, and has been part of the Nye County regional groundwater level monitoring network for many years. It is different than the 'Orchard' well, which is a newer well also located on the HHSEGS site, was used in the aquifer test during February, 2012.

assumptions are not supported with any empirical evidence and conflict with the test data from all three pumping tests.

The blue line drawn on the plot represents a type curve for an aquifer with semi-confined characteristics which include slow recharge from low permeability layers above and below the aquifer. The type curve matches the pumping test data nearly perfectly. Similarly, excellent curve fits were achieved for all monitoring wells for all three pumping tests that are consistent with semi-confined aquifer characteristics that include slow vertical recharge to the aquifer.

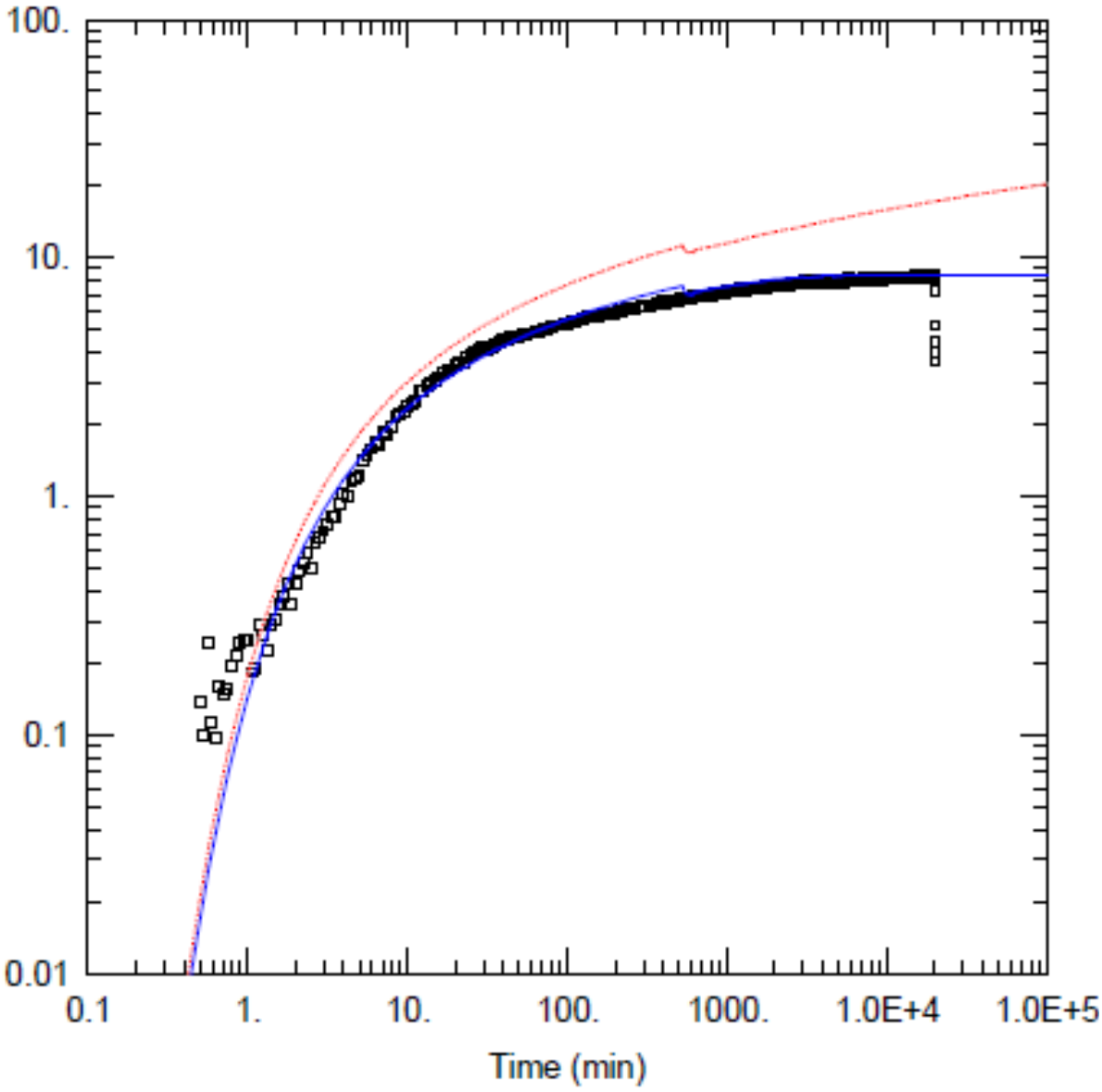


Figure 7. Time vs. Drawdown Plot of Well 3 for the August 2012 Pumping Test , demonstrating that water levels in the aquifer around the well stabilize after a short period and do not continue to decline as the well continues to pump. The blue line represents the type curve for an aquifer with characteristics that include slow recharge from low permeability layers above or below the aquifer. The red line is the type curve for aquifer characteristics that assume fully confined conditions, consistent with staff assumptions.

To further ensure the accuracy of the analysis, and verify that the FSA approach was invalid, efforts were made to fit the testing data to type curves associated with fully-confined aquifer characteristics, which do not include recharge. These efforts, which are commonly used to model aquifer characteristics, including confinement, were not successful. The red line on Figure 5 is the type curve for the same aquifer properties but for aquifer characteristics that involve fully confined conditions, consistent with the FSA assumptions. This solution predicts drawdown that exceeds

measured drawdown by about 5 feet (60%) after 14 days of pumping. With a longer pumping period, the curves continue to diverge and the solution that assumes fully-confined conditions and no recharge grossly overestimates drawdown in the aquifer in direct conflict with the empirical data. Similar disparities between measured drawdown and the response that would occur from a fully confined aquifer were observed for every monitoring well for every pumping test. The analysis of the drawdown plots clearly demonstrates that the aquifer receives vertical recharge from the finer grained units above and below the aquifer. The plots also illustrate how ignoring the recharge produces drawdown estimates that are grossly in excess of actual conditions observed during pumping tests.

The aquifer properties (transmissivity and storage coefficient) used in the FSA to make predictions of future drawdown are approximately an order of magnitude less than the measured values and are not representative of average or typical values. The FSA transmissivity value of 660 gpd/ft was actually from a monitoring well (MW4) completed in the fine grained shallow portion of the aquifer and not in the main aquifer zone. The value used is more representative of the shallow semi-confining zone above the aquifer and not of the aquifer itself. The average transmissivity values of the aquifer as determined from the three pumping tests conducted on the site range from 4,802 to 8,692 gallons per day per foot of drawdown (gpd/ft), and are consistent with the values reported from previous investigations on the site (4,675 gpd/ft by Broadbent & Assoc., 2003; and 7,225 gpd/ft by Geotechnical Consultants, 1966). The aquifer transmissivity values measured during these five pumping tests by three independent consultants over a period of 46 years are all consistent. The transmissivity value used in the FSA is not representative of site conditions and generates predicted pumping responses that are unreasonable and inconsistent with available empirical data.

Water Supply Figure 18 in the FSA estimates a range of drawdown at the Stump Spring Monitoring Well after 33 years of project pumping. The FSA estimates range from 0 to 19 feet. This prediction range is extremely large and results from the use of insupportable and extreme aquifer property assumptions. In turn, this approach produces results that are physically impossible. A simple distance drawdown plot of the aquifer using these assumptions indicates that the aquifer would be completely dewatered at the pumping well during any of the tests conducted before a cone of depression of the magnitude predicted in the FSA could be created. This is not a physically possible outcome.

Water levels measured during the pumping tests were observed to stabilize with only a few feet of drawdown within 50 feet of the pumping wells following only a few days of pumping. Figure 8 presents the predicted cone of depression around the project wells for the life of the project using average aquifer conditions and recharge rates measured by the pumping tests. The drawdown in the aquifer extends approximately 1,500 feet from the wells and stabilizes as shown by the 0.1 foot drawdown contours. No drawdown will occur beyond the site boundaries.

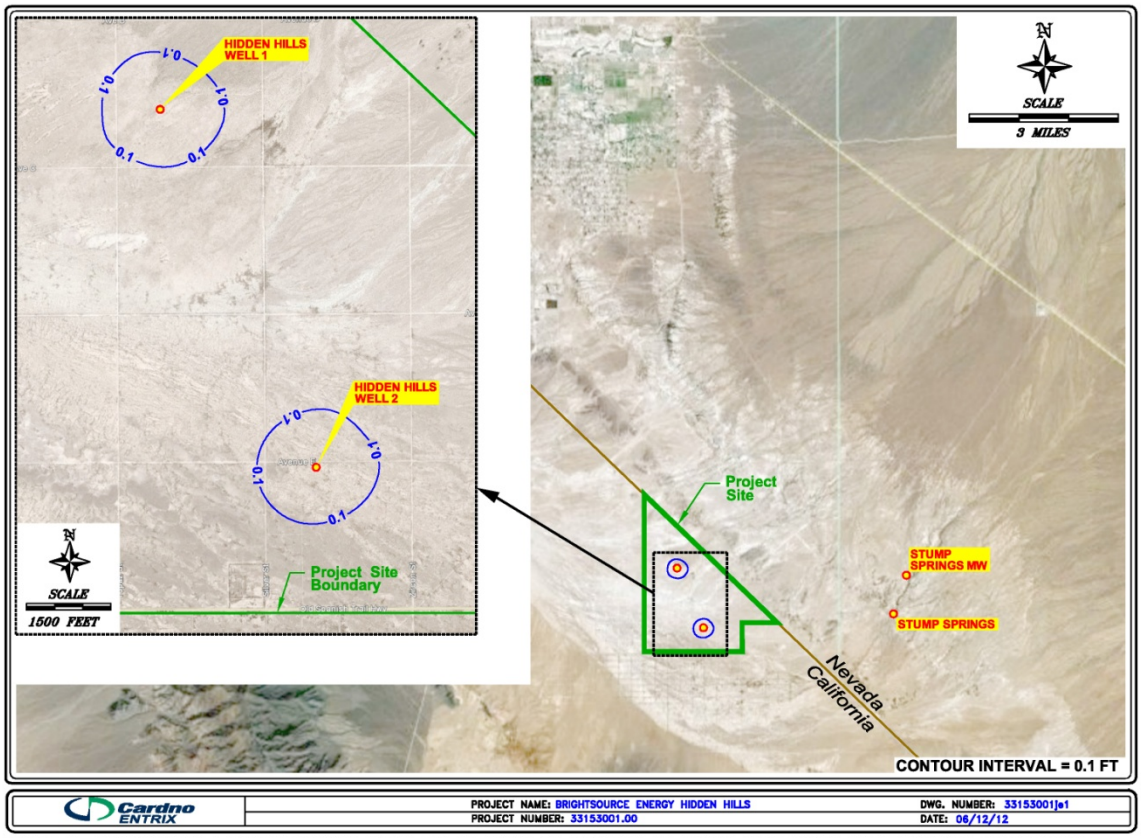


FIGURE 3. DRAWDOWN (0.1–FOOT CONTOUR) BASED ON 25 YEARS OF PUMPAGE BY HIDDEN HILLS ONLY, WITH LEAKANCE REPRESENTED.

Figure 8. Projected drawdown using measured aquifer properties, demonstrating that potential HHSEGS drawdown in the aquifer extends approximately 1,500 feet from the wells and stabilizes as shown by the 0.1 foot drawdown contours. No drawdown will occur beyond the site boundaries.

In summary, the pumping tests discussed above demonstrate that (a) water levels in the aquifer around the HHSEGS wells in the Valley Fill aquifer stabilize after a short period and do not continue to decline with continued pumping, (b) the drawdown associated with HHSEGS pumping extends less than 1,500 feet from the wells and (c) no drawdown will occur beyond the site boundaries.

6. The FSA "Trigger Levels" for mitigation are infeasible because they are much lower than existing, non-project related variations in background water levels and cannot be reliably detected.

The FSA recommends a trigger level for mitigation based on 0.5 feet of projected drawdown at the eastern property line of the site. This level was proposed based on the apparent assumption that a 0.5 foot drawdown signal from project water use can be detected with 100% confidence due to the assumption of stable water levels on the west side of the fault zone. Data from the existing wells on the west side of the fault zone, and the well construction detail recommended in the FSA, demonstrate that there is too much background water level variability to reliably detect project-related impacts at a 0.5 foot level.

To illustrate this variability, three different time periods were analyzed using a single dataset which yields three significantly different pictures of the "background water level trend" in the groundwater basin (Figure 9). The dataset consists of water level data from the Old Orchard well collected by Nye County from 2004 through 2011. Three hypothetical subsets of these data were used to demonstrate the natural variation in the basin.

- Period 1 assumes water level monitoring occurred from 2004 to 2007 and then project pumping was started. This period includes the aquifer recharge event in response to the significant rainfall events of 2005.
- Period 2 assumes background monitoring started in 2005 and project pumping started in 2008. This period begins just before the 2005 recharge event and includes the water level declines that followed.
- Period 3 assumes monitoring started in 2004 and extended to 2011, the full period of record currently available for the well. This period was chosen to capture all the data available for the well.

Figure 9 illustrates the trend lines for these three periods. The trend lines vary significantly yet all three lines are statistically significant at the 95% confidence interval, which Commission staff has suggested is indicative of an adequately reliable dataset.

Period 1, the 2004-2007 period indicated by the blue triangle data points and the dashed trend line, indicates a trend of rising water levels. Water levels drop below the trend line by over 0.5 feet within a year following the background monitoring period and over one foot within 2 years, and continuously decline by approximately 2 feet by 2011. If the project had started in 2007, the recommended procedures in the FSA would have resulted in the inaccurate determination that the project was causing 2 feet of drawdown even though the change would have been caused entirely by natural variations.

In Period 2, the second trend line for 2005 to 2008 indicated by the green square data points and the dotted trend line, indicates that water levels frequently drop below the trend line by 0.5 to one foot. In this case, a statistically valid trend line would be established during the background monitoring period to project regional declines but it would be impossible to determine if future departures of water levels from the trend line were due to natural variation or to project related pumping.

In Period 3, the third trend line indicated by the light blue diamond data points and the solid trend line, for the entire available period of record for this well, demonstrates that water levels frequently fall 0.5 to 1 feet above or below the trend line due to natural causes. The later part of the data appears to fit the trend line much better, but the trend line is dominated by the declines following

the recharge event. If the monitoring had commenced in 2006, the data would have fit the line well for many years, but then the water level data would begin to deviate off the trend line as the recovery from the recharge response dissipated in the aquifer. This illustrates the difficulty in establishing a valid trend in water level decline even with seven years of background data. If another recharge event were to occur, the water levels would be disturbed by a foot or more and the trend line data would be disrupted by the recharge event and steeper decline rates following the event.

These three hypothetical monitoring periods demonstrate how the natural variability in the aquifer is too high to accurately establish regional decline rates in the aquifer using periods of record of a few years. Trends in water level, even trends that appear to be statistically significant, can change dramatically with a single recharge event in the aquifer. It is impossible to remove these events without data from extended periods of record. Similarly, data from extended periods of record would be necessary to determine if water level changes during a period of project operation were due to project pumping with a tolerance of 0.5 feet. Larger trigger levels that exceed the magnitude of natural variability of the aquifer could be detected, but a trigger level of 0.5 feet cannot be detected with confidence.

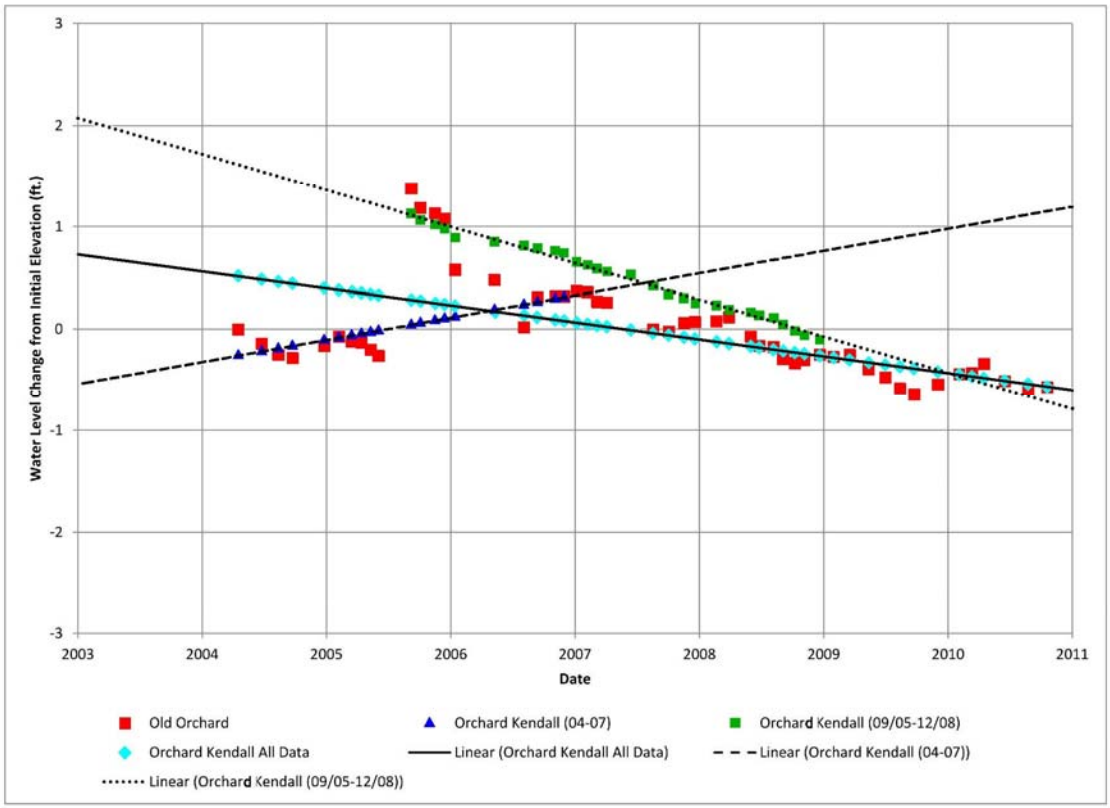


Figure 9. Plot of Old Orchard Well water level data showing Mann Kendall trend lines for three hypothetical background monitoring periods, showing that the under existing conditions water levels can change by over a foot over periods of a few months.

Data from two of the three wells shown on the upper half of Figure 6, the Quail Well and the Old Orchard Well, showed similar variability in water levels. The State Line Well, however, had a more consistent declining trend in water levels with less variation above and below the trend lines. Because construction data on these wells are limited, it is unclear if the differences in response are

related to the aquifer characteristics at the location of the well, the depth of completion, and/or the condition of well (e.g., damaged casing, occluded perforations, partially infilled, etc.).

One or more of the wells may have obstructions or casing failures, and may be completed in multiple zones of the Valley Fill aquifer. The water level trends they provide will not be consistent with conditions in the portion of the aquifer that is to be monitored for this project. Background monitoring with wells completed specifically to meet project requirements may yield a different magnitude in natural variations in water level over time.

Water levels in two of the shallow monitoring wells constructed on the site for the three pumping tests conducted 2012 have been monitored continuously over the past several months. These wells are all constructed to 200 feet deep and are screened in the finer grained portion of the shallow aquifer. The water levels in these monitoring wells are essentially flat except when the closest well is pumped. Figure 10 is a plot of the water level data in monitoring wells MW3 and MW6. The shallow wells have natural water levels that vary by a few tenths of a foot during the period of record. None of the other wells on site have shown such stable water levels for a similar period of time.

The fact that the shallow monitoring wells respond in a manner that is significantly different from the deeper wells demonstrates that the response of a monitoring well varies based on the depth of completion in the aquifer. These differences make it impossible to predict the variability in background water level data that will be collected by new wells all completed to depths of approximately 350 feet, the depth of the proposed project groundwater wells. It is impossible to use the existing data to predict the response of the new monitoring wells and it is therefore impossible to support the FSA assumptions that project-related drawdown can be detected reliably above natural variations at 0.5 foot

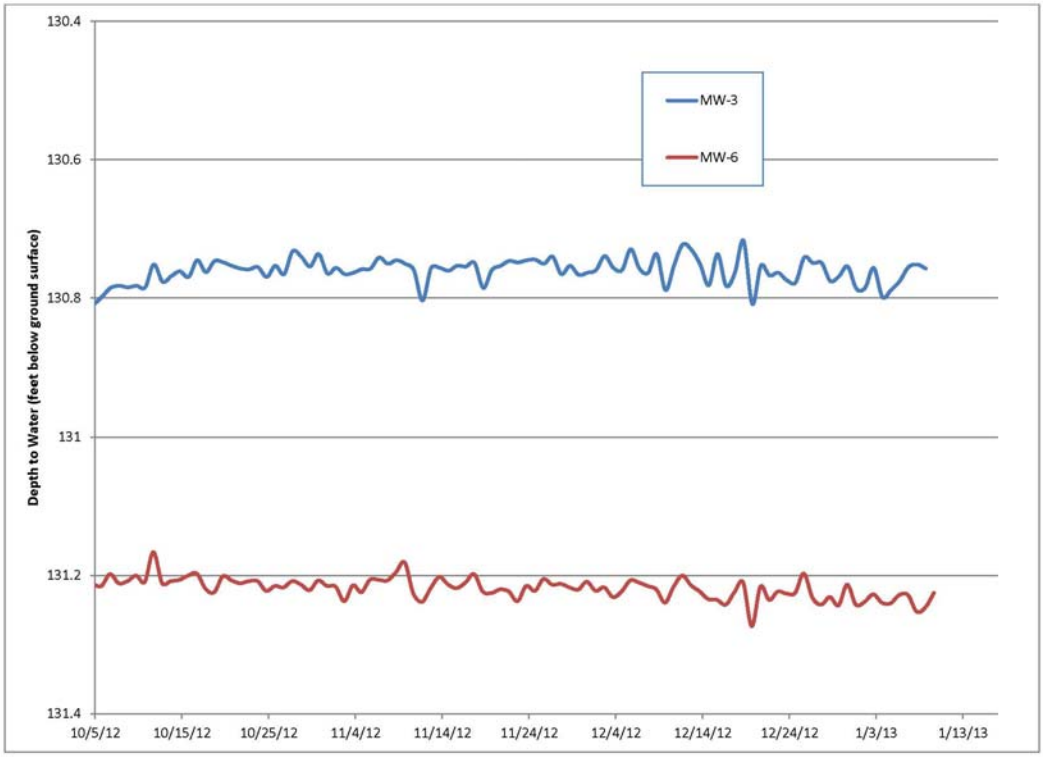


Figure 10. Plot of MW3 and MW6 showing flat response, thus demonstrating that water levels in shallow wells such as these 200 ft deep monitoring wells have a distinctly different variability that in wells of different depth, different construction or located in different areas.

7. Distance Drawdown Method and Filtering methods should be used to assess potential project impacts to ensure that observed water level declines can be definitively determined to be caused by project-related drawdown at the northeastern property boundary.

The purpose of project groundwater monitoring is to determine the extent to which an observed drawdown is caused by the project in contrast to factors other than the project's water use. To achieve this objective, an analysis of water level artifacts that remain after the filtering process is proposed to determine if any observed decline in water levels measured in the proposed project monitoring well network can be reasonably assumed to be caused by project pumping. This approach will include a "Distance-Drawdown Plot Method" as specified in the revised Water Supply-4 below.

The proposed analysis of project-related groundwater impacts is based on the basic, scientifically defensible assumption that any drawdown in the aquifer created by the project use would follow established hydraulic laws that govern the shape of a cone of depression in an aquifer. For either the Power Block 1 Monitoring Well Array or the Power Block 2 Monitoring Well Array, if the apparent water level declines after "filtering" (see below) to account for other drawdown causes, fall along a linear trend on a 'distance-drawdown' plot from the project pumping wells, and if the slope of that line defines an aquifer transmissivity value that is consistent with the aquifer properties defined by initial pumping tests, then the water level declines would be reasonably assumed to associated with project pumping.

If the magnitude of the drawdown projected at the northeastern property line using this method exceeds the proposed trigger levels, then the project will initiate mitigation measures as identified in Water Supply-4. The "Distance-Drawdown Plot Method" provides a more defensible and accurate means for assessing whether changes in groundwater levels are a result of the project's pumping or due to other sources of drawdown. The water level data for the monitoring well network will be filtered using the process described in USGS report 'SIR2006-5024'. This USGS method removes water level variations from many sources, such as barometric responses, seasonal and annual variation in recharge, and pumping from other wells. The effectiveness of the filtering method depends on having reliable water level data from background wells and knowing the pumping rate, location and aquifer properties from other pumping sources. To account for this uncertainty, the measured drawdown after the filtering process must also fit a pattern consistent with actual pumping from the project wells before the results can be attributed to project groundwater use.

The accuracy of the proposed methods can be demonstrated with data from the Quail, Old Orchard, and State Line wells. If the Quail Well is treated as a background well, the data shows that the 2005 recharge event causes natural variation in aquifer levels and the trend can be adjusted to account for this variability using the Old Orchard Well data. The background data would also allow the regional groundwater level decline associated with pumping in Nevada to be removed from the data. This would result in a water level plot for the Old Orchard Well that had less variation and was much flatter. The State Line Well, however, did not respond to the 2005 recharge event. The filtering process would show an apparent drawdown of over one foot in the State Line Well data. If this event had occurred after the project had started pumping, the FSA procedure would erroneously assume the decline was from project pumping. The proposed approach would avoid this potential analytical problem.

In summary, differences in the background variation for wells in the Valley Fill aquifer could lead to artifacts in the filtered data that may not be easily explainable. It is inaccurate and unreasonable to attribute these changes to project pumping and to use a mitigation trigger level that is smaller than the documented range in natural groundwater level variability.

8. The Applicant's Water Supply-4 proposes a two-tiered groundwater monitoring and mitigation with appropriate trigger levels.

The variation in the water levels east of the fault, including the Stump Spring monitoring well, show too much variation over short time scales to detect a change of 0.5 feet. Analysis of the hydrographs of wells on the west side of the fault shows significant changes in trend lines depending on the period of record. As described above, water levels can easily diverge by more than 0.5 feet from an apparently valid trend line that is based on several years of data, particularly if the baseline monitoring period includes or follows a recharge event. Based on the existing water level data, it would be difficult to reliably detect a change of 0.5 feet from a new source above the natural variability in the aquifer. Changes in the range of several feet could probably be detected with some degree of confidence in most wells on the west side of the fault zone, but not on the east side, given the fault's barrier effect.

The FSA analysis of background water level data shows that water levels in the Valley Fill aquifer decline an average of 2.18 ft/yr on the east side of the fault zone while the average decline is 0.19 ft/yr west of the fault zone, a difference of over 10 to 1 (Water Supply page 4.14-13, Tables 2 and 3). Given this 10 to 1 difference, a drawdown of between 2 to 5 feet at the project property line would correspond to a drawdown of 0.2 to 0.5 feet or less on the east side of the fault. Two mitigation triggers are proposed to account for this variability:

Tier 1 measures are triggered by declines of water levels at the northeast property line of two (2) feet over a two year period, corresponding to approximately 0.2 feet on the eastern side of the Stateline Fault system. Tier 2 measures are triggered by declines of water levels at the property line of five feet, corresponding to approximately 0.5 feet on the eastern side of the State Line Fault system. Both of these impacts are on the order of the decline in water levels that would occur in a matter of a few weeks due to regional decline on the northeast side of the fault and represent insignificant impacts over a period of years to decades of project operation.

If water levels in either of the Power Block 1 Monitoring Well Array or Power Block 2 Monitoring Well Array identify a projected 2 foot or greater project related drawdown at the property boundary during construction or operation for a period of at least two years as measured by the "Distance-Drawdown Plot Method", the Tier 1 measures would be triggered and the project owner will comply with Bio-23 and begin mitigation to reduce project related drawdown to less than 2 feet at the northeastern property line and maintain it below that level for the life of the project. Mitigation measures may include but are not limited to:

- Relocating the pumping wells to the western portion of the site to increase the separation of the wells from the site's northeastern boundary and allow water levels to recover in areas northeast of the site;
- Groundwater recharge to replace all or a portion of the project pumping and restore groundwater levels along the northeastern site boundary;
- Conducting through vegetation monitoring and soil coring described in BIO-23 and predictive water level trend analysis to demonstrate that a greater groundwater drawdown will not result in significant adverse impacts to the groundwater dependent vegetation.

If water levels in either of the Power Block 1 Monitoring Well Array or Power Block 2 Monitoring Well Array identify a projected 5 foot or greater project related drawdown at the northeast property boundary due to project pumping during construction or operation as measured by the Distance-Drawdown Plot Method, the Tier 2 measures would be triggered and the project owner will implement additional mitigation measures, including, but not limited to (i) purchase and retire additional senior water rights, (ii) seek water from other sources that may then be available, and/or (iii) conduct a feasibility study to determine whether an aquifer recharge program along the northeastern property line would reduce project related drawdown.

IV. Proposed Licensing Conditions

The FSA for the project proposes seven Conditions of Certification for this subject matter. The Applicant accepts Conditions of Certification: WATER SUPPLY-2, 3, and 5 and requests changes or deletion of WATER SUPPLY-1, 4, 6 and 7. The changes requested and reasons for them are described below.

WATER SUPPLY-1: WATER SUPPLY OFFSET PLAN

The construction pumping rate of 288 af/yr is a short-term use and will have short duration impacts over a small area of the aquifer that is fully within to the project site. Requiring the Applicant to replace this water, presumably with an offset in pumping at some other location in the Pahrump Groundwater Basin, is impractical and unnecessary.

It is unnecessary because the duration of construction pumping is limited to approximately 30 months and site data demonstrates that no offsite drawdown will occur in this time frame. No other

wells or groundwater-dependent vegetation are present within the portion of the aquifer that will be affected by construction pumping.

It is impractical because groundwater is pumped without restriction on the California side of the basin and there are no large water users near the project site that could verifiably reduce or cease their pumpage in amounts sufficient to offset 288 af/yr for the 30-month construction period. Water rights in Nevada are granted on a permanent basis and the mechanisms of temporarily assuming an existing water right are not obvious. Due to the remote location of the project site and limited pumping in that part of the valley, any reduction in pumpage on the Nevada side will be at a location too far from the project to restore water levels in the limited portion of the aquifer within the project site that will be impacted by construction pumping. Designing a groundwater recharge system sized for the construction pumping rate would result in a system that is oversized by a factor of approximately two times what would be necessary to replace long-term project pumping.

Additionally, as stated by Staff in their response to comment 10.9, the project has inherent water rights allowing it to beneficially use the groundwater underlying the HHHSEGS site: "In most areas of California, overlying land owners may extract percolating groundwater and put it to beneficial use without approval from the State Board or a court. California does not have a permit process for regulation of groundwater use. In several basins, however, groundwater use is subject to regulation in accordance with court decrees adjudicating the groundwater right within the basin." The project site area is not within or near an adjudicated basin.

Therefore, please revise Item 1 below.

WATER SUPPLY-1 The Project owner shall submit a Water Supply Plan that will identify how the project would mitigate project overdraft impacts to Pahrump Valley Groundwater Basin (PVGB). These activities shall result in replacement of ~~288 acre-feet per year for construction and~~ 140 acre-feet per year for groundwater pumped from the PVGB during project operation. ~~Replacement shall occur or be in implementation; by the time the project begins to pump groundwater for construction.~~ The activities proposed for mitigation may include, but are not limited to, retirement of active and senior water rights, forbearance of water use, and water conservation. The proposed method would be outlined in the Water Supply Plan to be submitted to the CPM for review and approval.

Verification

The Water Supply Plan shall include the following at a minimum:

1. Identification of the activity and water source that would replace ~~288 acre-feet per year for construction and~~ 140 acre-feet per year for groundwater pumped from the PVGB during project operation;
2. Demonstration of the project owner's legal entitlement to the water or ability to conduct the activity;
3. Assessment of whether any artificial recharge of groundwater can be achieved while using storm water controls in accordance with **SOILS-5** and **SOILS-6** or other methods. If recharge can be achieved then the volume recharged can be used to offset project water use in accordance with this condition.
4. Include a discussion of any needed governmental approval of the identified activities, including a discussion of the discussion of the conditions of approval;

5. Discuss whether any governmental approval of the identified activities would be needed, and, if so, whether that approval would require compliance with CEQA or NEPA;
6. Demonstration of how water pumped from the PVGB would be replaced for each of the activities;
7. An estimated schedule for completion of the activities;
8. Performance measures that would be used to evaluate the amount of water replaced by the activities;
9. Monitoring and Reporting Plan outlining the steps necessary and proposed frequency of reporting to show the activities are achieving the intended benefits and replacing PVGB extractions.

The project owner shall implement the activities reviewed and approved in the Water Supply Plan in accordance with the agreed upon schedule in the Water Supply Plan. ~~If agreement on identification or implementation of mitigation activities cannot be achieved the project owner shall not begin construction or operation until assurance that the agreed upon activities can be identified and implemented.~~

~~**Verification:**~~ The project owner shall submit a Water Supply Plan to the CPM for review 120 days prior to start of construction. ~~Construction or o~~Operation pumping will not begin until the Water Supply Plan has been approved by the CPM and implemented by the project owner.

WATER SUPPLY–4: GROUNDWATER MONITORING AND REPORTING FOR IMPACTS AND MITIGATION FOR GROUNDWATER-DEPENDENT VEGETATION, NEIGHBORING WELLS, AND WATER QUALITY

The Applicant has provided a detailed rationale for its proposed Waster-Supply-4 in Section III above. At the most basic level, as proposed in the FSA, there is no reasonable means to distinguish project related pumping effects from all other effects. As a cure for this flaw, the Distance Drawdown Methodology and the Filtering process discussed below, as described in USGS SIR2006-5024, is capable of removing water level variations from many sources, such as barometric responses, seasonal and annual variation in recharge, and pumping from other wells. The effectiveness of the filtering is dependent on having reliable water level data from background wells and knowing the pumping rate, location and aquifer properties from other pumping sources. While the filtering process is expected to remove many sources of water level variation in the aquifer, it will not account for extraneous factors that we do not have reliable data for. Therefore, the drawdown that remains after the filtering process cannot be definitively assigned to project related pumping unless it can be shown to fit a pattern consistent with pumping from the project wells.

Applicant proposes the “Distance-Drawdown Plot Method” as described in this testimony to better define whether drawdowns are a result of the project’s pumping or due to other sources of drawdown. Drawdown around a pumping well follows a predictable pattern with a slope on the groundwater surface that is determined by the pumping rate and transmissivity of the aquifer.

The Applicant’s testimony also explains the reasons for the two-tiered approach in the proposed Water Supply-4 language below. Analysis of background water level data shows that water levels in the Valley Fill aquifer decline an average of 2.18 ft/yr on the east side of the fault zone while the

average decline is 0.19 ft/yr west of the fault zone, a difference of over 10 to 1 (Water Supply page 4.14-13, Tables 2 and 3). All of the available lines of evidence point toward the fault as forming a flow barrier in the aquifer. As such, changes in groundwater levels on one side of the fault are terminated or greatly diminished on the other side of the fault. A drawdown of between 2 to 5 feet at the project property line would correspond to a drawdown of 0.2 to 0.5 feet or less on the east side of the fault. Water levels are declining at an average rate of over 2 ft/yr on the east side of the fault due to factors unrelated to the project. As a result, a drawdown of 5 feet at the property line of the site is equivalent to a decline of about 0.5 feet on the east side of the fault. This is equivalent to the decline in water levels on the east side of the fault that would occur in about 3 months or less due to the existing trend in regional water level decline. The additional drawdown contributed by project pumping under these conditions would be insignificant compared to the water level declines stressing the groundwater dependent vegetation from non-project related factors.

Using a two-tiered trigger level allows the project owner to respond to project related drawdown at a point where it can be reliably detected at the project boundary but before any negative impacts will occur at the groundwater dependent vegetation or spring on the east side of the fault. The use of a second higher trigger level provides an unambiguous signal that the project is having larger than anticipated impacts and that mitigation efforts are not sufficient to offset those impacts.

WATER LEVEL MONITORING FOR NEIGHBORING WELLS, MITIGATION AND REPORTING

WATER SUPPLY–4: The project owner shall submit a Groundwater Monitoring, Mitigation, and Reporting Plan (GMMRP) to the CPM for review and approval in advance of construction activities and prior to the operation of onsite groundwater supply wells. The GMMRP shall provide detailed methodology for monitoring background, on site, and off-site groundwater levels and water quality. The monitoring period shall include pre-construction, construction, and Project operation periods. The plan shall establish pre-construction and Project related groundwater level trends and water quality that can be quantitatively compared against predicted trends near the Project pumping wells and near potentially impacted resources. The GMMRP shall include all of the following:

Monitoring Well Locations

The project owner will install up to eleven (11) wells, subject to the ability to gain access and the right to use certain off-site well locations:

- Three wells directly up-gradient (gradient hereafter refers to inferred groundwater potentiometric surface included as part of staff analysis) from the Power Block 1 production well, in a linear array, within the property boundary. Two wells shall be installed within one –half mile of the Power Block 1 production well. The third well site shall be as close to the property lines as possible. (the “Power Block 1 Monitoring Well Array”).
- One well directly up-gradient from the Power Block 1 production well (well site not yet identified), between 1.0 and 1.5 miles from the project property boundary at the western edge of the mesquite Thicket on BLM land (BLM Mesquite Thicket Monitoring Well 1”).
- Three wells directly up-gradient from Power Block 2, in a linear array, within the property boundary. Two wells shall be installed within one-half mile of the Power

Block 2 production well (well site not yet identified) with the third well being as close to the property lines as possible (the "Power Block 2 Monitoring Well Array").

- One well directly up-gradient from Power Block 2, between 1.0 and 1.5 miles from the project property boundary (the "BLM Mesquite Thicket Monitoring Well 2").
- One well at the southern end of the site within the project boundaries (the "Southern Monitoring Well").
- One well at the northern end of the site within the project boundaries (the "Northern Monitoring Well").
- One well offsite in California between 2.0 and 3.0 miles from the southwest corner of the site, located between a bearing of southwest (225°) and west (270°) (the "Offsite California Monitoring Well").

On-Site and Off-Site Monitoring Well Locations

The eight monitoring wells located within the project Site shall be known as the "On-Site Monitoring Wells." The three monitoring wells located outside the project site (BLM Mesquite Thicket Monitoring Well 1, the BLM Mesquite Thicket Monitoring Well 2 and the Offsite California Monitoring Well) shall be known as the "Off-Site Monitoring Wells."

The On-Site Monitoring Wells shall be installed and operational before the project begins commercial operations. Commercial operations shall be defined as when the project first synchronizes to the transmission grid for purposes other than testing of the facility.

The ability to gain access to and the right to use the Off-Site Monitoring Wells is subject to the Project Owner's ability to obtain the right to use these sites for groundwater monitoring purposes. If the right to use one or more of the Off-Site Monitoring Wells is denied or delayed, the Project Owner shall continue to use commercially reasonable efforts to obtain the right to use these sites. If the right to use one or more of the sites cannot be obtained despite commercially reasonable efforts, the Project Owner shall propose for CPM review and approval alternative location(s) for Off-Site Monitoring Wells. During the time when the Project Owner is pursuing the right to use sites for the Off-Site Monitoring Wells, the Project Owner shall nevertheless be allowed to proceed with the GMMRP and construction and operation of the Project.

Background wells shall be the existing wells beyond the extent of project pumping either on-site or off-site that the Project Owner is able to access and monitor before commencement of project construction and during subsequent project construction and operation.

As authorized access allows, measure groundwater levels from the Off-Site Monitoring and On-Site Monitoring Wells within the network and Background Wells to provide initial groundwater levels for pre-project trend analysis. Assess the apparent trend and delineate project induced drawdown using the Drawdown Distance Method described below.

Distance Drawdown Methodology

Drawdown will be evaluated using the "Distance-Drawdown Plot Method." The test is based on the simple assumption that any drawdown in the aquifer created by the project wells would follow the established hydraulic laws that govern the shape of a cone of depression in an aquifer. For either the Power Block 1 Monitoring Well Array or the Power Block 2 Monitoring Well Array, if the apparent water level declines after Filtering (see Filtering Methodology description below), fall along a linear trend on a 'distance-drawdown' plot from the project pumping wells, and if the slope of that line defines an aquifer transmissivity value that is consistent with the aquifer properties defined by initial pumping tests, then the water level declines can be reasonably assumed to be from project pumping. If the magnitude of the drawdown projected at the northeastern property line exceeds the 'Tier 1 Trigger Level', as defined below, for a duration of two years (based upon the preceding 2 years of Filtered water level data), then the applicant will initiate the approved mitigation measures.

If the drawdowns measured in either the Power Block 1 Monitoring Well Array or the Power Block 2 Monitoring Well Array in the aquifer cannot be attributed to project related drawdown by use of the Distance Drawdown Plot Method, they must be associated with other causes and the applicant will not be required to institute the mitigation measures.

The water level data for the monitoring well network will be filtered using the Filtering Methodology as described in USGS report 'SIR2006-5024'. This USGS method removes water level variations from many sources, such as barometric responses, seasonal and annual variation in recharge, and pumping from other wells. The effectiveness of the filtering method depends on having reliable water level data from background wells and knowing the pumping rate, location and aquifer properties from other pumping sources. While the Filtering Methodology is expected to remove many sources of water level variation in the aquifer, it will not account for extraneous factors for which we do not have reliable data. Therefore, the drawdown that remains after the filtering process cannot be definitively assigned to project related pumping unless it can be shown to fit a Distance-Drawdown pattern consistent with pumping from the project wells.

A. Prior to Project Construction

The project owner shall:

1. Conduct a well reconnaissance review to investigate and document the condition of existing water supply wells located within 3 miles of the project site, provided that access is granted by the well owners.
2. Monitor to establish preconstruction conditions. The monitoring plan and network of monitoring wells shall make use of new monitoring wells installed after commencement of construction by the Project Owner. Monitoring wells shall be installed to a depth that matches the depth of the project pumping wells or to a maximum depth of 600 feet (the locations and depth of each well shall be decided based on the acceptance of the GMMRP). A plan for design and construction of the monitoring wells and an evaluation of how they will be effective in evaluating project pumping impacts on domestic well owners shall be submitted to the CPM for review and approval prior to installation and monitoring. Construction activities unrelated to the monitoring wells shall be allowed to proceed while the plan is under CPM review.

3. As access allows, measure groundwater levels from the off-site and on-site wells within the network and background wells to provide initial groundwater levels for pre project trend analysis.
4. Construct updated water level maps within the Pahrump Valley basin, within 5 miles of the site from the groundwater data collected prior to construction. Update trend plots and statistical analyses, as data are available.
5. Commence water quality monitoring to establish pre-construction groundwater quality conditions in the monitored wells. All monitoring wells shall be sampled at least quarterly for the following constituents: TDS, chloride, nitrates, major cations and anions, oxygen-18 and deuterium isotopes. The monitoring wells along the site property boundary, the production wells, and the monitoring wells closest to each production well shall be monitored on a monthly basis for a maximum of one year and then on a quarterly basis until the start of construction pumping for the same parameters.

B. Groundwater Monitoring and Protection of Groundwater Dependent Vegetation During Construction and Operation

The project owner shall:

1. Collect water levels from wells within the monitoring network on an hourly basis (based on site and well access) throughout the construction period and at the end of the construction period. Perform statistical trend analysis for water levels. Assess apparent trend and delineate project induced drawdown using the Drawdown Distance Method.
2. If water levels in either of the Power Block 1 or Power Block 2 Onsite Monitoring Wells identify a projected two (2) feet or greater project related drawdown, at the northeastern property boundary due to project pumping as measured using the Distance Drawdown Methodology during construction or operation for a continuous period of at least two years, the 'Tier 1 Trigger Level', the project owner shall **1)** comply with BIO-23 and initiate groundwater dependent vegetation monitoring, and **2)** initiate groundwater mitigation to reduce project related drawdown to less than 2 feet at the northeastern property line and maintain it below that level for the life of the project. Mitigation measures may include, but are not limited to:

    - relocating the pumping wells to the western portion of the site to increase the separation of the wells from the site's northeastern boundary and allow water levels to recover in areas northeast of the site;
    - groundwater recharge to replace all or a portion of the project pumping and restore groundwater levels along the northeastern site boundary;
    - conducting vegetation monitoring described in BIO-23 to demonstrate that a greater groundwater drawdown will not result in significant adverse impacts to the groundwater dependent vegetation.

3. If water levels in either of the Power Block 1 or Power Block 2 Onsite Monitoring Wells identify a projected five (5) feet or greater project-related drawdown at the northeastern property boundary due to project pumping as measured using the Distance Drawdown Methodology during construction or operation, the 'Tier 2 Trigger

Level', the project owner shall implement additional mitigation measures, including, but not limited to (i) purchase and retire additional senior water rights, (ii) seek water from other sources that may then be available, and/or (iii) conduct a feasibility study to determine whether an aquifer recharge program along the northeastern property line would reduce project related drawdown.

4. Prior to use of any groundwater for construction, all baseline groundwater quality monitoring data shall be reported to the CPM. The report shall include the following:

    a. An assessment of pre-project groundwater quality with groundwater samples analyzed for TDS, chloride, nitrates, major cations and anions, oxygen-18 and deuterium isotopes. The report to the CPM shall assess the utility of these constituents for future monitoring. Any recommendations to add or remove constituents shall be supported with the data and other relevant factual evidence. The CPM shall finalize the required list of constituents to be analyzed based on these recommendations and review of two years of monitoring results. The CPM may also modify the frequency of sampling required depending on the trends demonstrated by the monitoring results.

    b. The data shall be tabulated, summarized, and submitted to the CPM. The data summary shall include the range (minimum and maximum values), average, and median for each constituent analyzed.

5. During project construction, the project owner shall ~~monthly~~ monitor the quality of groundwater and changes in groundwater quality in the monitoring network and submit data semi-annually to the CPM. Sampling will be on a quarterly basis for all wells determined to have no statistically significant trends in water quality during preconstruction monitoring. Sampling shall be on a monthly basis for wells that were determined to have a valid trend in pre-construction monitoring to determine if any changes in the trend line have occurred. The summary report shall document water quality monitoring methods, the water quality data, water quality plots, and a comparison between pre- and post-construction water quality trends as itemized below. The report shall also include a summary of actual water use conditions. The report shall be provided to CPM 60 days following completion of each semi-annual monitoring period.

    a. Groundwater samples from all wells in the monitoring well network shall be analyzed and reported semiannually for the following constituent list: TDS, chloride, nitrates, major cations and anions, oxygen-18 and deuterium isotopes.

    b. The compliance data shall be analyzed for both trends and for contrast with the pre-project data. For analysis purposes, pre-project water quality shall be defined by samples collected prior to project construction as specified above, and compliance data shall be defined by samples collected after the construction start date.

6. During the first year of project operation, the project owner shall monitor the quality of groundwater and changes in groundwater quality in the monitoring network and submit data semiannually to the CPM. Sampling will be on a quarterly basis for all wells determined to have no statistically significant trends in water quality during preconstruction or construction monitoring. Sampling shall be on a monthly basis for wells that were determined to have a valid trend in pre-construction or construction monitoring to determine if any changes in the trend line have occurred.

7. After the first year of project operation, the project owner shall quarterly monitor the quality of groundwater and changes in groundwater quality in the monitoring network and submit data semiannually to the CPM. The summary report shall document water quality monitoring methods, the water quality data, water quality plots, and a comparison between pre- and post-construction water quality trends as itemized below. The report shall also include a summary of actual water use conditions.

    a) Groundwater samples from all wells in the monitoring well network shall be analyzed and reported semiannually for the constituent list approved by the CPM.

    b) The compliance data shall be analyzed for both trends and for contrast with the pre-project data. For analysis purposes, pre-project water quality shall be defined by samples collected prior to project construction as specified above, and compliance data shall be defined by samples collected after the construction start date.

8. Groundwater quality data shall be used to ensure the project owner complies with the requirements of WATER SUPPLY-7. If the water quality data show that project pumping is causing a decline in water quality that could lead to exceedance of the allowable Water Quality Objectives for beneficial uses of the PVGB the project owner shall prepare an engineering report consistent with the RWQCB requirements for protection of beneficial uses (See also SOILS-9, Septic System).

C. Protection for Neighboring Wells

If the monitoring well system put in place pursuant to this Condition demonstrates that water levels in neighboring wells have been lowered as a result of project-related drawdown 10 feet or more (under static-non-pumping conditions), the project owner shall provide CPM with evidence that the project owner has offered to compensate private well owners for the increased energy cost associated with pumping groundwater as a direct result of a drop in water levels associated with the project groundwater use.

If Project pumping has lowered water levels in existing neighboring wells such that to substantially impact well yield so that it can no longer meet its intended purpose, causes the well to go dry, or causes casing collapse, an assessment of remedial options will be conducted by project owner, followed by payment or reimbursement of an amount equal to the cost of cleaning or rehabilitating the well to restore its capacity, lowering the pump (as in item (e) below), deepening the well, or replacing the well (as cooperatively determined as the appropriate resolution) shall be provided to accommodate these effects. Payment or reimbursement shall be at an amount equal to the customary local cost of deepening the existing well or constructing a new well of comparable design and yield (only deeper). The demand for water, which determines the required well yield, shall be determined on a per well basis using well owner interviews and field verification of property conditions and water requirements compiled as part of the pre-project well reconnaissance. Well yield shall be considered substantially impacted if it is incapable of meeting 110% of the well owner's maximum daily demand, dry-season demand, or annual demand – assuming the pre-project well yield documented by the initial well reconnaissance met or exceeded these yield levels.

To be eligible for the well protection guarantee program, the well owner must notify project owner of the location and the well, provide such well construction data as may be known,

and authorize the project owner to inspect the well, document relevant factors such as the well depth, depth to static water level, pumping rate, and pumping water level, and allow the project owner access to the well to verify the conditions of any claims.

Pump lowering – In the event that groundwater is lowered as a result of Project pumping to an extent where pumps are exposed but well screens remain submerged under static non-pumping conditions, the pumps shall be lowered to maintain production in the well. The Project shall reimburse the impacted well owner for the costs associated with lowering pumps.

Deepening of wells – If the groundwater is lowered enough as a result of Project pumping that well screens and/or pump intakes are exposed under static-non-pumping conditions, and pump lowering is not an option, such affected wells shall be deepened or new wells constructed. The project owner shall reimburse the impacted well owner for all reasonable costs associated with deepening existing wells or constructing new wells shall be borne by the project owner.

After the first five-year operational and monitoring period the CPM shall evaluate the data and determine if the monitoring program for water level measurements should be revised or eliminated. Revision or elimination of any monitoring program elements shall be based on the consistency of the data collected. The determination of whether the monitoring program should be revised or eliminated shall be made by the CPM.

Verification:

The project owner shall submit a Groundwater Monitoring, Mitigation, and Reporting Plan (GMMRP) to the CPM for review and approval in advance of construction activities and prior to the operation of onsite groundwater supply wells. The GMMRP shall provide detailed methodology for monitoring background, on site, and off-site groundwater levels and water quality. The monitoring period shall include pre-construction, construction, and Project operation periods.

On a hourly basis for the first year of operation and daily thereafter for the life of the project, the project owner shall collect water level measurements from wells identified in the groundwater monitoring program to evaluate operational influence from the Project. Operational parameters (i.e., pumping rate) of the water supply wells shall be monitored. Additionally, annual groundwater-use in the southern Pahrump Valley shall be estimated based on available data.

On an annual basis, the project owner shall perform statistical trend analysis of water level data and compare to predicted water level declines due to project pumping. Analysis of the apparent trend shall be determined and the magnitude of that trend estimated. Assess the apparent trend and delineate project induced drawdown using the Distance Drawdown Methods.

On an annual basis, the project owner shall perform statistical trend analysis of water quality data and compare to pre-project water quality. Analysis of the apparent trends shall be determined.

The project owner shall also provide to the CPM all monitoring reports, complaints, studies and other relevant well monitoring data within 10 days of being received by the project owner.

WATER SUPPLY–6: GROUND SUBSIDENCE MONITORING AND ACTION PLAN

Subsidence has occurred in the greater Pahrump Valley groundwater basin due to historic over pumping, primarily in the more developed portions of the valley north of the site. Given the history of subsidence issues, it would be unreasonable to assume that any subsidence problems in the area would be caused by the project unless groundwater monitoring demonstrated that the project was causing significant drawdown off site and beneath adjacent structures.

The Applicant agrees to monitor for potential subsidence despite the fact that the Applicant's technical experts believe that the potential for causing substantial subsidence is very remote. The project's pumping is very limited (140 afy) and the project's potential effects will be entirely on site, within a few hundred meters of the well locations, all on-site. The proposed monitoring program must determine whether subsidence is caused by project pumping. The proposed changes below reiterate that there must be a causal link showing that purported subsidence was caused by the project. Subsection C requires preparation of a Mitigation Action Plan. Subsection C.1.c. calls for a shutdown of the project without there first being an evaluation to determine that the project's limited pumping is in fact causing subsidence offsite. Subsection C.2. also requires preparation of an "Action Plan" where potential mitigation strategies will be developed short of shutting down renewable generation. The shutdown provision is also a potential enforcement action, not a "significance criteria." Finally, the monitoring provisions are established as "annually" so references to "quarterly" have been revised to reflect annual reporting requirements.
The subsidence monitoring program is predicated on predicted drawdown from project pumping that is exceedingly unlikely given the aquifer properties on the site. If groundwater monitoring demonstrates that the project is not creating drawdown off site or beneath adjacent structures, there is no need for continued subsidence monitoring unless future groundwater monitoring shows that conditions have changed and the project does produce significant drawdown off site or beneath adjacent structures. Therefore, please revise Section C as follows.

WATER SUPPLY–6 One monument monitoring station per production well or a minimum of three stations shall be constructed to measure potential inelastic subsidence that may alter surface characteristics of the PVGB and affect structures near the proposed production wells. The project owner shall:

A. Prepare and submit a Subsidence Monitoring Plan (SMP), including all calculations and assumptions. The plan shall include the following elements:

   1. Construction diagrams of the proposed monument monitoring stations including size and description, planned depth, measuring points, and protection measures;

   2. Map depicting locations (minimum of three) of the planned monument monitoring stations;

   3. Monitoring program that includes monitoring frequency, thresholds of significance, reporting format.

B. Prepare annual reports commencing three (3) months following commencement of groundwater production during construction and operations.

1. The reports shall include presentation and interpretation of the data collected including comparison to the thresholds developed in Item C.

C. Prepare a Mitigation Action Plan that details the following:

1. Thresholds of significance for implementation of proposed action plan based on monitoring station data;

a. Subsidence caused by project pumping shall not be allowed to damage existing structures either on or off the site or alter the appearance or use of the structure;

b. Any subsidence caused by project pumping that may occur shall not be allowed to alter natural drainage patterns or permit the formation of playas or lakes;

~~c. If any subsidence violates (a) or (b) the project owner shall investigate the need to immediately modify or cease pumping for project operations until the cause is interpreted and subsidence caused by project pumping abates and the structures and/or drainage patterns are stabilized and corrected.~~

2. The project owner shall prepare an Action Plan that details proposed actions by the Applicant in the event thresholds are achieved during the monitoring program

The project owner shall submit the Ground Subsidence Monitoring and Action Plan that is prepared by an Engineering Geologist registered in the State of California thirty (30) days prior to the start of extraction of groundwater for construction or operation.

Verification: The project owner shall do all of the following:

1. At least thirty (30) days prior to project construction, the project owner shall submit to the CPM, a comprehensive report presenting all the data and information required in item A above.

2. During project construction and operations, the project owner shall submit to the CPM annual reports presenting all the data and information required in item B above.

3. The project owner shall submit to the CPM all calculations and assumptions made in development of the report data and interpretations.

4. After the first five (5) years of the monitoring period, the project owner shall submit a 5-year monitoring report to the CPM that submits all monitoring data collected and provides a summary of the findings. The CPM shall determine if the Ground Subsidence Monitoring and Action Plan frequencies should be revised or discontinued.

WATER SUPPLY-7: NON-TRANSIENT, NON-COMMUNITY WATER SYSTEM

The HHSEGS project has the option of providing potable water supply via bottled water service. Nevertheless, the FSA has correctly retained the option of setting up non-transient, non-community

water system under State law. Accordingly, proposed WATER SUPPLY-7 should be revised to clarify that the project will only be subject to California Code of Regulations, Title 22, Article 3, Sections 64400.80 through 64445 (22 CCR § 64400.80 – 64445) if it will operate a non-transient, non-community water system. Since such a water system is a creature of State law, the Commission preempts Inyo County's authority. The Condition should be revised to recognize the Commission's exclusive authority, giving review and approval authority to the CPM and having materials submitted to the County for review and comment. In addition, the timing of this requirement should be revised to allow the project owner to obtain the operations permit prior to operating the system, rather than the start of construction. It is not logical to require the project owner to obtain a permit to operate a system that has not been built.

WATER SUPPLY-7 If the project installs a non-transient, non-community water system as defined in ~~The project is subject to the requirements of~~ California Code of Regulations, Title 22, Article 3, Sections 64400.80 through 64445 (22 CCR § 64400.80 – 64445) ~~for a non- months). T~~the project owner shall submit water system plans to the CPM for review and approval, and to the Inyo County Environmental Health Services for review and comment ~~approval~~. In addition, the system will require periodic monitoring consistent with **WATER SUPPLY-4**, for various bacteriological, inorganic and organic constituents.

~~**Verification:** The project owner shall obtain a permit to operate a non-transient, non-community water system with the Inyo County Environmental Health Services a~~At least sixty (60) days prior to ~~to commencement of construction~~ the installation of a non-transient, non-community water system at the site, the project owner shall submit an application and applicable filing fees for a permit to operate a non-transient, non-community water system to the Inyo County Environmental Health Services for review and comment. The same application shall be submitted to the CPM for review and approval. In addition, the project owner shall submit to the CPM a monitoring and reporting plan for production wells operated as part of the domestic water supply system prior to plant operations. The plan shall include reporting requirements including monthly, quarterly, and annual submissions.

The project owner shall designate a California Certified Water Treatment Plant Operator as well as the technical, managerial, and financial requirements as prescribed by State law. The project owner shall supply the CPM updates on an annual basis regarding monitoring requirements, any submittals to the Inyo County Environmental Health Services, and proof of annual ~~renewal~~ payment of the operating permit fee.

Worker Safety and Fire Protection

I. Introduction

A. Names: Wes Alston and Karen Parker

B. Qualifications: The panel's qualifications are as noted in their resumes contained in Appendix A.

C. Prior Filings: In addition to the statements herein, this testimony includes by reference the following documents submitted in this proceeding:

- Application for Certification, Volume 1 & Volume 2, dated August 5, 2011 [Exhibit 1]
- Applicant's Data Response, Set 1A, dated November 16, 2011, Responses to Data Requests 17 through 23 [Exhibit 4]
- Applicant's Data Response, Set 1C, dated December 19, 2011. Responses to Data Requests 95 and 96 [Exhibit 17]
- Applicant's Data Response, Set 1C-3, dated May 8, 2012. Responses to Data Requests 95 and 96 [Exhibit 19]
- Applicant's Data Response, Set 2C, dated March 5, 2012. Responses to Data Request 150 [Exhibit 34]
- Applicant's Response to CEC Staff Requests, Supplemental Data Response Set 2, dated April 2, 2012, Response to Data Request PD-1 [Exhibit 46]
- Applicant's Updated Workforce Analysis, dated October 1, 2012 [Exhibit 63]
- Applicant's Preliminary Staff Assessment Comments, Set 2, dated July 23, 2012 [Exhibit 70]

D. Attachments:

- Applicant's Report of Conversation with Paul Postle, Southern Inyo County Fire Protection District, and Ashraf Shaqadan, CH2M HILL, consultant for Applicant, regarding Fire Protection Services, dated March 29, 2011 and July 11, 2011.

To the best of our knowledge, all of the facts contained in this testimony (including all referenced documents) are true and correct. To the extent this testimony contains opinions, such opinions are our own. We make these statements, and render these opinions freely and under oath for the purpose of constituting sworn testimony in this proceeding.

II. Summary of Testimony

A. Affected Environment

The area surrounding the project site is sparsely populated. The area to the south and east of the project site is private land that has been partially developed for residential use. This area is known as Charleston View. The area to the west and north is mostly undeveloped vacant land. The closest residence to any power block is located approximately 3,500 feet south of the power block for Solar Plant 2. The residence nearest to the project site's property boundary is approximately 300 feet east of the solar field. However, this residence is located farther away from the power block. The St. Therese Mission is a commercial development currently under construction on 17.5 acres approximately 0.5 mile

to the southeast of the project site. On its completion, the development will provide a chapel, columbarium, garden, restaurant, visitor's center, playground, restrooms, and caretaker house. The Front Sight Firearms Training Institute is located in Nevada approximately 1.7 miles north of the project site. This facility offers classes during both the day and nighttime hours, including nighttime courses using Uzi submachine guns and M16s.

Access to the project site is provided via Tecopa Road located at the southern boundary of the site. State Route 160 (SR 160), located approximately 10 miles to the east of the project site in Nevada, is connected to the project site via Tecopa Road. Tecopa Road connects Nevada SR 160 to California State Route 127 (SR 127) located approximately 28 miles to the west of the project site. Regional access to the project area is provided via Interstate 15 (I-15) located approximately 37 miles to the southeast of the project site.

HHSEGS is within the jurisdiction of the Southern Inyo Fire Protection District (SIFPD). The District currently operates out of a building in the Tecopa Hot Springs, and has an engine parked at the home of a volunteer fire fighter in Charleston View. The Fire District is responsible for 1,250 square miles and is staffed by 1 Fire Chief/Mechanic, 1 Administrative officer and 8 volunteers. SIFPD has an exclusive operating agreement with Inyo County for ground ambulance services within the district boundaries. The County of Inyo through their Health Department issues exclusive operating agreements with ground ambulance providers within the county. The providers are inspected and certified by the Inland Counties Emergency Medical Agency (ICEMA). SIFPD or the County, with the certification of ICEMA, can modify the agreements. The District operates 1 Basic Life support ambulance unit and responds to approximately 50 EMS calls per year. Mercy Air is not bound by the exclusive operating agreement in Inyo County and is ICEMA inspected and approved to operate independently in Inyo County and can respond to the site with a direct call from HHSEGS's onsite EMS staff.

The first response may come from fire/EMS engine crew (volunteer) in the Charleston View area (approximate response time of 5 to 10 minutes), but it is not a permanent station and is staffed only 75 percent of the time. Because of the remote nature of the area and the limited resources available in that area of Inyo County, there is a mutual aid agreement for fire, EMS and Haz Mat response in place between SIFPD and Nye County, Nevada. Pahrump Valley Fire-Rescue Services (PVFRS), which is located in Nevada, and the SIFPD are in the process of executing a mutual aid agreement. The purpose of this new agreement is to update an existing mutual aid agreement between PVFRS and SIFPD that has been in place for about 20 years. The Town of Pahrump approved the agreement between PVFRS and SIFPD on March 13, 2012. The agreement is pending signature by the SIFPD Board. The town of Pahrump has the capability and resources to respond to the site for emergency medical services (EMS), fires, and hazardous materials incidents. The PVFRS is currently responding into the area on mutual aid to SIFPD. PVFRS, Nye County and Clark County currently respond to 911 calls originating in Nevada through cell phone calls to their dispatch centers from locations in SIFPD responsibility area, even though there are no fully executed agreements. Emergency calls may be routed to any of these agencies depending on which cell phone tower in the area handles the call because of limited service on the California side of the area.

B. Potential Construction Related Impacts; Avoidance and Minimization Measures

During this project, the workers will be exposed to construction safety hazards that are similar in nature to those of other construction projects. A hazard analysis has been prepared to evaluate the project hazards and control measures. The hazard analysis was outlined in Table 5.16-3 of the AFC. The analysis identifies the hazards anticipated during construction and indicates which safety programs should be

developed and implemented to mitigate and appropriately manage those hazards. These programs were identified in Section 5.16 of the AFC.

The construction phase of the project may have minor on and offsite impacts on EMS, fire, or hazardous material resources. The Fire Protection and Emergency Services Needs Assessment (FNA) [Exhibit 19] submitted by the Applicant in May, 2012 evaluated whether the addition of the HHSEGS to the SIFPD service area would result in an increase in responses from the SIFPD service area. The potential was evaluated for SIFPD responses due to vehicle accidents on the roadways that may occur as a result of the additional daily trips generated by HHSEGS's construction workers. Based on revised workforce numbers provided in an updated workforce analysis submitted to the Energy Commission in October 2012 [Exhibit 63], the Applicant concluded there would be the potential for five additional vehicle accidents with injuries to occur per year on the surrounding roadways in Inyo County. An accident with injuries would require a response from the SIFPD as the entity having an ambulance service in the area. The addition of the HHSEGS to the SIFPD service area would result in an insignificant increase in responses from the SIFPD due to vehicle accidents on the roadways in the project vicinity. Therefore, no significant direct or cumulative impacts would occur.

The minor injuries would be treated on-site by the site nurse. Injuries that would need transportation to a medical facility would be stabilized on-site by the site nurse and then transported by private vehicle, ambulance, or air ambulance to the hospital. If transported by air ambulance a call could be made directly by plant employees to Mercy Air that is located in Pahrump. Mercy Air is not bound by the exclusive operating agreement in Inyo County and is ICEMA inspected and approved to operate independently in Inyo County.

C. Potential Operational Related Impacts; Avoidance and Minimization Measures

The types of hazards anticipated during plant construction and operation are similar. A hazard analysis similar to the one performed for construction was prepared for operations to evaluate the project hazards and control measures associated with operation of the facility. The operations hazard analysis was outlined in Table 5.16-4 of the AFC. The analysis identified the hazards anticipated during operation and indicated which safety programs should be developed and implemented to mitigate and appropriately manage those hazards. These programs were identified in Section 5.16 of the AFC.

The main risk of fire associated with the proposed project is from fires in the generator bearings. Unlike parabolic trough technologies at the Daggett, Kramer Junction, and Harper Dry Lake facilities, HHSEGS technology does not use a Heat Transfer Fluid (HTF). Instead, the HHSEGS uses water to create steam without any intermediate fluids. This results in a reduced use of hazardous materials and a lower fire risk. The plant will function in a similar manner to a gas fired thermal plant. Incidents in existing thermal plants per the State Fire Marshall's California All Incident Reporting System (CAIRS) reports are averaging 2 incidents per year throughout all the state's power plants.

D. Summary of Compliance with Applicable LORS

Construction and operation of HHSEGS will be conducted in accordance with all applicable LORS. Table 5.16-1 of the AFC summarizes the federal, state, and local LORS relating to worker health and safety. AFC Table 5.16-2 provides a summary of the applicable national consensus standards.

E. Summary of the Potential Cumulative Impacts

There are no existing industrial facilities in the vicinity of the proposed project. Other development projects in the vicinity of the project, such as the St. Therese Mission project, will have their own onsite worker safety programs that they will implement during construction and operation of their facilities.

The only potential cumulative impacts of multiple projects in the area would be on public safety, primarily potential public health and traffic impacts, and those impacts have been addressed in the Public Health and Traffic and Transportation sections of this testimony.

III. Response to Certain Issues Raised in the FSA

The following issues are raised by the FSA. Most of these issues were also contained in the PSA.

1. The FSA states on page 4.15-1, 4th paragraph, Summary of Conclusions: "Due to the minimal resources of the local SIFPD, staff agrees with the SIFPD that the likely emergency response requirements of HHSEGS would likely create a significant public impact." However, the FSA fails to explain the standard or threshold used to determine whether an impact on public services is significant. The FSA states that the incident rate for three existing solar plants was 2.5 emergency calls per year or 0.83 emergencies per solar plant per year. While this number may not be "statistically significant," it is extremely low. Regarding EMS, the FSA finds "incidents at gas-fired power plants that require EMS response are infrequent." Given the foregoing, it is not clear what aspect of HHSEGS would "significantly" impact SIFPD.

   The FSA appears to base the conclusion that HHSEGS would cause significant impacts on services provided by SIFPD on the lack of a signed mutual aid agreement between SIFPD and Pahrump Valley Fire-Rescue Services (PVFRS). From page 4.15-1, 5th paragraph, 1st sentence: "Staff's conversations with both Fire Chief Larry Levy of SIFPD and Fire Chief Scott F. Lewis of Pahrump Valley Rescue Service (PVRS) have confirmed that there is a longstanding practice of providing mutual aide between their respective fire and EMS agencies. However, currently there is not a formal, signed mutual aid agreement between the two agencies." Furthermore, page 4.15-24, 2nd paragraph, states: "At staff's request, the applicant provided Fire and Emergency Services Risk and Needs Analyses (FESNA) on May 9, 2012 (CH2 2012z). The analyses suggest that by complying with LORS, the project will not create significant impacts on the local SIFPD or local emergency response resources because any responses needed for fire, medical, or technical rescue needs would be sourced from Pahrump Valley Fire-Rescue Services (PVFRS) in Pahrump, Nevada. The official mechanism by which these various services (including technical rescue) would be sourced and paid for from another jurisdiction, like PVFRS in the state of Nevada, rather than from the local Authority Having Jurisdiction (AHJ), in this case SIFPD, has not been established." It is the Applicant's understanding that there is an existing mutual aid agreement dated January 3, 2006 between SIFPD and Nye County, Nevada for fire, EMS, and Haz Mat response, and there has been a mutual aid agreement in place between PVFRS and SIFPD for the last twenty years. As stated above, PVFRS and SIFPD have been negotiating a new agreement, the terms of which were finalized by the parties and approved by the Town of Pahrump on March 13, 2012. The agreement has not yet been scheduled for consideration and approval by the SIFPD Board. However, PVFRS continues to respond to incidents within SIFPD per the terms of the agreement. Currently, SIFPD, PVFRS, Nye County, and Clark County all respond to fire, EMS and Hazmat incidents within the project area. Therefore, it is erroneous to conclude that the HHSEGS project will result in significant impacts based on a temporary lack of a formal signed agreement between SIFPD and PVFRS.

2. The FSA further states (Page 4.15-1, 5th paragraph, 3rd sentence), "With ongoing growth in demand for response services in the areas caused by, among other things, solar energy plants, this informal practice could well be tested going forward, and cannot be relied upon in this siting case to enable the local fire department to maintain its level of service under increasing demands." Other than the HHSEGS, there are no other solar energy plants, proposed or

otherwise, that SIFPD will be required to provide fire services to, therefore there is no basis for the assumption that there will other "increasing demands" that would render SIFPD unable to maintain its level of service in concert with the existing agreements with other agencies.

3. Page 4.15-1, 3rd paragraph, states: "Staff has considered the position of the Southern Inyo Fire Protection District (SIFPD) and all relevant information as well as past experience at other solar power plants in California. SIFPD resources (both personnel and equipment) are limited commensurate with the low population density of the area it serves. The SIFPD has indicated, before the recent project changes that effectively doubled the construction workforce and associated traffic, that emergency services would be significantly impacted (SIFPD 2012a) because of the magnitude of the proposed project and the large (relative to local population) workforce. The potential for unmitigated impacts resulting from new demands for SIFPD services as a result of construction and operation of HHSEGS is increased by the fire district not being financially supported by county revenues, and thus would not benefit from any taxes paid to the county." Page 4.15-24, paragraph 1, makes similar statements. It is important to note that while SIFPD may not receive funds from county revenues, SIFPD does receive revenues from special parcel taxes and or assessments, and will receive revenue from property taxes by the HHSEGS project. In addition, fire protection districts have mechanisms granted by California law to generate revenue, if needed, to fund capital investments. In addition, the potential impact of the HHSEGS project on emergency and medical services is not an environmental impact that must be mitigated under CEQA. Therefore, the project has no legal duty to mitigate the impacts, if any, on emergency and medical services. Notwithstanding this fact, the Applicant is actively engaged in discussions with SIFPD to ensure adequate fire and emergency service for the project.

4. On page 4.15-10 (**EYESIGHT PROTECTION FROM PHOTOCHEMICAL RETINAL DAMAGE)** of the FSA, the analysis states, "When evaluating the implications of these effects on the viewer of the tower or the heliostats, it must be noted that the effect is directly related to the ambient and background light conditions. The Hidden Hills SEGF is located in a bright desert environment thereby ***increasing*** the potential chance for photochemical retinal damage (emphasis added). The cumulative daily exposure to workers to the ambient environment combined with the additional potential cumulative effects of heliostat and solar receiver steam generator (SRSG) exposure puts project workers at risk for photochemical retinal damage. This is due to the cumulative effect discussed above."

   This statement incorrectly quotes Applicant's Data Response 150. The correct language is as follows: As set forth in Data Response 150, the statement should be corrected as follows: "When evaluating the implications of these effects on the viewer of the tower or the heliostats, it must be noted that the effect is directly related to the ambient and background light conditions. The HHSEGS project is located in a bright desert environment thereby <u>reducing</u> ~~increasing~~ the potential chance for photochemical retinal damage." In addition, Applicant notes that the potential risk to workers is only as a result of long term exposure, or intense close viewing of the SRSG. Therefore, special safety glasses are issued to operators at the Solar Energy Development Center (SEDC) and facilities at Coalinga.

5. From page 4.15-19, paragraph 3: "Staff has considered the position of the SIFPD and all relevant information as well as past experience at existing solar power plants. The fire, hazmat, and EMS needs at the proposed plant are real and would pose significant added demands on SIFPD's local fire protection and emergency medical services. " As noted previously, while the impacts may be real, it is not clear why they are deemed substantial or significant. If there was no project and

the site was fully built out the State average for calls for service in residual subdivisions is 1 in 4 dwelling units per year. It could be assumed that the site's 172 homes would produce 43 additional calls per year on the site with no project. The impact of the project on public services, if any, is not an "environmental impact" subject to CEQA.

IV. Proposed Licensing Conditions

The FSA for the project proposes seven Conditions of Certification for this subject matter. We agree with the Conditions of Certification set forth in the FSA pertaining to this subject, except as set forth below.

CONDITION WORKER SAFETY-1

Condition WORKER SAFETY-1 applies to activities during construction, not operations. This condition should be revised to remove plans that should apply only during operations, such as the eye protection plan which is needed only to protect operators of the facility against potential retinal damage from long term exposure for workers engaged in intense solar field work, tower work, or intense close viewing of the SRSG. This condition should also be revised to ensure that the project owner has sufficient time to prepare and submit the required programs and plans for review. Therefore, Construction WORKER SAFETY-1 should be revised as follows:

WORKER SAFETY-1 The project owner shall submit to the Compliance Project Manager (CPM) a copy of the Project Construction Safety and Health Program containing the following:

- a Construction Personal Protective Equipment Program;
- a Construction Exposure Monitoring Program;
- a Construction Injury and Illness Prevention Program;
- a Construction Heat Stress Protection Plan that implements and expands on existing Cal OSHA regulations as found in 8 CCR 3395;
- a Construction Emergency Action Plan; and
- a Construction Fire Prevention Plan that includes the above-ground fuel depot.
- ~~an Eyesight Protection from Retinal Damage Plan that is designed to insure that workers in the solar field receive and wear the appropriate protective sunglasses. This Eyesight Protection from Retinal Damage Plan would:~~

  ~~(1) identify and acquire the appropriate eye protection (EP) equipment based on the IEC 62471 standards in sufficient numbers to provide safety glasses for the workers engaged in solar field work, and tower work where the potential exists for heliostat solar reflective exposure or SRSG exposure during operations,~~

  ~~(2) establish the requirements and procedures for the donning and doffing of the EP by workers and provide training and,~~

  ~~(3) monitor worker use of the PPE and compliance with the EP procedures.~~

Verification: The Construction Emergency Action Plan and the Fire Prevention Plan shall be submitted to the Southern Inyo Fire Protection District for review and comment 60 days prior to construction. The Personal Protective Equipment Program, the Exposure Monitoring Program, the Injury and Illness Prevention Program, and the Heat Stress Protection Plan shall be submitted to the CPM for review and approval of program compliance with all applicable safety orders 30 days prior to construction.

At least 30 days prior to the start of construction, the project owner shall submit to the CPM for review and approval a copy of the Project Construction Safety and Health Program.

CONDITION WORKER SAFETY-2

Condition WORKER SAFETY-2 should be revised as follows to ensure that the project owner has sufficient time and flexibility to prepare the program and plans required in this condition:

WORKER SAFETY-2 The project owner shall submit to the CPM a copy of the Project Operations and Maintenance Safety and Health Program containing the following:

- an Operation Injury and Illness Prevention Plan;
- an Operation Heat Stress Protection Plan that implements and expands on existing Cal OSHA regulations (Cal. Code of Regs., tit. 8,§ 3395);
- a Best Management Practices (BMP) for the storage and application of herbicides;
- an Emergency Action Plan;
- Hazardous Materials Management Program;
- Fire Prevention Plan that includes the fuel depot should the project owner elect to maintain and operate the fuel depot during operations (8 Cal Code Regs. § 3221); and
- Personal Protective Equipment Program (Cal Code Regs.,tit. 8, §§ 3401—3411).
- an Eyesight Protection from Retinal Damage Plan that is designed to insure that workers in the solar field receive and wear the appropriate protective sunglasses. ~~This Eyesight Protection from Retinal Damage Plan would:~~

  ~~(1) identify and acquire the appropriate eye protection (EP) equipment based on the IEC 62471 standards in sufficient numbers to provide safety glasses for the workers engaged in solar field work, and tower work where the potential exists for heliostat solar reflective exposure or SRSG exposure during operations,~~

  ~~(2) establish the requirements and procedures for the donning and doffing of the EP by workers and provide training and,~~

  ~~(3) monitor worker use of the PPE and compliance with the EP procedures.~~

Verification: The Operations Fire Prevention Plan and the Emergency Action Plan shall also be submitted to the Southern Inyo Fire Protection District for review and comment 60 days prior to the start of operations. The Operation Injury and Illness Prevention Plan, Heat Stress Protection Plan, BMP for Herbicides, and Personal Protective Equipment, and Personal Protective Equipment Program shall be submitted to the CPM for review and approval concerning compliance of the programs with all applicable safety orders 30 days prior to the start of operations.

At least 30 days prior to commercial operation, the project owner shall submit to the CPM for approval a copy of the Project Operations and Maintenance Safety and Health Program.

The Eyesight Protection from Retinal Damage Plan should:

(1) identify and acquire the appropriate eye protection (EP) equipment based on the IEC 62471 standards in sufficient numbers to provide safety glasses for the workers engaged in solar field work, and tower work where the potential exists for heliostat solar reflective exposure or SRSG exposure during operations,

(2) establish the requirements and procedures for the donning and doffing of the EP by workers and provide training and,

(3) monitor worker use of the PPE and compliance with the EP procedures.

CONDITION WORKER SAFETY-5

Condition WORKER SAFETY-5 should be revised because the condition requires an AED to be placed on the project site 30 days prior to site mobilization. CONDITION WORKER SAFETY-5 should be revised as follows:

WORKER SAFETY-5 The project owner shall ensure that a portable automatic external defibrillator (AED) is located on site during construction and operations and shall implement a program to ensure that workers are properly trained in its use and that the equipment is properly maintained and functioning at all times. During construction and commissioning, the following persons shall be trained in its use and shall be on site whenever the workers that they supervise are on site: the Construction Project Manager or delegate, the Construction Safety Supervisor or delegate, and all shift foremen. During operations, all power plant employees shall be trained in its use. The training program shall be submitted to the CPM for review and approval.

Verification: At least 30 days prior to the start of site mobilization, the project owner shall submit to the CPM proof that a portable automatic external defibrillator (AED) ~~exists on site~~ has been purchased and will be made available on site once mobilized and a copy of the training and maintenance program for review and approval.

CONDITION WORKER SAFETY-6

The Applicant has revised the timing for the compliance of this condition to be consistent with prior Commission decisions, including Abengoa Mojave Solar Project (09-AFC-5):

WORKER SAFETY-6 The project owner shall either:

(1) Reach an agreement with the Southern Inyo Fire Protection District (SIFPD) regarding funding of its project-related share of capital and operating costs to improve fire protection/emergency response infrastructure and provide appropriate equipment as mitigation of project-related impacts on fire protection/emergency response services within the jurisdiction; or

(2) if no agreement can be reached, the project owner shall fund a study conducted by an independent contractor who shall be selected and approved by the CPM and would fulfill all mitigation identified in the independent fire needs assessment and a risk assessment. The study will evaluate the project's proportionate funding responsibility for the above-identified mitigation measures, with particular attention to emergency response and equipment/staffing/location needs.

Should the project owner pursue option (2), above, the study shall be conducted pursuant to the Fire Needs Assessment and Risk Assessment shall evaluate the following:

(a) The project's proportionate (incremental) contribution to potential cumulative impacts on the SIFPD and the project allocated costs of enhanced fire protection/emergency response services including the fire response, hazardous materials spill/leak response, rescue, and emergency medical services necessary to mitigate such impacts;

(b) The extent that the project's contribution to local tax revenue will reduce impacts on local fire protection and emergency response services; and

(c) Recommend an amount of funding (and corresponding payment plan) that represents the project's proportional payment obligation for the above-identified mitigation measures.

Compliance Protocols shall be as follows:

(a) The study shall be conducted by an independent consultant selected by the project owner and approved by the CPM. The project owner shall provide the CPM with the names of at least three consultants, whether entities or individuals, from which to make a selection, together with statements of qualifications;

(b) The study shall be fully funded by the project owner.

(c) The project owner shall provide the protocols for conducting the independent study for review and comment by the SIFPD and review and approval by the CPM prior to the independent consultant's commencement of the study;

(d) The consultant shall not communicate directly with the project owner or SIFPD without express prior authorization from the CPM. When such approval is given, the CPM shall be copied on any correspondence between or among the project owner, SIFPD, and the consultant (including emails) and included in any conversations between or among the project owner, SIFPD and consultant; and

(e) The CPM shall verify that the study is prepared consistent with the approved protocols, ***or***

(3) If the project owner and SIFPD do not agree to the recommendations of the independent consultant's study, the Energy Commission CPM or designee shall, based on the results of the study and comments from the project owner and SIFPD, make the final determination regarding the funding to be provided to the SIFPD to accomplish the above-identified mitigation.

~~Site mobilization shall not occur until funding of mitigation occurs pursuant to either of the resolution options set forth above.~~ No construction of the permanent aboveground structures shall occur until funding of mitigation occurs pursuant to either of the resolution options set forth above.

Verification: At least 30 days before construction, the project owner shall provide to the CPM:

(1) A copy of the individual agreement with the SIFPD or, if the owner joins a power generation industry association, a copy of the group's bylaws and a copy of the group's agreement with the SIFPD; and evidence in each January Monthly Compliance Report that the project owner is in full compliance with the terms of such bylaws and/or agreement; ***or***

(2) a copy of the completed study showing the mitigation or the precise amount the project owner shall pay for mitigation; and documentation that the amount has been paid.

Annually thereafter, the owner shall provide TO the CPM verification of funding to the SIFPD, if annual payments were approved or recommended under either of the above-described funding resolution options.

Attachment

CH2MHILL TELEPHONE CONVERSATION RECORD

Call To:	Chief Paul Postle		Southern Inyo County Fire District/ Chief
Phone No.:	760-852-4130	**Date:**	March 29, 2011
Call From:	Ashraf Shaqadan	**Time:**	10:40 AM
Message Taken By:	Ashraf Shaqadan		
Subject:	Southern Inyo County Fire Protection		

I called Southern Inyo County Fire Protection District on 760-852-4130 and no one responded. I left a voice mail.

On 03/30/2011 9:30 am:

I called the Southern Inyo County Fire District to ask for Chief Paul Postle and no response. I left a voice mail requesting a call back.

Also, I sent my questions to the E-mail of Mr. Postle.

On 03/31/2011 2:00 pm:

I called Chief Postle and explained the project location and needs. I got the following information:

The responding stations and response times are

- Inyo County: Charleston View Crew (5 -10 minutes) - primary
- Inyo County: Tecopa Station (30 minutes) - primary - primary
- Nye County: Pahrump Valley Fire District (30-45 minutes) - primary
- Clark County: Las Vegas Fire (1 hr) - primary
- San Bernardino County: San Bernardino Fire District (1 hr)
- Clark County: Sandy Valley Fire District (45 minutes)

<u>Stations Details</u>

1. Charleston View:

It is not a permanent station; It is staffed with 8 volunteers stationed in Mountain View. The equipments are 1 fast response truck staffed with 3 personnel, and 1 fire truck with 5 personnel. The station is staffed 75% of time.

2. Tecopa Station:

It is a permanent station; it has 1 full time (Chief Postle) and 8 volunteer firefighters. The station is located in Tecopa at 410 Tecopa Hot Springs Road. The station has 1 operation truck with 5 staff, 2 water tenders with 2000 gal capacity, 2 ambulances with 2 staff each.

3. Pahrump Valley Fire District:

It has full time staff, more than 10 firefighters. It has fire, medical, and hazmat capacity. There is a Mutual Aid agreement (affirmed in 2006) between Inyo County on behalf of Southern Inyo Fire Protection District and Nye County (Nye County office of Emergency Services), that includes fire.

4. Las Vegas Fire Department:

There is Mutual Aid agreement with Clark County.

5. San Bernardino County Fire:

Not sure if there is mutual aid agreement.

6. Sandy Valley Fire:

Are closer than Las Vegas but the road connecting to the project area is in bad condition, so Aid from Sandy Valley is not reliable.

Currently, Southern Inyo County Fire has 3 personnel that are EMT certified (1 full time and 2 volunteers). Also; there are 5 more personnel under training. All full time and volunteer firefighters have had basic medical training.

Injuries are transported to Desert View Regional Hospital in Pahrump (360 South Lola Lane Pahrump, NV 89048). Trauma patients are air lifted by Mercy Air or Medical Evac to University Medical center in Las Vegas (1800 West Charleston Blvd., Las Vegas, NV 89102).

I asked Postle about HazMat response; postle indicated that local firefighters can handle simple incidents. However, Nye County has HazMat teams and can be called in for assistance (from Pahrump Valley) as part of the mutual aid agreements. The decision to call HazMat from other counties depends on the severity of the accident.

I asked Postle about impacts of the project on fire resources, Postle informed me that the project will have an impact and the fire district and more full-time staff and equipment will be needed. For example, injuries in multi-level structures such as heating tours would need special equipment that is not available.

The Southern Inyo fire District is working on having a second permanent station.

<u>Follow up call to Chief Postle (4:00 pm on 07/11/2011)</u>

I spoke to Fire Chief Postle to ask for more details on the operation truck in Tecopa Station. The operation truck is a Type I fire engine with 500 gallon water tank, 1 inch hose (for wild land fires), 1.5 and 2.5 inch hoses (for small and medium residential fires), ladders, breathing apparatus, and foam for wild fires. One of its 5 staff has EMT1 medical certification (usually the engine operator). Other staff has basic medical training.

I asked chief Postle about the BLM fire station in Barstow in San Bernardino County and he did not know its location. Chief Postle informed me that the fire station in Baker (Station 53) may respond from San Bernardino County. Station 53 is 80 miles away from the HHSEGS project location.

Paul Postle

Chief of South Inyo Fire Protection District
410 Tecopa Hot Springs RD
Tecopa , California 92389-0051
760-852-4130
paul2701@wildblue.net

Appendix A
Declarations and Resumes

List of Witnesses

The following witnesses are providing testimony in this proceeding on behalf of the Applicant. The witnesses are listed alphabetically below along with the testimony sections for which they are providing testimony:

Witness	Testimony Section(s)
Wes Alston	Worker Safety & Fire Protection
Mark Bastasch	Noise
Loren Bloomberg	Traffic and Transportation
Joe Desmond	Alternatives
Jonathan Forrester	Alternatives
Matt Franck	Soil & Surface Waters; Water Supply
Channing Haskell	Facility Design, Power Plant Efficiency and Power Plant Reliability; Hazardous Materials; Waste Management
Udi Helman	Alternatives
Clint Helton	Cultural Resources
Amy Hiss	Biological Resources
Dr. John Jansen	Water Supply
Clay Jensen	Alternatives; Land Use; Project Description; Transmission System Engineering; Socioeconomics
Dr. Sonke Johnsen	Biological Resources
Dr. Alice Karl	Biological Resources
Mike Klinefelter	Biological Resources
Tom Lae	Geological Hazards & Resources
Natalie Lawson	Cultural Resources
Steve Long	Soils & Surface Waters
Arne Olson	Alternatives
Karen Parker	Hazardous Materials; Waste Management; Worker Safety & Fire Protection
Dr. Robert Pearson	Transmission Line Safety & Nuisance
Dave Phillips	Biological Resources
Dr. Tom Priestley	Visual Resources
Michael Rojansky	Facility Design, Power Plant Efficiency and Power Plant Reliability; Geologic Hazards & Resources; Soils & Surface Waters; Water Supply
Dr. Kathy Rose	Biological Resources; Soils & Surface Waters
Gary Rubenstein	Air Quality; Public Health
Gary Santolo	Biological Resources
Jennifer Scholl	Alternatives; Land Use
Dr. Ivan Schwab	Biological Resources
Dr. Lynn Sebastion	Cultural Resources
Dr. Geof Spaudling	Biological Resources; Cultural Resources; Paleontological Resources; Water Supply
Susan Strachan	Facility Design, Power Plant Efficiency and Power Plant Reliability; Transmission System Engineering
Chifong Thomas	Alternatives
Tim Thompson	Water Supply
Susan Walzer	Facility Design, Power Plant Efficiency and Power Plant Reliability
Dr. Fatuma Yusuf	Socioeconomics

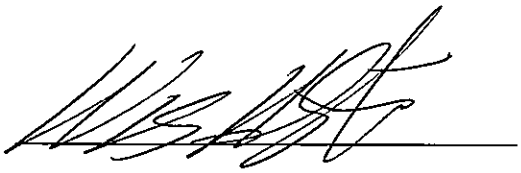
DECLARATION OF

Wes Alston

I, Wes Alston, declare as follows:

1. I am presently employed by Pacific Development Solutions Group as a principal.
2. A copy of my professional qualifications and experience are attached hereto and incorporated herein by reference.
3. I prepared the attached testimony on Worker Safety and Fire Protection for the Hidden Hills Solar Electric Generating System project based on my independent analysis, supplements thereto, data from reliable sources, and my professional experience and knowledge.
4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue(s) addressed herein.
5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: January 7, 2013 Signed: 

At: Long Beach, California

WESLEY A. ALSTON

Community Planning / Entitlement / Environmental Analysis
Fire Compliance Analysis / Fire Protection Services

CLIENTS SERVED

As Principal of Pacific Development Solutions Group (**PDSG),** Wes Alston has been an active participant in the endeavors of many California builders and developers. **PDSG** has provided services to relatively small entrepreneur developers, mid-size development firms, and major landowners including:

Alliance Residential	Lowes
Andland Properties, LLC	Nevis Development Company
Beazer Homes Southern California	Pacific Century Homes
Braddock and Logan Associates	Pulte Homes
Bren/Osgood Company	Rael Development Corporation
Canaday & Company	R.C. Hobbs Company
Centex Homes	SolarReserve
Cobra Plantas Industriales	Starbucks
Empire Companies	Stoneridge Commercial
Highpoint Communities	Suncal
K. Hovnanian Homes	Target
KB Homes	Taylor Woodrow Homes
Kohl's	Trumark Companies
Lincoln Properties	William Lyon Companies

PROFESSIONAL EXPERIENCE

Principal, Pacific Development Solutions Group **February 2003 – Current**

Serves as a key expert in the entitlement processing of commercial, industrial, and residential development projects throughout California. Manages the preparation of community planning and environmental analysis documentation with a special expertise in fire compliance analysis, fire needs assessments, and regulatory compliance documentation. Coordinates the plan submittal process at the regional and local level, obtains permits from responsible and trustee agencies, and manages the implementation of conditions of project approval.

Deputy Fire Chief, Riverside County Fire Department **July 1999 – February 2003**

The Riverside County Fire Department provides all risk emergency management to the County of Riverside and 18 contract Cities. Responsible for a $143 million dollar budget and the supervision and overall management of the Fire Department.

Fire Chief, City of Moreno Valley **February 2000 – December 2002**

Accountable for administering a $6 million budget and maintaining effective cost controls. Managed staff of 150 firefighters and administrative personnel. Coordinated resource exchanges with other California Department of Forestry (CDF) facilities and fire departments. Responsibilities included:

- *Fire Stations:* Sponsored program to facilitate reducing response time by 5 minutes.
- *Equipment Acquisition and Fire Stations:* Responsible for submitting RFP's, preparing and reviewing specifications, negotiating contracts, and awarding bids.
- *Financial Management:* Maintained the lowest per capita cost of cities in California with a population between 100,000 and 200,000.

Battalion Chief/Fire Marshal, City of Moreno Valley **November 1997 – February 2000**

Supervised clerical and engineering staff in preparation of files, records, drafts, and maps pertaining to Fire Protection Planning for the City of Moreno Valley Fire Prevention office. Provided technical assistance to Fire Protection staff, Building and Safety staff, Code Enforcement, Planning staff, and others within the City that require technical fire protection and planning information. Assisted in development of the Fire Department budget and monitor expenditures within the general Fire Department fund, development fees, and fire mitigation fees. Developed the Fire Department section of the City of Moreno Valley's new General Plan, presented to the City's Planning Commission and received approval. Attended all meetings throughout the City and County requiring the Fire Department representation. Provided a leadership role in all meetings.

Fire Captain Specialist **July 1984 – November 1997**

Managed the operation of the Fire Protection Planning and Engineering Division. Activities included:

- Participation in committees developing local and state ordinances.
- Serving as representative of the County Fire Department on planning matters before the Riverside County Board of Supervisors and Planning Commission.
- Negotiation of deal terms and purchase agreement conditions with property owners and brokers for new fire stations within the county.
- Preparation of economic and market feasibility analyses for specific plans within the county.

Responsibilities included:

- Management of current planning functions including subdivision, boundary adjustment, annexation, covenant modification, variance, and condition change.
- Preparation and presentation of staff reports and recommendations to Design Review Board and Board of Directors.
- Research and preparation of information on application processing, land use, governing documents, and regulatory code questions for staff, decision-makers, the membership, realtors and land-use professionals.
- Special projects in support or furtherance of Association policies and goals.
- Review and analyze regional plans and projects that have local impacts and generally tracking development in adjacent jurisdictions.
- Representing the Association at meetings of other jurisdictional entities.

EDUCATION

Bachelor of Science in Engineering, 1976
San Diego State

Associate of Arts in Fire Science, 1977
San Diego City College

PROFESSIONAL TRAINING AND CERTIFICATIONS

POST Basic
POST Intermediate
POST Supervision
SFM Fire Investigator 1
NFPA Fire Sprinklers
NFPA Fire Alarms

CURRENT COMMUNITY INVOLVEMENT / PROFESSIONAL AFFILIATIONS

Board Member Riverside Area Rape Crisis Center
Board Member United Way of Inland Valleys
Moreno Valley Community Hospital Foundation
Riverside Community College Foundation
RCC Community Partnership
Silver Eagles
Moreno Valley Chamber of Commerce
Building Committee, St. Patrick Church
National Fire Protection Association
International Conference of Building Officials
California Fire Chiefs Association
California League of Cities
California Conference of Arson Investigators
California Contractor (B2) License No. 81515

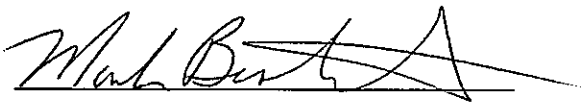
DECLARATION OF

Mark Bastasch

I, Mark Bastasch, declare as follows:

1. I am presently employed by CH2M HILL Engineers, Inc. as an Acoustical Engineer.
2. A copy of my professional qualifications and experience are attached hereto and incorporated herein by reference.
3. I prepared the attached testimony on Noise and Vibration for the Hidden Hills Solar Electric Generating System project based on my independent analysis, supplements thereto, data from reliable sources, and my professional experience and knowledge.
4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue(s) addressed herein.
5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: January 7, 2013 Signed: 

At: Portland, Oregon

Mark Bastasch, P.E.

Noise Task Lead

Education

M.S., Environmental Engineering
B.S. (cum laude), Environmental Engineering

Professional Registrations

- Professional Acoustical Engineer: Oregon
- Professional Civil & Environmental Engineer: Oregon
- Institute of Noise Control Engineers (INCE)

Relevant Experience

Mr. Bastasch is a registered acoustical engineer with 15 years of experience conducting acoustical evaluations, environmental audits, contamination assessments, and multimedia environmental permitting. His regulatory experience includes stormwater permitting, National Pollutant Discharge Elimination System permitting, Title V permitting, hazardous air pollutant studies, prevention of significant deterioration, Process Safety Management, and Risk Management Plan applicability studies, Form R preparation, spill documentation, response and reporting requirements, and audit preparation for the Oregon Department of Environmental Quality for hazardous waste and City of Portland Bureau of Environmental Services for stormwater and industrial wastewater.

Relevant Experience

Noise Task Leader, Hidden Hills Solar Electric Generating System, BrightSource Energy. Authored noise section of California Energy Commission (CEC) Application for Certification (AFC). Performed ambient noise studies applicable to nearby residential community.

Noise Task Leader, Ivanpah Solar Electric Generating System, BrightSource Energy. Authored noise section of CEC AFC. Successfully worked with CEC staff to streamline noise analysis and eliminate unnecessary field studies given remote project site and lack of noise sensitive receptors.

Noise Task Leader, Licensing and Permitting for San Francisco Electric Reliability Project (SFERP) for San Francisco Public Utilities Commission. Noise task lead for this controversial power plant. The SFPUC proposed to develop a 145-MW simple-cycle plant in southeast San Francisco, using three LM 6000 turbines. Although construction of another power plant in southeast San Francisco was controversial, it was licensed by the CEC. The plant would be located two blocks south of the existing Portrero Power Plant. Major issued included remediation of the power plant site (contaminated fill); Air Quality mitigation measures; water supply; Environmental Justice; and the need for in-city generation.

Noise Task Leader; Tehachapi Transmission Line; Southern California Edison, California. Prepared acoustical analysis to support regulatory permitting requirements. This multimillion dollar Proponent's Environmental Assessment included preparation of and support activities for a Proponent's Environmental Assessment submitted to the California Public Utilities Commission for an approximately 170-mile transmission line and substation project on federal, state, and private property.

Pacific Gas & Electric, Humboldt Bay Repowering Project, Humboldt, California. As acoustical permitting lead for this facility, evaluated and measured background noise levels to determine and evaluate risk associated with potential CEC permit limits; prepared application for certification to the CEC; and conducted site tour with CEC's acoustical staff.

Walnut Energy Center, Turlock Irrigation District, Turlock, California. Acoustical technical lead for a combined cycle power plant. Tasks included evaluating and measuring background noise levels; development of detailed noise model, comparison of expected noise levels with the City of Turlock, County of Stanislaus, and the CEC's noise guidelines; preparing Application for Certification and subsequent amendments submitted to the CEC;

regulatory negotiation; and review of Conditions of Certification. Additional tasks included development assistance with acoustical bid and guarantee specifications and independent analysis of manufacturer steam turbine generator enclosure.

Metcalf Energy Center, San Jose, California. Acoustical technical lead for a 600-megwatt power plant. Tasks include the following: evaluating and measuring background noise levels; modeling and comparison of expected noise levels with the City of San Jose, County of Santa Clara standards, and the CEC's 5 dBA over background guideline; recommendations to acquire additional property; preparing Application for Certification submitted to the California Energy Commission; regulatory negotiation; and review of Conditions of Certification, testimony at public hearings, and CEC evidentiary hearings, which included detailed cross-examination. Successful negotiations saved the client more than $5 million in capital expenditures.

AFCs for Walnut Creek Energy Park and Sun Valley Energy Project, Edison Mission Energy, City of Industry/Romoland, California. Provided support for two Applications for Certification before the California Energy Commission for similarly designed 500-MW natural gas-fired peaking power plants using the GE LMS100 advanced gas turbine technology. These applications were prepared in parallel and were filed at the Energy Commission within one week of one another. The AFCs were filed in December of 2005 and the projects are scheduled to begin construction in 2007.

AFC for Roseville Energy Park, Roseville Electric, Roseville, California. Assisted in the evaluation of noise impacts from the Roseville Energy Park, a natural gas-fired combined cycle power plant.

AFC for Los Esteros Critical Energy Facility, Calpine, California. Provided noise support in preparation of the AFC for submittal to the CEC. Tasks include evaluation of applicable regulations, identifying sensitive receptors, background and equipment noise measurements, mitigation recommendations. Conducted operational compliance monitoring in accordance with Conditions of Certification.

AFC for San Francisco Electric Reliability Project (SFERP), City and County of San Francisco, California. Provided noise support for document preparation for the SFPUC for the application for certification for a proposed power plant in City of San Francisco

AFC for San Joaquin Valley Energy Center, Calpine, California. Provided noise support in preparation of the AFC for submittal to the CEC. Tasks include evaluation of applicable regulations, identifying sensitive receptors, preparation of expert witness testimony that prevailed over CEC's Staff recommendations.

AFC for East Altamont Energy Center, Calpine, California. Provided noise support in preparation of the AFC for submittal to the CEC. Tasks include evaluation of applicable regulations, identifying sensitive receptors, numerous acoustical analyses.

AFC for Application for Certification, Salton Sea Unit 6 Geothermal Power Plant, Mid-American Energy Holding Company, Imperial County, California. Provided noise support for the licensing of the 185-MW geothermal power plant.

DECLARATION OF

Loren Bloomberg

I, Loren Bloomberg, declare as follows:

1. I am presently employed by CH2M HILL, Inc. as a Principal Technologist.

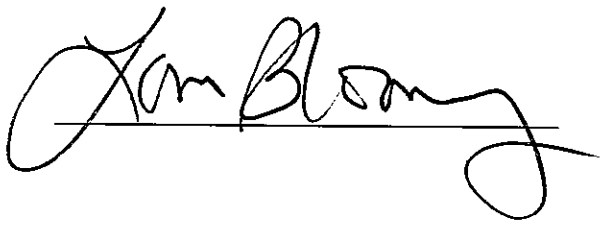
2. A copy of my professional qualifications and experience are attached hereto and incorporated herein by reference.

3. I prepared the attached testimony on Traffic and Transportation for the Hidden Hills Solar Electric Generating System project based on my independent analysis, supplements thereto, data from reliable sources, and my professional experience and knowledge.

4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue(s) addressed herein.

5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: January 7, 2013 Signed: 

At: Santa Ana, CA

Loren Bloomberg, P.E.

Principal Technologist – Traffic Engineering

Education

M.E., Civil Engineering, University of California, Berkeley, 1994
M.S., Civil Engineering, University of California, Berkeley, 1993
B.S., Systems Engineering, University of Virginia, 1989

Professional Registration

Professional Engineer (Traffic): California

Distinguishing Qualifications

- Experienced in practical and theoretical applications of traffic operations and Intelligent Transportation Systems (ITS), particularly for freeways, arterials, toll facilities, and ramp metering
- Broad background in transportation planning, conceptual design, and transportation systems analysis
- Expert in traffic simulation modeling
- More than 20 years of experience, including transportation modeling and analysis for local areas, corridors, and entire regions

Relevant Experience

Mr. Bloomberg is a senior traffic engineer and transportation planner with CH2M HILL's Transportation Business Group in Santa Ana, California. With more than 20 years of experience, he has led or played a key role in numerous large-scale planning and operations analyses. He has conducted studies and developed plans for local areas, corridors, and entire regions including roadways, maritime facilities, and airports. Mr. Bloomberg's technical expertise is in simulation modeling and traffic operations, with a particular focus on conceptual engineering and traffic analysis. He has worked on projects in 28 states, as well as internationally in New Zealand, Saudi Arabia, Abu Dhabi, and Canada. The breadth of his work assignments is a direct result of his ability to attract technical leadership roles across the country, both internally and externally.

Mr. Bloomberg is often called on as a technical expert for CH2M HILL's modeling projects and as a project manager for his ability to complete traffic analyses accurately and efficiently while meeting client requirements. He is also an expert in the application of Context Sensitive Solutions (CSS), with successful project applications on a wide range of feasibility studies and preliminary engineering, and has taught CSS to more than 400 agency staff across the United States. Mr. Bloomberg is a member of the Highway Capacity Committee of the Transportation Research Board, an international group of 30 professionals charged with developing and maintaining the *Highway Capacity Manual*.

Representative Projects

Traffic Analysis Lead; Pahnamid Wind Farm; Kern County, California; 2011. Lead for traffic analysis of a proposed wind energy facility that would include up to 137 wind turbine generators capable of generating up to 411 megawatts of power. The analysis included an assessment of existing traffic conditions, evaluation of proposed construction and operations traffic, and an analysis of expected impacts and associated mitigation.

Technical Advisor; Yanbu Refinery Expansion Project; Yanbu Industrial City, Saudi Arabia; 2011. Guided traffic analysis on this effort to expand the lube oil production of the existing Lubricating Oil Refining (LUBEREF) facility in Yanbu Industrial City, in the Kingdom of Saudi Arabia. Lead traffic analysis for the environmental evaluation, including evaluation of a traffic survey, assessment of

baseline conditions, and analysis of project impacts during and after construction of the proposed facility.

Ivanpah Solar Electric Generating System; BrightSource Energy; San Bernardino County, California. Traffic and transportation task lead for analysis of a solar energy project in the Mojave Desert, near the California/Nevada border. Prepared the traffic and transportation analysis section of the Application for Certification (AFC). The analysis focused on construction impacts to traffic operations, including construction workers, truck trips, and transport of hazardous materials. Assessed freeway, ramp, and local streets impacts.

Hidden Hills Solar Electric Generating System; BrightSource Energy; Inyo County, California. Traffic and transportation task lead for analysis of a solar energy project in the Mojave Desert, near the California/Nevada border. Prepared the traffic and transportation analysis section of the Application for Certification. The analysis focused on construction impacts to traffic operations, including construction workers, truck trips, and transport of hazardous materials. Assessed freeway, ramp, and local streets impacts. Assessed intersection and highway impacts of a complex worker schedule, and developed a comprehensive mitigation strategy.

Almond 2 Power Plant (A2PP); Turlock Irrigation District; Ceres, California. Directed the development of the Traffic and Transportation section for the A2PP Application for Certification. The project consisted of a natural-gas-fired, simple-cycle peaking facility rated at a gross generating capacity of 174 megawatts. The analysis focused on construction activities and traffic management strategies.

Walnut Energy Center Application for Certification and Traffic Control and Implementation Plan; Turlock Irrigation District, California. Developed the traffic control plan for the utility (potable and recycled water) lines for the Walnut Energy Center in Turlock. The TCIP addressed the mitigation of traffic impacts to the existing transportation facilities to satisfy the requirements of the CEC Conditions of Certification.

Metcalf Energy Center, Calpine Corp., San Jose, California. Task lead for traffic control for this fast-track AFC effort to design and construct linear facilities (recycled water, sewer, and potable water) to support a new energy center. Developed plans to support two pipeline alignments through 6 to 10 miles of urban streets. Worked with local agencies to develop a transportation management plan to support agency requirements and maintain construction schedules.

San Francisco Electric Reliability Project, San Francisco Public Utilities Commission, California. Task lead for the traffic and transportation section of the AFC. Traffic impacts focused on construction activities.

Proponent's Environmental Assessment (PEA), San Mateo County, California. Task lead for the transportation analysis to support the PEA and associated EIR for a major utility company. The project will involve trenching and overhead construction throughout San Mateo County, with potential impacts to freeways, ramps, surface streets, and BART. Led the transportation analysis (including evaluation, assessment of impacts, and development of mitigation measures) and was primary author for the transportation section of the environmental document. Leading the development of transportation management plans for the multiple jurisdictions.

Infrastructure Improvement Projects and Dutton Meadows EIR, Santa Rosa, California. Traffic task lead for developing project- and program-level EIRs to support planned development in Santa Rosa. Developed traffic/transportation sections of the CEQA documents, tiering off previous environmental documents and technical studies.

Owens Lake Dust Control Project EIR, Southern California. Traffic task lead for the assessment of the impacts of a major hauling operation near Lone Pine. Gathered traffic information and forecasts, and

conducted reconnaissance with local agency staff. Assessed traffic operations and impacts of the proposed project.

SR 237 Guadalupe Bridge Replacement, Santa Clara County, California. Traffic task lead for this project to replace the bridge on SR 237 over the Guadalupe River. Developed transportation management plan, including detour plans and lane closure charts. Conducted operational analysis for staging plans and late lane re-opening penalties.

Route 70/Algodon Road Interchange, Yuba City, California. Task lead for traffic operations analysis to support planning efforts for the Route 70/Algodon Road interchange near Yuba City. Led the analysis is to assess future operations of the freeway, interchange, and cross-streets to identify design improvements.

Highway 114/Hyampom Road, Trinity County, California. Traffic task lead for evaluating a rural road in Trinity County. Mr. Bloomberg directed the effort to gather traffic information and forecasts, conduct reconnaissance with local agency staff, and evaluate existing and future traffic. He worked with client staff to achieve consensus on future forecasts, and helped craft the purpose and need statement.

Clinton-Keith Initial Study/Environmental Assessment, Southern California. Traffic task lead for preliminary engineering and environmental documentation for a new transportation corridor in Riverside County. Led the development of traffic forecasts, including integrating travel demand forecasts from the regional model and traffic impact studies. Conducted traffic analysis, and worked with the engineering team to optimize the design. Coordinated traffic inputs to the environmental team.

DECLARATION OF JOSEPH DESMOND

I, Joseph Desmond, declare as follows:

1. I am presently employed by BrightSource Energy as Senior Vice President for Government Affairs and Communications.

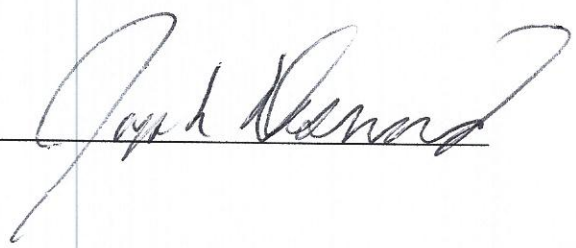
2. A copy of my professional qualifications and experience are attached hereto and incorporated herein by reference.

3. I prepared the attached testimony on Executive Summary and helped prepare the testimony for Alternatives for the Hidden Hills Solar Electric Generating System project based on my independent analysis, supplements thereto, data from reliable sources, and my professional experience and knowledge.

4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue(s) addressed herein.

5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: January 20, 2013 Signed: 

At: Oakland, California

Joseph Desmond - Resume

Positions Held

BrightSource Energy, Inc. July 2011 – Present
Executive Vice President, Marketing Government Affairs

Joseph Desmond is Senior Vice President of Marketing and Government Affairs for BrightSource Energy. A frequent public speaker and acknowledged authority in the energy industry, his track record is characterized by blending entrepreneurial vision, deep domain expertise and communication skills to successfully navigate complex regulatory and political environments to deliver results. His leadership and stakeholder engagement strategies are guided by his first-hand knowledge of utility, legislative and public policy decision-making processes at local, state and federal levels. Desmond brings more than two decades of energy sector experience in start-up and established organizations from the public and private sectors to his role at BrightSource Energy, where he is oversees marketing, communications, government, legislative and regulatory affairs.

Ice Energy, Inc. -August, 2010 – July, 2011
Executive Vice President and Chief Marketing & Business Development Officer

Mr. Desmond developed and drove strategic marketing and business initiatives to keep Ice Energy, a leading provider of smart grid enabled, distributed energy storage solutions, positioned at the forefront of the emerging energy storage market. To support sales and achieve wide-scale adoption of the company's approach and technology, executed a re-branding of the company while positioning Ice as a thought leader on all things related to distributed storage. Strategy implemented through new identity, messaging, website design, collateral development, content creation, videos and integration of social media tools.

Secured significant earned media through editorial influence and technology award competitions, resulting in steady, favorable press coverage. Leveraged best practices to achieve significant following on social media sites such as Twitter. Website content strategy yielded top Google search results for relevant keywords. Electronic newsletter open rate exceeded 26%. Launched new tradeshow strategy and booth design to dramatically increased traffic and qualified leads over all efforts.

Lobbied alongside Attorney General (now Governor) Brown's staff to secure passage of AB2514, a landmark bill designed to expand policy support for energy storage in California. Bill was signed into law within the first year of its introduction. Provide leadership on specific sales initiatives, coordinating internal company resources to prepare cost-justification for large scale storage investments within a utility integrated resource planning framework.

NorthernStar Natural Gas – 2007 – 2010
Senior Vice President, External Affairs

As a member of NorthernStar's senior management team, Mr. Desmond was directly responsible for all stakeholder engagement activities, helping guide the company's Bradwood project to become the first U.S. West Coast LNG import terminal to win approval from the Federal Energy Regulatory Commission. In addition to securing local land use approvals, the project received three Editorial Board endorsements challenging political environment from The Oregonian, the region's largest daily newspaper in a. A key element of the permitting strategy was the Salmon Enhancement Initiative, reflective of the firm's commitment to sustainable development and environmental, economic and community health. The $59

million initiative far exceeded regulatory requirements and represented the largest private commitment ever made to preserving and enhancing the salmon population in the Columbia River estuary.

Areas of Responsibility:

- Day-to-day management of the company's external affairs activities through a diverse team of employees, third-party consultants, attorneys and lobbyists.
- Formulation and execution of the company's legislative strategy and lobbying efforts at the local, state and federal levels.
- Integration and coordination of relevant legal, engineering, financing and permitting work into the company's communication activities to ensure message consistency, accuracy and credibility with all stakeholder groups.
- Media relations and crisis communications, serving as company spokesperson and single point-of-contact for all media inquiries, including print and radio interviews, as well as testimony preparation by company representatives before regulatory bodies.
- Development and implementation of all strategic communications and public relations programs, including but not limited to, marketing, branding, advertising, website, collateral, research, education, presentations, events, polling, community outreach, charitable giving, grassroots organization and business/union coalition building.

State of California – 2004 – 2006
Undersecretary for Energy Affairs
Chairman, California Energy Commission
Deputy Secretary of Energy, Resources Agency

Appointed by Governor Schwarzenegger, Joseph Desmond was responsible for coordinating and implementing energy policy across state agencies in the time period following California's energy crisis, interacting with Federal agencies and neighboring states, and advising the Governor on all energy matters. He served as the primary spokesman to the media on energy matters for the administration. In the first 20 months of public service, he participated in more than 100 speaking engagements on topics including electricity policy, advanced metering, distributed generation, R&D, transportation fuels, renewable energy LNG, technology investment and energy efficiency. He routinely testified on behalf of the Administration before the legislature, state agencies and Congress.

In his role as Chairman, Desmond was responsible for a 550 person staff, presiding over numerous proceedings and initiatives at the Commission, including siting cases for thermal power plants. During the Governor's first term, California licensed twelve power plants adding 6,260 megawatts to the California grid. Ten power plants began commercial operations, delivering 4,408 megawatts of needed capacity.

Mr. Desmond was actively involved in resource adequacy rules, Investor-owned utility procurement proceedings, transmission and natural gas issues, CAISO market design, DWR contract renegotiations, state and federal energy legislation and settlement negotiations connected to ongoing- litigation. Mr. Desmond coordinated the Western Governor's Association efforts to adopt resolutions in support of developing clean, renewable energy across the West and served as representative to the Western Interstate Energy Board. At the federal level, Desmond led lobbying efforts on key provisions related to the Energy Policy Act 2005 on energy efficiency, renewables and transmission. In California, he was instrumental in crafting landmark legislation that became known as California's Solar Initiative and developing the nation's first Greenhouse Gas performance standard for electricity procurement.

Infotility, Inc.
President & CEO 2000 to 2004

Founded successful Smart Grid research and software development consulting practice focused on systems integration work connecting wholesale and retail energy markets in real-time for risk management applications. Developed distributed intelligent agent platform for grid reliability and demand-response aggregation. Provided consulting services for implementation of customer relationship management software systems. Research work included intelligent grid design and real-time pricing programs along with energy standards for web-based collaboration.

In July 2001, Desmond was elected Co-chair for the Silicon Valley Manufacturing Group's Energy Committee, leading SVMG's energy policy advocacy efforts during and after the energy crisis. He continued to serve in that role until his appointment by Governor Schwarzenegger. He was an active participant in numerous CPUC proceedings on utility procurement, resource adequacy, advanced metering, energy efficiency and PG&E's Proposed Settlement Agreement. Desmond also served on the energy committee for Governor Schwarzenegger's transition team, developing an energy policy document and action plan recommendations for the incoming Administration.

Electronic Lighting, Inc.
President & CEO 1997 to 2000

Recruited for CEO position at a venture-backed manufacturer of controllable lighting systems for company turnaround and sale. Arranged corporate bridge financing, implemented new identity and marketing campaign. Discontinued agent network and replaced with direct sales strategy, hiring all new staff. Introduced new product lines and field technical support services. Increased sales pipeline from $300k to $20 million. During tenure, relocated manufacturing from China to Mexico and established a joint venture with an Austrian lighting manufacturer.

Parke Industries, Inc.
Vice President 1996 to 1997

Reporting to the CEO, responsible for all sales activity and corporate marketing. P&L responsibility for ten branch offices with twenty-two sales people. Personally responsible for $3 million in energy savings performance contract sales. Implemented sales force automation program and database driven marketing campaigns.

Parke Industries, Inc.
Division Manager, Glendora Division 1993 – 1995:

Reporting to the CEO, responsible for sales and P&L management for the geographic division that included Los Angeles, San Francisco, Chicago and Denver. Grew revenue from $4 million to $11 million with $1.6 million net income. Personally responsible for several large sales including Los Angeles County for $2.3 million at a 78% cost savings. Recipient of EPA's Green Lights Project-of-the-Year Award. Maintained responsibility for corporate marketing. Standardized messaging and marketing collateral for the corporation.

Parke Industries, Inc.
Director of Marketing, Chicago 1991-1992

Reporting to the CEO and to the Division Manager, responsible for all corporate marketing. Responsible for divisional sales and marketing. Created the "17 Costly Lighting Retrofit Mistakes" marketing campaign, recognized by Energy User News Magazine as the most successful direct response ad campaign in the publication's history.

Taunton Municipal Lighting Plant, a publicly owned electric utility
Marketing & Demand Planning Administrator 1987 to 1991

Working in the Power Supply Planning Department, designed and implemented innovative energy efficiency and demand response programs that garnered national and international attention. Participated in load forecasting, regulatory compliance filings, cost-of-service studies and the development of an integrated resource plan. Also responsible for utility marketing and communications, including annual reports, newsletters and community outreach activities in support of a proposed circulating fluidized bed coal plant.

Boards

Mr. Desmond currently serves on the Board of the American Council on Renewable Energy (ACORE). He also serves on the advisory board for Stanford University's Precourt Institute for Energy Efficiency.

Education

1987, Bachelor of Science, magna cum laude, Northeastern University
Concentration: Marketing, Finance and Management
Recipient, College of Business Outstanding Student Achievement Award

DECLARATION OF

Jonathan Forrseter

I, Jonathan Forrester, declare as follows:

1. I am presently employed by BrightSource Energy as a Senior Director, Origination and Marketing.

2. A copy of my professional qualifications and experience are attached hereto and incorporated herein by reference.

3. I helped prepare the attached testimony on Alternatives for the Hidden Hills Solar Electric Generating System project based on my independent analysis, supplements thereto, data from reliable sources, and my professional experience and knowledge.

4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue(s) addressed herein.

5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: 1/18/2013 Signed: 

At: Oakland, CA

JONATHAN FORRESTER

3526 Woodruff Avenue • Oakland, CA 94602
jon4ster@comcast.net • (510) 710-8307

EXPERIENCE

2011-Present — **BRIGHTSOURCE ENERGY** — **Oakland, CA**
Senior Director, Origination and Marketing
- Lead BSE's US Origination and Marketing group with responsibility for PPAs and structured commercial transactions
- Built US Origination and Marketing team including staffing and business strategy

2010 — **ENERGY RESOURCE MANAGEMENT** — **San Francisco, CA**
Director, Business Development
- Led strategy for energy markets and utility sales.
- Developed and negotiated key terms of energy agreements resulting in project pipeline.

2005-2010 — **PACIFIC GAS & ELECTRIC COMPANY** — **San Francisco, CA**
Principal, Energy Procurement, 2007-2010
- Lead transactor for renewable procurement within the Structured Transactions group.
- Led structuring and negotiations for utility-scale renewable transactions with a combined value of over $3B.
- Managed large transaction teams and procurement process for ~1 GW renewable energy transactions, successfully closing deals negotiated over multiple years.
- Project Manager, Renewable Generation for the BC Transmission Line reporting to SVP, Energy Procurement.

Senior Analyst, Energy Procurement, 2005-2006
- Developed market opportunity assessment for solar and energy storage leading to $30MM regulatory filing.
- Core team member, product development, for $20MM ClimateSmart program resulting in first-of-its-type climate neutral energy product.

2004 — **ESTEE LAUDER COMPANIES, INC.** — **Minneapolis, MN**
Climate Strategy Consultant (Student)
- Completed year-long energy and greenhouse gas reduction strategy for Aveda, resulting in changes to product delivery operations.

2004-2005 — **GE ENERGY** — **Tehachapi, CA**
Wind Energy Consultant (Student)
- Performed market assessment and sizing and developed market entry strategy for contract service agreements in the Wind Energy division.
- Built cost model for servicing remote wind projects under 10 MW.

2000-2002 — **CITY OF BERKELEY** — **Berkeley, CA**
Analyst
- Analyst for market development program for $100MM municipality.

EDUCATION

UNIVERSITY OF MICHIGAN — **Ann Arbor, MI**
Stephen M. Ross School of Business
Master of Business Administration, April 2005
- Emphasis in General Management
- Awarded 2 year Weyerhaeuser Fellowship

School of Natural Resources and Environment
Master of Science, April 2005
- Emphases in renewable energy and climate change

UNIVERSITY OF CALIFORNIA AT SAN DIEGO — **La Jolla, CA**
Eleanor Roosevelt College
Sociology, June 1997
- B.A., Sociology with honors

ADDITIONAL

- Wine buyer, restaurant manager, winery production 1997-1999
- Finalist, National Collegiate Alpine Skiing Championship

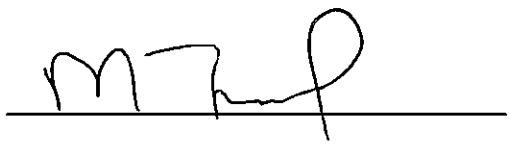
DECLARATION OF

Matthew Franck

I, Matthew Franck, declare as follows:

1. I am presently employed by CH2M HILL, Inc. as a Senior Project Manager.
2. A copy of my professional qualifications and experience are attached hereto and incorporated herein by reference.
3. I helped prepare the attached testimony on Soil and Surface Waters for the Hidden Hills Solar Electric Generating System project based on my independent analysis, supplements thereto, data from reliable sources, and my professional experience and knowledge.
4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue(s) addressed herein.
5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: January 7, 2013 Signed: 

At: Sacramento, CA

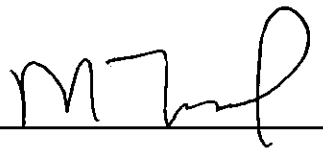
DECLARATION OF

Matthew Franck

I, Matthew Franck, declare as follows:

1. I am presently employed by CH2M HILL, Inc. as a Senior Project Manager.
2. A copy of my professional qualifications and experience are attached hereto and incorporated herein by reference.
3. I helped prepare the attached testimony on Water Supply for the Hidden Hills Solar Electric Generating System project based on my independent analysis, supplements thereto, data from reliable sources, and my professional experience and knowledge.
4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue(s) addressed herein.
5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: January 7, 2013 Signed: 

At: Sacramento, CA

Matthew Franck

Environmental Planner

Education

B.S., Environmental Policy Analysis and Planning

Relevant Experience

Mr. Franck is an environmental planner with 22 years of experience in managing and writing environmental impact assessment documents in compliance with NEPA and CEQA. He also coordinates local, state, and federal regulatory processes. Mr. Franck's education and multidisciplinary experience, as well as his expertise in land use and resource planning, provide a solid background for evaluating complex environmental policy issues.

Representative Projects

Water Resources Task Manager; Carlsbad Energy Center Project; NRG, Inc.; Carlsbad, California. Prepared Water Resources analysis for a project to repower the existing Encina Power Station in Carlsbad, CA, using natural gas turbines. The project involved the use of reclaimed water from the nearby wastewater treatment plant, with an alternative source to use desalinated seawater. Key issues included marine impacts from seawater intake, brine disposal, and the capacity of the existing reclaimed water distribution system.

Water Resources Task Manager; Mariposa Energy Project; Diamond Generating Corporation; Alameda County, California. Prepared Water Resources analysis for licensing this 200-MW simple cycle power plant near Byron, California, including an analysis if water, wastewater, and stormwater effects. The project involved the use of fresh water from Byron-Bethany Irrigation District because of the lack of reclaimed water sources in the area, and the analysis included justifying the environmental and economic advantages of this proposal and coordinating with the irrigation district to mitigate fresh water use. The project is currently under construction.

Water Resources Task Manager; Huntington Beach Energy Project; AES Corporation; Huntington Beach, California. Prepared Water Resources analysis for a project to reconstruct, using current technology, the existing Huntington Beach Generation Station. The project requires the use of potable water because of the lack of reclaimed water from nearby wastewater treatment plants. Key issues included the logistics associated with decommissioning the existing once-through ocean cooling system and replacing it with a much smaller brine discharge from new treatment processes. The site is also proposed for ocean water desalination.

Water Resources Task Manager; Application for Certification for San Francisco Electric Reliability Project; Public Utilities District for the City and County of San Francisco, California. Prepared the Water Resources section of an Application for Certification, a California Energy Commission process that is functionally equivalent to CEQA. The CEQA-equivalent evaluation focused on water, wastewater, and stormwater generation and was used by the proposed facility in the context of citywide compliance with the federal Clean Water Act and state Porter-Cologne Water Quality Control Act. Work efforts included testimony at evidentiary hearings.

AFCs for Walnut Creek Energy Park and Sun Valley Energy Project, Edison Mission Energy, City of Industry/Romoland, California. Provided support for two Applications for Certification before the California Energy Commission for similarly designed 500-MW natural gas-fired peaking power plants using the GE LMS100 advanced gas turbine technology. These applications were prepared in parallel and were filed at the Energy Commission within one week of one another. The AFCs were filed in December of 2005 and the projects are scheduled to begin construction in 2007.

AFC for San Francisco Electric Reliability Project, Public Utilities District for the City and County of San Francisco, California. Task Manager for the preparation of the Water Resources section of this Application for Certification, a California Energy Commission process that is functionally equivalent to CEQA. The CEQA-equivalent evaluation is focuses on water, wastewater, and stormwater generation and use by the proposed facility in the context of citywide compliance with the federal Clean Water Act and state Porter-Cologne Water Quality Control Act.

SPE for Modesto Irrigation District Electric Generation Station, Modesto Irrigation District, Ripon, California. Task Manager for the preparation of the Water Resources section of this Small Power Plant Exemption, a California Energy Commission process that is functionally equivalent to CEQA. The CEQA-equivalent evaluation focused on water, wastewater, and stormwater generation and use by the proposed facility in compliance with the federal Clean Water Act and state Porter-Cologne Water Quality Control Act.

Ongoing Environmental Documentation and Permitting Support, OMI-Thames Water, Stockton, California. Task Manager for environmental documentation and permitting support for the contract operation of the City of Stockton's wastewater, water, and stormwater infrastructure. To date, the major task in this support effort has been the coordination of a contractor's preparation of an Environmental Impact Report under CEQA for the upgrade of the City's wastewater treatment plant in accordance with Clean Water Act requirements. Another major task is the preparation of an application to the U.S. Coast Guard for a new utility bridge crossing of the San Joaquin River, including a NEPA Environmental Assessment. The utility bridge project has also included extensive agency coordination with the National Marine Fisheries Service, U.S. Fish and Wildlife Service, California Department of Fish and Game, Central Valley Regional Water Quality Control Board, and state and local levee agencies.

Task Leader; Arden Parallel Force Main; Sacramento Regional County Sanitation District; Sacramento, CA. Task Leader for the coordination of all environmental permit activities for the construction of a 60-inch sewer force main in Sacramento County, most of which was located within the environmentally sensitive American River Parkway. Coordinated with permitting agencies including the U.S. Army Corps of Engineers (USACE), U.S. Fish and Wildlife Service, California Department of Fish and Game, Central Valley Regional Water Quality Control Board, State Lands Commission, and the State Reclamation Board. Managed staff in wetland delineation and special-status species surveys. Coordinated with the county's Department of Environmental Review and Assessment to ensure completion of CEQA documentation for the project.

DECLARATION OF
CHANNING S. HASKELL

I, Channing S. Haskell, declare as follows:

1. I am presently employed by CH2M HILL Engineers, Inc. as a Project Manager for the Power Business Group.

2. A copy of my professional qualifications and experience are attached hereto and incorporated herein by reference.

3. I helped prepare the attached testimony on Facility Design, Power Plant Efficiency, and Power Plant Reliability for the Hidden Hills Solar Electric Generating System project based on my independent analysis, supplements thereto, data from reliable sources, and my professional experience and knowledge.

4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue(s) addressed herein.

5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: January 7, 2013 Signed: Channing S. Haskell

At: Atlanta, Georgia

DECLARATION OF

Channing S. Haskell

I, Channing S. Haskell, declare as follows:

1. I am presently employed by CH2M Hill Engineers, Inc. as a Project Manager for the Power Business Group.

2. A copy of my professional qualifications and experience is attached hereto and incorporated by reference herein.

3. I helped prepare the attached portion of the Hazardous Materials testimony for the Hidden Hills Solar Electric Generating System project based on my independent analysis and my professional experience and knowledge.

4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue(s) addressed herein.

5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: January 17, 2013 Signed: Channing S. Haskell

At: Sandy Springs, Georgia

DECLARATION OF

Channing S. Haskell

I, Channing S. Haskell, declare as follows:

1. I am presently employed by CH2M HILL Engineers, Inc. as a Project Manager for the Power Business Group.

2. A copy of my professional qualifications and experience is attached hereto and incorporated by reference herein.

3. I am adopting the attached portion of the Transmission System Engineering testimony for the Hidden Hills Solar Electric Generating System project based on my independent analysis and my professional experience and knowledge.

4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue(s) addressed herein.

5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: January 22, 2013 Signed: Channing S. Haskell

At: Sandy Springs, Georgia

DECLARATION OF

Channing S. Haskell

I, Channing S. Haskell, declare as follows:

1. I am presently employed by CH2M Hill Engineers, Inc. as a Project Manager for the Power Business Group.

2. A copy of my professional qualifications and experience is attached hereto and incorporated by reference herein.

3. I helped prepare the attached portion of the Waste Management testimony for the Hidden Hills Solar Electric Generating System project based on my independent analysis and my professional experience and knowledge.

4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue(s) addressed herein.

5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: January 17, 2013 Signed: Channing S. Haskell

At: Sandy Springs, Georgia

Channing S Haskell, P.E.

Engineering Project Manager

Education

Graduate Course, Engineering Management
Graduate Courses, Business Administration
B.S., Electrical Engineering

Professional Registrations

- Registered Professional Engineer: Arizona, Colorado, Georgia, Minnesota, Nevada, Ohio and Texas

Distinguishing Qualifications

- 35 years of experience with managing, engineering, designing, constructing, and commissioning of complex industrial projects primarily in the power industry with 30 years in leadership roles.
- Recent experience in Project Management and Project Engineering for engineer-procure-construct (EPC) power projects exceeding $100 million.
- Power plant project experience includes gas and oil-fired combustion turbines in simple-cycle, combined-cycle, and cogeneration applications; coal-fired plants including both plant and air quality control system design; both PWR and BWR nuclear, geothermal, and hydroelectric.
- Experienced with both engineering-procurement-construction (EPC) and engineering services only project contracting environments.
- Developed standard instrument installation detail drawings, standard bill of material for instrument installation, and instrumentation and controls (I&C) construction specification for power projects.
- Developed standard equipment specifications for distributed control system (DCS) continuous emissions monitoring system (CEMS), and remote terminal unit (RTU) for power projects.
- Power projects engineering experience includes Lead I&C Engineer with additional experience as Lead Electrical Engineer, Resident Engineer, and Estimating Engineer.
- Member of Project Management Institute, International Society of Automation, and Institute of Electrical and Electronic Engineers

Relevant Experience

Project Manager, BrightSource Industries, Israel; Mohave Desert Solar Electric Generating Facility, Southern, California. Managed performance of conceptual engineering and design services in support of permitting activities. Developed technical information for the facility will be utilized by the environmental permitting group to complete an Application for Certification to the California Energy Commission.

Project Manager, BrightSource Industries, Israel; Ivanpah Solar Electric Generating Facility, Nipton, California. Managed the performance of engineering and design services for the construction of a heliostat pre-assembly facility. The facility will receive heliostat components in shipping containers and assembly them into heliostats using construction labor at the rate of several thousand per week.

Project Manager, NYPA 500 MW Plant at Poletti, New York, New York. Performed Black Start Study for this 500 MW combine-cycle power plant. Study included evaluation more than ten options involving both onsite and offsite power sources.

Project Engineering Manager, Gainesville Regional Utilities, Deerhaven 2 AQCS Project, Gainesville, Florida. Retrofit of a Babcock Power Selective Catalytic Reduction (SCR) System, Babcock Power Dry Flue Gas Desulfurization System, and Hamon Fabric Filter on a 240 MW coal-fired power plant. Additional Equipment included a urea hydrolysis system for ammonia production, rail and truck unloading and conveying system for

pebble lime, lime hydration system, and fly ash conveying and storage system. Services included engineering, procurement, and construction. As Engineering Project Manager, responsible for day to day management of all project engineering and design activities, production of engineering deliverables according to the project schedule and within budget. Additional duties included review of project staffing levels to ensure that technical and schedule requirements were met, performed project member reviews and forwarded evaluations to each team member's discipline manager, monitoring scope and notifying project management of out-of-scope work, preparation of month progress reports for the Client, and monitoring the receipt, distribution, and return of shop drawings.

Assistant Project Manager, XCEL Energy High Bridge Combined Cycle, St. Paul, Minnesota. 570 MW gas-fired combine-cycle power plant located on an existing plant site approximately 2 miles from downtown St. Paul. Project services included engineering, procurement, and construction. The plant consists of two Mitsubishi M501F combustion turbine generators (CTGs), two Nooter/Erikson heat recovery steam generators (HRSGs) with supplemental firing and selective catalytic reduction systems, Mitsubishi steam turbine generator (STG), and an Emerson Process Management Ovation distributed control system (DCS). As Engineering Project Manager, administered project change process including identification of out of scope work, pricing of work, Client approval, and revision of contract documents; monitored equipment procurement process, and compiled the external monthly report. Additional duties included development of a database for tracking vendor and contractor diversity for reporting to the Client's corporate diversity program managers, produced technical descriptions and drawings for permits to modify the intake structure located on the Mississippi River, and developed a database to track spare parts for project equipment for incorporation into the Client's inventory control system.

I&C Engineer, NV Energy Harry Allen 3 Simple Cycle Project, Las Vegas, Nevada. Project entailed the addition of an 80 MW ultra low NO_x General Electric 7EA combustion turbine generator, installation of a new Remote Terminal Unit (RTU), and replacement of an existing CTG's Mark V turbine control system and Bailey Controls balance of plant control system with two new GE Mark VI control systems. Project services included engineering, procurement, and construction. As I&C Group Leader, Mr. Haskell supervised and developed all engineering and design activities for the project's instrumentation and controls.

I&C Engineer, GE AERO/Basin Electric Power Cooperative, Groton Generating Station, Groton, South Dakota. Balance of plant engineering for a 100 MW gas-fired simple cycle power plant on a green field site. The plant consisted of one General Electric LMS100 combustion turbine generator and General Electric Mark VI balance of plant control system. Project services included engineering and design. As I&C Group Leader, supervised all engineering and design activities for the project's instrumentation and controls.

I&C Engineer, GenWest Silverhawk Combined Cycle, Las Vegas, Nevada. 570 MW gas-fired combined-cycle power plant. The project scope included engineering, procurement, and construction. The plant consists of two Siemens 501F combustion turbine generators, two Alstom heat recovery steam generators with supplemental firing and selective catalytic reduction systems, General Electric steam turbine generator, an ABB Symphony distributed control system and an ABB continuous emissions monitoring system. As instrumentation and control systems group leader, was responsible for and supervised all engineering and design efforts related to the project's instrumentation and control systems.

I&C Engineer, Pinnacle West Energy West Phoenix 5 Combined Cycle, Phoenix, Arizona. 530 MW gas-fired combined-cycle power plant. Engineering, procurement and construction of the project were included in its scope. The unit included two Siemens 501F combustion turbine generators, two Kawasaki heat recovery steam generators with supplemental firing and selective catalytic reduction systems, Siemens steam turbine generator, ABB Symphony distributed control system and an ABB continuous emissions monitoring system. As instrumentation and control systems supervisor, was responsible for overall project technical, quality and budget performance and assisting the project's I&CS group leader with his duties.

I&C Engineer, El Paso Corporation, Shady Hills Facility, New Port Richey, Florida. EPC of a 570 MW gas/oil fired simple-cycle plant. The plant consisted of three GE 7FA CTGs, GE Fanuc programmable logic controller, Horiba CEMS and a Hathway remote terminal unit. As field instrumentation and control systems start-up engineer, led the effort to commission the plant's instrumentation and controls, programmable logic controller control system and plant's remote terminal unit that communicated plant data to three remote sites.

I&C Engineer, Mirant Corporation, Bosque County Project, Laguna Park, Texas. EPC of a simple-cycle plant generating 570 MW. The plant consisted of three GE 7FA combustion turbine generators, a General Electric Fanuc programmable controller and a Horiba Continuous Emissions Monitoring System. As instrumentation and control systems group leader, responsible for control system hardware and functional specification, control system design, specification of instruments and control devices, and wiring design.

I&C Engineer, BASF Fina Petrochemicals, Naphtha Steam Cracker, Port Arthur, Texas. Cogeneration plant to provide steam/electric power for the naphtha steam cracking process. Two General Electric 6B CTGs produce a total of 75 MW of electric power, two Deltak heat recovery steam generators produce a total of 680,000 lb/hr of steam at 1560 psi and 950F. A 150,000 lb/hr ABB auxiliary boiler provided. Project scope included engineering, procurement and construction. The entire facility including the cogeneration plant utilized a Foxboro I/A disturbed control system. As instrumentation and control systems group leader, was responsible for all instrumentation and control systems including the control system hardware and functional specification, control system design, specification of instruments, and wiring design.

I&C Engineer, BASF Corporation, Freeport, Texas. Cogeneration plant to the existing chemical plant facility included an 85 MW GE 7EA combustion gas turbine, Keystone-Allborg heat recovery steam generator with supplemental firing, a 12.5 MW non-condensing Dresser steam turbine generator, a Honeywell TDC 3000 distributed control system and a predictive emissions monitoring system. Project scope included engineering and procurement. As instrument and control systems group leader, developed specifications for instruments and control equipment, instrument and input/output lists, and wiring design.

I&C Engineer, Exxon Corporation/Entergy Corporation, Baton Rouge, Louisiana. Cogeneration project involved the replacement of existing boilers by a 150 MW combustion gas turbine generator and heat recovery steam generator. Project scope confined to conceptual engineering. As instrumentation and controls engineer, developed and reviewed P&IDs, developed control strategies and cost estimates for instruments and control equipment.

I&C Engineer, Reliant Resources, New Florence and Shelocta, Pennsylvania. Conemaugh Station, Units 1 and 2 and Keystone Station, Units 1 and 2. Controls upgrade replacing boiler controls, burner management systems and motor controls with Honeywell TDC-3000 distributed control systems on four 840 MW coal-fired super-critical plants. As project engineer, supervised the engineering effort on project. Major engineering tasks included extensive site investigations, specifying new instrument and control equipment, engineering and designing the disconnecting and reconnecting of 4500 cables per unit and planning activities so that work could be completed within the twelve week outage at each unit.

I&C Engineer, XCEL Energy Black Dog Station Unit 2, Burnsville, Minnesota. Project replaced a pulverized coal balanced draft boiler with a Foster Wheeler atmospheric fluidized bed boiler for this 130 MW plant. Engineering, procurement and construction management were included in the scope of this project located 20 miles south of Minneapolis, Minnesota. As instrumentation and controls engineer, specified additional instruments and a host computer interface enabling additional data gathering for EPRI program.

I&C Engineer, Rockwell International Corporation, Columbus, Ohio. Project included addition of dry scrubber, bag house, induced draft fans and stack to control emissions from existing industrial coal-fired power plant. As lead electrical engineer, supervised the development of project's design criteria, site investigations, load studies, equipment specifications and installation drawings, bid evaluations and review vendor drawings.

I&C Engineer, NV Energy North Valmy Station Unit 2, Battle Mountain, Nevada. Expansion of North Valmy Station by the addition of a 263 MW coal-fired power plant. Engineering, procurement and construction management were included. Plant included a Foster Wheeler boiler, GE steam turbine, Rockwell dry scrubber, Foxboro Spec 200 boiler control system, Electronics Corporation of America burner management system and a Foxboro plant computer. As electrical engineer, performed short circuit studies, supervised production of electrical drawings and cable and raceway schedule, and provided field construction support.

I&C Engineer, NV Energy North Valmy Station Unit 1, Battle Mountain, Nevada. Coal-fired 250 MW power plant utilizing a Babcock and Wilcox boiler, Westinghouse steam turbine, Foxboro Spec 200 boiler control system, Forney burner management system and Westinghouse plant computer. Project scope included engineering, procurement and construction management. As controls engineer, engineered a distributed digital control system utilizing a Foxboro 3 minicomputer and Motorola radio system to control eight wells located between five and fifteen miles from the station. Additional tasks included engineering and design for the plant computer and field based construction support and startup.

DECLARATION OF
E. UDI HELMAN

I, E. Udi Helman, declare as follows:

1. I am presently employed by BrightSource Energy as Managing Director, Economic and Pricing Analysis.

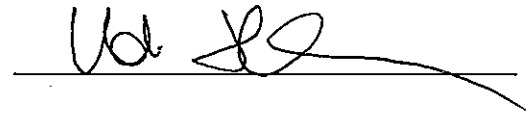
2. A copy of my professional qualifications and experience are attached hereto and incorporated herein by reference.

3. I helped prepare the attached testimony on Alternatives for the Hidden Hills Solar Electric Generating System project based on my independent analysis, supplements thereto, data from reliable sources, and my professional experience and knowledge.

4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue(s) addressed herein.

5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: 1-7-2013 Signed: 

At: Oakland, CA

E. Udi Helman

Managing Director, Economic & Pricing Analysis

BrightSource Energy
1999 Harrison Street, Suite 2150
Oakland, CA 94612
(510) 590-0928 (cell)
(510) 550-8136 (desk)

EXPERIENCE

Managing Director, Economic and Pricing Analysis, BrightSource Energy, Oakland, CA (1/2011 – present)

1. Quantitative Analysis of the Value of Thermal Storage

- Focus on the quantitative analysis of concentrating solar power (CSP) with thermal energy storage, along with corresponding state and federal regulatory and policy dimensions. Areas of analysis include valuation of energy, ancillary services, capacity, and integration costs.

- Conceived and jointly developed mixed-integer programming model of plant operations for economic valuation against market prices for energy and ancillary services.

- Lead author for CSP Alliance paper, "Economic and Reliability Benefits of CSP with Thermal Energy Storage," December 2012, available at http://www.csp-alliance.org/cspa-report/. This widely distributed paper provides a survey of the literature on economic analysis of CSP with thermal storage as well as some previously unpublished analytical contributions.

- Membership on advisory groups for system modeling:
  - Policy Advisory Committee, NREL project on concentrating solar power with thermal storage with representatives from SCE, PG&E, CPUC, CEC, CAISO, SMUD, LADWP, and other entities, August 2011 to present. Organized industry sub-group to provide specific information on technology characteristics.
  - Policy Advisory Committee, California Energy Commission/DNV-KEMA project on modeling concentrating solar power with thermal storage, August 2012 to present.
  - CAISO 33% RPS renewable integration advisory team, 2011 – present.

- Directed economic benefits analysis in commercial negotiations with California IOU and municipal utilities.

- Participation on BrightSource IPO team to review S-1 and supporting reports on economic valuation by consultants.

2. Policy and Regulatory Support

- Extensive dialogue with state regulators in California in support of economic valuation findings. Many public presentations at state agencies, as listed below.

- Primary author or lead reviewer/editor of numerous regulatory filings for BrightSource, Large-Scale Solar Association (LSA) and other collaborators before CAISO, CPUC and FERC (listed below).

- Public presentations over 2011-12 at California Public Utilities Commission (CPUC), California Energy Commission (CEC) California ISO (CAISO), Federal Energy Regulatory Commission (FERC), Department of Energy (DOE), Solar Power International, Stanford University, U.C. Berkeley POWER conference 2011, Center for Research into Regulated Industries (Rutgers University) annual Western conference, Western Independent Transmission Group, Western Resource Planners, and industry trade conferences by EUCI, Platts, Infocast, and Marcus Evans. Individual presentations listed below.

Principal, Division of Markets & Infrastructure Development, California Independent System Operator (CAISO), Folsom, CA (8/2007 to 1/2011)

1. Renewable Integration Studies

- Co-author of CAISO, "Integration of Renewable Resources: Operational Requirements and Generation Fleet Capability at 20% RPS," August 31, 2010.
    - Contributor to each analytical methodology used in the study – including statistical modeling and production simulation.
    - Continuing research to prepare subsequent study results at 33% RPS.
- Numerous presentations on renewable integration analysis to CAISO stakeholders and external audiences (see list of presentations below), including:
    - "ISO Study of Operational Requirements and Market Impacts at 33% RPS: Proposed Methodology and Selected Simulation Results available as of August 24, 2010," CPUC Workshop on CAISO and PG&E Renewable Integration Model Methodologies, August 24, 2010.
    - Panelist, FERC Technical Conference, Integrating Renewable Resources into the Wholesale Electric Grid (AD09-4-000), Washington, DC, March 2, 2009.

2. Renewable Transmission Policy and other Transmission Projects

- CAISO representative on California Transmission Policy Group (CTPG) scenario team, 2010; contributor to CTPG Phases 2-3 study plans and reports (www.ctpg.us), including:
    - Section 4 in 2010 CTPG Revised Final Study Plan for 2020: Phase 3, May 10, 2010.
    - Section 4 in 2010 CTPG Revised Final Study Plan for 2020: Phase 2, March 19, 2010.
    - Presenter on CTPG Phase 3 Study Plan, Stakeholder Input Meeting, March 24, 2010.

- CAISO team on the development of the renewable energy transmission planning process, 2009-2010. Contributor to 5 ISO stakeholder papers in 2009-2010 on the redesign of the transmission planning process to accommodate renewable resources up to 33% RPS.
- CAISO team on the C3ETP transmission proposal by PG&E; development of cost-benefit analysis and valuation of Helms pumped storage plant upgrades.
- Numerous presentations on reform of transmission policy to CAISO stakeholders and external audiences (see list of presentations below), including:
    - "Resource and transmission planning to achieve a 33% RPS in California – ISO modeling tools and planning framework," FERC Technical Conference on Planning Models and Software, Washington, DC, June 10, 2010

3. Wholesale Market Design to Support Renewable Integration

- Team lead for wholesale market design changes needed to address renewable integration.
    - Lead author on California ISO, "Discussion Paper – Renewable Integration: Market and Product Review," July 8, 2010.
- Lead author, "Comments of the California Independent System Operator Corporation," Integration of Variable Energy Resources, FERC Docket No. RM10-11-000, April 12, 2010.
- Team lead and lead author, ISO/RTO Council White Paper: Variable Energy Resources, System Operations and Wholesale Markets, Incorporating a Response to the Federal Energy Regulatory Commission's Notice of Inquiry on Integration of Variable Energy Resources, FERC Docket No. RM10-11-000, April 12, 2010.
- Organized 2-day workshop on Wind Integration and ISO/RTO Wholesale Markets for the ISO/RTO Council, Boston, June 8-9, 2009.
    - Coordinated 25 presentations (including 4 of my own) to review status of renewable integration in organized markets across the U.S. and Canada.

4. Capacity Pricing

- Lead on pricing of ISO backstop procurement of capacity from generators (equivalent to Resource Adequacy contracts), 2007-2008 and 2010 onwards; prepared review of pricing options and justification for tariff-based pricing rules.

5. Greenhouse Gas Policy

- CAISO representative on electricity sector team for California inter-agency Climate Action Team, August 2007-present; point person for ISO perspective on GHG regulation, including point of regulation design topics.
- CAISO representative to Western Climate Initiative (as needed), 2009-2010.
    - Appointed to Technical Advisory Group (TAG) of the Western Climate Initiative Electricity Subcommittee, 2008-2009.

6. Other Initiatives

- CAISO representative and contributor, inter-agency Clean California Energy Future initiative (CAISO, CPUC, CARB, CEC, CalEPA), 2009-2010. Final report on

implementation posted at http://www.cacleanenergyfuture.org/documents/CCEFImplementationPlan.pdf.

- CAISO representative to ISO/RTO Council (IRC) markets committee, 2008-2010.
  - Organized two day workshop on ISO initiatives on wind integration, June 8-9, 2009.
  - Managed 250 page IRC submission, including consulting team and inputs from all ISOs and RTOs, "Variable Energy Resources, System Operations and Wholesale Markets Incorporating a Response to the Federal Energy Regulatory Commission's Notice of Inquiry on Integration of Variable Energy Resources, Docket No. RM10-11-000, available at http://www.isorto.org/site/c.jhKQIZPBImE/b.4344503/k.83C1/FERC_Filings.htm.

Economist, Division of Policy Analysis and Rulemaking, Office of Energy Markets and Reliability, Federal Energy Regulatory Commission (FERC), Washington, DC (full time, 1/1999 to 8/2007; part time consultant, 11/1997 to 1/1999).

1. RTO/ISO Market Design and Market Start-up

- **Long-term Transmission Rights in Organized Markets**. Team lead for long-term transmission rights in organized markets (11/2006 to 8/2007); team member (3/2005 to 11/2006).
  - Coordinator of compliance filings by RTOs and ISOs, with review responsibility for all filings and lead responsibility for Midwest ISO.
  - Team member and co-author of Notice of Proposed Rulemaking (NOPR) on Long-Term Firm Transmission Rights in Organized Electricity Markets (February 2, 2006, Docket Nos. RM06-8-000, AD05-7-000); and Final Rule on Long-Term Firm Transmission Rights in Organized Electricity Markets (July 20, 2006, Docket No. RM06-8-000; Order No. 681).
  - Primary author of Staff Paper on Long-term Transmission Rights in Organized Markets (May 11, 2005, Docket No. AD05-7-000).

- **Eastern Seams Technical Conference and follow-up**. Team lead for Technical Conference on seams in the Eastern Interconnection (held 3/29/2007) and follow-up projects.

- **Midwest ISO Market Design and Market Start-up.** Lead economist from late 2002 to present for much of the analysis of Midwest Independent System Operator (ISO) market rules and start-up of the Day 2 market.
  - Prior to the finalization of the MISO Day 2 market design, individually or as member of small teams, worked on a number of initiatives to develop stakeholder support for the LMP/FTR market design. These included the following:
    - Technical advice to MISO on the assignment of counterflow FTRs to support conversion of existing Order 888 transmission contracts; and also on possible assignment of "contingent" FTRs that can assist in modeling network rights that involve the option to call on alternative generation sources.
    - From 02/2004 – 05/2004, conducted in-depth discussions with parties from the Wisconsin and Upper Michigan System (WUMS) region regarding concerns over

market issues in the prospective Midwest ISO market, particularly the allocation of sufficient FTRs from sources outside WUMS and potential for market power in spot energy within WUMS.

- Worked on the major order that approved the Midwest ISO market design, *Midwest Independent Transmission System Operator, Inc.*, 108 FERC ¶ 61,163 (TEMT II Order) (08/2004). Primary areas of focus were (1) safeguards for the start-up of the market, (2) allocation of financial transmission rights, (3) energy market procedures and pricing, and (4) coordination between the Midwest ISO and the control areas in its footprint. The safeguards included several innovative regulatory methods that were employed to enhance market operations in the first few months and years. In the period September 2004 to April 2005, reviewed or worked directly on sections of a sequence of rehearing and compliance orders: *Midwest Independent Transmission System Operator, Inc., order on reh'g*, 109 FERC ¶ 61,157 (2004) (TEMT II Rehearing Order); *Midwest Independent Transmission System Operator, Inc.*, 109 FERC ¶ 61,285 (2004) (Compliance Order I); *Midwest Independent Transmission System Operator, Inc.*, 110 FERC ¶ 61,169 (2005) (Order changing start of market); *Midwest Independent Transmission System Operator, Inc., order on reh'g*, 111 FERC ¶ 61,043 (2005) (Compliance Order III); *Midwest Independent Transmission System Operator, Inc.*, 111 FERC ¶ 61,053 (2005) (Compliance Order IV).
- From 2005 to present, worked on a variety of orders addressing MISO market design issues, including issues in marginal loss surplus refunds, redesign of the FTR rules and introduction of long-term auction revenue rights (ARRs), and most recently the designl for a bid-based market for regulation and operating reserves and scarcity pricing.

- **<u>Standard Market Design (SMD) Proposal</u>.** Member of staff team responsible for analysis and writing of the Standard Market Design (SMD) Pro Forma Open Access Transmission Tariff Notice of Proposed Rulemaking (NOPR) (RM01-12-000, 07/31/2002).
  - Lead writer for the proposed SMD tariff rules in Part III of the NOPR. This section comprises approximately 45% of the complete proposed SMD tariff, excluding service agreements and attachments. Also wrote some of the NOPR preamble, including much of Appendices C and E.
  - Participant in most of the FERC RTO Week and Standard Market Design seminars and workshops over 2001-2002. FERC panelist for several industry and academic industry sessions. Presented on SMD progress in several academic and technical professional conferences (listed under presentations).
  - Participated in policy research on several components of the proposed Standard Market Design, including the following:
    - Co-author with FERC staff and consultants of several papers over 2001-2002 on financial transmission rights and organization of markets for such rights (listed under publications). These papers included several new specifications for transmission rights that were included in the proposed SMD tariff.
    - Co-author with FERC staff and consultants of analyses of general market design and the role of unit-commitment day-ahead markets (listed under publications). This research helped formulate the concept of simultaneously optimized, unit commitment day-ahead markets.

- **ISO-New England Market Design and Market Start-up**. Lead economist from 1998 to 2002 for much of the analysis of ISO-New England market rules. Wrote initial economic policy memorandum on interim New England market rules in support of the FERC Order approving the market design and market start (85 FERC ¶ 61, 379; 12/17/1998). Worked on many of the numerous internal FERC memoranda and orders relating to New England markets in 1999-2002 (in conjunction with David Mead, Economist, FERC). These include the following:

  - Comprehensive filing of energy, ancillary services and capacity market rules (January 1999).
  - Additional market rules pertaining to emergency price changes due to market design flaws and ISO market conduct under emergency conditions (May 1999 to September 1999).
  - Development of congestion management system based on locational marginal pricing and multi-settlement system, from May 1999 to 2002.

2. Analysis of Market Performance and Market Power

- Member of staff team on Locational Market Power Mitigation (LMPM)/Reliability Must Run (RMR) (2003-2004). Staff expert at RMR Technical Conference, FERC, Washington, DC, February 4-5, 2004.

- Co-author of the Northeast Region Section of the "Staff Report to the Federal Energy Regulatory Commission on the Bulk Power Markets in the United States" (FERC, November 1, 2000). This study identified criteria for market performance and analyzed the available data (primarily public data but also some confidential data) on exercise of market power in the period 1998-summer 2000.

- Doctoral research on equilibrium market modeling applied to wholesale electricity markets, with large-scale simulation of the U.S. Eastern Interconnection. Results available upon request.

3. Other FERC Information

- FERC Award for Quality Service in the Public Interest, Energy Policy Act 2005 Implementation.
- FERC Award for Quality Service, 12/06/06, 8/15/06, 04/06/06, 01/06/06, 08/18/05, 06/07/05, 03/11/05, 07/09/04, 05/21/04, 03/03/04, 08/14/03, 04/22/03, 04/04/03, 8/28/02, 6/14/02, 09/18/01, 12/22/00, 8/31/00.
- Training in GAMS, SAS, PowerWorld, PROMOD IV.
- Advanced Energy Options Course with Vince Kaminski, FERC, Washington, DC, 03/16-03/17/2004.

Consultant with Johns Hopkins faculty (1997-1999)

- **Gas Research Institute,** Chicago, IL (June 1997 to January 1999). Statistical analysis of artificial neural net-based models for short-term natural gas load forecasts (with Benjamin Hobbs, Professor, Department of Geography and Environmental Engineering, Johns Hopkins University). Jim Fay and William Ingle, GRI Project Managers. Phase 1 concluded summer 1997; phase 2 ongoing. For a summary of results, see Hobbs, et al. (1998).

- **Maryland Power Plant Research Program,** Annapolis, MD (1997-1998). Analyzed natural resource damage assessment methods (focused on fishery resources) for the Power Plant Research Program of the Maryland Department of Natural Resources (with Benjamin Hobbs and John Boland, Professors, Department of Geography and Environmental Engineering, Johns Hopkins University). Under Contract No. PR97-056-001.

Consultant, U.S. Congress Office of Technology Assessment (OTA), Washington, DC (1992-1994)—part-time.

- Consultant on OTA Project on Energy and Environmental Technology Transfer to Central and Eastern Europe, directed by Alan Crane, Senior Analyst, Energy and Materials Division. Wrote chapter on "Programs to Assist Energy Efficiency" in first project report on *Energy Efficiency Technologies for Central and Eastern Europe* (OTA-E-562, May 1993). Co-wrote chapter on "Assistance, Trade and Investment Programs," in final project report on *Fueling Reform: Energy Technologies for the Former East Bloc* (OTA-ETI-599, July 1994).

Assistant Director, Environmental Affairs, Center for Strategic & International Studies, Washington, DC (9/93-8/95; Research Associate and Program Coordinator, 6/91 to 8/93; Research Assistant, 1/90 to 6/91), full-time.

- Listed in CSIS Directory of Specialists, 1992-1995. Presentations to corporate seminars and clients. Selected projects are listed below.

- Principal researcher for project on "Developing a U.S. Strategy for Environmental and Energy Technology Cooperation and Trade," supported by a grant from the U.S. Agency for International Development. Chaired by John Sawhill, President of the Nature Conservancy, the project brought together business and government officials to discuss options for a more coherent U.S. policy and resulted in several conferences and reports. Wrote and edited final report (February 1993). Also consulted to U.S. Congress Office of Technology Assessment over 1993-94 on this topic.

- Principal researcher and organizer for conference on "International Business and Environmental Technology Cooperation" (January 24-25, 1994). Cooperating organizations include the U.S. Council for International Business and the International Chamber of Commerce. Also organized conference on the "Global Environment Facility (GEF) and the Private Sector" (May 20, 1993), that involved about 50 companies and World Bank and International Finance Corporation officials involved with GEF project development.

- Principal CSIS researcher and writer for energy and environment sessions of the *Strengthening of America Commission*, an initiative chaired by Senators Sam Nunn and Pete Domenici. Worked closely with Fred Krupp (President, Environmental Defense Fund), senate staffers, and others to prepare an interim summary report (November 1991) and background paper (May 1992) for the commission.

- Primary researcher for CSIS component of joint project on the economics of climate change policy options (partners included Putnam, Hayes and Bartlett, International Resources Group, and DRI/McGraw-Hill). Research included identifying U.S. global warming policy proposals; reviewing modeling scenarios; assessing international policy making process; and co-writing section on international implications of U.S. policies. Final report entitled "Economic Effects of Alternative Climate Change Policies" (CSIS et. al., January 1991).

EDUCATION

Ph.D. Applied Microeconomics and Systems Analysis
Department of Geography and Environmental Engineering
The Johns Hopkins University, Baltimore, Maryland (1/2003)

M.A. Environmental Studies and Political Science
Institute of Environmental Studies/Department of Political Science
University of Toronto, Toronto, Canada (1989)

B.A. International Relations (Minor: Biology)
University of Toronto, Toronto, Canada (1987)

OTHER ACTIVITIES

Member, United States Association for Energy Economics, IEEE
Reviewer, *IEEE Transactions on Power Systems, Networks and Spatial Economics*
Invited Reviewer, NREL and LBNL papers on renewable valuation and integration.

REGULATORY FILINGS

1. Selected BrightSource/Large-scale Solar Association (Lead Author or Significant Contributor)

Primary drafter: "Comments of the Large-scale Solar Association on the Revised Straw Proposal for Renewable Integration Phase 2, September 22, 2011, http://www.caiso.com/Documents/LSAComments_RewewablesIntegrationMarket-ProductReviewPhase2RevisedStrawProposal.pdf

Prepared Direct Testimony of Dr. Udi Helman on Behalf of the Large-scale Solar Association, August 4, 2011, CPUC Docket No. R.10-05-006 (Track 1), Commissioner: Michael R. Peevey;

ALJ: Peter V. Allen, http://www.largescalesolar.org/files/_docs/CLEAN-LSA-Testimony-R10-05-006-Udi-Helman.pdf

Primary drafter: "Comments of the Large-scale Solar Association on the Discussion and Scoping Paper on Renewable Integration Phase 2," April 29, 2011, http://www.caiso.com/Documents/LSAComments-RenewablesIntegrationMarketandProductReviewPhase2_Discussion_ScopingPaper.pdf

Primary drafter: "Comments of the Large-scale Solar Association (LSA) on CAISO 33% RPS Integration Study: Production Simulation Model," February 28, 2011.

2. Selected CAISO Stakeholder Papers and FERC Filings (Lead Author Or Significant Contributor) – All available at www.caiso.com

"Discussion Paper – Renewable Integration: Market and Product Review," July 8, 2010.

"Comments of the California Independent System Operator Corporation," Integration of Variable Energy Resources, FERC Docket No. RM10-11-000, April 12, 2010.

"Renewable Energy Transmission Planning Process (RETPP), Draft Final Proposal," January 6, 2010.

"Getting to 33% RPS through Comprehensive, State-wide Grid Planning: A Revised Straw Proposal," October 30, 2009.

"Renewable Resources and the California Electric Power Industry: System Operations, Wholesale Markets and Grid Planning," July 20, 2009.

"Exceptional Dispatch," Technical Bulletin, 2009-05-01, May 11, 2009.

"Interim Capacity Procurement Mechanism," FERC Docket ER06-615, February 28, 2008.

"Final Proposal for Interim Capacity Procurement Mechanism Tariff Filing," November 9, 2007.

SELECTED PRESENTATIONS

BrightSource

"Economic and Reliability Benefits of CSP with Thermal Energy Storage: Recent Studies and Research Needs." Marcus Evans, 3rd Annual Electric Energy Storage, Phoenix, AZ, January 9-10, 2013.

"Update on Ivanpah project and BrightSource technology roadmap," Platts 8th Annual California Power Market Conference, November 13, 2012.

Panelist, Renewables Integration Panel at Western Resource Planners Forum/CREPC meeting, San Diego, October 3, 2012.

"Valuing concentrating solar power with thermal energy storage," California Energy Commission Staff Workshop, Solar Thermal Energy Storage and Solar Cogeneration, Sacramento, California, August 23, 2012.

"Valuing concentrating solar power with thermal energy storage: A survey of the literature and some extensions," CRRI Western Conference, Monterey, CA, June 28, 2012.

"Integration Analysis and Value of Concentrating Solar Power With Thermal Energy Storage," CEC IEPR Workshop on Renewable Integration, June 11, 2012.

"Value Of Concentrating Solar Power (CSP) With Thermal Storage," Photon 7th Solar Electric Utility Conference, San Francisco, February 2, 2012.

"BrightSource Technology Roadmap and Value of Thermal Storage," Department of Energy, Washington, DC, December 14, 2011.

"California RPS Rules and Valuation of Thermal Storage," Federal Energy Regulatory Commission, Washington, DC, December 13, 2011.

Panelist, Panel on Applications for high-density thermal storage at high temperatures for Concentrating Solar Power, ARPA-E HEATS workshop, Arlington, VA, December 12, 2011.

Moderator, Panel on "New Developments in California Transmission Planning," Platts 7th Annual California Power Market Forum, December 9, 2011.

"Integration Analysis and Value of CSP with Storage," Platts 7th Annual California Power Market Forum, December 8, 2011.

Panelist, Renewable Integration, Renewables Summit West, Infocast, San Diego, December 6, 2011.

"Valuing Long-Term, Utility-Scale RPS Contracts In California," EUCI, California RPS: Meeting The Mandate, Los Angeles, October 24, 2011.

"Utility-Scale Solar Integration in California – Study Results and Wholesale Market/RPS Procurement Issues," Solar Power International (SPI), Dallas, October 20, 2011.

Panelist, Roundtable on Western Transmission Planning and Prospective Changes Due to FERC Order 1000, Western Independent Transmission Group (WITG), Sacramento, October 19, 2011.

Presenter/Moderator, Panel on “Review of Other Ongoing Studies and Opportunities for Coordination,” 33% RPS Modeling, Phase 2 Working Group meeting, California ISO, October 7, 2011.

Discussant, “Session 1: The Paradigm Shift in the Role of the Transmission Network,” Conference on Transmission Policies to Unlock America's Renewable Energy Resources, Stanford University, September 15, 2011.

Discussant, Panel on “Resource Adequacy” Center for Research into Regulated Industries (Rutgers University) 24th Annual Western Conference, Monterey, California, June 17, 2011.

Chair, Panel on “Renewables,” Center for Research into Regulated Industries (Rutgers University) 24th Annual Western Conference, Monterey, California, June 16, 2011.

Co-Presenter, “"Integration of Wind and Solar Energy in the California Power System: Results from Simulations of a 20% Renewable Portfolio Standard," U.C. Berkeley POWER conference 2011, March 17, http://ei.haas.berkeley.edu/power2011.html, Panel on “Low-Carbon Resources on the Grid.”

Invited Participant, Harvard Electricity Policy Group quarterly meeting, Los Angeles, February 24-25, 2011.

California ISO

These do not include stakeholder presentations at CAISO.

“ISO Studies of Operational Requirements and Market Impacts at 20% -33% RPS,” GE Customer Forum, San Francisco, August 24, 2010.

“ISO Study of Operational Requirements and Market Impacts at 33% RPS: Proposed Methodology and Selected Simulation Results available as of August 24, 2010,” CPUC Workshop on CAISO and PG&E Renewable Integration Model Methodologies, August 24, 2010.

(w. Clyde Loutan) “Analysis of Operational Requirements and Assessment of Generation Fleet Capability under a 20% RPS Requirement,” 2010 IEEE PES General Meeting, Minneapolis, July 28, 2010.

“Between Planning and Markets: Preparing for the 33% RPS in California (from the Perspective of the ISO),” Center for Research into Regulated Industries (CRRI), Western Conference, Monterey, CA, June 22, 2010.

“Ancillary Service Markets in the California ISO: Current Conditions and Future Needs,” EUCI Conference on Trends in Ancillary Service Markets, Minneapolis, June 16, 2010.

“Resource and transmission planning to achieve a 33% RPS in California – ISO Modeling tools and planning framework,” FERC Technical Conference on Planning Models and Software, Washington, DC, June 10, 2010.

"Renewable Integration in ISO system operations, markets and planning," NextEra Customer Forum, Los Angeles, June 7, 2010.

(w. Mark Rothleder), "Stochastic Simulation of Unit Commitment and Dispatch Under a 20% RPS in California," FERC Technical Conference on Unit Commitment Software, Washington, DC, June 3, 2010.

"The ISO's Revised Transmission Planning Process to achieve 33% RPS," 2010 California Geothermal Forum, May 10, 2010.

"CAISO 33% RPS Operational Study," CPUC Public Workshop: Long-term Renewable Planning Methodologies, Inputs, and Assumptions for the 2010 Long-Term Procurement Plan Proceeding, San Francisco, December 10, 2009.

"California's Resource Adequacy Program, California ISO functions, and future considerations" and "CAISO Local Capacity Requirement (LCR) Rules", both presentations at EUCI conference on Smart Capacity Markets, Washington, DC, November 10-11, 2009.

"Preparing Power Markets for 2020," CMTA Annual Conference, South Lake Tahoe, July 30, 2009.

"Simulation of Renewable Integration Requirements in ISO Markets and Implications for Spot Market Procurement and Design," Center for Research into Regulated Industries (CRRI), Western Conference, Monterey, June 18, 2009.

"The CAISO Participating Intermittent Resources Program (PIRP) – imbalance and uplift charges," ISO-RTO Council (IRC) Workshop on Wind Integration and Markets, Boston, MA, June 8-9, 2009.

"Recent California PUC decisions on using an exceedance methodology for wind and solar counting towards Resource Adequacy requirements," ISO-RTO Council (IRC) Workshop on Wind Integration and Markets, Boston, MA, June 8-9, 2009.

"Remarks of Udi Helman" (panelist), FERC Technical Conference, Integrating Renewable Resources into the Wholesale Electric Grid (AD09-4-000), Washington, DC, March 2, 2009.

"Energy Storage in California ISO Markets and other ISO/RTO Markets," NARUC, Washington, DC, February 15, 2009.

"CAISO Market Design and Market Structure Issues: MRTU and Beyond," PANC Annual Conference, San Francisco, April 8, 2008.

"Building on MRTU: Implications for Environmental Policies," CPUC, June 19, 2008.

"CAISO and Greenhouse Gas Policy," IEP Annual Conference, South Lake Tahoe, September 2007.

FERC

"Some Opportunities for Market Modeling in Monitoring and Mitigation of U.S. Wholesale Generation Markets," *Institute of Electrical and Electronics Engineers (IEEE), Power Engineering Society (PES) General Meeting*, San Francisco, June 15, 2005.

"Locational Marginal Pricing and Financial Transmission Rights," FERC-wide presentation, February 24, 2005.

"Building Markets," *Edison Electric Institute (EEI) Market Design School*, Madison, WI, July 20, 2004 (joint presentation with Robert Camfield).

"Large-Scale Simulation of Oligopolistic Wholesale Electricity Markets using Complementarity Models and its Potential Uses for Policy Analysis and Regulation," *USAEE / IAEE 24th Annual North American Conference*, Washington, DC, July 9, 2004 (joint presentation with Benjamin Hobbs).

"Transmission Constraints and Generation Market Power in Wholesale Power Markets: Some Trends in Regulation and Research Topics," *National Energy Modeling System/Annual Energy Outlook Conference*, Energy Information Agency (EIA), Department of Energy, Washington, DC, March 23, 2004.

"Market Monitoring and Market Power Mitigation: Trends in Regulation," *Edison Electric (EEI) Institute Market Design School*, Madison, WI, August 1, 2003.

"FERC Policy Initiatives: Implications for Research on Electricity Markets," *Second NSF-EPRI Workshop on Power Systems Research*, Arlington, VA, March 28, 2002.

"Standard Market Design: FERC Process and Issues," *Institute of Electrical and Electronics Engineers (IEEE), Power Engineering Society (PES) Winter Meeting, 2002*, New York, NY, January 29, 2002.

"Congestion Management and Transmission Rights: RTO Requirements, Recent Experience and New Developments," *Conference on Profiting from New Transmission Technologies*, Washington, DC, June 18, 2001.

"Market Design and Performance of the Northeastern ISO Markets," *National Energy Modeling System/Annual Energy Outlook Conference*, Energy Information Agency (EIA), Department of Energy, Arlington, VA, March 27, 2001.

"Market Design in the North Eastern U.S. Wholesale Electricity Markets: Events and Issues, 1999-2000," *Energy Modeling Forum (EMF) 17*, Meeting 3, June 2, Washington, DC, April 2000 (joint presentation with Paul Sotkiewicz).

"Modeling Strategic Pricing in Bilateral & Poolco Electricity Markets: A Nash-Cournot Approach with Applications to US Eastern Interconnection," *Energy Modeling Forum (EMF) 16*, Washington, DC, October 1999.

"LCP Models of Nash-Cournot Competition in Bilateral & POOLCO Markets," *INFORMS Spring 1999 Meeting*, Cincinnati, OH.

SELECTED PUBLICATIONS AND REPORTS

O'Neill, Richard P. and Udi Helman, Benjamin F. Hobbs, Michael H. Rothkopf, and William R. Stewart, "A Joint Energy and Transmission Rights Auction on a Network with Nonlinear Constraints: Design, Pricing and Revenue Adequacy," Chapter 4 in J. Rosellon and T. Kristiansen (eds.), *Financial Transmission Rights*, Lecture Notes in Energy 7, DOI 10.1007/978-1-4471-4787-9_4, Springer-Verlag, London 2013.

Helman, Udi, and David Jacobowitz, "The Economic and Reliability Benefits of CSP with Thermal Energy Storage: Recent Studies and Research Needs," CSP Alliance Report, January 2013, available at http://www.csp-alliance.org/cspa-report/.

Venkataraman, Sundar, Mark Rothleder, Udi Helman, and Tao Guo, "Integrating Variable Energy Resources into the California Energy Market," CIGRE (International Council on Large Energy Systems), Paris, August 2012.

Rothleder, Mark and Udi Helman, Clyde Loutan, Tao Guo, June Xie, and Sundar Venkataraman, "Integration of wind and solar under a 20% RPS: Stochastic simulation methods and results from California ISO studies," *Proceedings of the IEEE*, Power Engineering Society, 2012 IEEE Power & Energy Society General Meeting, July 22–27, 2012, Paper #2012GM1892.

(co-author) California's Clean Energy Future: Implementation Plan, Joint publication of California Public Utilities Commission, California Energy Commission, California Air Resources Board, California Environmental Protection Agency, and California ISO, September 2010, available at http://www.cacleanenergyfuture.org/documents/CCEFImplementationPlan.pdf.

(co-author) California ISO, Integration of Renewable Resources: Operational Requirements and Generation Fleet Capability at 20% RPS, August 31, 2010, available at http://www.caiso.com/Documents/Integration-RenewableResources-OperationalRequirementsandGenerationFleetCapabilityAt20PercRPS.pdf.

Helman, Udi and Benjamin F. Hobbs, "Large-Scale Market Power Modeling: Analysis of the U.S. Eastern Interconnection and Regulatory Applications," *IEEE Transactions on Power Systems*, 25, 3, 2010, pp. 1434-1448.

(co-author) ISO/RTO Council White Paper, "Variable Energy Resources, System Operations and Wholesale Markets, Incorporating a Response to the Federal Energy Regulatory Commission's Notice of Inquiry on Integration of Variable Energy Resources, Docket No. RM10-11-000,"April

12, 2010, available at
http://www.isorto.org/site/c.jhKQIZPBImE/b.4344503/k.83C1/FERC_Filings.htm.

Helman, Udi, Harry Singh, and Paul Sotkiewicz, "RTOs, Regional Electricity Markets, and Climate Policy," in F. P. Sioshansi, ed., *Generating Electricity in a Carbon Constrained World*, Academic Press, 2009.

Helman, Udi, Benjamin F., Hobbs, and Richard P. O'Neill, "The Design of US Wholesale Energy and Ancillary Service Auction Markets: Theory and Practice," in F. P. Sioshansi, ed. *Competitive Electricity Markets: Design, Implementation, Performance*, Elsevier, 2008.

O'Neill, Richard P., and Udi Helman, "Regulatory Reform of the U.S. Wholesale Electricity Markets," in M.K. Landy, M.A. Levin, and M. Shapiro (eds.), *Creating Competitive Markets: The Politics of Regulatory Reform*, Brookings Press, 2007.

O'Neill, Richard P., Udi Helman, Benjamin F. Hobbs, and Ross Baldick, "Independent System Operators in the USA: History, Lessons Learned, and Prospects," in F. Sioshansi and W. Pfaffenberger, *Electricity Market Reform: An International Perspective*, Elsevier, 2006.

Helman, Udi, "Market power monitoring and mitigation in the US wholesale power markets," *Energy*, 31 (6-7), pp. 877-904, 2006.

Baldick, Ross, Udi Helman, Benjamin F. Hobbs, and Richard P. O'Neill, "Design of Efficient Generation Markets, *Proceedings of the IEEE*, Special Issue on Electric Power Systems: Engineering and Policy, 93(11), November 2005.

O'Neill, Richard P., Ross Baldick, Udi Helman, Michael H. Rothkopf, and William Stewart, "Dispatchable Transmission in RTO Markets," *IEEE Transactions on Power Systems*, 20, 1, 2005, 171-179. [IEEE PES Technical Committee Prize Paper Award]

Hobbs, Benjamin F., and Udi Helman, "Complementarity-Based Equilibrium Modeling for Electric Power Markets," in *Modeling Prices in Competitive Electricity Markets*, D. Bunn, Ed. Chichester: J. Wiley, 2004, pp. 69-98.

O'Neill, Richard P., Udi Helman, Ross Baldick, William Stewart, Michael Rothkopf, 2002, "Contingent Transmission Rights in the Standard Market Design," *IEEE Transactions on Power Systems*, 18, 4, 2003, pp.1331-1337.

O'Neill, Richard P., Udi Helman, Benjamin F. Hobbs, William R. Stewart, Jr., and Michael H. Rothkopf, "A Joint Energy and Transmission Rights Auction: Proposal and Properties," *IEEE Transactions on Power Systems*, 17, 4, 2002, pp.1058-1067.

O'Neill, Richard P., Michael H. Rothkopf, William R. Stewart, Jr., Udi Helman and Paul M. Sotkiewicz. 2001. "Regulatory Evolution, Market Design and the Unit Commitment Problem," Benjamin F. Hobbs, Michael H. Rothkopf and Richard P. O'Neill (eds.), *The Unit Commitment Problem in Electricity Markets*, Kluwer Press, 2001.

Helman, Udi, and Paul Sotkiewicz, “Market Design in the North Eastern U.S. Wholesale Electricity Markets: Events and Issues, 1999-2000.” Working paper, Division of the Senior Economic Advisor, OMTR, Federal Energy Regulatory Commission, 2000.

Hobbs, Benjamin, Udi Helman, Suradet Jitprapaikulsarn, Sreenivas Konda, and Dominic Maratukulam, “Artificial neural networks for short-term energy forecasting: Accuracy and economic value,” *Neurocomputing*, 23 (1998), pp. 71-84.

Hobbs, Benjamin, and Udi Helman. “Evaluation of Short-Term Gas Load Forecasts by Artificial Neural Net-Based Models.” Report for the Gas Research Institute. July 1997.

Helman, Udi, Benjamin Hobbs, and John Boland. “Fishery Resource Values Used for Damage Compensation in Maryland: Assessment of Need for Revisions.” Report to the Power Plant Research Program, Maryland Department of Natural Resources. Under Contract No. PR97-056-001. January 4, 1997.

Helman, Udi. “Sustainable Development: Strategies for Reconciling Environment and Economy in the Developing World, *The Washington Quarterly*, 18:4 (Autumn 1995), pp. 189-207.

U.S. Congress Office of Technology Assessment, *Fueling Reform: Energy Technologies for the Former East Bloc*. OTA-ETI-599 (Washington, DC: U.S. Government Printing Office, July 1994). (Udi Helman and Joy Dunkerely co-authored Ch. 7)

Helman, Udi. "Green Growth" (book review), *International Economic Insights*, September/October 1993.

U.S. Congress Office of Technology Assessment, *Energy Efficiency Technologies for Central and Eastern Europe*. OTA-E-562 (Washington, DC: U.S. Government Printing Office, May 1993). (author of Ch. 5)

(co-author) Center for Strategic and International Studies (CSIS), Putnam, Hayes & Bartlett, DRI/McGraw Hill, International Resources Group and the Brock Group, *Economic Effects of Alternative Climate Policies*. Washington, DC: CSIS et al., January 1991.

Helman, Udi. "Environment and the National Interest: An Analytical Survey of the Literature," *The Washington Quarterly*, 13, 4, Autumn 1990.

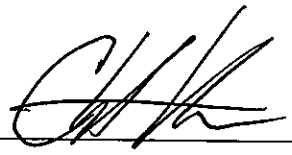
DECLARATION OF

Clint Helton

I, Clint Helton, declare as follows:

1. I am presently employed by CH2M HILL, Inc. as a Senior Technologist.
2. A copy of my professional qualifications and experience are attached hereto and incorporated herein by reference.
3. I helped prepare the attached testimony on Cultural Resources for the Hidden Hills Solar Electric Generating System project based on my independent analysis, supplements thereto, data from reliable sources, and my professional experience and knowledge.
4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue(s) addressed herein.
5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: January 7, 2013 Signed: 

At: Mission Viejo, CA

Clint Helton, RPA

Senior Cultural Resources/Cultural Heritage Specialist

Education

M.A., Anthropology, Brigham Young University
B.A., Language and Literature, University of Utah

Professional Registrations

Registered Professional Archaeologist (1999, No. 11280)

Distinguishing Qualifications

- 16 years of experience conducting environmental impact evaluations, with particular expertise in conducting cultural resources studies in California, Arizona, Nevada, and Utah
- Extensive experience in regulatory compliance, cultural resources, National Environmental Policy Act (NEPA) and National Historic Preservation Act (NHPA) compliance activities
- Highly experienced managing cultural resources studies for large linear utility, energy, and transportation projects
- International experience directing Cultural Heritage analysis as part of Environmental and Social Impact Assessment (ESIA) and World Bank and International Finance Corporation regulations.

Relevant Experience

Mr. Helton has more than 16 years of environmental management experience in the United States. He has a strong background in environmental impact evaluations, having directed technical studies; negotiated with lead agencies, responsible agencies and clients; and has written, edited, and produced a substantial number of environmental review and technical documents. Mr. Helton frequently acts as a senior technical advisor and senior reviewer for projects and clients throughout the United States, with particular expertise in Arizona, California, Nevada, and Utah.

His knowledge of regulatory compliance and cultural and paleontological resources enables him to manage National Environmental Policy Act (NEPA) and National Historic Preservation Act (NHPA) compliance activities and document preparation. Mr. Helton is a particularly skilled practitioner of federal regulations governing treatment of cultural resources, especially Section 106 of NHPA (36CFR800) and the Native American Graves Protection and Repatriation Act (NAGPRA) (43CFR10). Mr. Helton has significant expertise conducting consultation with State and Federal agencies, as well as facilitating formal government-to-government consultation with Native American groups and tribes throughout the western U.S. Mr. Helton has authored numerous environmental technical reports, cultural resources management plans, cultural resources studies, Programmatic Agreements, Memorandums of Understanding (MOU), and contributed to many NEPA documents for a variety of private and public sector clients.

Mr. Helton is experienced with the challenges of preparing environmental documentation for large linear utility and transportation projects and is familiar with the process and guidelines of the California Energy Commission (CEC) and Federal Energy Regulatory Commission (FERC), Western Area Power Administration (WAPA), Bureau of Land Management (BLM), US Forest Service, Bureau of Indian Affairs (BIA) among others.

Additionally, Mr. Helton has conducted Cultural Heritage environmental impact assessment and contributed as a Senior Advisor to technical teams for projects in Mexico, Saudi Arabia, Iraq and Algeria. Mr. Helton is also native-level bilingual in Spanish and has extensive knowledge of many Spanish-speaking countries; he performed graduate research in Mexico and Guatemala, studied at the University of Salamanca, Spain, and lived in central Chile.

Clint Helton, RPA

Representative Projects

United States

Historic Preservation Lead, EHP Review of HMGP Applications for FEMA Region IX in California: Currently leading historic preservation component of EHP review of HMGP grant applications in California for FEMA Region IX. Led completion of 6 Historic Property Findings Reports under Section 106 of the National Historic Preservation.

Cultural Resources Specialist, Phase I ESA, NEPA Documentation, and Environmental Studies Support for Facilities Expansion, CBP, TX, USACE Mobile District, AL: Preparation of 14 ESAs and 10 EAs. Led preparation of numerous cultural resources studies in support of NEPA EAs and Phase I Environmental Site Assessments in support of US Border Patrol facility expansion projects along the US/Mexico border. Included investigations for facilities in New Mexico, Texas, Arizona, and California. Received "Exceptional" rating for cultural resources study supporting Blythe, CA EA.

Cultural Resources Specialist, EA, Air Tour Management Plan for Volpe Center at Golden Gate National Recreation Area, San Francisco, CA: Cultural Resources Specialist, Environmental Assessment for an Air Tour Management Plan at Golden Gate National Recreation Area (GGNRA), Muir Woods National Monument, and Point Reyes National Seashore, California. Responsible for preparation of the Historic, Architectural, Archaeological, and Cultural Resources analysis at this National Park. There are a total of 739 documented historic structures within the GGNRA, including five National Historic Landmarks, 12 National Register-listed properties, and nine cultural landscapes. National Historic Landmarks comprise the Presidio, Fort Point, San Francisco Point of Embarkation, Alcatraz Island, and the San Francisco Bay Discovery Site.

Cultural Resources Specialist, Multi-Site EA, NEON, National Science Foundation, Nationwide; (AL, AZ, CA, CO, KS, MA, MD, MI, MN, NH, NM, FL, GA, OK, TX, WA, WI, VA) and Hawaii, Alaska, and Puerto Rico: Preparation of a multi-site EA. Provided overall management of a large national cultural resources study in support of NEPA EA. Analyzed environmental impacts of a large and comprehensive network of scientific infrastructure located in a variety of ecological zones designed to monitor environmental conditions and to provide data on climate change. Performed archival research, field visits, and coordination with applicable state archives and preparation of correspondence to multiple SHPOs. The project was completed on schedule and with minimal public comments.

Principal Investigator, U.S. Army National Guard Facility Redevelopment, Tustin, CA: Conducted an environmental review to specifically address potential impacts to historic properties for the Tustin US Army Reserve Center (USARC) Military Construction project. Since the Project has been defined as a federal undertaking, an assessment of potential impacts to historic properties is required, in compliance with Section 106 of the National Historic Preservation Act.

Team Principal, U.S. Navy Southwest Division Naval Facilities Engineering Command (NAVFACENGCOM), On-Call Cultural Resources Support, OR, WA, CA, AZ, NV, NM: Valued at over $15.1 million, Mr. Helton authored the winning proposal, and was the overall team leader for this multi-year contract to provide cultural resources services at all U.S. Navy facilities in Oregon, Washington, California, Arizona, Nevada, and New Mexico.

Principal Investigator, Cultural Resources Study for the Remediation Activity, Environmental Cleanup Activities and Demolition at National Aeronautics and Space Administration (NASA) Santa Susana Field Laboratory (SSFL), NASA Areas I and II, CA: Currently assisting NASA with preparation of a cultural resources study of the Santa Susana Field Laboratory in support of a NEPA EIS. Study includes analysis of prehistoric, historic, and architectural resources, outreach to Native Americans and consulting parties, and developing mitigation measures.

Senior Technical Advisor, Fort Douglas National Historic Landmark Archaeological Resources Management Plan, UT: CH2M HILL is completing a cultural resource investigation for the United States Army Reserve 88th Regional Support Command (88th RSC) to support an archaeological resource management plan that will set forth a comprehensive approach for assessing and managing the archaeological resources at Fort Douglas National Historic Landmark in Salt Lake City, Utah, in compliance with Section 106 of the National Historic Preservation Act (36CFR800). The plan will set forth a process for managing the surface and subsurface archaeological resources

that contribute to Fort Douglas' National Landmark status, while at the same time maintaining the Fort's operational mandate as part of the 88th RSC. The management plan will present a strategy for evaluation, management, and treatment of cultural resources.

Project Manager, Army National Guard Cultural Resources Support Contracts, UT: Managed cultural resources services from Army National Guard for all 29 facilities within the State of Utah. Primary goal was to assist National Guard with bringing facilities into compliance with Section 106 of NHPA. Managed archaeological survey, testing, and data recovery projects. Assisted with Native American consultation. Authored an Integrated Cultural Resources Management Plan (ICRMP) to assist the Guard in complying with Department of Defense Instructions 4715.3 and Army Regulation 200-4.

Historic Preservation Lead, EHP Review of HMGP Applications for FEMA Region IX in California: Currently leading historic preservation component of EHP review of HMGP grant applications in California for FEMA Region IX. Led completion of 6 Historic Property Findings Reports under Section 106 of the National Historic Preservation Act.

Task Manager, US Border Patrol; Customs and Border Protection, Facilities Expansion, Multiple Locations along United States Southern Border. Lead preparation of numerous cultural resources studies in support of NEPA Environmental Assessments and Phase I Environmental Site Assessments in support of US Border Patrol facility expansion projects along the US/Mexico border. Included investigations for facilities in New Mexico, Texas, Arizona, and California. Received "Exceptional" performance rating.

Task Manager/Principal Investigator, SolarReserve, Rice Solar Energy Project, San Bernardino County, California. Assisted with preparation of AFC for CEC in support of a large proposed solar power generation facility covering over 4,000 acres of land managed by the Bureau of Land Management in San Bernardino County, California. Lead Federal agency is WAPA and also included BLM coordination. Responsible for preparation of cultural resources component of project, including archival research, field surveys, report preparation, and conducting Native American consultation.

Project Principal; Parker to Blythe Transmission Line Project; Western Area Power Administration; Imperial County, California. Provided overall management of cultural resources services for the Parker-Blythe #1 161-kilovolt (kV) transmission line project. The inventory extended from Blythe, California, to Parker, Arizona. A total of 147 sites (136 in California and 11 in Arizona) were recorded.

Task Manager, BrightSource Energy, Ivanpah Solar Electric Generating System Project, San Bernardino County, California. Assisted with preparation of AFC for CEC in support of a large proposed solar power generation facility covering over 4,000 acres of land managed by the Bureau of Land Management in San Bernardino County, California. Responsible for preparation of cultural resources component of project, including archival research, field surveys, report preparation, and conducting Native American consultation.

Task Manager, Terra-Gen LLC Alta Wind Project, Kern County, California. Task Lead, quality control manager, and overall management of cultural resources studies for this 5,000-acre-plus alternative energy development project near the City of Tehachapi, Kern County, California. Provide regulatory guidance, regional technical expertise in cultural resources and coordination with Kern County. Supervised inventory for cultural resources, technical report preparation, and conducted Native American Consultation.

Task Manager, Iberdrola Renewables, Multiple Solar Energy Development Projects, Arizona, California, New Mexico, and Nevada. Led preparation of cultural resources assessments for solar power generation facilities in Arizona, New Mexico, Nevada, and California. Mr. Helton is acting as principal investigator for several critical issues analyses as well as full permit preparation of solar energy development projects in Arizona, California, Nevada, and New Mexico. Project acreages range from 5,800 acres to 35,000 acres.

Task Manager, PPM Energy, Solar Energy Development, Arizona, Nevada, California. Cultural resources assessments for solar power generation facilities in Arizona, Nevada, and California. Mr. Helton is acting as

principal investigator for literature searches and field visits for several proposed solar energy projects in Arizona, California, and Nevada. Project acreages range from 2,000 acres to 25,000 acres.

Senior Cultural Resources Specialist, Chevron Richmond Refinery Power Plant Replacement Project, Contra Costa County. Management of cultural resources studies for this major refinery facility reconfiguration and renewal project located in Richmond, California. The approximately 2,900-acre refinery occupies most of the Point San Pablo Peninsula. Responsible for preparation of cultural resources component of project, including field surveys, report preparation, and conducting Native American consultation.

Senior Cultural Resources Specialist, Turlock Irrigation District Almond 2 Power Plant, Stanislaus County, California. Task Lead and overall management of cultural resources studies for the construction of a simple-cycle peaking facility rated at a gross generating capacity of 174 megawatts. Responsible for preparation of cultural resources component of project, including field surveys, report preparation, and conducting Native American consultation. Approved as Designated Cultural Resources Specialist during construction phase of project.

Senior Cultural Resources Specialist, Russell City Energy Center, Calpine, Alameda County, California. Cultural Resources Specialist for the AFC license amendment for a 600-MW power plant located in Hayward, CA. Prepared cultural resources analysis including archival research, field survey, and report preparation. Approved as Designated Cultural Resources Specialist during construction phase of project.

Senior Cultural Resources Specialist, Mariposa Energy Project, Alameda County, California. Task Lead and overall management of cultural resources studies for the construction of a simple-cycle generating facility with a nominal capacity of 200-megawatts. Responsible for preparation of cultural resources component of project, including field surveys, report preparation, and conducting Native American consultation. Approved as Designated Cultural Resources Specialist during construction phase of project.

Project Manager; Sacramento Municipal Utility District (SMUD) Cosumnes Power Plant and Gas Pipeline Project, Environmental Compliance, Sacramento, CA. Managed interdisciplinary team of over 20 environmental specialists including archaeologists, biologists, and paleontologists during construction of 26-mile gas pipeline and associated power generation plant.

Senior Cultural Resources Specialist; Lodi Energy Center, NCPA, San Joaquin County, California. Cultural Resources Task Lead for the licensing of this 255-MW combined cycle power plant. Prepared cultural resources analysis including archival research, field survey, and report preparation. Approved as Designated Cultural Resources Specialist during construction phase of project.

Senior Cultural Resources Specialist; GWF Energy Tracy Combined Cycle Conversion Project, San Joaquin County, California. Task Lead and overall management of cultural resources studies for this conversion of an existing peaking plant to a combined-cycle baseload facility in San Joaquin County, California. Responsible for preparation of cultural resources component of project, including field surveys, report preparation, and conducting Native American consultation.

Designated Cultural Resources Specialist (CRS), Humboldt Bay Repowering Project, Humboldt County, California. Task Lead and California Energy Commission (CEC) approved Designated Cultural Resources Specialist (CRS) during construction of the Humboldt Bay Repowering Project (HBRP). The project consisted of construction of a load-following power plant consisting of ten natural-gas fired reciprocating engine-generator sets and associated equipment with a combined nominal generating capacity of 163 MW. The project repowers the existing 105 MW Humboldt Bay Power Plant Units 1 and 2. Responsible for ensuring implementation of the cultural resources Conditions of Certification (COCs) and Cultural Resources Monitoring and Mitigation Plan (CRMMP), directly supervising on-site construction monitors, reporting to the CEC's CPM and Cultural Resources Staff, and response to cultural resources discoveries during construction. Prepared Worker Environmental Awareness Program (WEAP) training material and ensured that compliance monitors, contractors, and construction crews met the requirements described in the projects COCs. Prepared daily and monthly reports, and a final monitoring report.

International

Senior Technologist/Task Leader, Punta Colonet Port Development, Baja, Mexico. Preparation of a management plan for cultural resources impact assessment for this proposed new port construction project in Baja, Mexico. Supervised preparation of subcontractor scope of work.

Senior Technical Advisor, SEIA for Two Seismic Surveys, Confidential Oil & Gas Client, Algeria. Cultural Heritage advisor for two Social and Environmental Impact Assessments (SEIA) for a seismic survey in the Zerafa block (22,000 km2) and Djebel Hirane-Reganne block (9,500 km2) in Algeria for a confidential oil & gas client.

Senior Technologist/Task Leader, ESIA for Confidential Clients, Iraq and Saudi Arabia. Cultural Heritage Lead for two Social and Environmental and Social Impact Assessments (ESIA).

Professional Organizations/Affiliations

Association of Environmental Professionals
Register of Professional Archaeologists
Society for American Archaeology
American Anthropological Association

Training and Certifications

CEQA Training
NEPA Training
Section 106/NHPA Training
U.S. Federal Antiquities Permits (Principal Investigator): Arizona, California, Colorado, Oregon, Washington, Utah, and Nevada

DECLARATION OF

Amy Hiss

I, Amy Hiss, declare as follows:

1. I am presently employed by CH2M HILL Engineers, Inc. as a Botanist/Wetland Ecologist.

2. A copy of my professional qualifications and experience are attached hereto and incorporated herein by reference.

3. I helped prepare the attached testimony on Botany for the Hidden Hills Solar Electric Generating System project based on my independent analysis, supplements thereto, data from reliable sources, and my professional experience and knowledge.

4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue(s) addressed herein.

5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: January 7, 2013 Signed: 

At: Sacramento, CA

Amy Hiss

Botanist and Wetland Ecologist

Education

M.A., Ecology and Systematic Biology, San Francisco State University
Recipient of Ledyard Stebbins Award for studies in Evolutionary Biology; recipient of Graduate Student Award for Distinguished Achievement in Biology
B.S., Botany, Humboldt State University
B.S., Environmental Biology, Humboldt State University

Distinguishing Qualifications

- Specializes in conducting and leading rare plant surveys, wetland delineations, and habitat mapping; conducting impact assessments; and preparing habitat mitigation and monitoring plans
- Experienced in preparing permit applications for a variety of agencies
- Experienced in preparing biological sections of environmental documents to fulfill CEQA, NEPA, and other resource agency requirements

Relevant Experience

Ms. Hiss has more than 20 years of experience in botany and wetlands ecology. She has conducted rare plant and noxious weed surveys and wetland delineations throughout much of California and southern Nevada. She is experienced in using GPS technology with submeter accuracy in the field to map findings and navigate to field sites. In addition, she prepares sections of CEQA documents, including AFCs, NEPA documents, and permits for USACE, RWQCB, and CDFG, mitigation and monitoring plans, and facilitates resource agency meetings.

Representative Projects

Hidden Hills Solar Electric Generating System, Inyo County, California. Senior botanist for botanical and noxious weed survey tasks: responsible for selecting qualified botanical team, and with team assistance, for planning the surveys and managing more than 10 botanists. Protocol-level botanical surveys were conducted within an approximately 3,300-acre site. Spring and late-season special-status plant surveys were also performed in offsite areas within San Bernardino and Inyo counties. In Nevada, special-status plant surveys were conducted within a 125-mile-long transmission line corridor for the Valley Electric Association (VEA). Several hundred populations of ten special status plants were observed during three years of surveys. With assistance from team, prepared botany section of the AFC and supplemental data requests.

Ivanpah Solar Electric Generating System, San Bernardino County, California. Senior botanist for the botany and noxious weed survey tasks: responsible for planning, preparation, contracting, mobilization, and management of more than 30 botanists. Protocol-level botanical surveys were conducted within an approximately 4,000-acre site. Several hundred populations of nine special status plants were observed during two years of surveys. Responsible for data QAQC of more than 6,000 GPS data points. With assistance from team, prepared botanical and other biology sections of the AFC and supplemental data requests. Assisted with waters of the U.S. delineation planning, data QAQC, and report preparation.

Confidential Solar Electric Generating System Client, Clark County, Nevada. Senior botanist for botanical and noxious weed survey tasks: responsible for planning, preparation, contracting, mobilization, and management of more than 30 botanists. Protocol-level botanical surveys were conducted within an approximately 4,000-acre site on BLM lands. Coordinated NEPA and survey documentation and survey requirements with an interdisciplinary team composed of BLM resource specialists and client project management team. Survey documentation efforts are currently ongoing.

Confidential Solar Power Energy Client, Riverside County, California. Senior Biologist for reconnaissance-level siting studies for two large solar power generating sites in eastern Riverside County, California. Special status

species occurrence was researched and assessed, and key biological resources issues that could constrain development, including sensitive natural communities and waters of the U.S., were identified. Results of the field surveys and literature review were used to recommend project redesign to minimize environmental impacts and mitigation costs.

Confidential Solar Power Energy Client, Kern County, California. Senior Biologist for reconnaissance-level siting study of three potential solar power generating sites in Kern County, California. Senior biologist for the team that assessed the likelihood of special status species occurrence and mapped the location of significant sensitive natural communities (including waters of the U.S.). Results of the field surveys and literature review were used to evaluate potential impacts to biological resources, including a core population of Mohave ground squirrel, a state-threatened species.

Confidential Solar Power Energy Client, Clark and Nye Counties, Nevada. Senior Biologist for reconnaissance-level siting study surveys for three potential solar power generating sites ranging in size from 4,000 to 21,000 acres. As part of a fatal flaws study, identified habitats present, including potential waters of the U.S., and assessed special status species occurrence. Advised client on the best site location to minimize environmental impacts and mitigation costs.

Northern Arizona FERC Relicensing Project. Responsible for identifying riparian plant species and collecting vegetation data. A sampling protocol was developed to explore the relationship between various stream flow regimes and soil moisture content in the riparian zone; the riparian vegetation community structure was analyzed relative to substrate. Botanical Surveys, Ashland to Medford, Oregon, PGT Gas Transmission Line Expansion Project. Conducted botanical surveys for this gas transmission line expansion project. During surveys of the approximately 100-mile-long linear corridor, seven special-status plant species were identified. One plant species, previously thought extirpated from Oregon, was identified within the project corridor. The locations of special-status plant species and plant community types within the project corridor were mapped using GPS, and all field information was imported to GIS for further data analysis.

96-mile Rock Creek-Rio Oso Transmission Line and Rock Creek Cresta Hydroelectric Project, PG&E. Project manager for a large habitat mapping effort. Habitat information was needed to fulfill requirements of an Additional Information Request (AIR) necessary to relicense the hydroelectric facility. Rare plant surveys were conducted concurrent with the habitat mapping effort. Identified more than 30 habitat types along the corridor. Managed the team that input vegetation and rare plant data into GIS to produce maps for the AIR submittal to the Federal Energy Regulatory Commission (FERC).

DECLARATION OF
JOHN JANSEN

I, John Jansen, declare as follows:

1. I am presently employed by Cardno Entrix as a Senior Hydrogeologist.
2. A copy of my professional qualifications and experience is attached hereto and incorporated by reference herein.
3. I helped prepare the attached portion of the Water Supply testimony for the Hidden Hills Solar Electric Generating System project based on my independent analysis and my professional experience and knowledge.
4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue(s) addressed herein.
5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: January 7, 2013 Signed: 

At: West Bend, WI

John R. Jansen, PhD

BrightSource Role
Hydrogeology

Current Position
Senior Geoscientist

Discipline Areas
> Aquifer testing
> Drilling technology
> Groundwater exploration
> Groundwater modeling
> Surface and borehole geophysics
> Sustainable resource development
> Water quality investigations
> Well & well field design
> Well rehabilitation
> Wellhead protection plans

Years' Experience
30

Joined Cardno
2009

Education
> PhD, Geological Sciences, University of Wisconsin, Milwaukee, 1995
> MS, Geological Sciences, University of Wisconsin, Milwaukee, 1983
> BS, Geology, University of Wisconsin, Milwaukee, 1981

Professional Registrations
> Professional Geologist: Wisconsin, Indiana, Delaware, Wyoming, Minnesota, Illinois, Arizona
> Registered Geophysicist: California

Affiliations
> Advisory Council on Water Investigations, Congressional Appointment, Member, 2006-present
> Association of Groundwater Scientists

www.cardnoentrix.com
www.cardno.com

Summary of Experience

Dr. Jansen is a Senior Managing Hydrogeologist with 30 years of experience in his field. He has broad experience in groundwater resource development, engineering and environmental geophysics, groundwater modeling, and wellhead protection. He previously worked nationally as an independent groundwater consultant and as the senior geoscientist for an international well construction contractor. He has conducted more than 200 ground water resource investigations throughout the US and Mexico. He is the author of numerous publications and presentations on groundwater-related topics, including the borehole geophysics section in the third edition of Groundwater and Wells, and holds three patents on well rehabilitation, horizontal drilling, and in-situ radium treatment. He is the 2013 NGWA McEllhiney Distinguished Lecturer in Water well Technology and the 2012 recipient of the NGWA Keith A. Anderson Award. He has been an expert witness in several water resource cases.

Significant Projects

Permitting

Hidden Hills Solar Energy Generating Station, Inyo County, CA
Dr. Jansen is conducting a series of pumping tests and reports to support the permit application for the Hidden Hills Solar Energy Generating Station for BrightSource Energy. He is assisting in the negotiations of permit conditions and a monitoring program to allow the operation of a groundwater source from Pahrump Groundwater Basin from the California Energy Commission.

Death Valley, Inyo County, CA
Dr. Jansen directed a series of gravity, magnetic, and Time Domain Electromagnetic Induction surveys in Death Valley National Park to map subsurface geology between Yucca Mountain and Death Valley and to determine the geologic factors controlling the location of several major springs along the eastern side of Death Valley. The surveys were conducted to support a regional ground water flow study being conducted by the Hydrodynamics Group for Inyo County. The study is attempting to document the continuity of a carbonate aquifer system from Yucca Mountain to Death Valley. The geophysical work indicated that that springs appeared to be related to faults and are supplied by a regional flow system. The interpretation has been independently supported by aeromagnetic data from the USGS and geochemical analysis of the spring water by the Hydrodynamics Group. Two deep monitoring wells were drilled on the basis of our geophysical surveys to measure the head and water quality in the carbonate aquifer in the western Amargosa Valley.

Haile Gold Mine, Kershaw, SC
Dr. Jansen is the groundwater lead for a third party EIS of the proposed Haile Gold Mine near Kershaw, SC being conducted for the USACE. John is reviewing pumping tests and a groundwater model prepared by the applicant to determine the probable impacts to the groundwater system and groundwater dependent ecosystems and identify methods to monitor and mitigate any impacts.

Groundwater Modeling

Troy Bedrock Valley Aquifer Model, Waukesha and Walworth Counties, WI
Dr. Jansen was the project manager and primary modeler to develop a regional groundwater model of the Troy Bedrock Valley Aquifer in southeastern Wisconsin. The model was funded by a consortium of municipal water utilities under the direction of the

and Engineers Division of the National Groundwater Association, Board of Directors, 2004-2007
> Environmental and Engineering Geophysics Society, Board of Directors, 1998-2000
> USGS Cooperative Water Program, External Review Task Force Member, 2004-2006
> Wisconsin Ground Water Association, Vice President, 1988, 1989

local regional planning agency. The model was designed to provide a common platform to assess surface water and groundwater impacts from a number of well fields planned as part of a regional water supply plan. The model is in the public domain and available to municipal water utilities, environmental groups, and the public to perform independent groundwater modeling for planning purposes and to evaluate potential environmental impacts of planned well fields.

Groundwater Model of the Muskego Landfill, Muskego, WI

Dr. Jansen represented the City of Muskego in negotiations with the PRP, the USEPA, and the Wisconsin Department of Natural Resources to delineate the extent of a vinyl chloride plume in the City's main aquifer from the Muskego Landfill, a NPL Superfund Site. As part of the negotiations, Dr. Jansen convinced all parties to install additional down gradient monitoring wells. Dr. Jansen managed the construction of a groundwater flow model of a complex glacial aquifer system around the landfill to determine the risk to existing and future municipal wells. The negotiations resulted in an increased monitoring plan with provisions for emergency treatment to protect the municipal wells.

Wellhead Protection Planning –Marquette County, MI

Working with Wilcox Engineers, Dr. Jansen managed a project to complete a wellhead protection plan for the former K.I. Sawyer Air Force Base, as part of the Sawyer International Business Center development for Marquette County, Michigan. Dr. Jansen helped prepare an analysis of the groundwater flow system of the aquifer supplying the well field as well as updating and validating an existing MODFLOW model of the aquifer and delineated wellhead protection areas for the well field. The report included recommendations for further development of the well field that avoid potential contamination threats to the existing wells.

Gogebic Range Water Authority

Working with Wilcox Engineers, Dr. Jansen managed a project to complete a wellhead protection plan for the Gogebic Range Water Authority. The study included analysis of a pumping test for two sand and gravel wells. The data was used to construct a three-dimensional MODFLOW model of the well field with particular attention to a confining unit separating two sand and gravel aquifers. The study delineated the capture zone of the well field and identified a critical recharge area for the well field. The analysis indicated that the well field had a very limited recharge area and was susceptible to drought. Based on the analysis, a decision was made not to expand the well field but to locate future wells in areas with more recharge and more reliable capacity.

Geophysical Investigations

Electrical Resistivity Tracer Test at the L31 Canal, Everglades National Park

Dr. Jansen conducted two electrical resistivity surveys to map three dimensional flow of a KBr tracer through the Biscayne Aquifer adjacent to the levee at the L-30 Seepage Management Pilot Project (L-30 SMPP) site in Miami-Dade County, Florida for the USACOE Jacksonville District. The study measured groundwater flow velocities in excess of 150 ft/day through distinct flow conduits in the aquifer. The study also included the installation of four monitoring wells in Water Conservation Area 3B and the installation of three horizontal flow meters.

Orange County Water District, Orange County, California

Dr. Jansen conducted an electrical resistivity and TEM survey for OCWD on the Seal Beach Naval Base. The purpose of the survey was to map zones of saline water in the coastal groundwater basin migrating through the Sunset Gap. The project. The survey mapped brackish and saline water in a layered aquifer system to depths of approximately 1,200 feet. The results of the survey will be used to evaluate the extent of sea water intrusion and evaluate mitigation options.

Water Replenishment District of Southern California

In 2006 and 2008, Dr. Jansen directed a TEM and resistivity survey for WRD in Los

Angeles County. The purpose of the survey was to map zones of saline water in the coastal groundwater basin. The project was complicated by the highly developed urban area which required modified field procedures to collect useful data. The survey identified zones of brackish and saline water in a layered aquifer system to depths of approximately 1,000 feet. Limited test drilling and water sampling completed to data has confirmed the interpretation of the survey results. Business reference name and phone number:

Geophysical Survey to Estimate Groundwater Flux Trough the Harper-Hinckley Gap, Hinckley Valley, California

Dr. Jansen directed a study in 2007 for the Mojave Water Agency (MWA) to identify the geometry and hydraulic properties of the Harper-Hinkley Gap (the gap). The gap is a shallow depression on the regional bedrock surface in the Hinkley. This study used seismic refraction to map the depth to bedrock in the gap area and electrical resistivity methods to estimate composition and hydraulic properties of the saturated unconsolidated material above bedrock. The geometry of the gap as derived from the geophysical methods was used with the regional water table maps and published estimates of the hydraulic conductivity of the saturated unconsolidated materials to calculate the groundwater flux through the gap using standard Darcy analysis.

Death Valley, Inyo County, California

Dr. Jansen directed a series of gravity, magnetic, and Time Domain Electromagnetic Induction surveys in Death Valley National Park to map subsurface geology between Yucca Mountain and Death Valley and determine the geologic factors controlling the location of several major springs along the eastern side of Death Valley. The surveys were conducted to support a regional ground water flow study being conducted by the Hydrodynamics Group for Inyo County, California. The study is attempting to document the continuity of a carbonate aquifer system from Yucca Mountain to Death Valley. The geophysical work indicated that the springs appeared to be related to faults and are supplied by a regional flow system. The interpretation has been independently supported by aeromagnetic data from the USGS and geochemical analysis of the spring water by the Hydrodynamics Group. Two deep monitoring wells were drilled on the basis of our geophysical surveys to measure the head and water quality in the carbonate aquifer in the western Amargosa Valley.

Mojave Water Authority, Apple Valley, California

Dr. Jansen helped design and implement a geophysical investigation to define the subsurface characteristics and hydraulic properties of the aquifer system in the Oro Grande Wash area for the Mojave Water Agency (MWA) as part of a feasibility study for an artificial recharge project. The study used electrical resistivity and Time Domain Electromagnetic Induction surveys to map the distribution of sand and gravel units and clay perching layers down to depth of about 1,000 feet. The results of the survey were used to evaluate groundwater recharge options and select optimal locations for recharge basins.

City of Monclova, Coahuila, Mexico

A comprehensive ground water resources evaluation was conducted for city of over 300,000 people. The study included constructing potentiometric surface and structural geologic maps, photo-geologic analysis and field mapping. Hydrologic and topographic data were used to estimate recharge and sustainable yield for the mountain valleys. A magnetotelluric survey was conducted to map local structures and identify drilling targets to depths of over 3,000. Two wells were drilled that provide an additional supply of ten million gallons per day of high quality water.

Waukesha Water Utility, Wisconsin - Well Siting Study

Description: Sand and gravel aquifer well siting study consisting of geologic reconnaissance, geophysical exploration, and test borings to identify new municipal well sites for the Waukesha Water Utility in Waukesha, Wisconsin. The geophysical surveys consisted of seismic refraction, electrical resistivity and TEM soundings using an EM47. Results: The most favorable area within the City limits of siting shallow aquifer wells has

been identified. Three wells were drilled on the basis of exploration project that yield a combined total of 2,200 gpm.

DECLARATION OF

CLAY JENSEN

I, Clay Jensen, declare as follows:

1. I am presently employed by BrightSource Energy, Inc, as a Senior Director of Project Development.

2. A copy of my professional qualifications and experience is attached hereto and incorporated by reference herein.

3. I helped prepare the attached portion of the Alternatives testimony for the Hidden Hills Solar Electric Generating System project based on my independent analysis and my professional experience and knowledge.

4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue(s) addressed herein.

5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: January 7, 2013

Signed: 

At: Las Vegas, Nevada

DECLARATION OF

CLAY JENSEN

I, Clay Jensen, declare as follows:

1. I am presently employed by BrightSource Energy, Inc, as a Senior Director of Project Development.

2. A copy of my professional qualifications and experience is attached hereto and incorporated by reference herein.

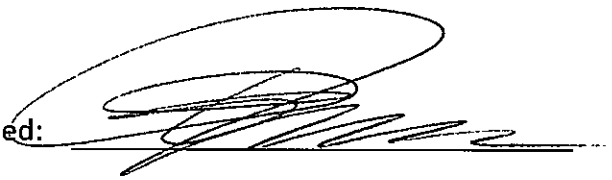
3. I helped prepare the attached portion of the Land Use testimony for the Hidden Hills Solar Electric Generating System project based on my independent analysis and my professional experience and knowledge.

4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue(s) addressed herein.

5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: January 7, 2013

Signed: 

At: Las Vegas, Nevada

DECLARATION OF
CLAY JENSEN

I, Clay Jensen, declare as follows:

1. I am presently employed by BrightSource Energy, Inc, as a Senior Director of Project Development.

2. A copy of my professional qualifications and experience is attached hereto and incorporated by reference herein.

3. I am adopting the attached portion of the Project Description testimony for the Hidden Hills Solar Electric Generating System project based on my independent analysis and my professional experience and knowledge.

4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue(s) addressed herein.

5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: January 7, 2013

Signed: 

At: Las Vegas, Nevada

DECLARATION OF

CLAY JENSEN

I, Clay Jensen, declare as follows:

1. I am presently employed by BrightSource Energy, Inc, as a Senior Director of Project Development.

2. A copy of my professional qualifications and experience is attached hereto and incorporated by reference herein.

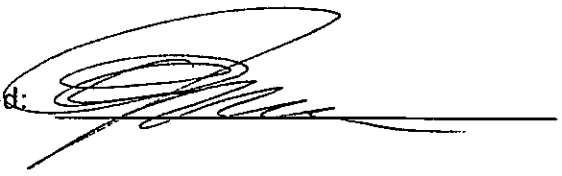
3. I helped prepare the attached portion of the Socioeconomics testimony for the Hidden Hills Solar Electric Generating System project based on my independent analysis and my professional experience and knowledge.

4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue(s) addressed herein.

5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: 1/16/13

Signed: 

At: Las Vegas

DECLARATION OF

CLAY JENSEN

I, Clay Jensen, declare as follows:

1. I am presently employed by BrightSource Energy, Inc, as a Senior Director of Project Development.

2. A copy of my professional qualifications and experience is attached hereto and incorporated by reference herein.

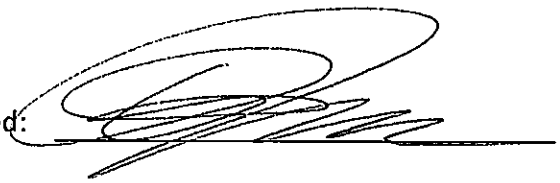
3. I am adopting the attached portion of the Transmission System Engineering testimony for the Hidden Hills Solar Electric Generating System project based on my independent analysis and my professional experience and knowledge.

4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue(s) addressed herein.

5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: January 7, 2013

Signed: 

At: Las Vegas, Nevada

Clay Jensen, P.E., M.B.A, LEED AP
700 Sethfield Place
Las Vegas, Nevada 89145
(702) 363-6225 (H)
(702) 556-0600 (C)

Education

Bachelor of Science, Civil Engineering, May 1996
University of Nevada, Las Vegas

Master's Business Administration, December 2001
University of Nevada, Las Vegas

Employment

June 2009 - Present
BrightSource Energy, Las Vegas, Nevada
Senior Director of Project Development
Responsible for identifying and advancing land positions for a portfolio of Large Scale Solar projects within Nevada, California and Northern Arizona. Responsible for all Development Activities associated with the 3200acre 500MW Hidden Hills SEGS. The HHSEGS project includes the development and permitting efforts associated with a 65-mile transmission project serving the Pahrump Valley, NV. Serve on key advisory committees to the Nevada Legislature and the Large Scale Solar Association. Opened Brightsource Las Vegas Office and manage day to day business activities.

January 2007 - June 2009
Wingfield Nevada Group, Las Vegas, Nevada
Executive Vice President of Development & Construction
Responsibilities included design, entitlements, market analysis and construction of the 42,000 acre Coyote Springs Masterplan. This Masterplan includes 14,000 acres land dedicated to renewable energy development. Worked with BrightSource energy to secure land lease terms, conduct feasibility efforts and identify key infrastructure services. Established strong relationships with key government officials, local contractors and key stakeholders which help support the development process for multiple commercial facilities, multi-family product designs, utility projects and major civil infrastructure. For full information please visit http://www.coyotesprings.com.

December 2004 - January 2007
Landtek, LLC (Focus Property Group Affiliate), Las Vegas, Nevada *Project Manger*
Responsibilities included overseeing a team of professionals through entitlement, engineering design, and commencement of

construction for the Inspirada Master Plan in Henderson, Nevada. Responsible for the creation and maintenance of the six year project schedule, $387 million infrastructure budget, and resulting project cash flow. Provided direction to numerous consultants and created processes and procedures to communicate information to owners/builders. The Inspirada Master Plan is a 1900+ acre New Urbanism Mixed Use Community which will eventually include a 300 Commercial Town Center, 15,000 residential units, full scale programmable parks and multiple recreation facilities. For full information please visit http://www.inspirada.com.

September 2001-
December 2004

City of Henderson, Public Works, Nevada
Project Engineer 1I
Managed the design and construction of numerous major infrastructure projects including water, sewer, power, storm drain, open channels, roadways and bridges. Established aggressive schedules and budgets to keep up with a rapidly growing population during a time of low municipal resources.

April 1997-
September 2001

City of Henderson, Public Works, Nevada
Project Engineer 1
Examine civil improvement plans for compliance to water, sewer and off-site construction standards. Review and coordinate master-planned communities major infrastructure improvements including water and sewer transmission mains, reservoirs and pumping stations. Serve as Public Works representative at the City of Henderson Planning Commission.

June 1996-
April 1997

Hunsaker and Associates, Las Vegas, Nevada
Project Supervisor
Supervised the design and construction of multiple projects under the supervision of three registered Professional Engineers. Managed a team of four individuals in the design of commercial, multi-family and single-family projects throughout the Las Vegas valley. Design included grading, utility design, plan and profiles sheets and horizontal control.

April 1996-
July 1996

VTN Nevada, Las Vegas, Nevada
Staff Engineer
Performed hydrology and hydraulic studies for multiple projects around the Las Vegas valley. Designed drainage structures, storm sewer systems and channels to handle a 100-year storm event. Analyzed water pressure systems to verify minimum flow requirements under various conditions.

August 1994-

City of Henderson, Public Works, Nevada

April 1996 — *Contracted Plans Checker*
Examined improvement plans for compliance to water, sewer and off-site construction standards. Reviewed improvement plans to ensure compliance with approved tentative maps for street R.O.W. and utility easements. Computed fees for building permits for commercial, multi-family and single-family developments.

April 1994-
August 1994 — **WMK (CRS) Materials**, Las Vegas, Nevada
Soils Analyst
Engineering materials testing including concrete cylinders, gradation analysis, water content and compaction testing. Primary responsibility included validating quality of concrete being used in various major structures in the Las Vegas area.

Professional Affiliation

- Urban Land Institute (ULI)
- Large Scale Solar Association (LSA)
- Greater Las Vegas Association of Realtors (GLVAR)
- Southern Nevada Home Builders Association (SNHBA)
- American Society of Civil Engineers (ASCE)
- American Public Works Association (APWA)

Registration

E.I.T., April 1995 (No.2911 Nevada)
Nevada P.E., No 14316
LEED Accredited Professional
Nevada Real Estate License, 54804
References available upon request

DECLARATION OF
SÖNKE JOHNSEN, Ph.D.

I, Sönke Johnsen, declare as follows:

1. I am presently employed by Duke University as a Professor of Biology.
2. A copy of my professional qualifications and experience are attached hereto and incorporated herein by reference.
3. I prepared the attached testimony on avian flux for the Hidden Hills Solar Electric Generating System project based on my independent analysis, supplements thereto, data from reliable sources, and my professional experience and knowledge.
4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue(s) addressed herein.
5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: 1/2/13 Signed: 

At: Durham, NC

Sönke Johnsen

Education:

University of North Carolina at Chapel Hill: Ph.D., Biology, 1996, "The Optical Design of the Photic System of Ophiuroids" Dr. William M. Kier, advisor.	1990-1996
Swarthmore College: B.A. with Distinction, Mathematics, 1988, Phi Beta Kappa and National Merit Scholarship.	1984-1988

Professional experience:

Professor, Biology Department, Duke University, Durham, NC.	2012-
Research Associate, Smithsonian Museum of Natural History	2012-2015
Adjunct Professor, Nicholas School of the Environment, Duke University	2003-
Associate Professor, Biology Department, Duke University, Durham, NC.	2007-2012
Assistant Professor, Biology Department, Duke University, Durham, NC.	2001-2007
Adjunct Scientist, Woods Hole Oceanographic Institution.	2002-2005
Assistant Scientist, Woods Hole Oceanographic Institution.	2000-2001
Postdoctoral Scholar, Woods Hole Oceanographic Institution, Dr. Laurence P. Madin, advisor.	1999-2000
Postdoctoral Fellow, Harbor Branch Oceanographic Institution, Dr. Edith A. Widder, advisor.	1997-1998
Lecturer, Department of Biology, University of North Carolina at Chapel Hill.	1996-1997
National Science Foundation Pre-Doctoral Fellow, Department of Biology, University of North Carolina at Chapel Hill.	1991-1994

Awards, honors, and fellowships:

Paul Illg Distinguished Lecturer, Friday Harbor Laboratories	2010
Schmidt-Nielsen Memorial Lecturer, Duke University	2010
University Distinguished Teaching Award, Duke University	2006
Julius Thomas Hansen Lecturer, University of California, Berkeley	2005
George A. Bartholomew Award for Research in Comparative Physiology, Society for Integrative and Comparative Biology.	2001
Woods Hole Postdoctoral Scholarship, Woods Hole Oceanographic Institution.	1999-2000
Harbor Branch Postdoctoral Fellowship, Harbor Branch Institution.	1997-1998
Campus-Wide Dissertation Award, University of North Carolina at Chapel Hill.	1996
Dissertation Improvement Award, National Science Foundation.	1994-1995
Pre-Doctoral Fellowship, National Science Foundation.	1991-1994
Merit Fellowship, University of North Carolina at Chapel Hill.	1990-1991

Research grants (other PIs not listed):

"Dynamic Camouflage in Benthic and Pelagic Cephalopods: An interdisciplinary approach to crypsis based on color, reflection, and bioluminescence" 2009-2014
Office of Naval Research $7,341,938
(lead-PI)

"Bioluminescence in the Deep-sea Benthos" 2009-2010
NOAA Ocean Exploration, $424,807
(= $81,607 + 11 days ship/submersible time at $31,200/day).
(one of five PIs with equal roles)

"Midwater animal models: Optical measurement of metabolic transitions in transparent pelagic biota", National Science Foundation, ~$650,000 2009-2012
(one of two PIs with equal roles)

"Deep Down Under: Exploration of Australia's deep waters" 2007-2009
ARC and private support (~$500,000 USD and 3 years of ship and submersible time) (many coPIs)

"Operation Deep-Scope 2007: Characterization of cliff ecosystems using new technologies" NOAA Ocean Exploration, $361,500 2007-2008
(= $55,500 + 12 days ship/submersible time at $25,500/day).
(lead-PI)

"Selective invisibility based on the differing temporal resolutions of sea turtles and billfish under low light conditions" 2005-2006
NOAA/NMFS, $15,306.
(Sole PI)

"Operation Deep-Scope 2005" 2005-2006
NOAA Ocean Exploration, $328,905 (= $44,705 + 14 days ship/submersible time at $20,300/day).
(one of five PIs with equal roles)

"Transparency: ultrastructural and biochemical modification in muscular and ocular tissues" National Science Foundation, $410,000. 2005-2008
(one of two PIs with equal roles)

"Mathematical model of the visual abilities of sea turtles and pelagic fishes" 2003-2004
NOAA/NMFS, $39,470.
(sole PI)

"Characterization of deep-sea communities using advanced optical techniques" 2004
NOAA Ocean Exploration, $296,377 (= $52,777 + 12 days

ship/submersible time at $20,300/day).
(one of five PIs with equal roles)

"Integrative and Comparative Vision Research" 2003
National Science Foundation, $6,000.
(one of three PIs with equal roles)

"Perception of bioluminescent signals underwater" 2002-2003
Office of Naval Research, $12,004.
(sole PI)

"Biologically Inspired Underwater Navigation Based on Geomagnetism" 2002-2003
Office of Naval Research, $99,956.
(one of two PIs with equal roles)

“Development of a Large Area Plankton Imaging System” 2002-2004
National Science Foundation, $499,820.
(one of two PIs with equal roles in proposal,
but left WHOI before project began)

“Development of a Portable Underwater Hyperspectral Radiometer”, 2000-2002
Cecil H. and Ida M. Green Technology Foundation, $30,700.
(lead PI)

“Eutrophication in Waquoit Bay: Effects on Visual Predation”, 2000-2001
Rinehart Coastal Research Center, $31,792.
(Lead PI)

Books:

Cronin, T. W., Johnsen, S., Marshall, N. J. and E. J. Warrant (in prep: ¾ written). *The Ecology of Vision.* Princeton University Press.

Johnsen, S. (2012). *The Optics of Life: A Biologist’s Guide to Light in Nature.* Princeton Univeristy Press. **(reviewed positively in *Physics Today*, *Current Biology* and other journals)**

Publications:

Johnsen, S. and Kier, W. M. (in prep). Ultrastructural correlates of transparency in the glass catfish *Kryptopterus minor*.

Sweeney, A., A. Holt, S. Johnsen and D.E. Morse (in prep) Natural camouflage in the infrared? Predators and prey in the ocean’s far-red Raman glow.

Johnsen, S., Marshall, N. J., and T. W. Cronin (in prep: half-written). Through the looking glass: Polarization vision versus transparency and mirror-based camouflage in the open sea.

Johnsen, S., Matz, M. V. S, and N. J. Marshall (in prep: half-written). The optics and ecology of animal fluorescence.

Speiser, D. I., Gagnon, Y., Chhetri, R. K., Oldenburg, A. L., and S. Johnsen (in prep: half-written). Live imaging with optical coherence tomography (OCT) reveals that both scallop retinas receive spatial information.

Muchhala, N., Johnsen, S. and S. D. Smith (in prep: half-written). A phylogenetic perspective of floral divergence within communities of *Iochroma* (Solanaceae).

Gagnon, Y., Sweeney, A. M., Speiser, D. I., Morse, D. E. and S. Johnsen (in prep: written). Coherent fluorescence in the lenses of the deep-sea fish *Chlorophthamlus*.

Zylinski, S., Gagnon, Y., Gross, T., Wheeler, J. and S. Johnsen (in prep: half-written). *Octopus bimaculoides* substrate choice: hierarchy and interactions between visual and tactile information.

Costello, M. J., Chauss, D., Mohamed, A., Gilliland, K. O., Johnsen, S., Bates, M., Brennan, L. A., and M. Kantorow (in review). Autophagy and Mitophagy in the Ocular Lens. *Journal of Cell Science.*

Brandley, N. C., Speiser, D. I., and S. Johnsen (in review). Eavesdropping on visual secrets. *Evolutionary Ecology.*

Moore, B. A., Kamilar, J. M., Collin, S. P., Bininda-Emonds, O. R. P., Dominy, N. J., Hall, M. I., Heesy, C. P., Johnsen, S., Lisney, T. J., Loew, E. R., Moritz, G., Nava, S. S., Warrant, E. J., Yopak, K. E., and E. Fernández-Juricic (in review). Are all vertebrate retinas configured the same? Implications for the evolution of acute vision. *Proc. R. Soc. Lond. B.*

Jaffe, J. S., Simonet, F., Laxton, B., Roberts, P. L. D., Zylinski, S., Johnsen, S., and A. Sweeney (in review). Omni-Cam and the Sub Sea Holodeck: Systems for recording *in-situ* radiance and simulating underwater optical environments in the lab. *Mar. Tech. Soc. J.*

Tedore, C. A., and S. Johnsen (in review). Trade-offs between visual recognition speed and accuracy in the jumping spider *Lyssomanes viridis*. *Journal of Experimental Biology.*

Zylinski, S. and S. Johnsen (in press). Visual cognition in deep-sea cephalopods: what we don't know and why we don't know it. *In*: Cephalopod Cognition, Editors: S. Darmaillacq and J. Mather.

Moore, B. A., Kamilar, J. M., Collin, S. P., Bininda-Emonds, O. R. P., Dominy, N. J., Hall, M. I., Heesy, C. P., Iwaniuk, A. N., Johnsen, S., Lisney, T. J., Loew, E. R., Moritz, G.,

Nava, S. S., Warrant, E. J., Yopak, K. E., and E. Fernández-Juricic (2012). A novel method for comparative analysis of retinal specialization traits from topographic maps. *Journal of Vision* **12**, 1-24.

Costello, M. J., Burette, A., Weber, M., Metlapally, S., Gilliland, K. O., Fowler, W. C., Mohamed, A., and S. Johnsen (2012). Electron tomography of fiber cell cytoplasm and dense cores of multilamellar bodies from human age-related nuclear cataracts. *Experimental Eye Research* **101**, 72-81.

Johnsen, S., Frank, T. M., Haddock, S. H. D., Widder, E. A., and C. G. Messing (2012). Light and vision in the deep-sea benthos. I. Bioluminescence at 500-1000 m depth in the Bahamian Islands. *Journal of Experimental Biology* **215**, 3335-3343. **(featured article)**

Frank, T. M., and S. Johnsen (2012). Light and vision in the deep-sea benthos. II. Special visual adaptations in deep-sea benthic crustaceans. *Journal of Experimental Biology* **215**, 3344-3353. **(featured article)**

Nilsson, D. E., Warrant, E. J., Johnsen, S., Hanlon, R. T., and N. Shashar (2012). A unique advantage for giant eyes in giant squid. *Current Biology* **22**, 683-688. **(featured article)**

Baldwin, J. L., and S. Johnsen (2012). The male blue crab, *Callinectes sapidus*, uses both chromatic and achromatic cues during mate choice. *Journal of Experimental Biology* **215**, 1184-1191.

Tedore, C. A., and S. Johnsen (2012). The function of male-male threat displays in the jumping spider *Lyssomanes viridis*. *Behavioural Processes* **89**, 203-211.

Zylinski, S. and S. Johnsen (2011). Mesopelagic cephalopods switch between transparency and pigmentation to optimize camouflage in the deep. *Current Biology* **21,** 1937-1941. **(cover and featured article)**

Marshall, N. J. and S. Johnsen (2011). Camouflage in Marine fish. In *Animal Camouflage: Current issues and new perspectives*. Cambridge University Press: Cambridge UK.

Baldwin, J. L., and S. Johnsen (2011). The effects of molting on the visual acuity of the blue crab *Callinectes sapidus. Journal of Experimental Biology.* **214**, 3055-3061.

Jackson, E. and S. Johnsen (2011). Orientation to objects in the sea urchin *Strongylocentrotus purpuratus* depends on apparent and not actual object size. *Biological Bulletin (Woods Hole)* **220,** 86-88.

Holt, A., Sweeney, A. M., Johnsen, S., and D. E. Morse (2011). A highly-distributed Bragg stack with unique geometry provides effective camouflage for Loliginid squid eyes. *Proceedings of the Royal Society: Interface* **8,** 1386-1399. **(cover article)**

Speiser, D. I., Eernisse, D. and S. Johnsen (2011). Chitons eye have calcitic lenses and provide spatial vision. *Current Biology* **21**, 665-670.

Sweeney, A. M., Boch, C. A., Johnsen, S., and D. E. Morse (2011). Twilight spectral dynamics and the coral reef invertebrate spawning response. *Journal of Experimental Biology* **214**, 770-777. **(featured article)**

Bhandiwad, A., and S. Johnsen (2011). The effects of salinity and temperature on the transparency of the grass shrimp *Palaemonetes pugio*. *Journal of Experimental Biology* **214**, 709-716.

Shashar, N., Johnsen, S., Lerner, A., Sabbah, S., Chiao, C-C., Mäthger, L. M., and R. T. Hanlon (2011). Underwater linear polarization- physical limitations to biological functions. *Philosophical Transactions of the Royal Society of London, Series B* **366**, 649–654.

Johnsen, S., Marshall, N. J., and E. A. Widder (2011). Polarization sensitivity as a contrast enhancer in pelagic predators: Lessons from *in situ* polarization imaging of transparent zooplankton. *Philosophical Transactions of the Royal Society of London, Series B* **366**, 655–670. **(cover article)**

Speiser, D. I., Loew, E. R., and S. Johnsen (2011). Spectral sensitivity of the concave mirror eyes of scallops: The influence of habitat and longitudinal chromatic aberration. *Journal of Experimental Biology* **214,** 422-431.

Costello, M. J., Johnsen, S., Frame, L., Gilliland, K. O., Metlapally, S., and D. Balasubramanian (2010). Multilamellar spherical particles as potential sources of excess light scattering in human age-related nuclear cataracts. *Experimental Eye Research* **91,** 881-889.

Yerramilli, D., and S. Johnsen (2010). Spatial vision in the purple sea urchin *Strongylocentrotus purpuratus* (Echinoidea). *Journal of Experimental Biology* **213**, 249-255. **(cover and featured article)**

Baldwin, J. L., and S. Johnsen (2009). The importance of color in mate choice in the blue crab *Callinectes sapidus. Journal of Experimental Biology* **212**, 3762-3768.

Leech, D. M. and S. Johnsen (2009). Light, Biological Receptors. In *Encyclopedia of Inland Waters*, (ed. G. E. Likens). Vol 2, pp 671-681.

Speiser, D. I., and S. Johnsen (2008). Comparative morphology of the mirror-based eyes of scallops (Pectinoidea). *American Malacological Bulletin* **26**: 27-34. **(cover article)**

Matz, M. V., Frank, T. M., Marshall, N. J., Widder, E. A., Johnsen, S. (2008) Giant deep-sea protist produces bilaterian-like traces. *Current Biology* **18**: 1849-1854.

Costello, M. J., Johnsen, S., Gilliland, K. O., Metlapally, S., Ramamurthy, B., Krishna, P. V., Balasubramanian, D. (2008) Ultrastructural analysis of damage to nuclear fiber cell

membranes in advanced age-related cataracts from India. *Experimental Eye Research.* **87**: 147-158.

Speiser, D. I., and S. Johnsen (2008). Scallops visually respond to the presence and speed of virtual particles. *Journal of Experimental Biology.* **211**: 2066-2070.

Metlapally, S., Costello, M. J., Gilliland, K. O., Ramamurthy, B., Krishna, P. V., Balasubramanian, D., and S. Johnsen (2008). Analysis of nuclear lens fiber cell cytoplasmic texture in advanced cataractous lenses from Indian subjects using Debye-Bueche theory. *Experimental Eye Research.* **86**: 434-444.

Gilliland, K. O., Johnsen, S., Metlapally, S., Costello, M. J., Ramamurthy, B., Krishna, P. V. and D. Balasubramanian (2008). Mie Light Scattering Calculations for Multilamellar Bodies in Indian Age-Related Nuclear Cataracts. *Molecular Vision* **14**: 572-582.

Johnsen, S., and K. J. Lohmann (2008). Magnetoreception in animals. *Physics Today.* **61(3)**: 29-35.

Gagnon, Y. L., Shashar, N., Warrant, E. J., and S. Johnsen (2007). Light scattering from pelagic zooplankton: measurements at different angles and modeling corresponding sighting distances. *Journal of Experimental Biology* **210**: 3728-3735.

Sweeney, A., Haddock, S. H. D., and S. Johnsen (2007). Comparative visual acuity of coleoid cephalopods. *Integrative and Comparative Biology* **47**: 808-814.

Johnsen, S., Mattern, E., and T. Ritz (2007). Light-dependent magnetoreception: quantum catches and opponency mechanisms of possible photosensitive molecules. *Journal of Experimental Biology* **210**: 3171-3178.

Martin, C. H. and S. Johnsen (2007). A Field Test of the Hamilton-Zuk Hypothesis in the Trinidadian guppy (*Poecilia reticulata*). *Behavioral Ecology and Sociobiology* **61**: 1897-1909.

Johnsen, S. (2007). Does new technology inspire new directions? Examples drawn from pelagic visual ecology. *Integrative and Comparative Biology* **47**: 799-807.

Cummings, M. M. and S. Johnsen (2007). Light in the rocky shores. Pp. 327-331 in *Encyclopedia of Tidepools and Rocky Shores*, (M. Denny and S. Gaines Eds.), University of California Press.

Sweeney, A. M., Des Marais, D. L., Ban, Y. A. and S. Johnsen (2007). Evolution of Graded Refractive Index in Squid Lenses. *Journal of the Royal Society Interface* **4**: 685-698.

Costello, M. J., Johnsen, S., Gilliland, K. O., Freel, C. D., and C. Fowler (2006). Predicted light scattering from particles observed in human age-related nuclear cataracts using Mie scattering theory. *Investigative Ophthalmology and Visual Science.* **48**: 303-312.

Leech, D. and S. Johnsen (2006). UV vision and the Feeding Ecology of Juvenile Bluegill Sunfish, *Lepomis machrochirus*. *Canadian Journal of Fisheries and Aquatic Sciences*. **63**: 2183-2190.

Tuthill, J. and S. Johnsen (2006) Polarization sensitivity in the red swamp crayfish *Procambarus clarkii* enhances the detection of moving transparent objects. *Journal of Experimental Biology*. **209**:1612-1616.

Johnsen, S., Kelber, A., Warrant, E. J., Sweeney, A. M., Lee, R. H. Jr., Hernández-Andrés, J. (2006). Crepuscular and nocturnal illumination and its effects on color perception by the nocturnal hawkmoth *Deilephila elpenor*. *Journal of Experimental Biology* **209**: 789-800 **(cover and featured article)**.

Johnsen, S. and K. J. Lohmann (2005). The physics and neurobiology of magnetoreception. *Nature Reviews Neuroscience* **6**: 703-712 (invited review).

Johnsen S. (2005). Visual ecology on the high seas. *Marine Ecology Progress Series* **287**: 281-285 (invited article).

Johnsen, S. (2005). The red and the black: Bioluminescence and the color of animals in the deep sea. *Integrative and Comparative Biology* **45**: 234-246. (invited article).

Blevins, E., and S. Johnsen (2004). Spatial vision in the echinoid genus *Echinometra*. *Journal of Experimental Biology* **207**: 4249-4253.

Gilliland, K. O., Freel, C. D., Johnsen, S., Fowler, C., and M. J. Costello (2004). Distribution, spherical structure and predicted Mie scattering of multilamellar bodies in human age-related nuclear cataracts . *Experimental Eye Research* **79**: 563-576.

Marsili, S., Salganik, R. I., Albright, C. D., Freel, C. D., Johnsen, S., Peiffer, R. L., and M. J. Costello (2004). Cataract formation in a strain of rats selected for high oxidative stress. *Experimental Eye Research*. **79**: 595-612.

Johnsen, S. and H. M. Sosik (2004). Shedding light on light in the ocean. *Oceanus* **43**: 24-28. (invited article).

Johnsen, S., Widder, E. A., and C. D. Mobley (2004). Propagation and perception of bioluminescence: factors affecting the success of counterillumination as a cryptic strategy. *Biological Bulletin* **207**: 1-16.

Johnsen, S. (2003). Lifting the cloak of invisibility: the effects of changing optical conditions on pelagic crypsis. *Integrative and Comparative Biology* **43**: 580-590.

Johnsen, S., and K. J. Lohmann (2003). Neurobiology of magnetoreception. In *Encyclopedia of Neuroscience 3rd Edition* (G. Adelman, B. H. Smith eds.), Elsevier Science, New York. (invited review)

Sweeney, A. M., Jiggins, C., and S. Johnsen (2003). Polarized light as a butterfly mating signal. *Nature* **423**: 31-32.

Johnsen, S. and H. M. Sosik (2003). Cryptic coloration and mirrored sides as camouflage strategies in near-surface pelagic habitats: implications for foraging and predator avoidance. *Limnology and Oceanography* **48**: 1277-1288.

Avens, L., Wang, J., Johnsen, S., Dukes, P., and K. J. Lohmann (2003). Responses of hatchling sea turtles to rotational displacements. *Journal of Experimental Marine Biology and Ecology* **288**: 111-124.

Leech, D. and S. Johnsen (2003). Avoidance and UV vision. Pp. 455-484 in *UV Effects in Aquatic Organisms and Ecosystems*, (W. Helbling, H. Zagarese eds.), Royal Society of Chemistry, London. (invited review)

Johnsen, S. (2002). Cryptic and conspicuous coloration in the pelagic environment. *Proceedings of the Royal Society of London: Biological Sciences* **269**: 243-256. (cover article)

Johnsen, S. (2001). Hidden in plain sight: the ecology and physiology of organismal transparency. *Biological Bulletin* **201**: 301-138. (invited review and cover article)

Johnsen, S., and E. A. Widder (2001). Ultraviolet absorption in transparent zooplankton and its implications for depth distribution and visual predation. *Marine Biology* **138**: 717-730.

Widder, E. A., and S. Johnsen (2000). 3D spatial point patterns of bioluminescent plankton: a map of the minefield. *Journal of Plankton Research* **22**: 409-420.

Johnsen, S. (2000). Transparent animals. *Scientific American* **282**(2): 62-71.

Lohmann, K. J., and S. Johnsen (2000). The neurobiology of magnetoreception in vertebrate animals. *Trends in Neurosciences* **23**: 153-159. (invited review)

Widder, E. A., Johnsen, S., Bernstein, S. A., Case, J. F., and D. J. Neilson (1999). Thin layers of bioluminescent copepods found at density discontinuities in the water column. *Marine Biology (Berlin)* **134**: 429-437.

Johnsen, S., and E. A. Widder (1999). The physical basis of transparency in biological tissue: ultrastructure and the minimization of light scattering. *Journal of Theoretical Biology* **199**: 181-198.

Johnsen, S., and W. M. Kier (1999). Shade-seeking behavior under polarized light by the brittlestar *Ophioderma brevispinum*. *Journal of the Marine Biological Association of the United Kingdom* **79**: 761-763.

Johnsen, S., Balser, E. J., and E. A. Widder (1999). Light-emitting suckers in an octopus. *Nature* **398**: 113-114. **(cover article)**

Johnsen, S., Balser, E. J., Fisher, E. C., and E. A. Widder (1999). Bioluminescence in the deep-sea cirrate octopod *Stauroteuthis syrtensis* Verrill (Mollusca: Cephalopoda). *Biological Bulletin (Woods Hole)* **197**: 26-39.

Johnsen, S., and E. A. Widder (1998). The transparency and visibility of gelatinous zooplankton from the north west Atlantic and Gulf of Mexico. *Biological Bulletin (Woods Hole)* **195**: 337-348. **(cover article)**

Johnsen, S., and W. M. Kier (1998). Damage due to solar ultraviolet radiation in the brittlestar *Ophioderma brevispinum* (Echinodermata: Ophiuroidea). *Journal of the Marine Biological Association of the United Kingdom* **78**: 681-684.

Johnsen, S., and E. A. Widder (1998). The transparency and visibility of gelatinous zooplankton. Proceedings of the Fourteenth Conference of the Ocean Optics Society, Kailua-Kona, HI, USA.

Widder, E. A., and S. Johnsen (1998). Optical imaging, identification and 3D analysis of spatial distribution patterns of bioluminescent plankton. Proceedings of the Fourteenth Conference of the Ocean Optics Society, Kailua-Kona, HI, USA.

Johnsen, S. (1997). Identification and localization of a possible rhodopsin in the echinoderms *Asterias forbesi* (Asteroidea) and *Ophioderma brevispinum* (Ophiuroidea). *Biological Bulletin (Woods Hole)* **193**: 97-105.

Johnsen, S. (1994). Extraocular sensitivity to polarized light in an echinoderm. *Journal of Experimental Biology* **195**: 281-291.

Smith, A. M., Kier, W. M., and S. Johnsen (1993). The effect of depth on the attachment force of limpets. *Biological Bulletin (Woods Hole)* **184**: 338-341.

Johnsen, S., and W. M. Kier (1993). Intramuscular crossed connective tissue fibers: skeletal support in the lateral fins of squid and cuttlefish. *Journal of Zoology (London)* **231**: 311-338.

Kauffman, S. A., and S. Johnsen (1991). Coevolution to the edge of chaos: Coupled fitness landscapes, poised states and coevolutionary avalanches. *Journal of Theoretical Biology* **149**: 467-505.

Kauffman, S. A., and S. Johnsen (1991). Co-evolution to the edge of chaos. Pp. 325-369 in *Artificial Life II, SFI Studies in the Sciences of Complexity* vol. X (C. Langton, C. Taylor, J. Farmer, S. Rasmussen eds.) Addison-Wesley, New York.

First author presentations at meetings:

American Society of Zoologists Annual Meeting, Atlanta, GA, (with W. M. Kier).	1991
American Society of Zoologists Annual Meeting, Vancouver, BC,	1992
American Society of Zoologists Annual Meeting, Los Angeles, CA.	1993
American Society of Zoologists Annual Meeting, St. Louis, MO.	1995
American Society of Zoologists Annual Meeting, Washington, DC.	1995
Society for Integrative and Comparative Biology Annual Meeting, Albuquerque, NM.	1996
Fourteenth Annual Ocean Optics Meeting, Kona-Kailua, HI, (with E. A. Widder).	1998
Society for Integrative and Comparative Biology Annual Meeting, Denver, CO,	1999
Society for Integrative and Comparative Biology Annual Meeting, Atlanta, GA.	2000
Society for Integrative and Comparative Biology Annual Meeting, Chicago, IL.	2001
Society for Integrative and Comparative Biology Annual Meeting, Anaheim, CA.	2002
Society for Integrative and Comparative Biology Annual Meeting, Toronto, CA.	2003
Society for Integrative and Comparative Biology Annual Meeting, New Orleans, LA.	2004
Society for Integrative and Comparative Biology Annual Meeting, San Diego, CA.	2005
Society for Integrative and Comparative Biology Annual Meeting, Orlando, FL.	2006
Society for Integrative and Comparative Biology Annual Meeting, Phoenix, AZ.	2007
9th International meeting on Light and Color in Nature, Bozeman, MT.	2007
Society for Integrative and Comparative Biology Annual Meeting, San Antonio, TX.	2008
2nd International Conference on Invertebrate Vision, Bäckaskog Castle, Sweden	2008
Society for Integrative and Comparative Biology Annual Meeting, Boston, MA.	2009
Society for Integrative and Comparative Biology Annual Meeting, Seattle, WA.	2010
Society for Integrative and Comparative Biology Annual Meeting, Salt Lake City, UT.	2011
Society for Integrative and Comparative Biology Annual Meeting, Charleston, SC.	2012
Society for Integrative and Comparative Biology Annual Meeting, San Francisco, CA.	2013

Invited presentations:

University of Utah, Salt Lake City, UT.	1998
Harbor Branch Oceanographic Institution, Fort Pierce, FL.	1998
Woods Hole Oceanographic Institution, Woods Hole, MA.	1999
Monterey Bay Aquarium and Research Institute, Moss Landing, CA.	1999
University of Florida, Gainesville, FL.	1999
Yale University, New Haven, CT.	2000
Oregon State University, Corvallis, OR.	2000
Wellesley College, Wellesley, MA.	2000

Boston University Marine Program, Woods Hole, MA.	2000
Duke University, Durham, NC.	2001
Mount Holyoke College, South Hadley, MA.	2001
Marine Biological Laboratory, Woods Hole, MA.	2001
Duke University Marine Laboratory, Beaufort, NC.	2001
Bartholomew Award Lecture, Anaheim, CA	2002
University of Maryland, Baltimore Campus, MD.	2002
University of North Carolina at Chapel Hill.	2002
Colloquium for Physical Ecology of Organisms, Roscoff, France.	2002
Swarthmore College Sigma Xi, Swarthmore, PA.	2002
University of Oregon, Coos Bay, OR.	2002
Defense Science Research Council, Washington, DC.	2003
University of Lund, Sweden.	2003
National Eye Institute, Bethesda, MD.	2003
Bartholomew Award Recipients Symposium, New Orleans, LA.	2004
North Carolina State University, Raleigh, NC.	2004
Photonics Center, Duke University	2004
Georgia Tech University, Atlanta, GA.	2004
University of Lund Sensory Ecology Symposium, Sweden.	2004
University of Rhode Island, Kingston, RI	2004
Julius Thomas Hansen Lecture (grad-invited), UC-Berkeley	2005
University of Bergen, Norway	2005
Conference Jacque Monod, Roscoff, France	2005
Rochester Institute of Technology, NY	2006
Wake Forest University, NC	2006
Lund University, Sweden	2006
North Carolina State University (Physics Department)	2006
University of South Carolina, Columbia, SC (grad-invited)	2007
University of North Carolina at Wilmington (grad-invited)	2007
Duke University Marine Laboratory, Beaufort, NC.	2007
Whitney Marine Lab, University of Florida	2007
Old Dominion University, VA (Math Department)	2007
University of North Carolina at Chapel Hill (Biochemistry Dept.)	2008
Polarization Conference, University of Queensland, Australia	2008
University of North Carolina at Chapel Hill (Dept. of Environmental Sci.)	2008
Cornell University, Ithaca, NY	2008
University of Lund Sensory Ecology Symposium, Sweden.	2008
National Intelligence Council, Washington, DC	2009
University of California at Davis	2009
Bodega Bay Marine Laboratory, CA	2009
University of Exeter, United Kingdom	2009
University of Texas at Austin (ONR Workshop)	2009
University of Toronto, Canada	2010
Duke University (Knut Schmidt-Nielsen Memorial Lecture)	2010
University of Pennsylvania, Philadelphia, PA	2010
Janelia Farm, Howard Hughes Medical Institute, Ashburn, VA	2010

Friday Harbor Laboratories, Seattle, WA (Paul Illg Memorial Lectures)	2010
University of North Carolina at Chapel Hill (Medical School)	2010
University of Lund Sensory Ecology Symposium, Sweden.	2010
Scripps Institute of Oceanography, La Jolla, CA (ONR Workshop)	2010
Harvard University, Cambridge, MA	2010
University of North Carolina at Chapel Hill (Math Dept)	2011
Ithaca College, Ithaca, NY	2011
Undersecretary of Defense, Washington, DC	2011
Army Research Laboratory, Washington, DC	2011
Chairman of the Joint Chiefs of Staff, US Department of Defense	2012
Monterey Bay Aquarium and Research Institute, Moss Landing, CA	2012
Hopkins Marine Station, Stanford University, Pacific Grove, CA	2012
Tenth International Congress on Neuroethology, College Park, MD	2012
Plenary talk at Ocean Optics XXI, Glasgow, Scotland	2012
University of Lund Sensory Ecology Symposium, Sweden	2012
Washington University, St. Louis, MO (upcoming: January 31st)	2013
University of California, Santa Barbara (upcoming: April 1st)	2013
Scripps Institution of Oceanography, La Jolla, CA (upcoming: April 4th)	2013
Iowa State University, Ames, IA (upcoming: September 24th)	2013

Undergraduates, Graduate Students, Postdoctoral Students:

Dr. Dina Leech:	postdoctoral student, now an assistant professor at DePauw University
Dr. Sandra Cooke:	postdoctoral student, now an assistant professor at High Point University
Dr. Sarah Zylinski:	postdoctoral student, now an assistant professor at Leeds University
Dr. Yakir Gagnon:	postdoctoral student
Dr. Christine Bedore:	postdoctoral student (arrives March 1st, 2013)
Dr. Karin Akre:	postdoctoral student (arrives April 1st, 2013)

Alison Sweeney:	graduate student, NSF Predoctoral and James B. Duke Fellow, now an assistant professor at the University of Pennsylvania
Daniel Speiser:	graduate student, NSF Predoctoral and James B. Duke Fellow, now a postdoc at the University of California at Santa Barbara
Jamie Baldwin:	graduate student, EPA STAR Fellowship (declined), now a postdoc at the Smithsonian Museum of Natural History
Cynthia Tedore:	graduate student, NSF Predoctoral and James B. Duke Fellow, will be a postdoc at Lund University in Sweden in Fall 2013
Nicholas Brandley:	graduate student, James B. Duke Fellow
Laura Bagge:	graduate student
Katie Thomas:	graduate student

On committees of: Larisa Avens (UNC), Jon Cohen (NSOE), Ed Venit, Kim Rosvall, Lisa Mangiamele (UNC), Andrij Horodysky (College of William & Mary), Robin Hopkins, Kriti Sharma, Brian Powell, David Steinberg, Courtney Endres (UNC), Tanya Kossler, Fay-Wei Li, David Ernst (UNC)

Undergraduates supervised: Shu Ying Kwan, Emily Pearce, Erin Blevins, Dahl Clark, Christopher Martin, Danielle Cornielle, Cirse Gonzalez, John Tuthill (Swarthmore College), Nicolas Lessios, Rebecca Fink, Lauren Cooke, Divya Yerramilli, Sebastian Larion, Teresa Gross, Dylan Wainwright, Lindsay Gaskins, Amy Taggart

High School students supervised: Sarah Fann (North Carolina School of Science and Math), John Thiele

Professional service and societies:

Editorial Board: *Cell Reports, Aquatic Biology, Bioinspiration & Biomimetics*

Reviewer for: *American Journal of Physics, Applied Optics, Aquaculture, Aquaculture Research, Behavioral Ecology and Sociobiology, Behavioral Processes, Bioelectromagnetics, Biological Bulletin, Biological Journal of the Linnean Society, Biology Letters, Canadian Journal of Zoology,* ***Current Biology****, Current Zoology, Deep Sea Research I, Environmental Biology of Fishes, Ethology, Evolution, Evolution: Education and Outreach, Frontiers in Zoology, HFSP Journal, Investigative Ophthalmology and Visual Science, Journal of Comparative Neurology, Journal of Comparative Physiology, Journal of Ethology, Journal of Experimental Biology, Journal of Fish Biology, Journal of Insect Physiology, Journal of the Optical Society of America A, Journal of Plankton Research, Journal of the Marine Biological Association of the United Kingdom, Marine Biology, Marine Ecology Progress Series, Limnology and Oceanography, Limnology and Oceanography Methods, Molecular Biology and Evolution,* ***Nature****, Naturwissenschaften, Oecologia, Oikos, Optics Express, Physical Biology, Physiological Entomology, Physiology and Behavior, PLOS one, Proceedings of the Royal Society: Interface,* ***Proceedings of the National Aacademy of Sciences****,* ***Proceedings of the Royal Society of London: Series B****, Psychonomic Bulletin and Review,* ***Science****, Scientific Reports (Nature), Trends in Ecology and Evolution, US Navy Journal of Underwater Acoustics, Vision Research*

National Science Foundation
National Institutes of Health
Air Force Office of Scientific Research
Department of Energy
MacArthur Foundation
National Geographic Society
Israeli Science Foundation
Marsden Fund, New Zealand

Organizer: "Integrative and Comparative Vision Research", Symposium for Annual Meeting of the Society for Integrative and Comparative Biology, Toronto, January 2003 (with Mason Posner and Todd Oakley). Editor of proceedings.

"Integrative Biology of Pelagic Invertebrates ", Symposium for Annual Meeting of the Society for Integrative and Comparative Biology, Phoenix, January 2007 (with Alison Sweeney)

Participant: "Evolutionary Shifts in Vertebrate Visual Ecology and Visual System Morphology", NESCent working group, Durham, NC, 2009-2011

Societies: Sigma Xi
Society for Integrative and Comparative Biology
Optical Society of America

committees:

Biology Department Admissions committee	2002
Nominating committee, Society for Integrative and Comparative Biology	2002
Scientific Advisory Board, Molecular Sciences Building	2002
Biology Department Computer Committee	2002-04
Bartholomew award committee, SICB	2002-04
Organismal Physiologist Search Committee, UNC-Chapel Hill	2003
Nominating committee, SICB	2003
Biology Department Curriculum committee	2003-06
Biology Department DCMB Faculty Search Committee	2003-04
Biology Department Executive Steering Committee	2004
Duke/UNC Oceanographic Consortium Program Advisory Committee	2004-
Biology Department ADUS evaluation committee	2005
Structure/Function Core course design committee	2005-06
Biology Department Teaching Consultation committee	2005-
Biology Department Performance Review Committee	2006-09
Honors Thesis Committee, Biology Department	2007
Biology-Global Health Faculty Search Committee	2007
Neuroscience Major Formation Committee	2007-
Executive Committee of the Graduate Faculty	2008-
Co-chair, Neurobiology and Behavior Search, Biology Department	2008-09
Biology Department Executive Steering Committee	2008-
Chair, re-appointment committee for Manuel Leal	2009
member, re-appointment committee for Nina Sherwood	2010
member, tenure committee for David Sherwood	2011

Officer:

member-at-large, Society for Integrative and Comparative Biology	2006-07
Director of Graduate Studies, Biology Department	2008-

Faculty advisor: Duke Postdoctoral Association 2007-

Advisory Board: Zoological Lighting Institute 2012-

Research presented in and interviews given to: *Science, Science News, New Scientist, Physics Today, Scientific American, Discover Magazine, New York Times, MSNBC, BBC, National Geographic, Voice of America, CBC Radio, ABC News, Boston Globe, Pixar (for* Finding Nemo*),* The Magic Treehouse *children's book series, and the poetry of John Updike* (along with dozens of lesser-known media outlets)

Lay Presentations: *approximately 10 presentations in the past five years*

DECLARATION OF

ALICE KARL

I, ALICE KARL, declare as follows:

1. I am presently the principal and sole proprietor of Alice E. Karl and Associates.

2. A copy of my professional qualifications and experience is attached hereto and incorporated by reference herein.

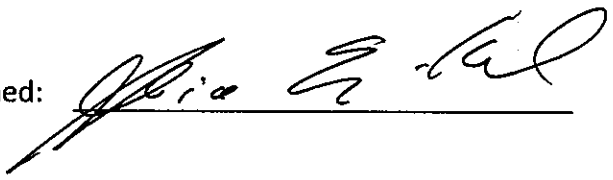
3. I am adopting the attached portion of the Biological Resources testimony regarding the Desert Tortoise analysis and translocation for the Hidden Hills Solar Electric Generating System project based on my independent analysis and my professional experience and knowledge.

4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue(s) addressed herein.

5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: January 7, 2013

Signed: 

At: Davis, California

ALICE E. KARL, Ph.D.

ALICE E. KARL & ASSOCIATES, INC.
P.O. Box 74006
Davis, California 95617
Phone: (530) 666-9567 (office) (530) 304-4121 (cell) FAX: (612) 465-4822 E-mail: heliophile@mindspring.com

Alice has been an environmental consultant since 1978 and is the principal for the firm Alice E. Karl & Associates, which qualifies for and has been certified as a woman-owned business. She has an extensive knowledge of the arid southwest, having worked continually in the southwestern deserts of the United States and Mexico for nearly 35 years. She has also completed biological surveys in the coastal ranges of California and the Central and San Joaquin valleys. She is a highly experienced botanist, herpetologist, small-mammalogist, and a recognized desert tortoise authority. She holds permits that allow her to conduct all activities on desert tortoises (e.g., handle tortoises, apply transmitters, collect blood for health analyses) and conduct independent Mohave Ground Squirrel trapping. She also holds a California scientific collecting permit.

Alice conducts field surveys on special-status species, assists with project permitting, conducts research and monitors construction. She regularly organizes and leads large crews to conduct the necessary biological resource surveys for projects, but also is contracted as a reviewer for other firms' biological surveys and reports. Agency coordination and permitting is a critical component of her projects and she works with agency biologists and project proponents in an efficient and scientifically credible manner to develop conservation-oriented, practical and feasible project design and mitigation measures. Research has included long-term and geographically extensive projects on (a) desert tortoise reproduction, translocation, population viability, and habitat relationships; (b) rare plants; (c) vertebrate community relationships; and (d) sampling methods, especially for desert tortoise.

In addition to being an accomplished field biologist, crew chief, and project manager, Alice has worked with agency biologists to develop protocols for desert tortoise surveys, translocation, handling, and other procedures. She has developed a sampling technique for estimating tortoise densities over large areas (TRED), which is currently being employed on large military projects. She has also contributed to several area-wide plans (West Mojave Plan, Northern and Eastern Colorado Desert Plan, Clark County HCP).

MAJOR TASK CATEGORIES

- Special-status species surveys
- Mitigation and monitoring plan development
- Permitting (ESA, CESA, CEQA, HCPs, BAs, 2081, 1603, 404, SMARA)
- Agency coordination and workshops
- Designated Biologist/Authorized Biologist
- Scientific research

SPECIAL-STATUS PLANTS and REVEGETATION

- Principal botanist for numerous rare plant surveys in the Mojave, Colorado and Great Basin deserts (California and Nevada), the Tehachapi Mountains, Sonora (Mexico), and the Central and San Joaquin valleys
- Thousands of quantitive plant transects in many desert, subtropical, and forest habitats, using multiple sampling techniques for biomass, density, frequency, vigor, percent cover, etc.
- Extensive knowledge of Mojave and Colorado Desert flora and habitats
- Restoration and revegetation plans and investigations throughout the Mojave, Colorado and Great Basin deserts and northern California
- Wetlands delineation

DESERT TORTOISE

- Recognized desert tortoise authority, with over 34 years experience studying desert tortoises in California, Nevada, Utah, and western Arizona; habitat specialist
- 2 advanced degrees involving desert tortoises
- Holds own handling and research permits from the USFWS and the California Department of Fish and Game
- Author of or contributor to many desert tortoise translocation plans and tortoise permitting documents for solar and other projects
- Designed and implemented three desert tortoise translocation projects, including one of the largest and longest desert tortoise research projects to date - approximately 130 tortoises were telemetered for 10

years to study reproduction, growth, home range, burrow use, dispersal within the context of forage production, size and gender
- Instructor for Desert Tortoise Council Technical Workshops and telemetry use; train construction employee groups and tortoise monitors for construction projects
- Over 25 Bureau of Land Management (BLM)-type trend plots or other mark-recapture plots for population studies and >3000 transects to assess relative densities
- Impacts assessment, mitigation development - numerous projects
- Development of TRED sampling model for region-wide and fine-grained density estimates, used for both the Fort Irwin and the MCAGCC Twentynine Palms base expansions.
- Construction monitoring and development of monitoring protocol
- Contributor to development of methodologies for USFWS survey and handling protocols
- A primary reviewer of USFWS original listing package for desert tortoises
- Contributor to Clark County Habitat Conservation Plan, West Mojave Plan, and Northern and Eastern Colorado Coordinated Management Plan

OTHER WILDLIFE
- Extensive knowledge of southwestern reptile and amphibian fauna
- Extensive small-mammal (rodents) trapping studies in California, Nevada and Arizona, including Mohave ground squirrel and other special-status rodents.
- Survey, research, and permitting experience with the following listed species: Valley elderberry longhorn beetle, Shasta salamander (permitted), Tehachapi slender salamander, San Joaquin kit fox
- Burrowing owl surveys and mitigation
- Numerous bird surveys in desert habitat.
- Mojave ground squirrel - permitted to conduct trapping

PERMITS HELD
- Federal 10(a)(1)(A) for Desert Tortoise (permit in Alice Karl's name) (TE 746058-11)
- State MOU for Desert Tortoise
- California Scientific Collection Permit (SC001368)
- Mohave Ground Squirrel trapping (Authorized field Investigator on W. Vanherweg permit)

EDUCATION

Ph.D., Ecology - University of California, Davis. January 1998. Dissertation: Reproductive strategies, growth patterns, and survivorship of a long-lived herbivore inhabiting a temporally variable environment.

M.S., Biology - California State University, Northridge. 1982. Thesis: The distribution, relative densities, and habitat associations of the desert tortoise, *Gopherus agassizii*, in Nevada.

PROJECT LIST

PROJECT MANAGER and/or SOLE/LEAD BIOLOGIST:

Military Projects

Twentynine Palms Marine Corps Air Ground Combat Center (MCAGCC), Twentynine Palms, California. 2009- ongoing. Directed and conducted desert tortoise, special-status animal, rare plant and habitat surveys to support impacts analysis for potential base expansion and to revise management on base. Over 3000 TRED tortoise transects plus other surveys. Consultant to NREA, MCAGCC.

Nellis Air Force Base, Las Vegas and Tonopah, California. 2005 - ongoing. Surveys for rare plants on the Nellis North Training Ranges. Consultant to Nellis AFB, Las Vegas, Nevada.

Fort Irwin Expansion Project, Barstow, California. 2002-2003. Authored all desert tortoise sections for the Fort Irwin Expansion Biological Assessment. Initial plan for translocation studies for translocation of several hundred tortoises from the expansion area. Contracted to Charis Corporation, Temecula, California.

Fort Irwin Expansion Project, Barstow, California. 1998-2003. Developed and tested methods to quantitatively assess population levels and impacts to desert tortoises from proposed land expansion. Included mark-recapture plots (1998, 2001, 2002) and new methodology for region-wide, quantitative population assessments. Consultant to Charis Corporation, Temecula, California (1999-2002) and Chambers Group, Irvine, California (1998).

Desert Scimitar (U.S. Marine Corps), 2001. BA for training exercise from Colorado River to *Twentynine Palms Marine Corps Air Ground Combat Center*

Twentynine Palms Marine Corps Air Ground Combat Center (MCAGCC), Twentynine Palms, California. 1996-7. Consultant on desert tortoise issues for housing area expansion. Consultant to Merkel and Associates, San Diego, California.

U. S. Air Force MX Missile Project, Coyote Springs Valley, Nevada. Summer, l981. Intensive field survey (300 transects) of potential facility site to determine the relative densities of the desert tortoise. For Biosystems Analysis, Inc., San Francisco, California.

Miscellaneous Projects

Hyundai Motor America Mojave Test Track, western Mohave Desert, California. 2003 - ongoing. Wrote and/or reviewed permitting documents, including HCP. Wrote and conducted 5-year translocation plan and study. Assessed compensation properties. Consultant to Hyundai Motor America, California City, California.

Sonoran Desert Tortoise Project, Sonora, Mexico. 2005- ongoing. Ecology and genetics study of the desert tortoise in Sonora, Mexico. Field work includes continuous cohort of over 20 telemetered tortoises since 2005, habitat analyses, habitat use analyses, genetics, health assessments.

Unnamed Housing Project, Lancaster, California. 2007. Mohave ground squirrel protocol trapping. Consultant to Sundance Biology, Inc., Paso Robles, California.

San Diego County Water Authority, 2002 - 2005. Technical consultant for biological issues relating to Quantification Settlement Agreement water transfer on Colorado River. Consultant to Greystone Environmental Consultants, Sacramento, California.

Los Angeles County Sanitation District Palmdale Water Reclamation Plant, Palmdale, California. 2003. Agency meetings, survey protocol development and surveys for desert tortoise presence and impacts; surveys for burrowing owl; Mohave ground squirrel trapping; habitat assessment for special-status plants. Consultant to Environmental Science Associates, Oakland, CA.

Los Angeles County Sanitation District, Lancaster, California. 2002. Surveys of proposed pipeline for special-status plants and animals. Special-status plants and animals of greatest concern included desert tortoise, Mohave ground squirrel, burrowing owl, alkali mariposa lily, Lancaster milk-vetch. Consultant to Los Angeles County Sanitation District, Whittier, California.

Burlington-Northern Santa Fe Landfarm Project, Barstow, California. 2001-2003. Assessment of desert tortoise impacts , mitigation development, agency coordination for landfarm closure. Consultant to TRC Environmental Solutions, Irvine, California.

Central Washington University and Cal-Tech, Barstow, California. 1994. Monitoring trenching and closure activities for Endangered Species Act compliance (desert tortoises) on Emerson Fault research project. Consultant to Dr. Charles Rubin, Central Washington University.

U.S. Geological Survey, Landers, California. 1993 and 1994. Monitoring trenching and closure activities for Endangered Species Act compliance (desert tortoises) on Landers' Fault project. Consultant to Dr. David Schwartz, U.S. Geological Survey, Menlo Park, California.

Twentynine Palms Marine Corps Air Ground Combat Center (MCAGCC), Twentynine Palms, California. 1993. Tustin military base relocation project. Desert tortoise surveys to determine impacts and mitigation to tortoises from relocation of the base to MCAGCC . Authored several interim reports and co-authored final report to MCAGCC with Ogden Environmental, San Francisco, California

County of San Bernardino Medical Center, San Bernardino, California. September. 1990 General species inventory, and focused surveys for special-status plants and animals at three proposed sites for location of new medical center. Consultant to Higman-Doehle, Inc., Los Angeles, California.

Lake Minerals Corporation, Owens Valley, California. August, 1990 to present. Field surveys to determine tortoise presence at site of soda ash processing plant. Consultant to McClenahan and Hopkins Associates, Inc., San Mateo, California.

Del Webb Housing Development, Palm Desert, California. August, 1990. Assessment of tortoise habitat quality and likelihood of tortoise presence on proposed site. Consultant to Environmental Science Associates, Los Angeles, California.

Miller Housing Development, Palm Desert, California. 1990. Assessment of tortoise habitat and densities at proposed housing site; development of mitigation. For ERC Environmental, San Diego, California

Great Basin Unified Air Pollution Control District, Owens Lake Dust Control Project. December, 1989. Determined impacts to small mammal special-status species on sites proposed for disturbance. Consultant to McClenahan and Hopkins Associates, Inc., San Mateo, California.

Pacific Agricultural Holdings, Inc., Piute Valley, California. Fall, 1989. Field assessment of tortoise presence on site. Consultant to Pacific Agricultural Holdings, Inc., Fresno, California.

City of Rosamond, California, Expansion. Spring, 1989. Field survey of expansion site to determine impacts to sensitive flora, tortoises, and Mojave Ground Squirrel. Tortoise transects, live-trapping for diurnal rodents. Consultant to CWESA, Sanger, California.

Jet Propulsion Lab Site, Edwards Air Force Base, California. Fall and Winter 1988. Field determination of impacts to tortoises (transects, habitat analyses) from new facility siting. Consultant to WESTEC Services, San Diego, CA.

City of Ridgecrest Off-Road Vehicle Park, Searles Valley, California. January to March 1988. Field determination (transects, habitat analyses) of impacts to local desert tortoise populations from siting of proposed park. Consultant to CWESA and Saito Associates, Fresno, California.

Bullhead City Airport Expansion, Laughlin, Nevada. October, 1987. Assessment of potential impacts to the desert tortoise from expansion of the Bullhead City Airport. Transects, habitat analyses. Consultant to Heron, Burchette, Ruckert, and Rothwell Washington, D.C.

U.S. Borax and Chemical Co., Boron, California. May, 1986. Field assessment of impacts to sensitive flora and fauna on proposed Cogeneration II facility. Consultant to Dames and Moore, Santa Barbara, California.

Propeace, Inc., Victorville, CA to Nevada. March, 1986. Assessment of impacts to wildlife and development of mitigation on proposed route of peace march in the Mojave Desert portion of route. Consultant to Propeace, Inc., Los Angeles, California.

Utilities and Transportation (Power Plants, Transmission Lines, Pipelines, Solar or Wind Facilities, Telecommunications, Railroads)

*McCoy Solar Generating Facilit*y, Blythe area, California. 2007 - ongoing. Directed and conducted all botanical and biological surveys for permitting. Lead permitting biologist with Tetra Tech, Lakewood, Colorado, through all phases of permitting process; permits are pending.

*Genesis Solar Generating Facilit*y, Blythe area, California. 2007 - ongoing. Directed and conducted all botanical and biological surveys for permitting. Lead permitting biologist with Tetra Tech through all phases of California Energy Commission permitting process (hearings and workshops, preparer and/or reviewer of all plans and documents) and permits with Fish and Wildlife Service and U.S. Bureau of Land Management. Currently implementing site revegetation plan, authored by A. Karl. Consultant to Tetra-Tech, Inc., Irvine, California.

Eagle Mountain Pumped Storage Project, Desert Center, California. 2007-ongoing. Directed and conducted all botanical and biological surveys for permitting. Lead permitting biologist with GEI through all phases of FERC, USFWS, and BLM permitting processes (meetings, preparer and/or reviewer of all plans and documents) . Consultant to Eagle Crest Energy, Palm Springs, California.

*Abengoa Mojave Solar Project, w*estern Mojave Desert, California. 2008 - ongoing. Advisory role: reviewer and advisor for all biological permitting and mitigation documents; direction to company conducting mitigation (AECOM). Participant in hearings and workshops. Wrote desert tortoise translocation plan. Consultant to AECOM, Camarillo, California.

Solar Millennium, Blythe, Palen and Ridgecrest Solar Projects. 2009-ongoing. Advisory role: reviewer and advisor for desert tortoise, Mojave fringe-toed lizard and other permitting and mitigation documents. Participant in hearings and workshops. Consultant to AECOM, Camarillo, California.

Palmdale Hybrid Power Project, Palmdale, California. 2008 - ongoing. Advisory role: reviewer and advisor for biological permitting. Consultant to AECOM, Camarillo, California.

Victorville II Hybrid Power Project, Victorville, California. 2007 - 2009. Advisory role: reviewer and advisor for all biological permitting and mitigation documents; direction to company conducting mitigation (AMEC). Participant in hearings and workshops. Consultant to AECOM, Camarillo, California.

Beacon Solar Energy Project, western Mojave Desert, California. 2007 - 2009. Advisory role: reviewer and advisor for all biological permitting and mitigation documents; direction to company conducting biological surveys (AECOM). Conducted field surveys to ssess compensation properties and alternative routes. Consultant to AECOM, Camarillo, California.

Southern California Edison Palo Verde-Devers II Transmission Line, Colorado River to Devers, California. 1985, 1987, 1988, 2002, 2003, 2004, 2005, 2007. Surveys of proposed transmission line for special-status plants and animals; technical reports. Consultant to: E. Linwood Smith and Associates, Tucson, Arizona (1985-8); EPG Inc., Tucson, Arizona (2002-4; 2007); Tetra-Tech, Inc., Irvine, California (2005).

Blythe Energy Project 230 kV Transmission Line, Blythe to Desert Center, California. 2004 and 2005. Surveys of proposed transmission line alternatives, for special-status plants and animals; technical reports. Consultant to Tetra-Tech, Inc., Irvine, California (2005).

Blythe Energy Project, Blythe, California. 2000 - ongoing. Designated biologist for proposed power plant, with attendant duties including surveys; biological technical reports; B.A.; AFC assistance; development of mitigation (BRMIMP), monitoring, and education programs (WERP); implementation of mitigation measures; agency coordination; public hearings; and general document reviewer. Special-status plants and animals of greatest concern included desert tortoise, burrowing owl, Harwood's milk-vetch. Consultant to Greystone Environmental Consultants, Sacramento, California (2000-2002), Blythe Energy, LLC (2003 to present).

Desert Southwest Transmission Project (Imperial Irrigation District) Blythe to Niland and Blythe to Devers, California. 2000-2002, 2005. Surveys of multiple, proposed transmission lines for special-status plants and animals, technical reports, EIR. Consultant to: Greystone Environmental Consultants, Sacramento, California (2000-2002); Tetra-Tech, Inc., Irvine, California (2005).

Moapa Power Project, Las Vegas, Nevada. 2001. Initial surveys for special-status plants and animals for proposed power plant, transmission line and pipeline. Consultant to URS Corp, Santa Barbara, California.

Ocotillo Power Project, Palm Springs, California. 2000-2001. Surveys and biological technical report for special-status plants and animals for proposed power plant, transmission line and pipeline. Consultant to URS Corp, Santa Barbara, California.

Imperial Irrigation District, Blythe to Desert Center, California. 2000. Surveys for special-status plants and animals for proposed transmission line upgrade. Consultant to Greystone Environmental Consultants, Sacramento, California.

Enron Pastoria, Tejon Ranch (Bakersfield), California. 1999-2001. Surveys, biological technical report, and AFC preparation for special-status plants and animals for proposed power plant, transmission line and pipeline. HCP preparation for San Joaquin kit fox. Consultant for CEC hearings. Consultant to URS Corp, Santa Barbara, California.

Enron Antelope Valley, Victorville, California. 1999-2001. Surveys and biological technical report for special-status plants and animals for proposed power plant, transmission line and pipeline. Consultant to URS Corp, Santa Barbara, California.

PG&E Generating Company Harquahala Power Project, Toquop, Arizona. 1999-2000. Surveys and biological technical report for special-status plants and animals for proposed power plant and transmission pipeline. Consultant to URS Corp - Dames and Moore, Phoenix, Arizona.

Santa Fe Pacific Pipeline Company, Concord to Colton Pipeline, Mojave to Adelanto, California. Spring 1995. Surveys for special-status plants, desert tortoises, and Mojave
Ground Squirrels (CHIEF protocol); project leader. Consultant to Woodward-Clyde Consultants, San Diego, California.

Harper Lake Company, San Bernardino County, California. 1994. Re-evaluation of and assistance with position paper on primary compensation measures for LUZ Harper Lake solar project. Consultant to ENSR, Fort Collins, Colorado.

Santa Fe Railroad Company, San Bernardino County, California. Spring 1994. (1) Monitoring construction for Endangered Species Act compliance (desert tortoises) on bridge upgrades and (2) educational presentation to Santa Fe employees. Consultant to Environmental Solutions, Inc., Walnut Creek, California.

Western Area Power Administration, Parker to Yuma, California. 1994. Led large crew to survey transmission line for determining impacts to desert tortoises, special-status plants, birds, amphibians, and mammals from future transmission line upgrades. Consultant to Woodward-Clyde Consultants, Denver, Colorado.

Mojave Pipeline Operating Company, Mojave Desert, California. 1993. Survey of five proposed compressor station sites for desert tortoise impacts. Consultant to CWESA, Sanger, California. Report submitted to Woodward Clyde Associates, Denver, Colorado.

Mojave Pipeline Operating Company, Kramer Junction, California. 1992-93. Led large crew to survey proposed pipeline from Kramer Junction to Inyokern for impacts to desert tortoises, special-status plants, and Mojave ground squirrels. Consultant to CWESA, Sanger, California. Report submitted to Woodward Clyde Associates, Denver , Colorado.

Lake Minerals-Vulcan Mine Railroad Upgrade, Searles, Indian Wells, and Owens Valley, California. 1991. Desert tortoise surveys along existing railroad to determine future impacts to desert tortoises from upgrade of railroad. Report submitted to McClenahan and Hopkins, San Mateo, California.

U. S Ecology Radioactive Waste Facility, Beatty, Nevada. August 1990. Survey of proposed power line route to radioactive waste site for impacts to tortoises.

Mojave Pipeline Project, Toquop, Arizona to Bakersfield, California. Spring, 1989-90. Lead botanist and wildlife biologist for species of concern in the Mojave Desert and Tehachapi Mountains portion of line. Included: field surveys and agency meetings; development of mitigation and relocation techniques for tortoises and training program for field observers; development of portions of Environmental Quality Assurance Program for construction phase. For CWESA, Sanger, California, and Woodward Clyde Consultants, Denver, Colorado.

Southern California Edison Victorville/Kramer High Voltage Transmission Line. Spring 1990. Directed field study to determine tortoise abundance along proposed route. Consultant to ERC Environmental, San Diego, California.

AT&T Fiber Optics Cable Route, southern Nevada. 1990. Field survey of route to determine relative tortoise abundance, impacts on tortoise populations, and appropriate mitigation from burial of cable. Also involved relocation of tortoises and training of field personnel during construction. Consultant to ENSR, Fort Collins, Colorado.

Los Angeles Department of Water and Power Telecommunications Network Project, Los Angeles Basin, California. Winter and Spring, 1989. Field survey of proposed microwave facility sites in mountains surrounding the Los Angeles Basin to determine impacts to wildlife and botanical species of concern. Consultant to Higman Doehle, Inc., Los Angeles, California.

AT&T Fiber Optics Line, Victorville, California to Las Vegas, Nevada. Fall, 1988 to Winter, 1989. Field survey of route to determine relative tortoise abundance, impacts on tortoise populations, and appropriate mitigation from burial of cable. Also involved relocation of tortoises and training of field personnel during construction. Consultant to ENSR, Fort Collins, Colorado.

Luz Engineering, Kramer Junction and Harper Lake, California. Spring, 1987 to 1990. Led large crew to assess tortoise densities and habitat quality on relocation site for solar generating facility; density analyses and habitat assessments on facility expansion sites and relocation of tortoises during construction. Consultant to CWESA, Sanger, California, and ENSR, Fort Collins, Colorado.

U.S. Telecom, Banning to Blythe, California- May, 1986 - Field assessment of impacts to special-status plants and fauna along proposed route. Consultant to E. Linwood Smith and Associates, Tucson, Arizona.

Los Angeles Department of Water and Power, Intermountain Power Project (IPP), Nevada-Utah. July, l982 to August, l985. Field determination of impacts to the desert tortoise (transects), development of mitigation procedures, and implementation of mitigation along two routes of the HVDC Transmission Line in southern Nevada and southeastern Utah. Also, monitoring of sensitive flora and tortoises during construction. Consultant to E. Linwood Smith and Associates, Tucson, Arizona.

Los Angeles Department of Water and Power, Sylmar-Celilo (HVDC) Transmission Line Upgrade, Owens Valley, California. July, l984 to December, 1987. Field determination of impacts to special-status flora and wildlife and development of mitigation procedures along the line from Sylmar, California north to Nevada. Construction monitoring and crew education. Consultant to Applied Conservation Technologies, Inc., Newport Beach, California.

Mines and Aggregate Operations:

Ballast Rock Project, Hinkley, California. 2002- continuing. Special-status species impacts assessments, surveys. Special-status plants and animals of greatest concern included desert tortoise, Mohave ground squirrel, burrowing owl, chuckwalla,

Mojave monkeyflower and Barstow woolly sunflower. Consultant to Resource Design Technology, Inc., Folsom, California.

S and V Cinder Mine, Big Pine, California. 2002. Baseline, quantitative vegetation surveys for SMARA compliance. Consultant to Resource Design Technology, Inc., Folsom, California.

Lehigh South (Calaveras) Cement (limestone, shale), Shasta County, California. 1998, continuing. Field surveys, biological impacts assessment, reclamation plans, Shasta salamander 2081, Shasta salamander research, revegetation. Consultant to Resource Design Technology, Inc., Folsom, California.

Carone Properties (hard rock), Napa County, California. 2000, continuing. Field surveys, biological impacts assessment, California red-legged frog issues. Consultant to Resource Design Technology, Inc., Folsom, California.

RMC Lonestar (aggregate), Tulare County, California. 1997, continuing. Biological inventory and impacts assessment; Valley Elderberry Longhorn Beetle surveys; wetlands issues; biological portion of EIR. Consultant to RMC Lonestar, Pleasanton, California, and Resource Design Technology, Inc., Folsom, California.

RMC Pacific Materials (hard rock), Fresno, California. 1999, continuing. Field studies, impacts assessment. Consultant to Resource Design Technology, Inc., Folsom, California.

Lehigh South (Calaveras) Cement (limestone), Tehachapi, California. 1999, continuing. Field studies, impacts assessment. Consultant to Resource Design Technology, Inc., Folsom, California.

Last Chance Sand and Gravel (aggregate), Beatty, Nevada. 1998-9 Biological consultant for all phases of project. Surveys for desert tortoise, special-status plants, mammals, reptiles, birds. Consultant to Bill Marchand (operator), Beatty, Nevada.

San Benito Supply (aggregate). 1997-present. Vegetation survey to determine baseline conditions for SMARA reclamation compliance; developed revegetation plan. Consultant to Lilburn Corporation, San Bernardino, California, and Resource Design Technology, Inc., Folsom, California.

M&T Chico Ranch (aggregate), Butte County, California. 1997-present. Wrote biological portion of EIR. Consultant to Resource Design Technology, Inc., Folsom, California.

Granite Construction Co. (aggregate), Whitewater, California. 1997. General species inventory; surveyed for desert tortoises, special-status plants, mammals, reptiles, birds. Consultant to Lilburn Corporation, San Bernardino, California.

Teichert Aggregates (aggregate), Esparto, Yolo County, California. 1996. Wrote biological portion of EIR. Consultant to Lilburn Corporation, Folsom, California.

Teichert Aggregates (aggregate), Woodland, Yolo County, California. 1996. Wrote biological portion of EIR. Consultant to Lilburn Corporation, Folsom, California.

Cache Creek Aggregates (aggregate), Yolo County, California. 1996. Wrote biological portion of EIR. Consultant to Lilburn Corporation, Folsom, California.

Asphalt Construction Company (aggregate), Ridgecrest, California. 1995. Vegetation surveys to determine baseline and regrowth conditions for SMARA compliance. Consultant to Lilburn Corporation, Folsom, California.

Castle Mountains Gold Mine (mineral), San Bernardino County, California, 1995, 1996. Assessment of desert tortoise impacts from proposed expansion (field surveys, habitat analysis). Also included re-evaluation of existing mitigation and compensation measures. Consultant to Lilburn Corporation, Folsom, California.

Santa Fe Pacific Gold (mineral), Glamis, California. 1994. (1) Examination of potential drilling sites for desert tortoise impacts (field surveys) and (2) developed proposal to assess
remaining tortoise habitat on mine site. Consultant to Santa Fe Pacific Gold Corporation, Reno, Nevada.

Goldfields Mining Company (mineral), Brawley, California. 1991-92. Field surveys and habitat analysis of gold mine site. Co-authored Biological Assessment. Developed mitigation plan and impacts studies. Led large crew for desert tortoise clearance surveys. Trained core group of facility employees in tortoise handling. Consultant to Environmental Solutions, Inc., Irvine, California.

Cactus Gold Mine (mineral), Mojave, California. August, 1990. Assessment of tortoise presence on site of heap leach pad extension. Consultant to McClenahan and Hopkins Associates, Inc., San Mateo, California.

Waste Facilities

Los Angeles County Sanitation Districts Mesquite Regional Landfill, Brawley, California. 2004 - 2008. Developed approximately 18 mitigation plans for construction and operations phases of landfill to ensure that the project remains in compliance with all permits. Conducted baseline biological surveys for identification of project impacts, including quantitative plant surveys, small-mammal trapping, exotic weeds, quantitative and qualitative habitat monitoring and revegetation; developed and directed other baseline surveys on birds and ravens. Conducted tortoise clearance of 1800+ acres. Planned and conducted translocation study for desert tortoises. Co-produced Worker Environmental Awareness Program video. Consultant to Resource Design Technology, Inc., Folsom, California.

Arid Operations Mesquite Regional Landfill, Brawley, California. 1992 to 2000. Led large crew to conduct desert tortoise surveys for determining impacts and mitigation to tortoises from construction and maintenance of proposed landfill and associated rail spur. Co-authored Biological Assessment. Expert witness to address activists' concerns. Developed research program (mitigation) to track ecosystem health effects from landfill development. Consultant to Environmental Solutions, Inc., Irvine, California, Arid Operations, El Centro, California, and Resource Design Technology, Inc., Folsom, California.

NORCAL Sanitary Landfill, Victorville, California. Spring, 1997. General species inventory on expansion area; special surveys for desert tortoises, special-status plants, mammals, reptiles, birds. Consultant to Lilburn Corporation, San Bernardino, California.

NORCAL Sanitary Landfill, Landers, California. Spring, 1997. General species inventory on expansion area; special surveys for desert tortoises, special-status plants, mammals, reptiles, birds. Consultant to Lilburn Corporation, San Bernardino, California.

U.S. Ecology/California Department of Health Services Low-level Radioactive Waste Facility, Ward Valley, California, March. 1987 to 2001. Determined impacts to and developed mitigation for desert tortoises in association with construction and maintenance of proposed facility. Developed and conducted a ~10 year, continuous research project on tortoise translocation that focused on effects to reproduction, movements, physiology and mortality. Study cohort included ~150 radiotelemetered tortoises. Principal author of two biological assessments. Reviewer of numerous project opponents' papers and author of response documents. Consultant to U.S. Ecology, Rocklin, California.

RAIL-CYCLE (Waste Management of North America, Inc. and the Atchison, Topeka, and Santa Fe Railway Company). 1994, 1997. Expert witness for biological impacts at County of San Bernardino hearings for proposed landfill. Consultant to Waste Management of North America, Inc., Pasadena, California.

RAIL-CYCLE, Amboy, California, 1991 - Led large crew for desert tortoise surveys to determine impacts and mitigation to tortoises from construction and maintenance of proposed landfill. Report submitted to Ecological Research Services, Claremont, California and Jacobs Engineering, Pasadena, California.

Yucca Mountain Nuclear Waste Project, Nevada Test Site, Nevada. Fall 1989-90. Determination of tortoise abundance, distribution and habitat associations on proposed site of high-level nuclear waste. With Environmental Science Associates, San Francisco, California

Hidden Valley Resources Toxic Waste Disposal Facility, Newberry Springs, California. June to September 1988. Determination of impacts to and mitigation for desert tortoises from construction and maintenance of facility. Transects and habitat analyses. Consultant to J&M Land Restoration, Bakersfield, California.

Non-Military Government Contracts:

U.S. Army Corps of Engineers Construction Engineering and Research Laboratory (CERL). Spring 2003. Trained biologists in desert tortoise telemetry techniques, handling, and behavior for tortoise activity project near Barstow, California. Contacts: Mr. Andrew Walde and Dr. Larry Pater.

Joshua Tree National Monument, Twentynine Palms, California. 1987-88. Assessed status of the desert tortoise throughout the monument (transects, habitat analyses); developed relocation techniques and assessed sites for tortoises turned in to headquarters. Contact: Dr. Jerry Freilich.

Bureau of Land Management, Las Vegas, Nevada. June to October, 1987 (employee). Developed new method for estimating tortoise densities from transects; led team to estimate tortoise densities from transects throughout southern Nevada; developed habitat assessment technique from quantitative habitat analyses. Supervisor: Sidney Slone.

Nevada Department of Wildlife, Las Vegas, Nevada. Spring, l984 to 1989. Development of a comprehensive, computerized data base of locations and habitat associations of all vertebrate taxa in Nevada through field, literature, and museum collections' surveys. Field research included live-trapping of all taxa, quantitative censuses of birds, rodents, and carnivores, statistical analyses, and development of baseline research methods for the Department of Wildlife. Contract No. 84-33.

Bureau of Land Management, Riverside, California. March to August, l980. Independent, 60-day quantitative and qualitative study of a population of desert tortoises in eastern California. Included extensive analysis of the site's vegetation. Technical report emphasized the relationship of primary production, disturbance, and geo-characteristics to the population demographics of the desert tortoise in this area. Contract No. CA-060-CTO-3.

Bureau of Land Management, Las Vegas, Nevada. March, l979 to August, l982. Sole project to date to determine the distribution and relative densities of the desert tortoise in Nevada; also delineated habitat requirements of the tortoise in Nevada. Solitary research involving foot-transecting over 450 miles in Clark, Lincoln, and Nye counties. Also included qualitative and quantitative examinations of three populations of tortoises similar to those mentioned above. Contract No. YA-512-CT9-90.

Bureau of Land Management, Riverside, California. Spring, l979. Independent, 60-day quantitative and qualitative study of a population of desert tortoises in the western Mojave Desert. Included aforementioned aspects. Contract No. CA-960-CT9-106.

Bureau of Land Management, Riverside, California. Spring, l978. Independent 30-day quantitative and qualitative study of population of desert tortoises in eastern San Bernardino County, California. Included aforementioned aspects. Contract No. CA-060-CT8-000042.

California Department of Fish and Game, Chino, California. June to December, l978 - Independent, foot-transecting of over 400 miles of the Mojave and Colorado deserts in California to assist in the determination of the status of the desert tortoise in California. Additional study of pupfish (*Cyprinodon maculatus*) in the Salton Sea, California.

ASSOCIATE PROJECT BIOLOGIST:

Mojave Ground Squirrel Behavioral Project. 2003. Trapping and telemetry with Drs. Phil Leitner and John Harris near Ridgecrest, California.

Eagle Mountain Landfill, Desert Center, California. 1996**.** Desert tortoise surveys on proposed site. Consultant to Circle Mountain Consultants, Wrightwood, California.

City of Rosamond General Plan. 1992. Trapping ssessment of Mohave Gound Squirrel population status. Consultant to CWESA, Sanger, CA.

*Clark County Desert Tortoise Habitat Conservation Pla*n. 1990-91. Reviewer and partial author of HCP and member of biological technical team; also included field assessments of tortoise habitat quality. Consultant to RECON, San Diego, California.

Desert Tortoise Council. 1990-present. Requested by Council to present techniques for finding tortoises, identifying sign and analyzing data to biologists, developers, and consultants at annual techniques workshop.

American Motorcycle Association/U.S. Fish and Wildlife Desert Tortoise Listing. 1989-90. Review of U.S. Fish and Wildlife Service's basis for Emergency Endangered Listing of the desert tortoise. Examination of all available data, both published and unpublished, to analyze status of the desert tortoise. Draft report heavily cited by U.S. Fish and Wildlife as support for their final listing determination. Subcontracted to Biosystems Analysis, Inc., Tiburon, California.

Salt River Project, Quemado, New Mexico. September, l985, 1987. Determination of impacts to vegetation and evaluation of re-vegetation success (quantitative vegetation transects) from mining coal reserves. In association with E. Linwood Smith and Associates, Tucson, Arizona.

Sonora Mining Corporation, Sonora, California. Fall, 1986. Assessment of impacts to fish populations (electro-shocking)in Woods Creek, from mining operations. CWESA, Sanger, California.

UNOCAL Platform Irene Project, Lompoc, California. September, 1986. Monitoring of pipeline construction for sensitive wildlife and floral issues. CWESA, Sanger, California.

Southern California Edison, Kingman, Arizona. May, 1986. Botanical survey along proposed transmission line route; Kingman, Arizona to Boulder City, Nevada. Biosystems Analysis Inc., Santa Cruz, California

Belridge Cogeneration Project, Bakersfield, California. Spring, 1985. Field survey of the blunt-nosed leopard lizard (Gambelia silus) and analysis of vegetation. CWESA, Sanger, California.

CWESA , Sanger, California- September, l984. Field survey of the blunt-nosed leopard lizard in the San Joaquin Valley, California, to determine population dynamics and ecology.

U.S. Forest Service, Klamath Forest, California. Summer, l983. Project to determine the population dynamics, behavior, and effective control techniques of pocket gophers (Thomomys bottae) in red fir clearcuts. Field work included use of radio telemetry and live trapping. Walter E. Howard, U.C., Davis.

Southwest Biological Associates, Encinitas, California. Winter, l978. Literature search on the herpetofauna of central and southern California.

Bureau of Land Management, Riverside, California. Summer, l978 - Field study of the effects of grazing and urbanization on reptiles at two Mojave Desert sites.

EDUCATIONAL EMPLOYMENT:

Collector and preparer, Museum of Vertebrate Zoology, Wildlife and Fisheries Biology, University of California, Davis, California. l983-l985 - Included trapping, preparation (skeletal and study skin preparation, live-pose taxidermy, freeze-drying), and cataloguing of specimens.

Teaching Assistant, U. C. Davis. l983-85. Courses in wildlife ecology and museum science.

Teaching Assistant, California State University, Northridge. September, l981 to June, l982. Courses in general biology, physiological ecology and local California flora and fauna.

PUBLICATIONS AND PRESENTED PAPERS (not including technical reports and documents associated with projects):

Karl, A. l980. The distribution and relative densities of the desert tortoise, *Gopherus agassizi,* in Nevada. *In*: K. Hashagen, ed., Proceedings of the l980 Desert Tortoise Council Symposium, Riverside, California. Pp 75-87. (Paper also presented.)

Karl, A. l981. The distribution and relative densities of the desert tortoise, *Gopherus agassizi,* in Nevada. Part II. *In*: K. Hashagen, ed. Proceedings of the l981 Desert Tortoise Council Symposium, Riverside, California. Pp76-92. (Paper also presented.)

Karl, A. and E. Smith. l984. - Densities of and impacts to the desert tortoise, *Scaptochelys agassizii,* along the proposed 500 kv D.C. Intermountain Power Project Transmission Line in Nevada and Utah. Paper presented at the Desert Tortoise Council Symposium, Lake Havasu, Arizona.

Karl, A. 1994. Reproduction in desert tortoises - ecological and evolutionary perspectives. Paper presented at both the 1994 Desert Tortoise Council Symposium, Las Vegas, Nevada and the American Society of Ichthyologists and Herpetologists Meetings, Los Angeles, California.

Karl, A. 1995. Indirect censusing methods for desert tortoises. Paper presented at an invitational workshop on censusing desert tortoises. Reno, Nevada.

Karl, A. 1997. Factors affecting reproduction of desert tortoises and resultant implictions for management. Paper presented at the 1997 Desert Tortoise Council Symposium, Las Vegas, Nevada

Karl, A. 1997. Reproductive strategies of the desert tortoise. Paper presented at the 1997 American Society of Ichthyologists and Herpetologists Meetings, Seattle, Washington.

Karl, A. 1998. Growth patterns of the desert tortoise in an East Mojave population. Paper presented at the 1998 Desert Tortoise Council Symposium, Tucson, Arizona.

Karl, A. 2002. Revised techniques for estimating desert tortoise abundance in the Fort Irwin National Training Center Expansion Area in 2001 and the results of those studies. Paper presented at the 2002 Desert Tortoise Council Symposium, Palm Springs, California.

Karl, A. 2004. Drought effects on the desert tortoise and population recovery. Paper presented at the 2004 Desert Tortoise Council Symposium, Palm Springs, California.

Karl, A. 2005. Revised Techniques for Estimating Desert Tortoise Abundance in the Fort Irwin National Training Center Expansion Area in 2001 and the Results of Those Surveys. Paper presented at the 2005 Western Section of the Wildlife Society Meetings, Sacramento, California.

Karl, A., Ma. Cristina Melendez Torres, Cecil R. Schwalbe, Mercy Vaughn, Philip C. Rosen, Daren Riedle and Lisa A. Bucci. 2006. The Morphologically Distinct Sinaloan Desert Tortoise. Paper presented at the 2006 Desert Tortoise Council Symposium, Tucson, Arizona.

Freilich, J., R. Camp, J. Duda and A. Karl. 2005. Problems with sampling desert tortoises: a simulation analysis based on field data. J. Wildl. Manage. 69(1):45-55.

MEMBERSHIPS:

California Native Grass Association
California Native Plant Society
Southern California Botanists
Desert Tortoise Council
Society for the Study of Amphibians and Reptiles
Society for Ecological Restoration

DECLARATION OF

MICHAEL J. KLINEFELTER

I, Michael J. Klinefelter, declare as follows:

1. I am presently self-employed as an environmental consultant.

2. A copy of my professional qualifications and experience is attached hereto and incorporated by reference herein.

3. I helped prepare the attached portion of the Biological Resources testimony for the Hidden Hills Solar Electric Generating System project based on my independent analysis and my professional experience and knowledge.

4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue(s) addressed herein.

5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: January 7, 2013 Signed: 

At: Murrieta, California

MICHAEL J. KLINEFELTER

Wetland Scientist/Regulatory Specialist

Education

- M.S. Soil Science, University of California at Riverside, 1998.
- B.S. *magna cum laude*, Environmental Science, University of California at Riverside, 1995.

Expertise

- Wetland/Jurisdictional Delineations and Functional Assessment
- CWA Section 404 permitting – nationwide and individual
- CDFG Section 1602 Agreements
- ESA Compliance and Section 7 Consultations
- CEQA and NEPA Documentation
- Habitat mitigation planning, implementation, and monitoring

Selected Projects

- Heartland Project, Beaumont, California – 420 acre residential development project. Complete Jurisdictional Delineation of San Timoteo Creek, permitting (§404 IP, CDFG §1602, Water Quality Certification), mitigation planning, permit compliance, and construction monitoring
- Imperial Valley Solar Project. – 6500 acre solar power project. Field functional assessment using the California Rapid Assessment Method (CRAM).

Professional Activities

- California Society for Ecological Restoration, Member
- Society of Wetland Scientists, Member
- International Association of Hydrological Sciences (IAHS), Member

Mike Klinefelter is the owner of M.J. Klinefelter, a consulting firm specializing in providing environmental documentation, planning, permitting services and impact mitigation. Mike has over fourteen years of experience in wetland delineation, regulatory permitting, functional assessment, mitigation monitoring, and geographic information systems (GIS). His professional experience has focused on accurate and efficient assembly and assessment of biological data, particularly data relating to aquatic resources and sensitive species, for compliance with state and federal regulations (Clean Water Act, California Fish and Game Code, Federal Endangered Species Act, and State Endangered Species Act) and finding scientifically sound solutions to development challenges where potential impacts to biological and aquatic resources may occur.

Mike has managed, contributed to, and authored numerous Clean Water Act Section 404 jurisdictional delineations of Waters of the U.S. and wetlands, general biological assessments, constraints analyses, Biological Assessments (pursuant to Section 7 consultations with the U.S. Fish and Wildlife Service), focused surveys for sensitive species, wetland functional assessments, habitat mitigation monitoring plans, and mitigation monitoring reports. He has successfully processed Army Corps Individual and Nationwide permits, RWQCB 401 Certifications, RWQCB Waste Discharge Requirements, ESA Section 7 consultations, and CDFG Streambed Alteration Agreements.

Since 2002 Mike has been involved as a Regional Team member and more recently as a trainer for the implementation of the California Rapid Assessment Method (CRAM) for wetland assessment. He has taught CRAM courses and used CRAM for wetland assessment, including the assessment of a 6500 acre solar energy project in the Imperial Valley.

Mike has significant experience in the use of GIS and GPS for mapping, modeling, and analysis of environmental and wetland impacts. He has taught GIS courses at UC Riverside and UC San Diego, and was a speaker at the 2006 CLE California Wetlands Conference.

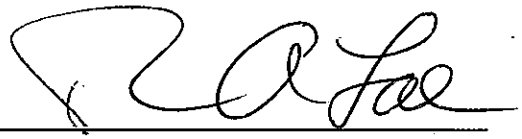
DECLARATION OF

Thomas A. Lae

I, Thomas A. Lae, declare as follows:

1. I am presently employed by CH2M HILL, Inc. as a Geologist/Project Manager.
2. A copy of my professional qualifications and experience are attached hereto and incorporated herein by reference.
3. I helped prepare the attached testimony on Geologic Hazards and Resources for the Hidden Hills Solar Electric Generating System project based on my independent analysis, supplements thereto, data from reliable sources, and my professional experience and knowledge.
4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue(s) addressed herein.
5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: January 7, 2013 Signed: 

At: Sacramento, CA

Thomas A. Lae, P.G.

Geologist/Project Manager

Education

B.S., Geology. California State University, Fullerton, 1991

Professional Registrations

State of California Professional Geologist, License No. 7099

Relevant Experience

Mr. Lae has more than 21 years of experience in environmental geology that includes 12 years of project management and is a California Professional Geologist. Mr. Lae serves as a project or task manager on numerous projects for a variety of private, federal and municipal clients. He has an extensive background in environmental field investigations. Projects include: Section preparer for over 25 power plant licensing projects: Superfund site investigation oversight: remedial investigations/feasibility studies: underground storage tank/oil water separator closures: landfill groundwater monitoring: phase II environmental assessments: among others.

Representative Projects

Electrical Power Plant Application for Certification section preparer (2002-Present). Mr. Lae has prepared the Geologic Hazards and Resources sections for numerous AFCs. These include the Mariposa Energy Project (Mariposa Energy, LLC), Almond 2 Power Plant (Turlock Irrigation District), East Altamont Energy Center (Calpine), Central Valley Energy Center (Calpine), Los Esteros Energy Center (Calpine), Cosumnes Power Plant (SMUD), Woodland II (Modesto Irrigation District), Modesto Electric Generation Station (Modesto Irrigation District), Walnut Energy Center (Turlock Irrigation District), San Francisco Electrical Reliability Project (San Francisco Public Utilities Commission), Highgrove (AES Pacific),Walnut Creek Energy Project (Edison Mission Energy), Sun Valley Energy Project (Edison Mission Energy), Eastshore Energy Project (Tierra), South Bay Energy Facility (Duke), Chevron Richmond Power Plant Replacement Project SPPE, Ivanpah Solar Electric Generating System (Bright Source Energy), Hidden Hill Solar Electric Generating Station (Brightsource), Carlsbad Energy Center Project (NRG), Tracy Power Plant (GWF), Vacaville Energy Center (Competitive Power Ventures), Fontana Energy Center (Calpine) Lodi Energy Center (NCPA), Oakley Generating Station (Radback), Redondo Beach (AES), Huntington Beach (AES). Mr. Lae is well versed in the assessment of geologic resources and hazards relating to CEQA and NEPA requirements.

California Energy Commission Hazardous Waste Remediation Oversight (2007-present). A part of construction of the PG&E's Gateway Generating Station (Antioch, CA),Colusa Generation Station (Colusa, CA), Lodi Energy Center (Lodi, CA), and Mariposa Energy Center, Mariposa, CA), Mr. Lae served/serves as the projects' on-call Professional Geologist. His duties included the coordination of sampling, characterization, and remediation of hazardous waste materials (including asbestos, PCBs, and TPH) encountered during plant excavation activities. Mr. Lae provided a summary report upon completion of remedial activities for submittal to the CEC.

Wind Power Projects Section Preparer (2009-present). Mr. Lae has prepared Geologic Hazards and Resources sections for 10 wind power projects in the greater southern California area. Mr. Lae is well versed in the assessment of geologic resources and hazards relating to CEQA and NEPA requirements for wind farm siting and licensing.

USEPA - Superfund Site Investigation and Oversight (2000-present). CH2M HILL provides support to the USEPA for a number of task orders, with Mr. Lae currently serving as project manager. Active task orders include a former gold mine site in Nevada County, CA impacted by past mining operations where Mr. Lae manages three task orders including the O&M of a remedial action, mine water pilot treatment plant testing, and a feasibility study. At a rocket engine manufacturing and test facility impacted by solvent, fuel, propellant, and metals contamination, Mr. Lae manages a task order that involves the review and comment of reports, white papers, technical memoranda, and studies that are submitted for EPA regulatory review. Mr. Lae served as a

project (site) manager for the Cooper Drum superfund site, located in Southgate, CA. This project involved the evaluation and remedial investigation of soil and groundwater contamination from past releases at a drum recycling center.

AFCEE - Remedial Investigation (2009-present). Mr. Lae serves as the project manager for the RI of the Beale AFB Clinic site. This site has been impacted by past release of TPH- and VOC-related contaminants. This project includes the removal of two 8,000-gallon diesel USTs, drilling, sampling, and well construction for contaminant delineation. The site lies between two former ranges – potentially impacted by UXO.

City of Roseville, CA - Groundwater Monitoring (2000- 2010). Mr. Lae served as the project manager and the supervising geologist for the Annual and Semi-Annual groundwater monitoring reports for the former sanitary landfill. Duties included planning sampling events, evaluation of laboratory data, preparation of graphics and tabular data, and report writing. Mr. Lae also supports landfill gas studies at the site.

Union Pacific Railroad (2007-2010). Mr. Lae served as the project manager for several UPRR projects that included: a groundwater and soil TPH investigation at a former UST site (Donner Summit UST); an arsenic in soil assessment at a Right of Way (Clyde, CA), a TPH in soil site at Right of Way (Chico, CA), and nitrogen contamination in onsite soils (Willows, CA). Mr. Lae successfully received regulatory closure at all of these project sites.

AFCEEE - Oil /Water Separator Closure Investigation (2003-2008). Mr. Lae served as the project manager for two projects at Beale AFB in the evaluation for regulatory closure of 25 former oil/water separators across Beale. The project includes the assessment of environmental impacts to underlying soil and groundwater from past releases and preparing closure documentation. To date, Mr. Lae has successfully received closure of 18 OWSs.

UST and Oil Water Separator Investigation (2000-2004). Mr. Lae served as the project manager for three U.S. Navy project sites at Rough and Ready Island, Stockton, CA. These projects involved the evaluation of soil and groundwater contamination at sites with underground storage tanks or oil water separators. Soil and groundwater samples were collected and analyzed to determine the presence or absence of contamination. Each of the three sites was successfully evaluated and a determination of “No Further Assessment” was granted by the RWQCB.

Project Geology Tasks, Various Clients and Locations (1991-2000). Supported the early remedial investigations of McClellan AFB and Castle AFB and conducted Phase I and Phase II environmental assessments and remedial investigations. Duties included regulatory agency contact, site reconnaissance, historical aerial photograph and map review, report preparation, development of Phase II work plans, preparation of health and safety plans, work plan implementation, data collection and interpretation, and final report preparation. Also provided groundwater well design and installation, including placement of bore locations, soil sampling, logging of drill cuttings, monitor well casing design, groundwater sample collection, conducting slug tests, and report preparation. Provided construction observation of municipal-supply wells for numerous cities and agencies throughout Orange County, CA. Duties included oversight of subcontractors, lithologic collection and description, sieve analyses, geophysical log interpretation, assistance with casing design, well development, test-pump and data collection and interpretation, and report preparations. Performed underground storage tank assessments/removals, including subcontractor coordination, initiating permit acquisitions, soil sampling, and report preparations.

Certifications/Training

OSHA 40-Hour HAZWOPER
OSHA 8-Hour Refresher
OSHA 10-Hour Construction Safety Training
OSHA 8-Hour Supervisor’s Training
DOT Sample Packaging and Shipping
Hydrogeology Extension Course (CSUS)
Innovative Soil Gas Monitoring and Remediation Applications (seminar)

DECLARATION OF

Natalie Lawson

I, Natalie Lawson, declare as follows:

1. I am presently employed by CH2M HILL as a cultural resources specialist.
2. A copy of my professional qualifications and experience are attached hereto and incorporated herein by reference.
3. I helped prepare the attached testimony on Cultural Resources for the Hidden Hills Solar Electric Generating System project based on my independent analysis, supplements thereto, data from reliable sources, and my professional experience and knowledge.
4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue(s) addressed herein.
5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: January 18, 2013 Signed: 

At: Orange, California

Natalie Lawson, M.A., RPA

Cultural Resources Specialist
CH2M HILL Santa Ana, California

Education

California State University, Fullerton, California, M.A., Anthropology
Arizona State University, Tempe, Arizona, B.S., Chemistry, (minor, Anthropology)

Professional Registrations

Registered Professional Archaeologist (RPA)

Distinguishing Qualifications

- Meets Secretary of Interior Professional Qualification Standards (36CFR61)
- Experienced in cultural resource management and Section 106 of the National Historic Preservation Act consultation
- Experienced in the National Environmental Policy Act (NEPA) and California Environmental Quality ACT analyses (CEQA)
- Listed on California and Nevada BLM permits for CH2M Hill

Professional Positions Held

Cultural Resources Specialist, Present
Junior Cultural Resources Manager, 2004-2008
Archaeology Technician, 2002-2004
Graduate Assistant, Anthropology Department, California State University, Fullerton, California, 2001–2003.

Project Experience

ISEGS-Roads Mitigation, San Bernardino County, California. Ms. Lawson conducted the archaeological evaluation of several roads on BLM land in San Bernardino County. Ms. Lawson conducted the pedestrian survey, directed site recordation, and led in the preparation of the technical report and site evaluation. Ms. Lawson was the primary author on the final reports. Work was done in December 2012 and January 2013.

Chiquita Canyon Landfill, Bowers Cave, Los Angeles County, California. Ms. Lawson conducted the literature search and prepared the testing plan for the evaluation phase of the well known archaeological site, Bower's Cave. Ms. Lawson also directed the evaluation phase field studies. Additional research, Native American consultation, artifact analysis, and preparation of the final technical report are ongoing. Work was conducted in November and December of 2012. Work is ongoing into January 2013.

Williams Expansion Pipeline, Washington State. Ms. Lawson participated in the pedestrian survey of nearly 200 miles of pipeline survey in western Washington. Ms. Lawson acted as crew chief for this project. Work was conducted in October 2012.

Bright Star Canyon Wind Energy Project. Kern County, CA. Ms. Lawson conducted cultural studies for the construction of a wind farm in the Tehachapi Mountains. Ms. Lawson directed the cultural pedestrian survey, and worked on the preparation of the final technical memo, including site records. Work was done in August 2012.

Hidden Hills Ranch Solar Generation Station, Inyo County, California and Clark and Nye Counties, Nevada. Ms. Lawson assisted with the archaeological evaluation of a solar farm project in Inyo County and the associated 100 mile long transmission line corridor within Clark and Nye Counties, Nevada. Ms. Lawson conducted the literature search for the transmission line corridor and assisted with the preparation of the research design for the pedestrian survey. This research design was submitted to the NV BLM. Ms. Lawson also participated in the pedestrian survey for both the solar project and the transmission line corridor. She assisted with site recordation

in both California and Nevada on CA Department of Parks and Recreation and IMACS forms. Ms. Lawson was an author on the final reports and conducted additional archival research for the CEC Data Adequacy Phase. Work was done in June, July, August, September, and October 2011.

Walnut Creek Energy Project. Los Angeles County, CA. Ms. Lawson is the designated Cultural Resources Specialist for the WCEP project. Ms. Lawson was the primary author on the WCEP CRMMP. Ms. Lawson oversees monitoring activities at the construction site and prepares monthly reports for all monitoring activities.

National Ecological Observation Network (NEON), U.S., including AK and HI, Puerto Rico. The NSF is building several observation towers throughout the greater U.S. and Puerto Rico to study climate change and threatened species. Ms. Lawson conducted literature searches and archival research for the following states: Alaska, Washington, Wyoming, California, Massachusetts, and Florida. Ms. Lawson also is an author for the cultural sections of the following states: VA, FL, GA, TN, AL, WI, MI, WA, CA, AK, KS, MA, NH. Work was done in November and December of 2008 and January of 2009.

California Border Patrol-Indio Station, Indio, CA. Ms. Lawson conducted cultural studies for the expansion of the CA Border Patrol station in Indio, CA including the initial literature search, Native American consultation, Phase I pedestrian survey, and preparation of the final report. Work was done in June 2008.

Fort Irwin Solar Project, CA. April 2012 and June 2012. Ms. Lawson conducted cultural studies for a proposed solar farm at Fort Irwin, CA including the Phase I pedestrian survey and preparation of the final report.

Port Hueneme, California. Ms. Lawson conducted cultural studies for at the Naval Construction Battalion Center at Port Hueneme in Ventura County, California. Ms. Lawson conducted the pedestrian survey and evaluation of several historic rail lines. Work was done in March 2012.

North Sky River Wind Energy Project. Kern County, CA. Ms. Lawson conducted cultural studies for the construction of a wind farm in the Tehachapi Mountains and adjacent Mojave Desert in Kern County, California. Ms. Lawson conducted the literature search and the Native American consultation, directed the cultural pedestrian survey, and prepared the final technical memo, including site records. Ms. Lawson also prepared the testing plan for the evaluation phase of this work, directed the evaluation phase field studies, and assisted with the preparation of the final evaluation report. Work was done in December 2010, April 2011, July 2011, and October 2011.

Fort Irwin Expansion, Baker and Barstow, CA. June 2002 through September 2002. Ms. Lawson participated in fieldwork for this project for approximately 4 months. She served as an Archaeology Technician and performed Section 106 Phase I surveys of BLM land at Avawatz near Fort Irwin, CA. She also assisted in site recordation of several prehistoric and historical sites as well as limited Extended Phase I surveys, including surface collection. This survey of approximately 24, 000 acres was conducted to supplement previous surveys related to the expansion of the National Training Center at Fort Irwin.

Proposition 50. Ms. Lawson was the Principal Investigator for cultural studies conducted related to the drilling of several new wells within the ACID, FWD, RD108, Sutter Mutual Water Company, Pelger Mutual Water District, and Meridian Farms Water Company in Northern California. Studies were completed in Colusa, Sutter, Shasta, and Yolo Counties. Ms. Lawson conducted pedestrian surveys and prepared a total of five technical reports. Ms. Lawson also recorded several resources and evaluated impacts for each resource related to these projects. Work was conducted in March, April, May, June, and September of 2011. SHPO concurrence was received in September and October 2011.

Southern California Edison Canyon Power Plant. Ms Lawson was the primary monitor of construction activities for the construction of the Southern California Edison Canyon Power Plant in Orange County, California. Work was done in August 2010.

Monte Vista Solar Project, PV 12, Edison Mission Energy. Ms. Lawson conducted cultural studies for the construction of a solar farm near Mojave, California. Ms. Lawson conducted the Native American consultation,

directed the cultural pedestrian survey, and prepared the final technical memo and prepared site records. Work was done in September and October 2009.

PG&E Humboldt WaveConnect Hydrokinetic Pilot Project FERC License Application. Ms. Lawson conducted cultural studies for the construction of a pilot wave farm near Eureka, California. Ms. Lawson conducted a search of the State Land Commission Shipwreck Database, completed the Native American consultation and the cultural pedestrian survey for the terrestrial facilities, and prepared the final cultural section for the FERC License Application. Additionally, Ms. Lawson prepared site records for the cultural section. Work was done in September and December 2009.

Contra Costa Generating Station. Ms. Lawson conducted cultural studies for the preparation of the AFC license for the new construction of the Contra Costa Generation Station in Contra Costa County. Ms. Lawson conducted the literature search, Native American consultation, cultural pedestrian survey, and prepared the final technical memo and wrote the cultural section of the AFC application. Work was done in September 2009.

Siskiyou Telephone, Godfrey Ranch, Siskiyou County, CA. Ms. Lawson conducted cultural studies for the expansion of telecommunications cable along forest service roads in Siskiyou County, CA including the initial literature search, Native American consultation, Phase I pedestrian survey, and preparation of the final report. Work was done in October and November 2008.

Darrah Road Bridge Widening, Mariposa County, CA. Ms. Lawson prepared the final Historical Property Survey Report (HPSR, Caltrans) for the widening of the Darrah Road Bridge as well as updating appropriate site records, conducting the Native American consultation, and updating the literature search. Work was done in October 2008 and February 2009.

L**odi Energy Center Project, Lodi, CA.** Ms. Lawson conducted cultural studies for the preparation of the AFC license for the expansion of the Lodi Energy Plant in Lodi, CA. Ms. Lawson conducted the literature search, Native American consultation, cultural pedestrian survey, and prepared the final technical memo and wrote the cultural section of the AFC application. Work was done in July and August of 2008.

DECLARATION OF

Steven P. Long

I, **Steven P. Long**, declare as follows:

1. I am presently employed by CH2M HILL, Inc. as a Project Manager 2.
2. A copy of my professional qualifications and experience are attached hereto and incorporated herein by reference.
3. The attached testimony on Soils for the Hidden Hills Solar Electric Generating System project was prepared by me or under my direction based on my independent analysis, supplements thereto, data from reliable sources, and my professional experience and knowledge.
4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue(s) addressed herein.
5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: January 7, 2013 Signed: Steven P. Long

At: Sacramento, CA

Steve Long

Environmental Scientist

Education

M.S., Soil Science
B.S., Forest Resources

Distinguishing Qualifications

- Broad range of experience in natural resource and ecological assessment.
- Accomplished in field testing for soil and groundwater contaminants and wetland delineation and assessment.
- Experienced in ecological and habitat evaluations used in ecological risk assessments.
- Forest mensuration and soil mapping expertise.

Relevant Experience

With 25 years of professional experience as an environmental scientist, Mr. Long is responsible for a wide range of tasks associated with natural resource and hydrogeologic environmental evaluations. Duties include evaluating contaminants study results for surface water, sediment and biota, relating land use to surface water quality, preparation of proposals, field data collection, interpretation, and preparation of reports and presentation of results.

His natural resource experience includes evaluation of wetland systems, including delineation and documentation of wetlands by federal and state criteria in California, Nevada, Connecticut, Massachusetts, New York, New Hampshire, and Maine; evaluation of project constraints and development of alternate strategies for local, state, and federal permitting.

Hydrogeological experience includes in-field testing of soil, soil gas, and groundwater samples using portable gas chromatograph; in-situ aquifer permeability testing; monitoring subsurface explorations and installations (monitoring wells, piezometers and vapor extraction systems); environmental sampling and analytical testing; and development of contaminant transport hydrogeologic models. Mr. Long possesses strong skills in onsite chemical testing; description and taxonomic classification of soils, vegetation, and insects; permitting of wetland activities; and statistical analyses of groundwater analytical data.

Representative Projects

Chula Vista Energy Upgrade Project, MMC Energy, San Diego County, California. Prepared CEQA-equivalent documentation to support an Application for Certifications (AFC) for review by the California Energy Commission. Prepared AFC section that assessed potential impacts to soil and agricultural resources for the proposed power plant projects. This documentation included a summary of applicable laws, ordinances, and regulations (LORS), estimates of soil losses from wind and water erosion during construction, and agencies contacts.

South Bay Replacement Project, LS Power. Prepared CEQA-equivalent documentation to support an Application for Certifications (AFC) for review by the California Energy Commission. Prepared AFC section that assessed potential impacts to soil and agricultural resources for the proposed power plant projects including all linear features (transmission lines, water supply and discharge lines, and natural gas supply lines). Also prepared section for waste management that described demolition, construction, and operation waste streams. This documentation included summaries of applicable laws, ordinances, and regulations (LORS) and agencies contacts. It also included estimates of soil losses from wind and water erosion during construction and mitigation and management strategies.

Eastshore Energy Center, Tierra. Prepared CEQA-equivalent documentation to support an Application for Certifications (AFC) for review by the California Energy Commission. Prepared AFC section that assessed potential impacts to soil and agricultural resources for the proposed power plant projects including all linear features

(transmission lines, water supply and discharge lines, and natural gas supply lines). This documentation also included a summary of applicable laws, ordinances, and regulations (LORS), estimates of soil losses from water erosion during construction, and agencies contacts.

AFCs for Walnut Creek Energy Park and Sun Valley Energy Project, Edison Mission Energy, City of Industry/Romoland, California. Provided support for two Applications for Certification before the California Energy Commission for similarly designed 500-MW natural gas-fired peaking power plants using the GE LMS100 advanced gas turbine technology. These applications were prepared in parallel and were filed at the Energy Commission within one week of one another. The AFCs were filed in December of 2005 and the projects are scheduled to begin construction in 2007.

AFC for Roseville Energy Park, Roseville Electric, Roseville, California. Provided support for Application for Certification before the California Energy Commission for a 160-MW natural gas-fired power plant in Roseville, California.

Application for Certification, Los Esteros Critical Energy Facility, Calpine C*Power, San Jose, California. Prepared Biological Resources Mitigation and Monitoring Plan (BRMIMP) for the Los Esteros Critical Energy Facility. Also documented the extent of jurisdictional waters of the U.S. at a stormwater outfall along Coyote Creek. Prepared a Low Effect Habitat Conservation Plan for the Phase II Facility. This plan was submitted for Section 10 consultation with the U.S. Fish and Wildlife Service to secure an incident take permit for Bay Checkerspot butterfly and to offset potential impacts to four endemic serpentine plants under the Endangered Species.

Application for Certification, East Altamont Energy Center, Calpine Corp., Tracy, California. Prepared CEQA-equivalent documentation to support an Application for Certifications (AFC) for review by the California Energy Commission. Prepared AFC section that assessed potential impacts to soil and agricultural resources for the proposed power plant projects including all linear features (transmission lines, water supply and discharge lines, and natural gas supply lines). This documentation also included a summary of applicable laws, ordinances, and regulations (LORS), estimates of soil losses from wind and water erosion during construction, and agencies contacts. Additionally, conducted field investigations to assess wetlands in proximity to linear routes for the East Altamont Energy Center.

AFC for San Joaquin Valley Energy Center, Calpine Corp., City of San Joaquin, California. Prepared CEQA-equivalent documentation to support an Application for Certifications (AFC) for review by the California Energy Commission. Prepared AFC section that assessed potential impacts to soil and agricultural resources for the proposed power plant projects including all linear features (transmission lines, water supply and discharge lines, and natural gas supply lines). This documentation also included a summary of applicable laws, ordinances, and regulations (LORS), estimates of soil losses from water erosion during construction, and agencies contacts.

AFC for AES Highgrove Project. Prepared CEQA-equivalent documentation to support an Application for Certifications (AFC) for review by the California Energy Commission. Prepared AFC section that assessed potential impacts to soil and agricultural resources for the proposed power plant projects including all linear features (transmission lines, water supply and discharge lines, and natural gas supply lines). This documentation also included a summary of applicable laws, ordinances, and regulations (LORS), estimates of soil losses from wind and water erosion during construction, and agencies contacts.

AFC for Walnut Energy Center, Turlock Irrigation District. Prepared CEQA-equivalent documentation to support an AFC for review by the California Energy Commission. Prepared AFC section that assessed potential impacts to soil and agricultural resources for the proposed power plant projects including all linear features (transmission lines, water supply and discharge lines, and natural gas supply lines). This documentation also included a summary of applicable laws, ordinances, and regulations (LORS), estimates of soil losses from wind and water erosion during construction, and agencies contacts. Prepared Response to Comments from the CEC.

DECLARATION OF

Arne Olson

I, Arne Olson, declare as follows:

1. I am presently employed by Energy and Environmental Economics, Inc. as a Partner.

2. A copy of my professional qualifications and experience are attached hereto and incorporated herein by reference.

3. I helped prepare the attached testimony on Alternatives for the Hidden Hills Solar Electric Generating System project based on my independent analysis, supplements thereto, data from reliable sources, and my professional experience and knowledge.

4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue(s) addressed herein.

5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: 1/10/2013 Signed: 

At: San Francisco, CA

Arne Olson

101 Montgomery Street, Suite 1600, San Francisco, CA 94104 415.391.5100
arne@ethree.com

ENERGY AND ENVIRONMENTAL ECONOMICS, INC. San Francisco, CA
Partner 2008 – Present
Senior Consultant 2002-2008

Mr. Olson is a lead in the practice areas of Resource Planning; Renewables and Emerging Technology; Transmission Planning and Pricing; and Energy and Climate Policy. He is an expert in evaluating the impacts of aggressive state and federal policies to promote clean and renewable energy production. He is currently leading the California Independent System Operator's studies of renewable integration needs. He was the lead investigator for the California Public Utilities Commission in its 33% RPS Implementation Analysis and in recommending reforms to the California Utilities' Long-Term Procurement Plans. He served as advisor, facilitator and drafter to the Idaho Legislature in developing the 2007 Idaho Energy Plan, the state of Idaho's first comprehensive, statewide energy plan in 25 years. He served as lead negotiator for wholesale electricity market design on behalf of the BC Hydro and Power Authority, and he has evaluated the cost-effectiveness of long-distance transmission lines to harvest remote renewable resources for many utilities in the Western US and Canada. His clients include the California Independent System Operator, California Public Utilities Commission, Colorado Public Utilities Commission, the Western Electric Coordinating Council, the Western Electric Industry Leaders' Group, the City of Seattle, Pacific Northwest Generating Cooperative, Mid-American, AltaLink, Pacific Gas & Electric Company, Bonneville Power Administration, Powerex, TransElect, BC Hydro, and Hydro-Quebec TransEnergie.

Resource Planning and Valuation:

- Currently assisting the Colorado Public Utilities Commission in developing long-term scenarios to use across a range of energy infrastructure planning dockets.
- Assisted BC Hydro in evaluating the impact of BC's provincial greenhouse gas reduction policies on future electric load as part of BC Hydro's 2011 Integrated Resource Plan.
- Provided expert testimony in front of the California Public Utilities Commission on rates and revenue requirements associated with several alternative portfolios of demand-side and supply-side resources, on behalf of Pacific Gas and Electric Company, Southern California Edison, and San Diego Gas & Electric.
- Served as lead investigator in assisting the California Public Utilities Commission (CPUC) in its efforts to reform the long-term procurement planning process in order to allow California to meet its aggressive renewable energy and greenhouse gas reduction policy goals.
- Constructed an integrated resource plan (IRP) on behalf of Umatilla Electric Cooperative, a 200-MW electric cooperative based in Hermiston, Oregon. The IRP considered a number of different resource and rate product options, and addressed ways in which demand-side measures such as energy efficiency, distributed generation and demand response can help UEC reduce its wholesale energy and bulk transmission costs.
- Served as lead investigator in developing integrated resource plans for numerous publicly-owned utilities including PNGC Power, Lower Valley Energy, and Platte River Power Authority.

- Provided generation and transmission asset valuation services to a number of utility and independent developer clients.

Renewables and Emerging Technology:

- Currently leading the California Independent System Operator's (CAISO) renewable integration needs studies. The studies are evaluating the need for firming capacity and flexible resources to accommodate the variable and unpredictable nature of wind and solar generation. Results of the studies will be used to determine the need to procure new, flexible resources.
- On behalf of the Wyoming Governor's Office, developed a model of the cost of developing wind resources in Wyoming relative to neighboring states to inform policy debate regarding taxation. The model included detailed representations of state-specific taxes and capacity factors.
- On behalf of the CPUC, investigated a number of strategies for achieving a 33% Renewables Portfolio Standard in California by 2020, and estimated their likely cost and rate impacts using the 33% RPS Calculator, a publicly-available spreadsheet model developed for this project.
- Evaluated market opportunities and provided strategic advice for renewable energy developers in California and the Southwest.
- Investigated for Bonneville Power Administration (BPA) the economics and feasibility of investing in new, long-line transmission facilities connecting load centers in the Pacific Northwest with remote areas that contain large concentrations of high-quality renewable energy resources. The study informed BPA about cost-effective strategies for procuring renewable energy supplies in order to meet current and potential future renewable renewables portfolio standards and greenhouse gas reduction targets.
- Co-authored *Load-Resource Balance in the Western Interconnection: Towards 2020*, a study of west-wide infrastructure needs for achieving aggressive RPS and greenhouse gas reduction goals in 2020 for the Western Electric Industry Leaders (WEIL) Group, comprised of CEOs and executives from a number of utilities through the West, and presented results indicating that developing new transmission infrastructure to integrate remote renewable resources can result in cost savings for consumers under aggressive policy assumptions.

Transmission Planning and Pricing:

- Currently serving as technical support to the Western Electric Coordinating Council's Scenario Planning Steering Group (SPSG). The SPSG is developing scenarios for long-term transmission planning in the Western Interconnection.
- Currently advising several transmission developers seeking approval for projects through the CAISO's Transmission Planning Process.
- Led studies in 2009, 2011 and 2012 to develop generation and transmission capital cost assumptions for use in WECC's Transmission Expansion Planning and Policy Committee (TEPPC) studies.
- Contributed to a study of the benefits of North-South transmission expansion in Alberta on behalf of AltaLink.
- Led a study for WECC to estimate the benefits of developing a centralized Energy Imbalance Market (EIM) across the Western Interconnection. The study estimated benefits due to increased generation dispatch efficiency resulting from reduced market barriers and increased load and resource diversity among western Balancing Authorities. Led several follow-up studies of alternative Western EIM footprints for potential EIM participants.

- Retained by a consortium of southwestern utilities and state agencies including the Wyoming Infrastructure Authority, Xcel Colorado, Public Service Company of New Mexico, and the Salt River Project to perform an economic feasibility study of the proposed High Plains Express (HPX) transmission project, a roadmap for transmission development in the Desert Southwest and Rocky Mountain regions.
- Provided assistance to the Seattle City Council to develop guidelines for the evaluation of large electric distribution and transmission projects by Seattle City Light (SCL). Guidelines specified the types of evaluations SCL should perform and the information the utility should present to the City Council when it seeks approval for large distribution or transmission projects.
- Conducted screening studies of long-distance transmission lines connecting to remote renewable energy zones for multiple western utilities.
- Assisted in the development of a methodology for evaluating the renewable energy benefits of the Sunrise Powerlink transmission project in support of expert testimony on behalf of the California ISO.
- Assisted British Columbia Transmission Corporation and Hydro-Quebec TransEnergie with open access transmission tariff design.
- Represented BC Hydro in RTO West market design process in areas of congestion management, ancillary services, and transmission pricing.

Energy and Climate Policy:

- Served as advisor, facilitator and drafter to the Interim Committee in developing Idaho's first comprehensive, statewide energy plan in 25 years. The Interim Committee and subcommittees held 18 days of public meetings and received input from dozens of members of the public in developing state-level energy policy recommendations. This process culminated in Mr. Olson drafting the 2007 Idaho Energy Plan, which was approved by the Legislature and adopted as the official state energy plan in March 2007.
- Currently serving as advisor to the State-Provincial Steering Committee, a body of western state and provincial officials that provides oversight for WECC.
- Developed a model that forecasted renewable and conventional generating resources in the WECC region in 2020 as part of an E3 project to advise the California Public Utilities Commission, California Energy Commission and California Air Resources Board about the cost and feasibility of reducing greenhouse gas emissions in the electricity and natural gas sectors.

WASHINGTON OFFICE OF TRADE AND ECONOMIC DEVELOPMENT Olympia, WA
Senior Energy Policy Specialist 1996-2002

- **Electricity Transmission**: Lead responsibility for developing and representing agency policy interests in a variety of regional forums, with a primary focus on pricing and congestion management issues. Lead negotiator on behalf of agency in IndeGO and RTO West negotiations in areas of Congestion Management, Ancillary Services, and Transmission Planning. Participated in numerous subgroups developing issues including congestion zone definition, nature of long-term transmission rights, and RTO role in transmission grid expansion.
- **Western Regional Transmission Association, 1996-2001:** Member, WRTA Board of Directors. Participated in WRTA Tariff, Access and Pricing Committee. Participated in sub-groups examining "seams" issues among multiple independent system operators in the West and developing a proposal for tradable firm transmission rights in the Western interconnection.

- **Wholesale Energy Markets:** Monitored and analyzed trends in electricity, natural gas and petroleum markets. Editor and principal author of Convergence: Natural Gas and Electricity in Washington, a survey of the Northwest's natural gas industry in the wake of the extreme price events of winter 2000-2001, and on the eve of a significant increase in demand due to gas-fired power plants. Authored legislative testimony on the ability of the Northwest's natural gas industry to meet the demand from new, gas-fired power plants.
- **Electricity Restructuring:** Co-authored Washington Electricity System Study, legislatively-mandated study of Washington's electricity system in the context of ongoing trends and potential methods of electric industry restructuring. Authored legislative testimony on the impact of restructuring on retail electricity prices in Washington, electric industry restructuring and Washington's tax system, and the interactions between restructured electricity and natural gas markets.
- **Energy Data:** Managed three-person energy data team that collected and maintained a repository of state energy data. Developed Washington's Energy Indicators, a series of policy benchmarks and key trends for Washington's energy system; second edition published in January 2001.

DECISION ANALYSIS CORPORATION OF VIRGINIA Vienna, VA
Associate 1993-1996

- **Energy Modeling and Analysis:** Developed energy demand forecasting models for Energy Information Administration's National Energy Modeling System. Results are published each year in EIA's Annual Energy Outlook.

Education

University of Pennsylvania Philadelphia, PA
Institut de Francais du Petrole Rueil-Malmaison, France
M.S., International Energy Management & Policy

University of Washington Seattle, WA
B.S., Mathematical Sciences, B.S. Statistics

Citizenship

United States

Refereed Papers

1. *Olson A., R. Jones (2012) "Chasing Grid Parity: Understanding the Dynamic Value of Renewable Energy," Electricity Journal, 25:3, 17-27.*

2. *Woo, C.K., H. Liu, F. Kahrl, N. Schlag, J. Moore and A. Olson (2012) "Assessing the economic value of transmission in Alberta's restructured electricity market," Electricity Journal, forthcoming.*

3. *DeBenedictis, A., D. Miller, J. Moore, A. Olson, C.K. Woo (2011) "How Big is the Risk Premium in an Electricity Forward Price? Evidence from the Pacific Northwest," Electricity Journal, 24:3, 72-76.*

4. *Woo, C.K., I. Horowitz, A. Olson, A. DeBenedictis, D. Miller and J. Moore (2011) "Cross-Hedging and Forward-Contract Pricing of Electricity in the Pacific Northwest," Managerial and Decision Economics, 32, 265-279.*

5. *Olson A., R. Orans, D. Allen, J. Moore, and C.K. Woo (2009) "Renewable Portfolio Standards, Greenhouse Gas Reduction, and Long-line Transmission Investments in the WECC," Electricity Journal, 22:9, 38-46.*

6. *Moore, J., C.K. Woo, B. Horii, S. Price, A. Olson (2009) "Estimating the Option Value of a Non-firm Electricity Tariff," Energy, 35, 1609-1614.*

7. *Woo, C.K., I. Horowitz, N. Toyama, A. Olson, A. Lai, and R. Wan (2007) "Fundamental Drivers of Electricity Prices in the Pacific Northwest," Advances in Quantitative Analysis of Finance and Accounting, 5, 299-323.*

8. *Lusztig, C., P. Feldberg, R. Orans, and A. Olson (2006) "A survey of transmission tariffs in North America," Energy-The International Journal 31, 1017-1039.*

9. *Woo, C.K., A. Olson, I. Horowitz and S. Luk (2006) "Bi-directional Causality in California's Electricity and Natural-Gas Markets," Energy Policy, 34, 2060-2070.*

10. *Woo, C.K., I. Horowitz, A. Olson, B. Horii and C. Baskette (2006) "Efficient Frontiers for Electricity Procurement by an LDC with Multiple Purchase Options," OMEGA, 34:1, 70-80.*

11. *Woo, C.K., A. Olson and R. Orans (2004) "Benchmarking the Price Reasonableness of an Electricity Tolling Agreement," Electricity Journal, 17:5, 65-75.*

12. *Orans, R., A. Olson, C. Opatrny, Market Power Mitigation and Energy Limited Resources, Electricity Journal, March, 2003.*

Research Reports

1. *Economic Assessment of North/South Transmission Capacity Expansion in Alberta, January 2012, contributor.*

2. *WECC EDT, Phase 2 EIM Benefits, Analysis & Results, October 2011, contributor, http://www.wecc.biz/committees/EDT/EDT%20Results/EDT%20Cost%20Benefit%20Analysis%20Report%20-%20REVISED.pdf*

3. *High Plains Express Initiative, Stage 2 Feasibility Report, April 2011, contributor, http://www.highplainsexpress.com/site/stakeholderMeetingDocuments/HPX_Stage-2_Feasibility-report.pdf*

4. *State of Wyoming Wind Energy Costing Model, June 2010, author, http://legisweb.state.wy.us/2010/WyomingWindModel_7_01_2010.pdf.*

5. *Recommendations for Documentation of Seattle City Light Energy Delivery Capital Expenditures, February 2010, contributor, http://clerk.seattle.gov/~ordpics/31219exA.pdf.*

6. *California Public Utilities Commission, 33% Renewables Portfolio Standard Implementation Analysis, Preliminary Results, June 2009, contributor, http://www.cpuc.ca.gov/NR/rdonlyres/1865C207-FEB5-43CF-99EB-A212B78467F6/0/33PercentRPSImplementationAnalysisInterimReport.pdf*

7. *California Public Utilities Commission, Energy Division Straw Proposal on LTPP Planning Standards, June 2009, contributor, http://www.cpuc.ca.gov/NR/rdonlyres/1865C207-FEB5-43CF-99EB-A212B78467F6/0/33PercentRPSImplementationAnalysisInterimReport.pdf.*

8. *Remote Renewable and Low-Carbon Resource Options for BPA, May 2008, author, http://www.ethree.com/public_projects/BPA_options.html.*

9. *Load-Resource Balance in the Western Interconnection: Towards 2020, Western Electric Industry Leaders Group, January 2008, co-author, http://www.weilgroup.org/E3_WEIL_Complete_Study_2008_082508.pdf.*

10. *Umatilla Electric Cooperative 2008 Integrated Resource Plan, January 2009, author.*

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11. *Lower Valley Energy 2007 Integrated Resource Plan Update, February 2007, author.*

12. *Idaho Legislative Council Interim Committee on Energy and Technology and Energy and Environmental Economics, Inc., 2007 Idaho Energy Plan, January 2007. http://www.legislature.idaho.gov/sessioninfo/2007/energy_plan_0126.pdf*

13. *Base Case Integrated Resource Plan for PNGC Power, April 2006, author.*

14. *Integrated Resource Planning for Coos-Curry Electric Cooperative, August 2005, author.*

15. *Integrated Resource Planning for Lower Valley Energy, December 2004, author.*

16. *"A Forecast Of Cost Effectiveness: Avoided Costs and Externality Adders", prepared for the California Public Utilities Commission, February 2004, contributor.*

17. *Stepped Rate Design Report, prepared for BC Hydro and filed with the BCUC, May 2003, contributor.*

18. *Convergence: Natural Gas and Electricity in Washington, editor and principal author. Washington Office of Trade and Economic Development, May 2001. http://www.energy.cted.wa.gov/Papers/Convergence.htm.*

19. *2001 Biennial Energy Report: Issues and Analyses for the Washington State Legislature, contributing author. Washington Office of Trade and Economic Development, February 2001. http://www.energy.cted.wa.gov/BR2001/default.htm.*

20. *Study of Electricity Taxation, contributing author. Washington Department of Revenue, December 1999. http://www.energy.cted.wa.gov/papers/taxstudy.doc.*

21. *Washington Energy Indicators, author. Washington Department of Community, Trade and Economic Development, February, 1999. http://www.energy.cted.wa.gov/Indicators99/Contents.htm.*

22. *Washington State Electricity Study, contributing author. Washington Department of Community, Trade and Economic Development and Washington Utilities and Transportation Commission, January 1999. http://www.energy.cted.wa.gov/6560/finalapp.htm.*

23. *Our Energy Future: At a Crossroads. 1997 Biennial Energy Report, contributing author. Washington Department of Community, Trade and Economic Development, January 1997. http://www.energy.cted.wa.gov/BIENREPO/CONTENTS.HTM.*

24. *Washington State Energy Use Profile 1996, contributing author. Washington State Energy Office, June, 1996. http://www.energy.cted.wa.gov/FILES/PRFL/BASE02.HTM.*

25. *Model Documentation Report: Transportation Sector Model of the National Energy Modeling System, contributing author. Decision Analysis Corporation of Virginia. Prepared for Energy Information Administration, March 1994.*

DECLARATION OF
KAREN L. PARKER

I, Karen L. Parker, declare as follows:

1. I am presently employed by CH2M HILL Incorporated as a Senior Project Manager.
2. A copy of my professional qualifications and experience are attached hereto and incorporated herein by reference.
3. I helped prepare the attached testimony on Hazardous Materials for the Hidden Hills Solar Electric Generating System project based on my independent analysis, supplements thereto, data from reliable sources, and my professional experience and knowledge.
4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue(s) addressed herein.
5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: January 7, 2013 Signed: Karen L Parker

At: Sacramento, California

DECLARATION OF
KAREN L. PARKER

I, Karen L. Parker, declare as follows:

1. I am presently employed by CH2M HILL Incorporated as a Senior Project Manager.
2. A copy of my professional qualifications and experience are attached hereto and incorporated herein by reference.
3. I helped prepare the attached testimony on Waste Management for the Hidden Hills Solar Electric Generating System project based on my independent analysis, supplements thereto, data from reliable sources, and my professional experience and knowledge.
4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue(s) addressed herein.
5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: January 7, 2013 Signed: Karen L. Parker

At: Sacramento, California

DECLARATION OF
KAREN L. PARKER

I, Karen L. Parker, declare as follows:

1. I am presently employed by CH2M HILL Incorporated as a Senior Project Manager.
2. A copy of my professional qualifications and experience are attached hereto and incorporated herein by reference.
3. I helped prepare the attached testimony on Worker Safety and Fire Protection for the Hidden Hills Solar Electric Generating System project based on my independent analysis, supplements thereto, data from reliable sources, and my professional experience and knowledge.
4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue(s) addressed herein.
5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: January 7, 2013 Signed: Karen L. Parker

At: Sacramento, California

Karen Parker

Hazardous Materials Management Support

Education

B.S., Environmental Studies

Distinguishing Qualifications

- Expertise in federal, state, and local environmental regulations
- Firsthand knowledge of regulatory compliance issues from both a manufacturing and a government perspective
- Ability to negotiate terms and conditions of proposed regulatory standards and permits with regulatory agencies

Relevant Experience

Ms. Parker has more than 25 years of experience in all aspects of environmental compliance. As an environmental regulatory specialist, her responsibilities have included review of regulatory requirements for compliance with hazardous waste, hazardous materials, air quality, water quality, underground tank, site assessment and cleanup, and pollution prevention programs.

Representative Projects

Natural Gas-Fired Energy Facility Siting Applications, Various Locations, California. Prepared, reviewed, or supervised the preparation of hazardous materials and waste management elements for a number of Applications for Certification (AFCs) submitted to the California Energy Commission for siting of new gas-fired electric power plants in California. Plant locations included multiple sites in or near San Jose, San Francisco, Fresno, Modesto, Los Angeles, San Diego, and Sacramento.

Concentrating Solar Energy Facility Siting Application, Inyo County, California. Served as deputy project manager and oversaw preparation of hazardous materials, waste management, and worker health and safety sections of an AFC for a large concentrating solar power plant. Also supported preparation of resource reports contributing to an Environmental Impact Statement for a transmission line and a backup natural gas supply pipeline.

Photovoltaic Solar Energy Facility Siting Application, Kings County, California. Project manager for preparation of an Initial Study/Mitigated Negative Declaration for a 125-MW solar PV facility.

Pre-Construction Compliance, Russell City Energy Center, Hayward, California. Project manager for preparation of Biological Resources Mitigation Implementation and Monitoring Plan (BRMIMP), Cultural Resources Monitoring and Mitigation Plan (CRMMP), Paleontological Resources Monitoring and Mitigation Plan (PRMMP), Worker Environmental Awareness Training Plan and Training Documents, Traffic Control Plan, Land Use Development Plan, Visual Resources Off-site and On-site Landscaping Plans, and miscellaneous supporting correspondence and documentation for construction of a 600 MW natural gas-fired power plant in Northern California.

Pre-Construction Compliance Documents and Construction Monitoring, Woodland 2 Generating Station, Modesto, California. Project manager for preparation of BRMIMP, CRMMP, PRMMP, Worker Environmental Awareness Training Plan and Training Documents, and Ammonia Delivery Safety Plan for construction of a natural gas addition to an existing power plant in Modesto, California.

Pre-Construction Compliance Documents and Construction Monitoring, Metcalf Energy Center, San Jose, California. Assistant project manager for preparation of pre-construction compliance documents, including Worker Environmental Awareness Training and for monthly compliance monitoring reports for construction of the Metcalf Energy Center.

Construction Compliance Monitoring, Hayward, California. Project manager for several projects providing support services during construction of the Russell City Energy Center. Biological, cultural, and paleontological resources monitoring as well as miscellaneous visual resources, hazardous materials, EMF, and traffic support services.

Other New Power Plant Siting, Various Locations. Prepared elements of Environmental Impact Statements and air quality permit applications for the siting of new power plants in the Salt Lake City area, Southern Nevada, Southern California, and Illinois.

Other Electric Power Plant Construction Compliance, Various Locations, California. Completed or oversaw completion of documentation required prior to mobilization for construction under energy facility licensing conditions imposed by the California Energy Commission. Documents included Fugitive Dust Management Plans, Hazardous Materials Business Plans, Cultural Resources Monitoring and Mitigation Plans, Paleontological Resources Monitoring and Mitigation Plans, Biological Resources Mitigation Implementation and Monitoring Plans, Waste Management Plans, and Construction Worker Training Plans. Facilities were located in or near San Jose, Pittsburg, Modesto, Antioch, and Sacramento, California.

Natural Gas Dehydration Stations, Various Locations, California. Determined the need for and prepared applications for hazardous materials storage permits at several new natural gas dehydration stations in Northern California. Conducted site reconnaissance at a number of existing dehydration and compressor stations to determine the presence of underground storage tanks that may require closure or upgrading to meet new EPA requirements.

Natural Gas Pipeline Interconnector Permitting, Sacramento River Delta, California. Coordinated a review of environmental impacts of constructing a pipeline interconnector for transport of natural gas from a well field in central California to Bay Area power plants. Project included wetlands assessment, endangered species identification, and permitting associated with stream and river crossings.

Due Diligence, Existing Fossil-Fuel Fired Power Plants, San Francisco Bay Area, California. Performed an environmental due diligence assessment for a prospective purchaser of four existing Bay Area electric power generating plants as part of the State-required divestiture of power generation assets by Pacific Gas and Electric Company. Facilities included Potrero, Pittsburg, Contra Costa, and the Geysers.

Co-generation Facilities, Northern California. Managed assessments of permitting requirements for two co-generation facilities in northern California. Assessments covered air permitting, land use, hazardous materials management, water supply and disposal, and waste management issues.

Environmental Impact Report, Downtown-Natomas-Airport, Sacramento. Participated in preparation and review of hazardous materials section of an Environmental Impact Report for a planned extension of the City of Sacramento's light rail system from downtown Sacramento to the Sacramento International Airport.

Hazardous Waste Site Identification and Compliance Study, PG&E, Walnut Creek. Provided assistance to the Gas Services Division of PG&E periodically with hazardous waste identification and compliance with underground storage tank requirements.

DECLARATION OF

Robert Pearson, Ph.D., P.E.

I, Robert Pearson, declare as follows:

1. I am presently employed by CH2M HILL, Inc. as a Vice President and Principal Technologist.

2. A copy of my professional qualifications and experience is attached hereto and incorporated by reference herein.

3. I am adopting the attached portion of the Transmission Line Safety and Nuisance testimony for the Hidden Hills Solar Electric Generating System project based on my independent analysis and my professional experience and knowledge.

4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue(s) addressed herein.

5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: January 7, 2013

Signed: 

At: Denver, Colorado

ROBERT L. PEARSON, Ph.D., P.E.

Vice President

Education

Ph.D., Remote Sensing of Natural Resources, Colorado State University, 1973.
M.S., Remote Sensing of Natural Resources, Colorado State University, 1971.
Professional Geophysical Engineer, Colorado School of Mines, 1968.

Professional Registrations/Certifications

Registered Professional Engineer in Colorado (12582

Experience

Vice President and Principal Technologist, CH2M HILL, Denver, CO, 2000 to Present

Project Manager, Radian International, LLC, Denver, CO, 1994-2000.

Senior Staff Scientist, Radian Corporation, Denver, CO, 1992-1994.

Administrator, Environmental Affairs, Public Service Company of Colorado, Denver, CO, 1979-1992.

Senior Environmental Engineer, Public Service Company of Colorado, Denver, CO, 1973-1979.

Project Geophysicist, Chevron Oil Company, Geophysical Division, Los Angeles, CA and Houston, TX, 1968-1969.

Fields of Experience

Dr. Pearson is currently a Vice President and Principal Technologist in the Southwest Region Denver operations staff of CH2M HILL with responsibility for developing programs to respond to clients in all areas of environmental services with a particular emphasis to clients in the electric utility industry. Previously, he was a Project Manager and Senior Staff Scientist on the Denver technical staff of Radian International LLC responsible for the technical conduct of research and analysis projects for these clients. He has over 33 years of experience in environmental and technical engineering, regulatory review and assessment, preparation of industrial compliance policy, and environmental consulting. He has proven ability to work with clients to assess regulatory programs, define needs, and develop programs to satisfy those needs. His program administrative experience includes projects in health effects of electric and magnetic fields, air pollution control and assessment, water quality control, environmental permitting, and environmental research and development. Prior to joining Radian, Dr. Pearson was a nationally recognized expert concerning environmental issues in the electric utility industry. He was also a state water quality regulatory commissioner and commission chairman appointed by the Governor of Colorado, as well as a member and chairman of a water quality operator certification board, also governor appointed.

Electric and Magnetic Field Health Effects

- Managed utility company participation in two state of the art epidemiological research studies on the relationship between electric power lines and the occurrence of childhood cancer. These studies were done in Denver by Wertheimer and Leeper in 1978 and Savitz et al. in 1985. Much of the data required for the studies were provided from company data files and the overall design and execution of both studies was critiqued for its correctness and appropriateness.
- Provided electromagnetic field (EMF) analysis and testimony for a 115 kV underground electric transmission project In Denver which had been stalled by community opposition. As a result, the concerns of the citizens were allayed and the project was allowed to be constructed and placed into operation on schedule.
- Provided EMF analysis and expert testimony to governmental bodies for an overhead electric transmission project being relocated due to construction of the new Denver International Airport. The EMF concerns raised by the governmental bodies were reduced to a level allowing them to approve the project to be built on schedule.

- Chaired the EMF Health Studies Task Force of the Electric Power Research Institute. This industry advisory committee directs the EMF health studies research program of the Institute which is the largest such basic EMF research program in the world.
- Served as Vice Chairman of the Electric and Magnetic Fields Task Force of the Edison Electric Institute. This trade association industry committee of the investor-owned electric utilities in the United States provided policy preparation and issue management for this largest sector of the American electric utility industry.
- Participated in the organization and conduct of annual EMF scientific meetings for the Electric Power Research Institute (EPRI). These annual meetings are the principle informational meetings for representatives of the electric utility industry.
- Provided analysis and expert opinion on the EMF effects of a proposed Regional Transportation District light rail transportation system. This system, which is electrically powered, runs through several residential neighborhoods as well as commercial and industrial districts in the Denver area.
- Analyzed and provided expert opinion on a proposed university high energy physics facility. This facility proposed to be constructed on the campus of the University of California at Los Angeles (UCLA), will house state of the art high energy particle accelerators. The analysis provided information regarding the exposure to the surrounding neighborhood of magnetic fields from the facility as well as within the facility laboratories.
- Analyzed and provided expert opinion on a proposed electric cogeneration facility. This facility, also to be constructed on the campus of the UCLA, will provide electric power to the University. The analysis provided information regarding the potential interference with adjoining telephone switching equipment, as well as exposure to workers in nearby offices.
- Served as co-principal investigator and Project Manager of a study to investigate the “wire code paradox”, sponsored by the Electric Power Research Institute. The apparent paradox was revealed when earlier EMF epidemiological studies done in Denver and elsewhere demonstrated a relationship between a surrogate measure of magnetic fields exposure, the wire code, and the occurrence of childhood cancer. Actual measures of magnetic fields showed no such relationship. The study investigated the nature of the wire code paradox and to determine if the wire code is related to other parameters of the neighborhood such as its layout or of the house such as its age where the child lived. Several papers on the design and status of this project were presented to the Annual DOE/EPRI Contractor’s Review Meetings and Annual Meetings of the Bioelectromagnetics Society.
- Served as co-principal investigator and Project Manager of a study to investigate the feasibility of conducting an epidemiological investigation of children living in very high current configuration residences, sponsored by the Electric Power Research Institute. This study is exploring the feasibility of identifying children who live near larger power lines who could be surveyed for their incidence of contracting various forms of cancer including leukemia.
- Served on the study team evaluating the environmental impacts of the proposed Seattle East Link Light Rail System segment from Seattle to Belleview WA. My role was to evaluate the exposure to EMF for both passengers on the train as well as members of the public long the right of way. I also reviewed the potential for interference with sensitive electronic equipment in buildings near the ROW as well as pipelines corrosion in underground utilities along the ROW.
- Serving on the study team evaluating the environmental impacts of the proposed California High Speed Rail System segment from Modesto to Fresno CA. My role will be to evaluate the exposure to EMF for both passengers on the train as well as members of the public long the right of way.
- Served as Project Director of an assessment of the magnetic fields to be generated by the proposed high speed electric rail system to be built in Texas. This project determined the background levels of magnetic fields and the field levels which will be generated by the transit system when it is placed into service. Areas

which will be exposed to an elevated magnetic field as a result of the operation of the transit system were determined. These magnetic field levels were then screened to determine if existing occupational or environmental guidelines or standards will be exceeded and if so what health implications there may be given the current scientific knowledge on the subject. As a portion of this project, measurements were made of the magnetic fields produced by the Spanish high speed rail train, the AVE, which operates between Madrid and Seville. This rail system is identical to the system proposed to be constructed in Texas. Measurements were made both on the train as well as alongside the tracks and at a power substation which supplies electricity for the AVE rail system.

- Conducted two surveys of magnetic fields produced by 25 kV distribution power lines for an electric utility in Granada, Spain. The utility had received two requests to relocate two primary voltage distribution power lines, one from the local government and one from a group of concerned neighbors. Measurements were made of the magnetic fields produced by each of these lines which demonstrated the magnetic fields to be very low. Reports were produced for the utility for presentation to the city government and the group of concerned neighbors.
- Representing two electric utilities in Colorado at public meetings on the construction of new 115 and 230 kV electric transmission lines to be built to serve eight separate areas in Colorado and New Mexico. Presented information on the expected magnetic field levels to be produced by the transmission lines and the broader issue of the status of scientific knowledge on human health effects of electric and magnetic fields. That information was specifically requested by the public to be presented by a recognized expert in the field other than an employee of the utilities.
- Modeled the magnetic fields in the transmission switchyard and in an underground power transmission cable at the Protrero Power plant in California. The project is to add a seventh unit to the power plant. The California Energy Commission requested that the modeling be done as part of the environmental impact analysis for the plant.
- Served as Principle Investigator of an EMF research project on the Denver area for the Electric Power Research Institute. The project measured the voltages induced in grounded water pipes and electric neutrals along with magnetic fields in the homes and wire codes from nearby power lines in 191 homes selected from the Denver metropolitan area.
- Testified as an expert EMF witness for Tri State Generation and Transmission in the Eighth District Court in Raton, New Mexico, January 2006. The issue was a condemnation proceeding: Tri-State Generation and Transmission Association, Inc. v. Faver, King, Sierra Grande, and Spanish Trail Ranches, [consolidated] and the damages to the ranches from the construction and operation of the new power line.
- Testified as an EMF and corona noise expert in the Colorado Public Utility Commission hearings on the Xcel Energy Midway to Daniels Park transmission line.
- Testifying as an EMF and corona noise expert in the Colorado PUC hearings on the San Luis Valley to Calumet to Comanche transmission line project in Southern Colorado.
- Participated as an expert in the Xcel Energy hearings for the Silverthorne Substation in central Colorado and the Chambers Transmission Line rebuild project in Aurora Colorado.

EMF Publications

Pearson, R.L., and H. Wachtel. An Examination of the Residential and Lifestyle Factors Which May Underlie the Wire Code Paradox. RP2964-22, Electric Power Research Institute, January, 1994.

Pearson, R.L., and H Wachtel. “An Examination of the Residential and Lifestyle Factors Which May Underlie the Wire Code Paradox.” Presented at The Annual Review of Research on Biological Effects of Electric and Magnetic Fields From the Generation, Delivery and Use of Electricity, Savannah, Georgia, November, 1993.

Wachtel, H., and R.L. Pearson. “An Approach to Unraveling the Wire Code Paradox.” Presented at The Annual Review of Research on Biological Effects of Electric and Magnetic Fields From the Generation, Delivery and Use of Electricity, Savannah, Georgia, November, 1993.

Pearson, R.L. and H. Wachtel, “An Approach to Automatically Computing Wiring Code Patterns for a City.” Presented to the Annual Meeting of the Bioelectromagnetics Society, Copenhagen, Denmark, June 1994.

Wachtel, H and R.L. Pearson. “Associative Residential and Lifestyle Factors Which Appear to Underlie the Wiring Code Paradox.” Presented to the Annual Meeting of the Bioelectromagnetics Society, Copenhagen, Denmark, June 1994.

Pearson, R.L. and H. Wachtel, “An Automatic Wire Coding System for Exploring Possible Control Selection Bias and Identifying Large Exposed Populations for Cohort Studies.” Presented at The Annual Review of Research on Biological Effects of Electric and Magnetic Fields From the Generation, Delivery and Use of Electricity, Albuquerque, New Mexico, November 1994.

Wachtel, H., R.L. Pearson and D.A. Savitz. “A Determination of Childhood Cancer Risk in Relation to Residential Environment and Lifestyle Factors Associated With Wire Codes.” Presented at The Annual Review of Research on Biological Effects of Electric and Magnetic Fields From the Generation, Delivery and Use of Electricity, Albuquerque, New Mexico, November 1994.

Pearson, R.L., H. Wachtel and K.L. Ebi, Childhood Cancer Risk in Relation to Residential Environment and Lifestyle Factors that are Associated with Wire Codes. Presented to the Annual Meeting of the Bioelectromagnetics Society, Boston Massachusetts, June 1995.Wachtel, H., R.L. Pearson and K.L. Ebi, Could Air Pollution Be an n Alternative to or a Cofactor With Magnetic Fields as a Link Between Wire Codes and Childhood Cancer? Presented to the Annual Meeting of the Bioelectromagnetics Society, Boston Massachusetts, June 1995.

Pearson, R.L., H. Wachtel and K.L. Ebi, Automatic Wire Coding, A Method for Mapping Electric Power Lines and Identifying Potentially Exposed Populations for Epidemiologic Studies. Presented at The Annual Review of Research on Biological Effects of Electric and Magnetic Fields From the Generation, Delivery and Use of Electricity, Palm Springs, California, November 1995.

Wachtel, H., R.L. Pearson and K.L. Ebi. Childhood cancer Risk in Relation to Wire Code Associated REL factors and Causal Links that are Implicated. Presented at The Annual Review of Research on Biological Effects of Electric and Magnetic Fields From the Generation, Delivery and Use of Electricity, Palm Springs, California, November 1995.

Pearson, R.L., H. Wachtel and K.L. Ebi. Assessing Possible Control Selection Bias Using a Method for Automatic Wire Coding. Presented to the Annual Meeting of the Bioelectromagnetics Society, Victoria, B.C. Canada, June 1996.

Wachtel, H., R.L. Pearson and K.L. Ebi. Rental Status and Wire Code Are Risk Factors for Childhood Cancer. Presented to the Annual Meeting of the Bioelectromagnetics Society, Victoria, B.C. Canada, June 1996.

Pearson, R.L. “Transmission Lines, Electric and Magnetic Fields.” Encyclopedia of Chemical Processing and Design, Volume 47, Marcel Decker, Inc., New York, July, 1996

Wachtel, H., R.L. Pearson and K.L. Ebi Distance Weighted Traffic Density Is Associated With Wire Code and Is A Risk Factor For Childhood Cancer. Presented at The Annual Review of Research on Biological Effects of Electric and Magnetic Fields From the Generation, Delivery and Use of Electricity, San Antonio, Texas, November 1996.

Pearson, R.L., H. Wachtel and K.L. Ebi. A Retrospective Test of Control Selection Bias Using Census Data and City Wide Automatic Wire Coding. Presented at the Annual Review of Research on Biological Effects of Electric and Magnetic Fields from the Generation, Delivery and Use of Electricity, San Antonio, Texas, November, 1996

Zaffanella, L.E., S. Greenland, D.A. Savitz, R.L. Pearson, and R. Iryie. Application of the Case Specular Method to the Savitz Denver Study Residences. Technical Report 107751, Electric Power Research Institute, Palo Alto, California, 1997

Pearson, R.L., H. Wachtel, K.L. Ebi. Feasibility of a Study of VHCC Wire Code as a Risk Factor for Childhood Leukemia. Technical Report 107745, Electric Power Research Institute, Palo Alto, California, March, 1997 (in press).

Pearson, R.L., H. Wachtel, K.L. Ebi. The Use of Automatic Wire Coding to Evaluate Control Selection Bias in the Savitz et. al. Study. Technical Report TR-108044, Electric Power Research Institute, Palo Alto, California, August, 1998.

Pearson, R.L., H. Wachtel, K.L. Ebi. Feasibility of a Study of VHCC Wire Code as a Risk Factor for Childhood Leukemia. Technical Report TR-107745, Electric Power Research Institute, Palo Alto, California, December, 1997.

Pearson, R.L., H. Wachtel and K.L. Ebi. Residence Specific Air Pollution as a Possible Childhood Cancer Risk Factor and a Potential Link between Wire Codes, Traffic Density and Childhood Cancer. Presented at the Second World Congress for Electricity and Magnetism in Biology and Medicine, Bologna, Italy, June, 1997.

Wachtel, H., R.L. Pearson and K.L. Ebi. Study Design for Evaluating VHCC Wire Code as a Risk Factor for Childhood Cancer. Presented at the Second World Congress for Electricity and Magnetism in Biology and Medicine, Bologna, Italy, June, 1997.

K. L. Ebi, H. Wachtel, R. L. Pearson and L. Kheifets. Assessment of Control Selection Bias as a Possible Explanation of the Association between Wire Code and Childhood Cancer. Presented at the Second World Congress for Electricity and Magnetism in Biology and Medicine, Bologna, Italy, June, 1997.

R.L. Pearson. Residence Specific Air Pollution as a Possible Childhood Cancer Risk Factor and a Potential Link between Wire Codes, Traffic Density and Childhood Cancer. Presented at the Second World Congress for Electricity and Magnetism in Biology and Medicine, Bologna, Italy, June, 1997.

Wachtel, H., R.L. Pearson and K.L. Ebi. Why Is Wire Code Associated With Childhood Leukemia Risk In Some Cities But Not In Others? Presented at the Annual Review of Research on Biological Effects of Electric and Magnetic Fields from the Generation, Delivery and Use of Electricity, San Diego California, November, 1997

Pearson, R.L., H. Wachtel and K.L. Ebi. Determining the Historical Stability of Associations between Traffic Density, Wire Codes and Cancer Risk. Presented at the Annual Review of Research on Biological Effects of Electric and Magnetic Fields from the Generation, Delivery and Use of Electricity, San Diego California, November, 1997

Wachtel, H., R.L. Pearson and K.L. Ebi. Control Selection Bias as a Possible Explanation for the Observed Associations between Wire Codes and Childhood Cancer. Presented to the Annual Meeting of the Bioelectromagnetics Society, St Petersburg, Florida, June 1998.

Pearson, R.L., H. Wachtel and K.L. Ebi. Wire Codes, Traffic, And Air Pollution, Citywide Associations. Presented to the Annual Meeting of the Bioelectromagnetics Society, St Petersburg, Florida, June 1998.

Wachtel, H., R.L. Pearson and K.L. Ebi. What Might We Learn About Childhood Cancer Etiology From 20 Years Of "EMF Inspired" Research? Annual Review of Research on Biological Effects of Electric and Magnetic Fields From the Generation, Delivery and Use of Electricity, Tucson, Arizona, November, 1998

Wachtel, H., R.L. Pearson and K.L. Ebi. Traffic Density And Wire Codes May Be Risk Cofactors For Childhood Cancer. Presented to the Annual Meeting of the Bioelectromagnetics Society, Long Beach California, June 1999.

Pearson, R.L., H. Wachtel, K.L. Ebi and J Crawford. Wire Codes And Traffic Density Are Associated On A Citywide Basis. Presented to the Annual Meeting of the Bioelectromagnetics Society, Long Beach California, June 1999.

K. L. Ebi, L. Kheifets, R. L. Pearson and H. Wachtel. Evaluation of Control Selection Bias in the Savitz et al. Childhood Cancer Study, 2000. Journal of the Bioelectromagnetics Society, vol. 21, pp 346-53.

Pearson, R.L., H. Wachtel and K.L. Ebi. Distance Weighted Traffic Density in Proximity to a Home is a Risk factor for Childhood Cancer, Particularly Childhood Leukemia, 2000. Journal of the Air and Waste Management Association, vol. 50, pp175-80.

Pearson, R.L., H. Wachtel and K.L. Ebi. Traffic Density as a Risk Factor for Childhood Cancer in Denver and Los Angeles. Technical Report TR-114231. Electric Power Research Institute, Palo Alto, California, December 1999.

R. Pearson, H. Wachtel, K. Ebi, J. Crawford, Association Of Traffic Density With Wire Codes, Comparison Of Patterns Seen In Los Angeles And Denver. Presented to the Annual Meeting of the Bioelectromagnetics Society, Munich, Germany, June 2000.

H. Wachtel and R. Pearson. Interactions of traffic density and wire codes as cancer risk factors—a comparison of results in Los Angeles with those in Denver. Presented to the Annual Meeting of the Bioelectromagnetics Society, Munich, Germany, June 2000.

R.L. Pearson, H.Wachtel, and K.L. Ebi. Integrated Distance Weighted Traffic Density in Proximity to a Home Is a Risk Factor for Leukemia and Other Childhood Cancers. Presented to the Annual meeting of the Air and Waste Management Association, Salt Lake City Utah, June 2000.

H. Wachtel and R. Pearson. Combined Exposures to High Levels of Air Pollution and Electromagnetic Fields May Increase Leukemia and Other Cancer Risks in Children. Presented to the Annual meeting of the Air and Waste Management Association, Salt Lake City Utah, June 2000.

R. Kavet, L. Zaffanella, R. Pearson, and J. Dallapiazza. Association of Residential Magnetic Fields with Contact Voltage, 2004. Journal of the Bioelectromagnetics Society.

DECLARATION OF

David M. Phillips

I, David M. Phillips, declare as follows:

1. I am presently employed by CH2M HILL Engineers, Inc. as a Project Manager/Senior Biologist.

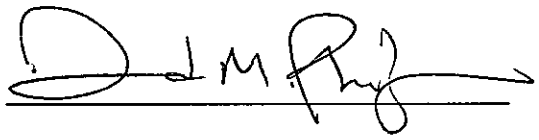
2. A copy of my professional qualifications and experience are attached hereto and incorporated herein by reference.

3. I helped prepare the attached testimony on Biological Resources for the Hidden Hills Solar Electric Generating System project based on my independent analysis, supplements thereto, data from reliable sources, and my professional experience and knowledge.

4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue(s) addressed herein.

5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: January 7, 2013 Signed: 

At: Laramie, Wyoming

David Phillips

Siting and Licensing Project Manager, Senior Biologist

Education

M.S., Wildlife Ecology/Statistics, University of Maine, 1994
B.S., Environmental Science/Biology, Stephen F. Austin State University, 1991

Professional Registrations

The Wildlife Society— Certified Wildlife Biologist
The Wildlife Society - Renewable Energy Working Group member
National Wind Coordinating Collaborative—Wildlife Workgroup Associate Member
American Wind Energy Association, Siting Committee – Wildlife Subcommittee Member
AWEA Offshore Wind Working Group – Member
Raptor Research Foundation – Member

Relevant Experience

Mr. Phillips is a Project Manager and Senior Biologist with CH2M HILL's Environmental Services Business Group in Denver, Colorado. He specializes in building teams to provide development, construction, and operations related consulting and permitting services to industrial clients as a project manager, but is also an established technical expert for resolution of environmental conflicts through permitting, studies, and strategic agency interaction for industrial development projects. He interfaces effectively with agencies, industrial clients, and industrial contractors to identify and manage permit risk issues, effectively navigate the regulatory environment, and bring development stage projects to construction and into operations. His demonstrated success with NEPA, ESA, BGEPA, MBTA CWA, NHPA, NPDES, and other relevant local, state, and federal environmental regulations applicable to development and construction of industrial projects is substantial, as is his experience managing and working with diverse interdisciplinary teams (legal, engineering, biological, social, cultural, construction, land acquisition, and development) to accomplish permitting and compliance objectives. Mr. Phillips is a wildlife technical lead in CH2M HILL and provides technical support and accurate and up to date policy information to project managers and biologists that interface regularly with agencies and power generation clients.

Representative Project Involvements

Alta Wind Project, Phases VII and IX – Terra-Gen Power – March 2012 – present: Develop and implement construction compliance system to meet environmental compliance requirements under the California Environmental Quality Act Final Environmental Impact Report and Incidental Take Permit issued by California Department of Fish and Game for Bakersfield cactus and desert tortoise. Supervise and train staff, develop environmental training program and communications and reporting systems to enable onsite staff to interface effectively with construction contractors and meet compliance objectives.

Imperial Solar Energy Center West – (March 2011- present): Leading development and implementation of Avian Protection Plan, Burrowing Owl Mitigation and Monitoring Plan, and Fatality Monitoring Plan for CSOLAR Development Corporation's 230 MW concentrated photovoltaic solar energy project in Imperial County, California. Project requires involve installation of 230-kV transmission lines across BLM lands and therefore involve a joint CEQA Environmental Impact Report (EIR) and BLM Environmental Assessment (EA), with Imperial County functioning as the local lead agency. BLM right of way has been authorized and current work involves coordination with USFWS on avian protection planning. Special emphasis is placed on developing and implementing effective take avoidance measures for burrowing owls.

Tesoro Refining and Marketing – Eagle Non-purposeful Take Permit Application - January 2012: Provided technical expertise and managed preparation of permit application for non-purposeful take of a bald eagle nest located within 660 feet of a Crude Railcar Unloading Facility planned for construction during the 2012 nesting season on Tesoro's Anacortes, Washington refinery property located on March Point in Skagit County.

AWEA Technical Advisor – Jan-February 2012. Served as technical advisor for AWEA's sage-grouse task force for development of AWEA response to BLM sage-grouse policy IM 2012-043 and 044, and recommended Conservation Measures in preliminary priority and general habitats.

Quaking Aspen Wind Energy Project – EnXco (February 2011 – present): Managing NEPA Environmental Impact Statement process for enXco's proposed 150-MW wind energy project located on lands administered by the BLM in Sweetwater County, Wyoming. Drafted Plan of Development, and now coordinating scoping, public involvement, and baseline data collection and analyses processes. Critical issues include aesthetic impacts, biological resource issues, MBTA compliance, risk of golden eagle take, cultural resource impacts, and public perception.

Tule Wind Energy Project – Iberdrola Renewables – December 2011- January 2012: Lead team to develop nesting Bird Monitoring, Management, and Reporting Plan required per BLM and County Final Impact Statement and Environmental Impact Report for the Tule Wind Project, located in an unincorporated portion of San Diego County approximately 70 miles east of San Diego. The project is located on lands administered by the U. S. BLM, the Ewiiaapaayp Indian Reservation, Manzanita and Campo Indian Reservations (access only), and the California State Lands Commission, as well as private lands. The project is planned for construction during spring and summer 2012.

Laurel Hill Wind Energy Project – Duke Energy Renewables – November 2011 – January 2012: Completed golden eagle risk assessment for Duke Energy's Laurel Hill Wind Energy Project located on private and state lands within Jackson and MacIntyre Townships of Lycoming County, Pennsylvania. Risk assessment includes technical review of raptor migration studies completed for the project in 2005 and 2006, review of existing data and literature, a qualitative assessment of risk, and recommendations for protective measures to avoid minimize or mitigate potential risks to golden eagles associated with construction and operations of the project.

Confidential Client – Oil Shale Development project – March 2012 – Present: Serve as wildlife technical lead on large scale oil shale development planned for Uintah County, Utah. The planned development is mainly on private land; however, requisite pipeline and road crossings of Bureau of Land Management (BLM) land create challenging compliance issues, especially related to evolving greater sage-grouse policy on federal lands and MBTA/BGEPA compliance. Leading review of existing data, providing technical guidance and assisting client-agency interaction, developing and leading implementation of studies for special status species to ensure adequate baseline data for NEPA compliance and development of effective impact avoidance and mitigation measures.

Black Hills Power & Light Co. – November 2011- present. Serve as senior technical consultant for Wyoming Industrial Siting Permit process and for USEPA Air Quality Permitting for Black Hills Power's proposed natural gas combustion turbine generation facility consisting of five 40-megawatt natural gas combustion turbine generators and associated infrastructure. Responsible for design and implementation of wildlife and plant survey activities for ESA Section 7 consultation process, avian surveys to ensure MBTA and BGEPA compliance, and assessment of environmental impacts.

East Helena Smelter RCRA Site, Montana Environmental Trust Group (November 2011- present): Senior wildlife technical lead on wetland functional assessment necessary for agency decision making, coordination, and baseline data requirements to complete NEPA analysis and permitting of potential South Plant Hydraulic Controls project. Completed desktop review and onsite habitat evaluations in accordance with the Montana Department of Transportation Montana Wetland Assessment Method Parts 14 A, B, and C, covering wildlife habitats and species designated as federally listed, proposed, threatened, and endangered and rated S1, S2, or S3 by the Montana Natural Heritage Program.

Tehachapi Renewable Transmission Project, Southern California Edison, (Fall 2011). Oversaw preparation of the biological resources portion of a Supplemental Environmental Impact Report (EIR) evaluating potential impacts associated with installation and maintenance of lighting and aviation markers required by the FAA that were not

considered in the final EIS or EIR for the project. The final Project Modification Report is subject to evaluation by the California Energy Commission, U.S.D.A. Forest Service, USFWS, and FAA.

Sevier Dry Lake Exploratory Testing Project, Peak Minerals, Inc (Fall 2011): Prepared Wildlife and Plant Inventory Plan and Wildlife Mitigation and Monitoring Plan for potash mining exploration project located in Millard County, Utah and involving lands administered by the BLM Filmore Field Office. The inventory and monitoring plans were drafted in compliance with requirements of the Exploratory Testing EA (DOI-BLM-UT-W02002011-0115 EA) and Leasing Proposal EA (DOI-BLM-UT-W020-2010-014-EA) and designed to address federally listed and BLM-sensitive species, USFWS Birds of Conservation Concern, big game, and other sensitive/special status avian and mammal species warranting consideration.

Wind Project Avian and Bat Protection Plans –Terra Gen Power (June 2010 to Present): Leading development of Avian and Bat Protection Plans (ABPPs) for multiple private land and Bureau of Land Management (BLM) wind energy generation projects in Kern County, California. ABPPs prepared include a corporate Plan to address all projects in development, construction, and operation and project-specific Plans for both private land and BLM NEPA regulated projects. ABPPs for BLM projects are designed to specifically address BLM and FWS expectations per the requirements of the BLM Instructional Memorandum 2010-156 requiring an approved Avian and Bat Protection Plan to address golden eagle impact risk issues and ensure acceptable avoidance and mitigation for the species. Processes involve technical expertise and strategic negotiation with U.S. Fish and Wildlife Service (USFWS) and BLM with a client oriented focus. Recently prepared a draft Eagle Conservation Plan (ECP) for a BLM project to demonstrate the lack of need for mitigation and programmatic take permitting.

Confidential Wind Overpower Project (2011): Overseeing baseline studies and providing biological technical leadership for a 20 MW wind energy overpower project located in San Gorgonio County and Desert Hot Springs, California. Process involves strategic interaction with California Department of Fish and Game (CDFG) and USFWS to identify data needs for impact assessment and mitigation in accordance with state regulations and a programmatic Habitat Conservation Plan in place for the project. Leading preparation of an Avian and Bat Protection Plan to address MBTA and BGEPA concerns raised by the USFWS.

Vasco Wind Repowering Project, NextEra Wind Energy (2011): Drafted Avian Protection Plan (APP) for the Vasco Winds Repowering Project (Altamont Passs) in Contra Costa County, California to address potential avian and bat impacts resulting from the operation of the Project. The goal of this ABPP is to meet the intent of the MBTA, BGEPA, ESA, and the California Endangered Species Act (CESA) by implementing the provisions and conditions of a 2010 Settlement Agreement a settlement agreement among NextEra Energy Resources, the Audubon Society, the State of California Attorney General's Office, local chapters of the Audubon Society, Californians for Renewable Energy, and others, thereby reducing and managing risk to avian and bat species.

Alta Oak Creek Mojave Wind Energy Project, Phases 1-5 – Terra-Gen Power (January 2010 – March 2011): Managed construction compliance by assisting client with adherence to mitigation measures as defined in federal, state, and county level permits during construction of an eight phase, 800-MW wind energy generation project near Tehachapi, California. Compliance measures included oversight of two CH2M HILL onsite Compliance Specialists, preparation and delivery of training materials for construction teams, wildlife and botanical survey and monitoring commitments, and cultural and paleontological mitigation programs and management plans, and oversight of environmental subcontractors. Role required extensive staffing and scheduling, coordinating CH2M HILL employees and subcontractors, and effective client communication to respond to immediate and long-term planning issues. Effectively mentored mid level project manager to assume responsibilities in spring 2011 for remaining construction compliance associated with the final two phases of construction.

Alta Wind Energy Center – Terra-Gen Power (March 2010 – June 2011): Senior technical lead coordinating preparation of California Incidental Take Permits, federal Habitat Conservation Plan, and Biological Assessment for state/federal listed species (Bakersfield cactus, desert tortoise, southwest willow flycatcher, California condor), and leading preparation of Avian and Bat Protection Planning for five confidential wind energy projects in the development stages located near Tehachapi in Kern County, California.

Confidential Wind Project (June 2011-present): Overseeing biological resource studies required for siting energy facilities under the Oregon Department of Energy siting statutes and leading strategic agency coordination with USFWS related to eagle act compliance for a proposed150-MW wind energy project located in Sherman and Wasco Counties, Oregon. Process involves strategic interaction with Oregon Department of Fish and Wildlife and USFWS to identify data needs for impact assessment and mitigation. Serving as eagle technical specialist with regard to study design, defensible impact/risk assessment, take estimation and programmatic take permitting.

Emma and Will Windpower Projects - Wyoming Wind and Power (November 2010-present): Managing permitting and baseline environmental studies for a proposed 1,000 MW private land wind energy project near Wheatland, Wyoming. Developed and implementing comprehensive 2-year biological resource study program in coordination with USFWS and Wyoming Game and Fish Department (WGFD) to specifically address state and federal regulatory requirements for wind project development.

Sand Hills Wind Energy Project - Avian Protection Plan – Shell Wind Energy (Fall 2010 to Present): Providing technical leadership for golden eagle impact assessment and Eagle Conservation Plan (ECP) preparation for Shell Wind Energy's 50 MW project in Albany County, Wyoming. The ECP is being prepared in response to BLM IM 2010-156 as part of the BLM and Western Area Power Administration (Western) Environmental Assessment. Also provided technical leadership for formal conferencing under Section 7 of the Endangered Species Act (ESA) for the mountain plover, a species that was proposed for listing by the USFWS as federally threatened. Completed data review and preparation of ECP and Advanced Conservation Practices for both species to develop biologically appropriate measures for the project through strategic coordination with the USFWS, BLM, and Western. Additional services include, but are not limited to, general ABPP development, Wildlife Monitoring Plan development, and strategic agency communication and coordination.

Mountain Air Windpower Project – Duke Energy (Fall 2010): Due Diligence review of wind projects located near Mt. Home, Idaho, during consideration for acquisition. Review consisted of a cursory evaluation of development and operational risk issues related to permitting and environmental issues. Managed informal consultation with the USFWS per requisite ESA Review Procedures for NPDES Construction General Permitting under U.S. Environmental Protection Agency permitting authority. Managed setup and implementation of baseline avian and slickspot peppergrass (federally threatened plant species) studies, wetland delineations for subsequent permitting with the U.S. Army Corps of Engineers, and cultural resource assessments to ensure no impact to cultural resources.

Alpine Solar Project - NRG (March 2011): provided professional testimony for an appeal of a California Environmental Quality Act (CEQA) mitigated negative declaration granted to a 96 MW photovoltaic solar energy project in Los Angeles County, California. Process included technical review of biological resource studies and preparation with NRG legal counsel for testimony to address opposition by a local conservation organization.

Imperial Solar Energy Center South – (2011): Managed preparation of Avian Protection Plan, Burrowing Owl Mitigation and Monitoring Plan, and Fatality Monitoring Plans for CSOLAR Development Corporation's 200 MW concentrated photovoltaic solar energy projects in Imperial County, California. Projects involves installation of 230-kV transmission lines across BLM lands and therefore involves a joint CEQA EIR and BLM EA, with Imperial County functioning as the local lead agency. BLM right of way has been authorized for Phase 1 (200 MW), and project is currently under construction.

Critical Issues Analysis (May 2011): Managing assessment of critical issues for confidential client in Albany and Carbon Counties, Wyoming, including, but not limited to complete raptor nest assessment for project area and region.

Confidential Wind Project (2010-11): Overseeing baseline studies and providing technical leadership on Los Angeles County Conditional Use Permit, CEQA EIR preparation, and related agency consultation for confidential wind project in early development stages.

Confidential Solar Project (2011): providing technical leadership for agency interaction and development of biological resource study design for proposed solar project near Barstow, California in San Bernadino County. Process involves strategic negotiation to address golden eagle impact assessment and potential permitting issues.

Wind Project Site Assessment (Fall 2010): Managed baseline environmental studies and agency consultation for confidential wind project in Laramie County, Wyoming.

Wind Project Due Diligence (Fall 2010): Due Diligence review of wind project under consideration for acquisition by Confidential Client in Carbon County, Wyoming. Thorough evaluation of development and operational risk issues related to permitting and environmental issues.

Sand Hills Wind Energy Project - Shell Wind Energy (September 2009 to November 2011): Managed preparation of Plan of Development and Environmental Assessment for Shell Wind Energy's 50-MW wind project in Albany County, Wyoming. BLM is the lead federal agency with Western Area Power Administration as the cooperating agency. Managed cultural and environmental resource reviews and preparation of relevant monitoring and environmental protection programs during construction and operation, such as wildlife monitoring, revegetation, and reclamation plans. Also managing county and local permitting processes.

Reno Junction Wind Energy Project – Third Planet Windpower (Spring 2010): Managed development of Wyoming Industrial Siting Act (ISA) Permit Application for Third Planet's proposed 150-MW wind energy generation project and 5-mile transmission line in Campbell County, Wyoming. Assisted client with requisite agency consultation and negotiation (USFWS, WGFD, Wyoming Department of Environmental Quality (WDEQ), Wyoming State Historic Preservation Office (WSHPO), communication with local officials, and public involvement activities.

Confidential Solar Project, Confidential Client (Fall 2010): Senior review for initial site assessment of proposed solar energy facility near Desert Center in Riverside County, California.

Alpine Solar Project; Confidential Client; California (Summer 2010): Senior environmental review for initial site assessment and of proposed solar energy facility in Los Angeles and Kern County, California.

Resolute 1 Wind Energy Project – Clipper Windpower (Spring 2010): Managed coordination with WGFD, WDEQ, WSHPO, and local officials for State and County level permitting of Clipper's proposed 150-MW wind project in Converse County, Wyoming. Leading strategic negotiations with USFWS Wyoming Ecological Services Field Office to proactively address operational risk issues relevant to wind farm development (impacts to federally listed species, MBTA, BGEPA).

Confidential Solar Project; Kern County, California (Spring 2010 to Present). Senior review and guidance on biological risk assessment and impact mitigation for during development and permitting phase of a large scale solar energy facility in Kern County, California.

Operational Risk Management – Avian Risk Issues, Confidential Client (2009-present): Working with confidential wind energy generation client to proactively address operational risk issues related to MBTA and BGEPA compliance at two wind project sites. Assisting with agency consultation and consideration of options for impact mitigation to USFWS trust species and their habitats. Providing technical and policy-oriented guidance to the client and legal counsel, and to the third party consultant that is responsible for preparing project-specific ABPPs and completing field studies.

Top of the World Wind Energy Project – Duke Energy (Fall 2008-Fall 2010): managed preparation of state ISA Permit Application for Duke Energy's 200-MW wind energy generation project and 6-mile transmission line in Converse County, Wyoming. Managed baseline environmental studies to evaluated biological, cultural, and wetland/waterbody resources impacts. Provided oversight of construction activities outlined in the SWPPP, SPCC plan, and ISA Permit and to ensure compliance with Section 404 of the CWA, ESA, and MBTA and other agency directives. ISA permit application available online: http://deq.state.wy.us/isd/downloads/TOTW_ISA_Permit_Application_09-21-09.pdf.

Dunlap Ranch Wind Energy Project – PacifiCorp Energy (Summer 2009 - Present): executed permitting and environmental studies for state Industrial Siting Permit Application process for PacifiCorp Energy's proposed wind energy generation project and 15-mile transmission line located on private and state lands in Carbon County, Wyoming. Managed execution of environmental compliance audits to provide oversight of construction activities outlined in the SWPPP, SPCC plan, ISA Permit, and County Conditional Use Permits and to ensure compliance with cultural and avian nest buffers, Section 404 of the CWA, ESA, and MBTA. ISA permit application available online: http://deq.state.wy.us/isd/downloads/Dunlap_ISA_FINAL.pdf

Campbell Hill Wind Energy Project – Duke Energy (Summer 2008-Fall 2009): managed state Industrial Siting Permit Application and environmental subcontractors for Duke Energy's 99-MW Wind Project and 11-mile transmission line in Converse County, Wyoming. Developed written environmental compliance plan and assisted with preparation of reports to regulatory agencies. Assisted development of Wildlife Mitigation and Monitoring Program to address impact concerns to sensitive environmental resources specifically focused on avoiding, minimizing, and measuring impacts to nesting raptors. Provided oversight of construction activities outlined in the SWPPP, SPCC plan, and ISA Permit and to ensure compliance with Section 404 of the CWA, ESA, and MBTA and other agency directives. ISA Permit Application available online: http://deq.state.wy.us/isd/downloads/Campbell_Hill_All_Combined_Final_010709.pdf.

Limon Wind Energy Project – Iberdrola Renewables (Fall 2008 – present): managed preparation of county Use by Special Review permit application, and currently managing Western Area Power Administration NEPA Analysis and baseline wildlife monitoring program for Iberdrola's proposed 100-MW wind project in Lincoln County, Colorado.

High Plains McFadden Ridge Wind Energy Project – PacifiCorp Energy (Summer 2009 – Spring 2010): executed environmental compliance audits to provide oversight of construction activities outlined in the SWPPP, SPCC plan, ISA Permit, County Conditional Use Permits and to ensure compliance with cultural and avian nest buffers, Section 404 of the CWA, ESA, and MBTA.

Williams Echo Springs Gas Plant Industrial Siting Permit (Fall 2008): team member for State Industrial Siting Permit Application for a gas plant expansion project near Wamsutter, Wyoming. ISA Permit Application available online: http://deq.state.wy.us/isd/downloads/Williams_ISA_FINAL.pdf.

Milford Wind Corridor Project – First Wind (Fall 2008): team member for preparation of Plans of Development and EAs for First Wind's geotechnical work, 300-MW wind project, and 80-mile transmission line involving BLM and private lands near Milford, Utah.

Fatal Flaw Analyses (2009): completed fatal flaw analyses for two potential wind project areas near Clovis, New Mexico for Confidential Client, evaluating environmental, cultural, and Federal Aviation Administration concerns.

Fatal Flaw Analyses (2009): completed fatal flaw analyses for potential wind project areas in Converse and Natrona Counties, Wyoming for Confidential Client, evaluating resource and permitting concerns and challenges or limitations for development.

Fatal Flaw Analyses (2009): completed fatal flaw analyses for three potential wind project areas in eastern Colorado for Confidential Client, evaluating resource and permitting concerns and challenges or limitations for development.

Environmental Constraints Analyses (2009): completed constraints/fatal flaw analyses for three potential project areas in Laramie County Wyoming for Confidential Client.

Fatal Flaw Analyses (2009): completed fatal flaw analyses for potential wind project areas in Carbon and Albany Counties, Wyoming for Confidential Client, evaluating resource and permitting concerns and challenges or limitations for development.

Critical Environmental Issues Analyses (2008): completed Critical Issues Analyses for two potential project areas in Colorado for Confidential Client and designed wildlife monitoring program in coordination with state and federal agencies.

White Mountain Wind Project EA (Fall 2007- Spring 2008): managed early stages of BLM EA, and planned and implemented preconstruction wildlife monitoring program for Teton Wind Energy, LLC's proposed 130-turbine wind project in Sweetwater County, Wyoming. Project details are available online: http://www.blm.gov/wy/st/en/info/NEPA/rsfodocs/whitemtnwind.html

TEMAX and TIME III Pipeline Projects – Spectra Energy (Summer 2008): Team member in preparation of FERC Environmental Report for Texas Eastern Transmission, LP's (Spectra Energy Corp.'s) planned installation and upgrade of natural gas pipelines and compression facilities through six counties in southern Pennsylvania.

White River Hub Natural Gas Pipeline Project EA – Questar Pipeline (2007): coordinated FERC Environmental Report/EA preparation for FERC/BLM NEPA analysis of Questar Pipeline Company's 8-mi natural gas pipeline and compressor project in northwest Colorado. Managed execution and completion of resource reports, wildlife/plant/cultural surveys, Plan of Development, permitting, and maintenance of project website. Environmental reports and draft EA are available online: http://www.whiteriverhubproject.com/documents.htm. Project information is at http://www.whiteriverhub.com/

FMC-349 Storage Area Development Project – FMC Corporation (2007): prepared EA for water lines, road construction, and injection/extraction wells associated with an FMC Corporation sodium mine. Responsible for NEPA documentation, and exception requests required for implementation of projects.

Albany County Predator Control Project (2007): prepared literature review and designed research program to evaluate the potential influence of predator control for livestock protection on wildlife population dynamics in Albany County, Wyoming.

BNSF Railway Biological Assessment, Biological Evaluation, & Management Indicator Species Analyses (2007): contributing writer to documents required for 31-mi rail project on Forest Service and BLM administered lands.

Jonah Bridger to Opal Natural Gas Project EA – Teppco (now Enterprise) (2005-2006): coordinated wildlife surveys and habitat mapping and completed the biological resource impact assessment and BA for Jonah Gas Gathering Company's 80-mi pipeline intersecting three BLM Field Offices in western Wyoming.

Continental Divide-Creston EIS (2005-2006): served as NEPA IDT-wildlife lead, interacting with industry and BLM, planning and implementing resource assessments, and preparing NEPA documents (Ch.3&4, and BA) for conglomerate of natural gas companies developing gas resources in south central Wyoming.

Creston Blue Gap EIS (2005): key participant in initial planning phases of EIS prior to project being combined with the adjacent Continental Divide EIS. Worked with BP, Anadarko, Devon Energy, and BLM to proactively identify and address biological resource issues associated with a large-scale gas field development.

Waterfowl Assessment, Duck Valley, Idaho (2005): Executed study of potential impact of water development projects to migrating waterfowl on the Shoshoni Paiute Indian reservation. Utilized aerial and ground surveys to quantify baseline use and evaluate potential impacts resulting from the proposed action.

Coordinated wildlife, plant, wetland, and habitat mapping surveys for major gas development and pipeline projects in the Powder River Basins of Wyoming and Montana, the Great Divide and Green River Basins of Wyoming, and the Piceance Basin of Colorado for clients such as Fidelity, Petro-Canada, Anadarko, Devon, ConocoPhillips, Questar, BP, and FMC Corporation (2005-2006).

Technical Skills

GPS: Fully competent in utilizing handheld Garmin and Trimble GPS units for spatial data collection and coordination with ARC GIS

David Phillips

NEPA: Formal training, professional experience, and proven success managing BLM and FERC NEPA projects

ESA: Involvements with Section 7 with on projects involving BLM, Western Area Power Administration, FERC, EPA, and USACE and with Section 10 HCPs on private land projects.

Publications

Payer, D., D. Harrison, and D. Phillips. 2004. Territoriality and home-range fidelity of American martens in relation to timber harvesting and trapping. Pages 99 -114 in D.J. Harrison, A.K. Fuller, and G.J. Proulx eds. Martens and fishers (Martes) in human altered environments – an international perspective.

Krohn, W., Hoving, C., Harrison, D., Phillips, D., Frost, H. 2004. Martes foot-loading and snowfall patterns in eastern North America: implications to broad-scale distributions and interactions of mesocarnivores. Pages 115-132 in D.J. Harrison, A.K. Fuller, and G.J. Proulx eds. Martens and fishers (Martes) in human altered environments.

Phillips, D.M., D.J. Harrison, and D.C. Payer. 1998. Seasonal changes in home-range area and fidelity of martens. J. Mammal. 79:180-190.

Chapin, T.G., D.J. Harrison, and D.M. Phillips. 1997. Seasonal habitat selection by marten in an untrapped forest preserve. J. Wildl. Manage. 61(3):707-713.

Chapin, T.C., D.M. Phillips, D.H. Harrison, and E.C. York. 1997. Seasonal selection of habitats by resting martens in Maine. Pages 166-181 in G. Proulx, H.N. Bryant, and P.M. Woodard, eds. Martes: taxonomy, ecology, techniques, and management. Provincial Museum of Alberta, Edmonton, Alberta, Canada.

Hodgman, T.P., D.J. Harrison, D.M. Phillips, and K.D. Elowe. 1997. Survival of martens in an untrapped forest preserve in Maine. Pages 86-89 in G. Proulx, H.N. Bryant, and P.M. Woodard, eds. Martes: taxonomy, ecology, techniques, and management. Provincial Museum of Alberta, Edmonton, Alberta, Canada.

Phillips, D. 1994. Social and spatial characteristics, and dispersal of marten in a forest preserve and industrial forest. M.S. Thesis, Univ. Maine Dept. Wildl. Ecol. 95 pp.

Phillips, D., T. Chapin, and K. Elowe. 1993. The American marten. Maine Fish and Wildlife 35(2):2-4.

Personal Qualities

Highly motivated, results-oriented individual with excellent communication, technical, managerial, and leadership skills

DECLARATION OF
THOMAS PRIESTLEY

I, Thomas Priestley, declare as follows:

1. I am presently employed by CH2M HILL, Inc. as a Senior Environmental Planner.

2. A copy of my professional qualifications and experience are attached hereto and incorporated herein by reference.

3. I prepared the attached testimony on Visual Resources for the Hidden Hills Solar Electric Generating System project based on my independent analysis, supplements thereto, data from reliable sources, and my professional experience and knowledge.

4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue(s) addressed herein.

5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: January 7, 2013 Signed: Thomas J. Priestley

At: Los Angeles, California

Thomas Priestley, Ph.D., AICP/ASLA

Senior Environmental Planner

Education

Ph.D., Environmental Planning, Department of Landscape Architecture, University of California, Berkeley, 1988
M.C.P., City Planning, Department of City and Regional Planning, University of California, Berkeley, 1976
M.L.A., Environmental Planning, Department of Landscape Architecture, University of California, Berkeley, 1974
B.U.P., Urban Planning, Department of Urban and Regional Planning, University of Illinois, 1969

Professional Affiliations

American Institute of Certified Planners (Certified Planner No. 008919)
American Planning Association
American Society of Landscape Architects

Relevant Experience

Dr. Priestley is the leader of CH2M HILL's Visual Resources Practice Group. In this role, Dr. Priestley guides the company's visual resources work through issue scoping, development of study designs, mobilization of staff and technologies appropriate to the assignment, guidance of analysis activities, and senior review of final products. In addition, Dr. Priestley consults directly in cases that require special visual resources expertise and he provides expert witness testimony when required.

Dr. Priestley has more than 30 years of professional experience in urban and environmental planning and visual resource assessment. He is known nationwide for his expertise in evaluating aesthetic, land use, property value, and public acceptance issues related to electric energy projects. Through his project experience and research conducted for utility clients, Dr. Priestley has developed expertise in methods used for siting electric generation, transmission, and substation facilities and mitigating their land use, aesthetic, and other environmental effects. As editor or co-author, he has made major contributions to Edison Electric Institute (EEI) publications related to understanding and evaluating the environmental effects of electric facilities.

Representative Projects

Visual Resource Impact Analyses of Gas-fired, Solar Thermal, and Geothermal Power Plants, Various Locations, California. As the project analyst, senior advisor/reviewer, or special consultant, involved in the evaluation of the potential visual resources impacts of more than 35 major gas-fired, solar thermal, and geothermal power plant projects proposed for a variety of urban and rural settings in both Southern and Northern California. Identified visual issues, designed the analysis strategies, contributed to development of architectural and landscape treatments, prepared visual resource analyses for the Applications for Certification submitted to the California Energy Commission, reviewed and critiqued relevant sections of the Energy Commission's analyses of the projects, and evaluated the visual issues associated with CEC-proposed alternative sites. As an expert witness on visual resources, prepared written testimony and provided oral testimony in hearings before the California Energy Commission. Specific projects for which Dr. Priestley has made major contributions to the evaluation of visual resource issues include:

- Redondo Beach Repower, Los Angeles County (2012 to present)
- Huntington Beach Energy Project, Orange County (2012 to present)
- Hidden Hills Solar Electric Generating System, Inyo County (2011 to present)
- Henrietta Peaker Project Combined Cycle Expansion, Kings County (2010 to 2011)
- Hanford Combined Cycle Power Plant, Kings County (2010)
- Mariposa Peaker Project, Alameda County (2009 to 2011)
- Oakley Generating Station, Contra Costa County (2009 to 2011)
- Almond 2 Power Plant Project, Stanislaus County (2009 to 2011)
- Rice Solar Energy Project, Riverside County (2009 to 2010)

- Tracy Combined Cycle, San Joaquin County (2008 to 2010)
- Lodi Energy Center, San Joaquin County (2008 to 2010)
- Vaca Station, Solano County (2008)
- Ivanpah Solar Electric Generating Station, San Bernardino County (2007 to 2010)
- Chula Vista Replacement, San Diego County (2007)
- Eastshore, Alameda County (2006)
- AES Highgrove Project, San Bernardino County (2006)
- Walnut Creek Energy Park, Los Angeles County (2005 to 2008)
- Vernon Power Plant Project, Los Angeles County (2005 to 2006)
- Sun Valley Energy Project, Riverside County (2005 to 2006)
- San Francisco Electric Reliability Project, San Francisco (2003 to 2006))
- Modesto Irrigation District Electric Generation Station, San Joaquin County (2003 to 2004)
- Los Esteros Critical Energy Facility, Santa Clara County (2003 to 2006)
- Salton Sea Geothermal Unit 6, Imperial County (2002 to 2003)
- Walnut Energy Center, Stanislaus County (2002 to 2004)
- San Joaquin Valley Energy Center, Fresno County (2002-2004)
- Russell City Energy Center, Alameda County (2001 to 2007)
- Tesla Power Plant, Alameda County (2001 – 2004)
- Inland Empire Energy Center, Riverside County (2001 to 2003)
- Woodland Generation Station 2, Stanislaus County (2001 to 2003)
- East Altamont Energy Center, Alameda County (2001 to 2003)
- San Joaquin Valley Energy Center AFC (2001 to 2003)
- SMUD Cosumnes Power Plant AFC (2001 to 2003)
- Gilroy Energy Center Phase I and Phase II Projects, Santa Clara County (2001 to 2002)
- Rio Linda Power Plant, Sacramento County (2000 to 2001)
- Newark Energy Center, Alameda County (1999)
- Metcalf Energy Center, Santa Clara County (1998 to present)
- Delta Energy Center, Contra Costa County (1998 to 2000)
- Elk Hills Power Project, Kern County (1999 to 2000)
- Sutter Power Project, Sutter County (1997 to 1999)

Senior Consultant; First Solar; Silver State Photovoltaic Power Project; Clark County, Nevada. As the senior consultant, oversaw the preparation of the Federal environmental impact statement (EIS) visual resource assessment for a proposal to develop a photovoltaic power plant on 7,840 acres of federal land managed by BLM that are located immediately east of Primm, Nevada.

Senior Consultant; NRG Solar; Alpine Solar Generating Station; Los Angeles County, California. As the senior consultant, oversaw the preparation of the visual resources technical report for a proposal to develop a photovoltaic power plant on 800 acres of privately owned desert land located in the Antelope Valley in northern Los Angeles County. Issues included potential visibility of the project from nearby residential areas and a state park and a state reserve.

Task Lead; Dominion Energy; Visual Impact of Cooling Tower Alternatives for the Salem Harbor Generating Station; Salem, Massachusetts. Evaluated the visual impacts of three alternative cooling tower options being considered for development at a large harborside coal-fired power plant located in close proximity to historic and cultural resources of national importance. Scoped the issues, directed the preparation of analytic maps, identified and photo-documented critical viewpoints, directed the production of visual simulations depicting the three alternative cooling tower structures and the steam plumes associated with them, evaluated the visual impacts of the alternatives on the critical viewpoints, and prepared the report documenting the analysis for submission to the U.S. Environmental Protection Agency (EPA).

Senior Consultant; NextEra Energy Resources; North Sky River Project; **Kern County, California.** Senior consultant for a study of the visual effects of a proposed wind energy project on a site in the southern Sierra Nevada Mountains, 15 miles north northwest of Mojave. Analyses, including the use of zone of visual influence mapping and visual simulations, were incorporated into a technical report to accompany both BLM Plan of Development (POD) and County applications and to support County's development of an Environmental Impact Report (EIR).

Task Lead; Horizon Wind Energy; Antelope Ridge Wind Farm; Union County, Oregon. Senior task lead for the preparation of Exhibit L (Impacts on Protected Areas) and Exhibit R (Scenic and Aesthetic Values) for the Oregon Energy Facility Siting Council (EFSC) permit application for this 300-MW wind farm. Specialized analyses included detailed visibility studies from the City of Union and the Oregon Trail. Prepared materials related to the project's visual issues to support public outreach activities and participated in the project's public information meeting. Prepared simulations to depict the project's appearance, including a simulation to counter a citizen-prepared simulation circulating in the community that grossly misrepresented the project's appearance and visual effects.

Task Lead; Southern California Edison (SCE); Tehachapi Renewables Transmission Project; Southern California. Technical lead for the analysis the visual impacts of a proposed 190-mile, 500-kV transmission line. The route traversed a diverse and complex set of landscapes that include open lands in the Antelope Valley, National Forest lands in the San Gabriel Mountains valued for their recreational and scenic importance, and highly developed urban areas in the San Gabriel Valley. Designed the analysis strategy that was implemented by a team of five CH2M HILL visual resource specialists, who were supported by CH2M HILL planners and GIS, visual simulation, graphics, and report production staff.

Senior Consultant; SCE; Eldorado to Ivanpah 220-kV Transmission Line, Proponent's Environmental Assessment; San Bernardino County, California and Clark County, Nevada. Provided senior guidance and review for the preparation of the Proponent's Environmental Assessment (PEA) visual resources impact analysis of a proposal by SCE to develop a new 36-mile 220-kV transmission line between the Eldorado Substation and a new Ivanpah Substation located in eastern San Bernardino County, California, 7 miles southwest of Primm, Nevada.

Senior Consultant; Pacific Gas and Electric (PG&E); Jefferson-Martin Transmission Project, Proponent's Environmental Assessment; San Mateo County, California. Senior reviewer and consultant for an analysis of the aesthetic issues associated with the proposed replacement of a 14.7-mile segment of an existing electric transmission line with a 230-kV line on larger towers. The transmission line's location in an open space area prized for its scenic qualities and in proximity to affluent residential areas made the visual issues a sensitive and critical dimension of this project, requiring an intensive degree of analysis. Contributed to a detailed critique of the CPUC's conclusions regarding project aesthetic effects. Prepared written expert witness testimony.

Task Lead; Montana Department of Environmental Quality; Mountain States Transmission Intertie Project; Montana and Idaho. Technical lead for the visual resources impact and property value impact assessments of a 400-mile, 500-kV transmission line being proposed by Northwest Power. The assessment was designed to fulfill the analytic requirements of the Montana Department of Environmental Quality, USFS, and BLM. As the technical lead for this task, designed the analysis strategy and directed its implementation by a team that included CH2M HILL staff and other team partners.

DECLARATION OF
MICHAEL ROJANSKY

I, Michael Rojansky, declare as follows:

1. I am presently employed by Complete Project Solutions, Inc. as a Principal.

2. A copy of my professional qualifications and experience is attached hereto and incorporated by reference herein.

3. I helped prepare the attached testimony on Facility Design, Power Plant Efficiency, and Power Plant Reliability for the Hidden Hills Solar Electric Generating System project based on my independent analysis and my professional experience and knowledge.

4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue(s) addressed herein.

5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: 1-3-13 Signed: M. Rojansky

At: Pleasant Hill, California

DECLARATION OF

MICHAEL ROJANSKY

I, Michael Rojansky, declare as follows:

1. I am presently employed by Complete Project Solutions, Inc. as a Principal.
2. A copy of my professional qualifications and experience is attached hereto and incorporated by reference herein.
3. I helped prepare the attached portion of the Geologic Hazards and Resources testimony for the Hidden Hills Solar Electric Generating System project based on my independent analysis and my professional experience and knowledge.
4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue(s) addressed herein.
5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: January 7, 2013 Signed: M. Rojansky

At: Pleasant Hill, California

DECLARATION OF

MICHAEL ROJANSKY

I, Michael Rojansky, declare as follows:

1. I am presently employed by Complete Project Solutions, Inc. as a Principal.

2. A copy of my professional qualifications and experience is attached hereto and incorporated by reference herein.

3. I helped prepare the attached portion of the Surface Waters and Soils testimony for the Hidden Hills Solar Electric Generating System project based on my independent analysis and my professional experience and knowledge.

4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue(s) addressed herein.

5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: January 7, 2013 Signed: M. Rojansky

At: Pleasant Hill, California

DECLARATION OF
MICHAEL ROJANSKY

I, Michael Rojansky, declare as follows:

1. I am presently employed by Complete Project Solutions, Inc. as a Principal.

2. A copy of my professional qualifications and experience is attached hereto and incorporated by reference herein.

3. I helped prepare the attached portion of the Water Supply testimony for the Hidden Hills Solar Electric Generating System project based on my independent analysis and my professional experience and knowledge.

4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue(s) addressed herein.

5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: January 7, 2013 Signed: 

At: Pleasant Hill, California

Commercial Resume

DR. MICHAEL ROJANSKY, P.E., S.E.

Professional Qualifications

Dr. Rojansky, a principal of **CPS,** has over 35 years of extensive experience in civil, structural and earthquake engineering and risk assessment throughout the US and Internationally. His areas of expertise include structural analysis and design of lifelines in the water, wastewater, transportation, telecommunication and power sectors, deep foundation projects onshore and offshore as well as seismic retrofit design of buildings for private and public clients. Additionally, he is experienced with site analysis, design-build project management and cost estimating.

Experience

2007 – Present *Principal*, **Complete Project Solutions, Inc.**

2003 – 2007 *Senior Vice President, Engineering,* **ATI Architects and Engineers**. Principal in charge of all Engineering Operations including Civil, Structural, Mechanical, Electrical and Process Divisions.

2001 – 2003 Senior *Vice President, Chief Operating Officer of WRMS Engineering, Inc., a Division of* **Calpine Corporation**.

2000 – 2001 *President and Chief Executive Officer*, **WRMS Engineering, Inc.**

1988 – 2000 *Founding Principal and Senior Vice President*, **EQE International, Inc.**
1981 – 1983

1983 – 1988 *Principal Engineer*, **Ben C. Gerwick, Inc.**
1977 – 1981

Education

D. Eng. – Civil Engineering UC Berkeley, 1981
M. Sc. – Civil Engineering UC Berkeley, 1978
B. Sc. – Civil Engineering Technion IIT, 1975

Memberships and Affiliations

Structural Engineers Association of California
American Society of Industrial Security

DECLARATION OF
KATHY ROSE

I, KATHY ROSE, declare as follows:

1. I am presently employed by CH2M HILL as a Scientist 6 (Soil and Water Scientist).

2. A copy of my professional qualifications and experience are attached hereto and incorporated herein by reference.

3. I helped prepare the attached testimony on Surface Waters and Soils for the Hidden Hills Solar Electric Generating System project based on my independent analysis, supplements thereto, data from reliable sources, and my professional experience and knowledge.

4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue(s) addressed herein.

5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: 1/3/13 Signed: Kathy Rose

At: Sacramento, CA

DECLARATION OF

KATHY ROSE

I, Kathy Rose, declare as follows:

1. I am presently employed by CH2M HILL, Inc. as a Scientist 6.
2. A copy of my professional qualifications and experience is attached hereto and incorporated by reference herein.
3. I am adopting the attached testimony on Biological Resources for the Hidden Hills Solar Electric Generating System project based on my independent analysis and my professional experience and knowledge.
4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue(s) addressed herein.
5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: January 7, 2013 Signed: Kathy Rose

At: Sacramento, CA

Kathy Rose

Waters of the U.S./State Task Lead

Education

Ph.D., Soil and Water Sciences
M.S., Soil Science
B.S., Soil Science

Distinguishing Qualifications

- Water Quality Planning and Regulatory Compliance
- California Environmental Quality Act (CEQA) Compliance
- Mitigation Planning

Relevant Experience

Kathy Rose is a senior soil and water scientist with more than 20 years of experience in water quality regulatory planning and compliance, mitigation planning, CEQA, and academic research related to soil-plant-water relationships in natural ecosystems. She has been lead author on sections of Applications for Certification (AFC), and has provided testimony at the California Energy Commission (CEC) hearing for the Ivanpah Solar Energy Generating System, which is currently being constructed in the Mojave Desert. She has been water quality compliance lead in applying for Clean Water Act Section 404/401 permits and CDFG Streambed Alteration Agreements for numerous solar and wind projects. In addition she has extensive experience with construction and industrial storm water compliance.

Representative Projects

Senior Soil and Water Scientist; Bright Source Energy; Water Quality Regulatory Compliance and Permitting Services; Hidden Hills Solar Energy Generating System; San Bernardino County, California. Assisted with preparation of the Biological Resources section of AFC, assists with preparation of responses to CEC data requests, and provided comments on the Preliminary Staff Assessment. Serves as project lead for developing agency consensus with respect to identification and mapping of state jurisdictional waters; staff lead on project compliance under Section 1602 of the California Fish and Game Code, and Sections 404 and 401 of the Clean Water Act.

Senior Soil and Water Scientist; Bright Source Energy; Water Quality Regulatory Compliance and Permitting Services; Ivanpah Solar Energy Generating System; San Bernardino County, California. Prepared responses to comments for CEC on soil erosion and water quality aspects of the Final Staff Assessment. Responses included estimates of eroded soils from offsite areas being deposited on the site; reduction of soil erosion with implementation of best management practices; assessment of potential vegetation changes resulting from additional soil water; chemical constituent loading to the soil from wash water. Coauthored the *Closure, Revegetation, and Rehabilitation Plan* for the facility, and in particular provided procedures for soil rehabilitation at closure. Served as the lead author for a Beneficial Use Impacts Assessment related to dredge/fill and other project effects to Waters of the State, which was submitted to the Lahontan RWQCB for review and development of recommended waste discharge requirements. Provided testimony on matters pertaining to soil and water resources at the CEC hearings in January 2010.

Senior Soil and Water Scientist; Confidential Wind Energy Client; Water Quality Regulatory Compliance and Permitting Services; Kern County, California. For several wind energy projects comprising more than 10,000 acres of land in the western Mojave Desert, served as task lead for obtaining dredge/fill Waste Discharge Requirements (WDRs) from the Lahontan Regional Water Quality Control Board and Lake and Streambed Alteration Agreement (LSAA) from the California Department of Fish and Game. Oversaw field delineations of Waters of the U.S./State, preparation of dredge/fill WDRs applications for the RWQCB, and preparation of Streambed Alteration Notification for CDFG; obtained approved Jurisdictional Determinations from the U.S. Army Corps of Engineers

(USACE) L.A. District; participated in site visits with engineers and the Regional Water Quality Control Board (RWQCB); coordinated permit requirements with RWQCB staff and facilitated obtaining coverage under General versus Individual WDRs.

Senior Soil and Water Scientist; Contra Costa Generating Station; Applications for Certification; California. Task lead for preparation of soils evaluations for AFC. Evaluated potential for soil erosion by water and wind. Utilized the RUSLE2 model for estimating soil loss during construction. Described soil limitations/suitability for construction. Identified appropriate measures to mitigate soil-related impacts.

Senior Soil and Water Scientist; Rice Solar Energy Project; Applications for Certification; California.

Evaluated potential for soil erosion by water and wind. Utilized the RUSLE2 model for estimating soil loss during construction. Described soil limitations/suitability for construction. Identified appropriate measures to mitigate soil-related impacts.

Senior Soil Scientist; Iberdrola Solar Generation Facility Floodplain Assessment; California, Nevada, New Mexico, and Arizona. Provided a soils assessment of 12 individual proposed large solar generation facilities proposed to be developed on Bureau of Land Management (BLM) lands throughout the desert environments in California, New Mexico, Arizona, and Nevada. Using published soil surveys where available, evaluated soil characteristics for each map unit to arrive at a site-specific assessment, primarily related to wind and water erosion potential. Results helped inform decisions on solar energy facility siting.

Senior Soil and Water Scientist; Union Pacific Railroad; Regulatory Compliance and Permitting Services; Dunsmuir Northern Railyard; Siskiyou County, California. Coordinated with USACE, California Department of Fish and Game, and RWQCB, in Redding, California, to fast-track approvals to conduct a subsurface investigation immediately adjacent to the Sacramento River, at the Dunsmuir railyard, where oil has been observed to discharge to the river periodically. Time was of the essence to determine cause of the seepage prior to the onset of the 2009 rainy season; successfully obtained approvals in approximately 6 weeks.

DECLARATION OF
GARY RUBENSTEIN

I, Gary Rubenstein, declare as follows:

1. I am presently employed by Sierra Research, Inc., as a Senior Partner.

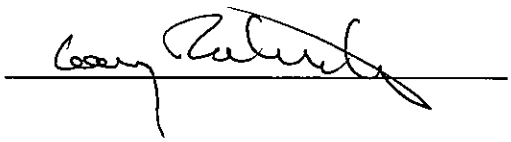
2. A copy of my professional qualifications and experience is attached hereto and incorporated by reference herein.

3. I helped prepare the attached portion of the Air Quality testimony for the Hidden Hills Solar Electric Generating System project based on my independent analysis and my professional experience and knowledge.

4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue(s) addressed herein.

5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: January 7, 2013 Signed: 

At: Sacramento, CA

DECLARATION OF
GARY RUBENSTEIN

I, Gary Rubenstein, declare as follows:

1. I am presently employed by Sierra Research as a Senior Partner.

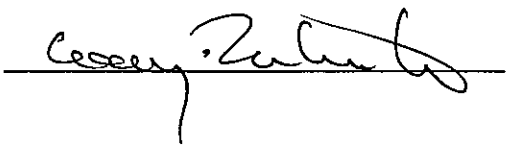
2. A copy of my professional qualifications and experience is attached hereto and incorporated by reference herein.

3. I helped prepare the attached portion of the Public Health testimony for the Hidden Hills Solar Electric Generating System project based on my independent analysis and my professional experience and knowledge.

4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue(s) addressed herein.

5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: January 7, 2013 Signed: 

At: Sacramento, CA

sierra
research

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Ann Arbor, MI
Tel: (734) 761-6666
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Résumé

Gary S. Rubenstein

Education

1973, B.S., Engineering, California Institute of Technology

Professional Experience

8/81 to present Senior Partner
Sierra Research

As one of the founding partners of Sierra Research, responsibilities include project management and technical and strategy analysis in all aspects of air quality planning and strategy development; project licensing and impact analysis; emission control system design and evaluation; rulemaking development and analysis; vehicle inspection and maintenance program design and analysis; and automotive emission control design, from the initial design of control systems to the development of methods to assess their performance in customer service. As the Partner principally responsible for Sierra Research's activities related to stationary sources, he has supervised the preparation of control technology assessments, environmental impact reports and permit applications for numerous industrial and other development projects.

While with Sierra, Mr. Rubenstein has managed and worked on numerous projects, including preparation of nonattainment plans; preparation and review of emission inventories and control strategies; preparation of the air quality portions of environmental review documents for controversial transportation, energy, mineral industry and landfill projects; preparation of screening health risk assessments and supporting analyses; and the development of air quality mitigation programs. Mr. Rubenstein has managed the preparation of air quality licensing applications for over 14,000 megawatts of generating capacity before the California Energy Commission, and has managed air quality analyses for over 24,000 megawatts of generating capacity in a variety of jurisdictions.

Mr. Rubenstein has presented testimony and served as a technical expert witness before numerous state and local regulatory agencies, including the U.S. Environmental Protection Agency, California State Legislative Committees, the California Air Resources Board, the California Energy Commission, the California Public Utilities Commission, numerous California air pollution control districts, the Connecticut Department of Environmental Protection, the Hawaii Department of Health, and the Alabama Department of Environmental Management. Mr. Rubenstein has also served as

a technical expert on behalf of the California Attorney General and Alaska Department of Law, and has provided expert witness testimony in a variety of administrative and judicial proceedings.

6/79 to 7/81 — Deputy Executive Officer
California Air Resources Board

Responsibilities included policy management and oversight of the technical work of ARB divisions employing over 200 professional engineers and specialists; final review of technical reports and correspondence prepared by all ARB divisions prior to publication, covering such diverse areas as motor vehicle emission standards and test procedures, motor vehicle inspection and maintenance, and air pollution control techniques for sources such as oil refineries, power plants, gasoline service stations and dry cleaners; review of program budget and planning efforts of all technical divisions at ARB; policy-level negotiations with officials from other government agencies and private industry regarding technical, legal, and legislative issues before the Board; representing the California Air Resources Board in public meetings and hearings before the California State Legislature, the California Energy Commission, the California Public Utilities Commission, the Environmental Protection Agency, numerous local government agencies, and the news media on a broad range of technical and policy issues; and assisting in the supervision of over 500 full-time employees through the use of standard principles of personnel management and motivation, organization, and problem solving.

7/78 – 7/79 — Chief, Energy Project Evaluation Branch
Stationary Source Control Division
California Air Resources Board

Responsibilities included supervision of ten professional engineers and specialists, including the use of personnel management and motivation techniques; preparation of a major overhaul of ARB's industrial source siting policy; conduct of negotiations with local officials and project proponents on requirements and conditions for siting such diverse projects as offshore oil production platforms, coal-fired power plants, marine terminal facilities, and almond-hull burning boilers.

During this period, Mr. Rubenstein was responsible for the successful negotiation of California's first air pollution permit agreements governing a liquefied natural gas terminal, coal-fired power plant, and several offshore oil production facilities.

10/73 to 7/78 — Staff Engineer, Vehicle Emissions Control Division
California Air Resources Board

Responsibilities included design and execution of test programs to evaluate the deterioration of emissions on new and low-mileage vehicles; detailed analysis of the

effect of California emission standards on model availability and fuel economy; analysis of proposed federal emission control regulations and California legislation; evaluation of the cost-effectiveness of vehicle emission control strategies; evaluation of vehicle inspection and maintenance programs, and preparation of associated legislation, regulations and budgets; and preparation of detailed legal and technical regulations regarding all aspects of motor vehicle pollution control. Further duties included preparation and presentation of testimony before the California Legislature and the U.S. Environmental Protection Agency; preparation of division and project budgets; and creation and supervision of the Special Projects Section, a small group of highly trained and motivated individuals responsible for policy proposals and support in both technical and administrative areas (May 1976 to July 1978).

Credentials and Memberships

Air & Waste Management Association (Chair, Board of Directors, Golden West Section; Member, Board of Directors, Mother Lode Chapter)

American Society of Mechanical Engineers

Qualified Environmental Professional, Institute of Professional Environmental Practice, 1994

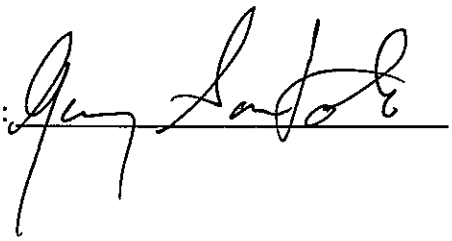
DECLARATION OF

Gary Santolo

I, Gary Santolo, declare as follows:

1. I am presently employed by CH2M HILL, Inc. as a Project Scientist.
2. A copy of my professional qualifications and experience are attached hereto and incorporated herein by reference.
3. I helped prepare the attached testimony on Solar Flux Effects for the Hidden Hills Solar Electric Generating System project based on my independent analysis, supplements thereto, data from reliable sources, and my professional experience and knowledge.
4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue(s) addressed herein.
5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: January 7, 2013 Signed: 

At: Sacramento, CA

Gary M Santolo

Project Scientist (Wildlife Biologist/Toxicologist)
Natural Resources Operations Lead

Education

M.S., Avian Sciences, University of California, Davis
B.S., Avian Sciences, University of California, Davis

Professional Registrations

Joint California and Federal Scientific collecting Permit No. 002407 (current)
Master Banding and Salvage Permit No. 22717 (current)
Federal Migratory Bird Permit No. PRT-829185 (current)
Federal Endangered Species Permit No. PRT-825680 (5/16/97-5/15/99)

Distinguishing Qualifications

- North American Director, Raptor Research Foundation
- Collects biological samples for contaminant studies and Ecological Risk Assessments. Prepares biological assessments for endangered species and developed mitigation plans for Section 7 and 10(a) under the Endangered Species Act. Conducts endangered species surveys and resolves endangered species conflicts. Specializes in bird and mammal trapping, biological monitoring, and endangered species surveys, including willow flycatcher, California gnatcatcher, and Pacific pocket mouse.
- Designed and implemented several field and laboratory studies on reproductive effects of selenium on American kestrels.

Relevant Experience

Mr. Santolo is a wildlife biologist and toxicologist with over 24 years experience with CH2M HILL. He has technical expertise in vertebrate biology and ecology and in wildlife toxicology and has experience in conducting biological, ecological, and toxicological studies. Mr. Santolo has conducted field surveys and inventories for common and special-status vertebrate species for environmental documents to determine effects to wildlife and associated habitats. Mr. Santolo serves as a senior technical reviewer for wildlife-related sections of CEQA/NEPA documents, Natural Environmental Study reports, Biological Assessments, and Section 7 consultations with USFWS. He has developed and co-authored a report recommending guidelines for conducting ecological risk assessments in California for the California EPA. He has also participated in preliminary site characterizations, habitat mapping, and plant species inventories in several ecosystems throughout California, Oregon, Washington, Utah, Nevada, Arizona, Alaska, and the Mideast.

Representative Projects

Project Manager, Orange County Nitrogen and Selenium Management Program. Due to the concern that groundwater-related selenium discharges in the Newport Bay watershed may adversely affect surface waters and would likely not comply with established Total Maximum Daily Loads (TMDLs) for the watershed, the County of Orange established a Working Group to develop and implement a comprehensive Work Plan to address selenium and nitrate discharges in the watershed over the 5-year permit term. Two alternative compliance approaches that require either (a) compliance with an average monthly concentration limit of 4 µg/L selenium and a daily maximum concentration limit of 8 µg/L selenium, or (b) participation in a Working Group to develop and implement a comprehensive Work Plan to address selenium and nitrate discharges in the watershed over the five year permit term. Specific and aggressive deadlines for many Work Plan tasks must be met, with a final compliance deadline of December 20, 2009. Meeting these deadlines is critical for compliance with the requirements of the Order. If these deadlines are missed, the Working Group will be considered out of compliance with the permit and the numeric effluent limits will apply. The primary objectives are to: 1) Support compliance by implementing the detailed Nitrogen and Selenium Management Program Work Plan approved by the Regional

Board; 2) Develop a comprehensive understanding of and management plan for nutrients and selenium discharges to surface waters within the San Diego Creek/Newport Bay watershed that result from groundwater-related inflows; 3) Implement all project tasks by the required deadlines to ensure continued compliance with the Order; 4) Maintain flexibility throughout the completion of the Scope of Work to ensure the implementation of the Work Plan complies with the requirements of the Order. As of Year 5 of this five-year project, all deadlines have been met and a Site Specific Objective for selenium in the watershed has been developed for the Regional Board.

Project Scientist for BrightSource Energy, Solar Flux Effects on Avian Species, Solar Energy Development Center, Dimona, Israel. BrightSource Energy, Inc. (BSE) has proposed to construct and operate renewable solar energy generation facilities using solar distributed power tower (DPT) technology that they developed to produce renewable electricity. Federal and most state laws require that potential impacts associated with energy projects, including renewable and DPT plants, be evaluated prior to issuing final construction and operational approvals. DPT technology is known to produce solar flux that increases in intensity up to the location of the energy receiver on the central tower. Solar flux is the latent energy potential produced by a series of heliostats focusing solar reflections on the central power receiver and is typically measured in terms of kilowatts per square meter (kW/m^2). Mr. Santolo conducted the first studies to determine the threshold level of effects from elevated solar flux to birds. The empirical and physical information collected is being used to assess solar flux risks to avian species.

Cabrillo–Santa Ynez 115 kV Reconductoring Environmental Services, PG&E, Santa Barbara County, CA. 14.6 mile, 115 kV reconductoring project through agriculture, viniculture, rural residential, critical habitat and known populations of multiple federal- and state-listed special status species. Supported development of the PEA and provide senior wildlife review of biological technical report and permit applications to USFWS and CDFG. Provided senior review during protocol-level surveys for least Bell's vireo and MTBA nesting bird surveys.

Senior Biologist, PG&E Solar Photovolatic 15 - 20 MW Site Environmental Assessments – Huron PEA, Schindler PEA, San Bernard PEA, San Joaquin PEA and Stroud PEA, Central Valley, CA. Performed biological resources assessment field visits and prepared PEA Biological Section for five small-scale solar PV projects and associated generation interconnection lines (less than five miles) in central California.

Senior Biologist, PG&E Vaca-Dixon Birds Lands 230 kV Reconductoring Project, Solano County, CA. Mr. Santolo was the senior biologist for a 20-mile-long transmission line project in Solano County. He was responsible for managing the biological studies and supporting consultation with the U.S. Fish and Wildlife Service (USFWS), and preparation of relevant environmental permit applications (e.g., RWQCB, USACE).

For the City of Newport Beach, California, Project Manager. Conducted a study to sample selenium in water, sediment, and biota in Big Canyon Wash, a tributary to Newport Bay, and identify the source of the selenium. The City had plans to restore the wash and create a pond for wildlife. The study provided information for the City to use in its decision to delay the restoration until a way can be found to reduce selenium concentrations or an alternate source of water can be found.

For the Utah Department of Environmental Quality selenium site specific standard for the open waters of the Great Salt Lake. Task manager for avian ecology/toxicology; conducted oversight and review of avian studies for the project. He provided specialized expertise for this project in tracking selenium through birds and eggs and developed a food-chain model to predict the concentrations of selenium in bird eggs from water and prey items.

For the US Bureau of Reclamation, Kesterson Program. Project manager from 1988 to 1994 for the Kesterson Reservoir Biological Monitoring Program at Kesterson Reservoir in the Central San Joaquin Valley. Responsible for bird, mammal, invertebrate, and plant surveys and for collecting biological samples. Results of the biological monitoring are used to determine risks to wildlife and the success or failure of cleanup procedures in place at the reservoir. By identifying that environmental risk could be reduced by converting the site from a wetland to a terrestrial habitat, the monitoring program substantially reduced the cost to the Kesterson Program.

For the US Bureau of Reclamation, Kesterson Program. Designed and managed Kesterson monitoring and studies. Responsible for trapping and surveying for a variety of wildlife at Kesterson Reservoir in the Central San Joaquin Valley as part of the biological monitoring program. Uses several techniques of live and kill trapping to gather samples, which are analyzed for selenium content by an outside laboratory. Results are used to determine risks to wild-life and the success or failure of cleanup procedures in place at Kesterson. Also responsible for data analysis and technical documents that are used to develop management plans for the reservoir. To assess the risks of dietary selenium to terrestrial birds using Kesterson Reservoir, conducts field and laboratory studies. Established an American kestrel (a small falcon) colony at the University of California at Davis for feeding and reproductive studies. As part of this research effort, he also conducts banding and nest studies of wild birds including loggerhead shrike, American kestrel, and barn owl. The feeding studies and field sampling of birds on and near Kesterson were used to characterize the exposure of birds to selenium. The results of these studies were used by the Bureau to make management decisions for Kesterson.

Ecological Risk Assessments, Kesterson Reservoir, Bureau of Reclamation. Conducted an ecological risk assessment for Kesterson Reservoir, which had become contaminated with selenium through the disposal of agricultural subsurface irrigation drainage water. The assessment determined whether the Bureau needed to consider other management practices for the site in the foreseeable future. It included analysis of ecological succession, food-chain relationships, dietary exposure, and risk characterization for 20 years into the future, using modeling and Monte Carlo simulations. The assessment indicated that there was no significant risk to terrestrial animals, but aquatic birds could be adversely affected during years of heavy rainfall when surface water pools would persist into the spring breeding season. A second ecological risk assessment was conducted to update previous work based on additional years of biological and hydrological monitoring. The conclusions of this risk assessment validated the earlier predictions and provided more detail concerning the levels of risk for terrestrial wildlife and aquatic birds. The overall conclusion was that risks of adverse effects were low and recommended a reduced level of monitoring for the site.

For Chevron. Conducted surveys of bird use and reproduction, to determine if the Richmond Refinery water enhancement wetland was beneficial to birds using it. Collected American avocet eggs for selenium analysis and evaluated embryo age and condition. Using hatching success as the criteria for evaluation, it was determined that control of predators at the site mitigated for potential detrimental effects of selenium and that the wetland was clearly a benefit.

Mr. Santolo conducted habitat surveys and mapping and wildlife surveys for the National Water Company, Kingdom of Saudi Arabia. Jeddah Sewage Lake was formed in Wadi Al Mari (upstream of Wadi Al Asla) in the 1990s to temporarily store and dispose of raw wastewater from the growing Municipality of Jeddah (City) in the Kingdom of Saudi Arabia (KSA). Wastewater from septic tanks and other storage locations near Jeddah was hauled by tanker trucks to the Lake where it was discharged, sometimes at rates up to 50,000 cubic meters per day (m3/d). The Lake was never meant to be a permanent solution to the City's wastewater management needs; however, the Lake eventually grew to cover an area of 2.0 to 2.8 square kilometers (km2) with storage of 7 to 9.5 million m3 of water and 0.385 million m3 of organic sediments.

- The Lake was held in place by an earth fill dam across a desert wadi; the dam was progressively raised as the Lake grew in size. In May 2010, Custodian of the Two Holy Mosques King Abdullah bin Abdulaziz issued a royal decree ordering that the hazardous Sewage Lake be emptied within 1 year. The Ministry of Water and Electricity was tasked with pumping water out of the Lake.
- As part of the evaluation of alternatives, Mr. Santolo conducted surveys of lake, wetland, and upland habitats in the vicinity of the Sewage Lake. He developed detailed vegetation maps for the various habitat areas and a list of species observed to provide documentation of the ecological features associated with the Lake. His surveys showed that Sewage Lake supported several unique inland aquatic ecosystems featuring open water, wetlands, and associated water-based vegetation that attracted a variety of wildlife, including birds, reptiles, and mammals. He found that the Jeddah Sewage Lake and its associated habitats were unique inland features

that attract wildlife, especially birds not typically found in the area. The vegetation associated with the Lake and wetlands provides habitat that birds use for feeding, sheltering, and breeding.

- During the bird surveys, Mr. Santolo identified 44 species of using the Lake and associated wetlands, upland deserts, and planted forests. He determined that draining of the Lake and the subsequent removal of the earthen dam will have direct impacts on these aquatic ecosystems and associated wildlife.

Environmental Scientist, Central Utah Project, Utah. Carried out wildlife surveys and collected waterfowl and shorebird eggs to evaluate trace metal contamination, salinity, and bioaccumulation (emphasis on selenium effects) in a wide variety of freshwater habitats throughout central Utah.

For Southern California Coastal Water Research Program and Santa Ana Regional Water Quality Control Board Conducted surveys of bird reproduction and food-chain items, to determine if the San Diego Creek watershed was beneficial to birds using it. Collected American avocet, black-necked stilt, and killdeer eggs for selenium analysis and evaluated embryo age and condition. Results of this project are not yet available.

Project Manager and Senior Biologist, Lawrence Livermore National Laboratory. The one-square-mile Lawrence Livermore National Laboratory (LLNL) site is an active multi-program research laboratory operated by the University of California for the U.S. Department of Energy. A number of research and support operations at LLNL handle, generate, or manage hazardous materials that include radioactive wastes. Hazardous waste treatment activities are carried out on site. Loggerhead shrikes are abundant at LLNL and were used to evaluate exposure to contaminants at the site. Mr. Santolo instructed LLNL biologists in shrike tissue sample collection (blood and feather) and storage techniques and aided LLNL biologists in capturing shrikes (small bird) using a cage trap designed by Mr. Santolo, collecting shrike tissue (blood & feathers), and conducting behavioral & demographic observations.

Environmental Scientist, Wildlife and Plant Surveys, Camp Pendleton Marine Corps Base, California. Conducted bird surveys, small mammal trapping, invertebrate, and plant sample collections to identify potential contaminant exposure routes for the Camp Pendleton Marine Corps base, California Ecological Risk Assessment. Conducted endangered species surveys for a biological assessment for site remediation on the base. Conducted surveys for the federally endangered arroyo southwestern toad, coastal California gnatcatcher, and Pacific pocket mouse and evaluated habitat for least Bell's vireo.

For the U. S. Bureau of Reclamation, Senior Biologist. Conducted desert tortoise, rare plant, and general wildlife surveys and co-authored a Programmatic Biological Assessment to comply with Section 7 of the Endangered Species Act. In the past, consultation had been done separately for each quarry which was time consuming and costly. This single Biological Assessment was prepared to address operations of nine quarries along the Lower Colorado River in Nevada, California, and Arizona used for routine maintenance and emergency repairs to the bed and bank of the river following floods.

For Petro Star, Inc. Valdez Refinery, Alaska. After delisting of the Threatened Bald Eagle, there was no permit process for removing an eagle nest from an area of the refinery that was needed for expansion to allow low-sulfur diesel fuel to be refined. Mr. Santolo negotiated with the U.S. Fish and Wildlife Service in Alaska and they allowed him to conduct an experiment moving the existing nest to an artificial structure. The nest was successfully moved during the 2008 winter.

Responsible for the bald eagle Biological Assessment for the U.S. Bureau of Reclamation Long-term Central Valley Project Operations Criteria and Plan. To predict the potential effects of water drawdowns at Lake Shasta, he developed a model that related lake level to reproductive success of eagles at Shasta.

For the Imperial Irrigation District. Conducted bird and mammal surveys to support an Environmental Impact Report (EIR) for a group of projects related to the Imperial Irrigation District's water conservation program mandated by the State Water Resources Control Board. The Imperial Valley, part of the arid Colorado Desert, is of very flat terrain south of the Salton Sea and is intensively farmed. The EIR evaluated habitats and receptors in the project area (including agricultural ecosystems, adjacent native habitats, and the Salton Sea) that might be

adversely affected by the construction or operation of the water conservation program structures. In particular, the ecotoxicological focus was on increased concentration of contaminants in the drainage water or increased concentration of salts in the sea. Potential impacts to several special-status species as well as the protected species were evaluated in the assessment.

Elmendorf AFB and Eielson AFB Alaska. Conducted wildlife surveys and initial habitat characterizations to identify potential wildlife exposure routes for the Phase I Ecological Risk Assessments. The results of the assessment were used to develop the conceptual exposure model and identify wildlife receptor species for the Ecological Risk Assessment.

Project Scientist; Confidential and Classified Project—Klau/Buena Vista Mines (KBV) Superfund Site; U.S. Environmental Protection Agency; San Luis Obispo County, California; 2008. The KBV Mines are located in San Luis Obispo County near Paso Robles, California. The KBV Mines properties consist of two adjacent, abandoned, mercury mines. Mr. Santolo contributed to the Ecological Risk Assessment planning and well as Field Sampling Plan and led field teams in sampling to characterize terrestrial plants, invertebrates, and bird eggs as part of the Ecological Risk Assessment and Remedial Investigations of baseline conditions at the site.

Project Scientist; Confidential and Classified Project—Sulfur Bank Mercury Mine; U.S. Environmental Protection Agency, Region IX; Clear Lake, California; 2005 to Present. Avian biologist evaluating mercury contamination in birds and bird eggs as part of baseline monitoring and evaluation for the Sulfur Bank Mercury Mine Superfund Site, Clear Lake, California for the Ecological Risk Assessment. Current remedial investigations include a Pilot Project for capping of mercury contaminated lake sediments and the control of methylmercury formation. The work involves avian surveys and nest searches to collect eggs from American coots, blackbirds, and other wetland-associated species. The monitoring results will be used as input into the design of remedial actions for control of mercury exposure to humans and wildlife.

Designated Biologist for Calpine Corporation's Los Esteros Critical Energy Facility Project in San Jose, CA. As the designated biologist, he was responsible for advising the project proponents on implementation of the Biological Resource Conditions of Certification, supervising or conducting mitigation, monitoring, and other biological resources compliant efforts, particularly in the areas requiring avoidance or containing sensitive biological resources. During mobilization and construction, he maintained written records of the above tasks and submitted summaries of these records to the project owner along with Monthly Compliance Reports.

Environmental Scientist; Los Angeles Department of Water and Power; Owens Dry Lake Dust Mitigation Program. Conducted general wildlife surveys and specific surveys for Le Conte's thrasher and Mohave ground squirrel at Owens Lake, to determine presence prior to construction of water conveyance pipelines. Installed photostations at the south and east ends of the 110-square-mile lake over a three-year survey period to determine the presence of Mohave ground squirrel, a state-threatened species, and other common species inhabiting the area. Surveys also included migratory bird species, and species of concern such as the loggerhead shrike. Mr. Santolo also collected shorebird and gull eggs for modeling and monitoring selenium and other trace elements for evaluation of project-related impacts to birds at Owens.

The Owens Dry Lake near Lone Pine, California is one of the largest sources of dust (PM10) in the world. Over 100 square miles in area, the saline playa produces dust that regularly clouds adjacent roads, and can be seen 300 miles away. The City of Los Angeles has agreed with the State of California, the Federal Government, and local regulatory agencies to mitigate dust at the dry lake to bring the region to within federal PM10 standards.

CEQA Compliance. Numerous rare species were encountered while planning the dust control measures. CH2M HILL worked with resource agencies to develop IS/MNDs and mitigation measures so the project could go forward. CH2M HILL's relationships with resource agencies provided the following benefits to the Department:

- Project moved ahead on schedule and dust control measure implementation is expected to meet the strict aggressive schedule that the Department committed to with the local air pollution control district.

- Resource agencies have developed a level of trust with CH2M HILL on behalf of the Department that allows rapid and relatively smooth approvals for project changes and future project implementations.
- The risk of change orders due to complying with CEQA mitigation measures during construction has gone down substantially because the resource agency input was incorporated into the contract documents issued by the Department.
- **Los Angeles Department of Water and Power.** Conducted general wildlife surveys and specific surveys for Le Conte's thrasher and Mohave ground squirrel at Owens Lake, CA to determine presence prior to construction of water conveyance pipelines.
- Monitoring changes in wildlife use and contamination in birds in areas of the lake where shallow flooding and managed vegetation are being used for dust control. Quarterly surveys are conducted and shorebird eggs are collected during the breeding season for contaminant analyses, aging, and evaluation of embryo condition.

For the Department of Energy, Office of Environmental Restoration and Waste Management. Developed a conceptual exposure model for an area contaminated as a result of the operations of nine plutonium production (nuclear) reactors located within six reactor areas along the Columbia River in Washington. This model illustrates ecological food webs and the biotic and abiotic pathways that link contaminants to receptor species. Using the existing information for the site, criteria for identifying terrestrial receptor species and exposure pathways through various trophic levels were developed. This conceptual site model was developed to focus the planning of the Ecological Risk Assessment, such that the assessment could be directed toward those activities that best describe and quantify the ecological risks within the terrestrial ecosystem at the Hanford site.

For the USEPA, served as senior biologist for wildlife surveys and initial habitat characterizations used to identify potential wildlife exposure routes for the Montrose Chemical Ecological Risk Assessment. (Note: letter of commendation for the project).

For the USEPA, served as senior biologist for wildlife survey oversight for the Casmalia Landfill Superfund Site advising USEPA on wildlife issues and accompanying contractors during surveys and sampling. He authored a draft Biological Assessment for USEPA that was used by USFWS to write a Biological Opinion that developed offsite wetlands for California red-legged frogs and California tiger salamanders (federally listed species) so onsite ponds can be closed as part of the remediation for the site.

For the **USEPA** at Bainbridge Island, Washington, conducted wildlife surveys and initial habitat characterizations to identify potential wildlife exposure routes. The results were used to develop the conceptual exposure model and identify wildlife for receptor species for the **Wyckoff Ecological Risk Assessment**.

Environmental Scientist, Wildlife Surveys, Sonoma Baylands Wetland Demonstration Project, **Corps of Engineers**, California**.** Conducted a monitoring study as part of an effort to evaluate a wetland demonstration project. A historic wetland on the San Francisco Bay was reclaimed by the Corps. Mr. Santolo conducted waterfowl and shorebird surveys twice-monthly and compared this data to field data collected in the previous year to identify changes in bird use as the wetland matured.

Tulare Irrigation District, CA. Conducted surveys for San Joaquin kit fox, a listed California threatened and federal endangered species. Successfully negotiated a modified survey protocol with the U.S. Fish and Wildlife Service (Section 7, ESA) that decreased the survey area from a 2-mile radius to a 300-foot corridor based on the fact that it was a linear project with a limited maximum temporary disturbance area.

Senior wildlife biologist for the **PGT Medford** Extension natural gas transmission line routing studies in Oregon. Involved in the initial alternative route selection for this project and responsible for coordinating the data for the geographical information system (GIS) used. Also designed the methodology and conducted the wildlife surveys to determine the presence of special-status species along an 85-mile alignment. A field global positioning system (GPS) was used and the information was added to the GIS database so that historical and current information

could be viewed with the proposed alignment to determine alignment changes cost-effectively and to minimize environ-mental effects of construction.

For the City of Santa Rosa, conducted surveys for avian and mammalian species in habitats in Santa Rosa to assess the impacts of creating wetlands with treated waste-water. These surveys were used to identify areas where the wetlands would enhance wildlife habitats and existing riparian and wetland habitats.

Participated in trapping and marking the California endangered giant kangaroo rats and federal endangered blunt-nosed leopard lizards in Kern County as part of ongoing population research.

Served as technical resource in support of the U. S. Postal Service's Alaska Hovercraft wildlife monitoring program. The program currently involves Bethel and seven remote Alaskan villages along the Kuskokwim and Johnson Rivers. The villages are Kwethluk, Akiak, Akiachak, Napaskiak, Napakiak, Nunapitchuk, and Kasigluk. Bethel serves as the base from which deliveries are made to the other eight villages. Prepared and assisted with the negotiation of the wildlife/subsistence monitoring plan for the program. Key individual responsible for the actual conducting of the monitoring. Also was responsible for much of the analysis of data for the project environmental assessment.

Membership in Professional Organizations

- American Ornithological Union
- Cooper Ornithological Society
- Raptor Research Foundation (North American Director)
- The Wildlife Society
- American Society of Mammalogists
- Association of Field Ornithologists
- Western Bird Banding Association
- North American Bird Banding Association

Publications

Santolo, G.M. 2012. Book Review: Environmental Contaminants in Biota: Interpreting Tissue Concentrations. Second edition. W. Nelson Beyer, James P. Meador, editors. 2011. CRC Press Taylor & Francis Group, Boca Raton, FL, USA. Journal of Wildlife Management; DOI: 10.1002.

Santolo, G., J. Yamamoto, P. Nieberg, and B. Wilson. 2010. Selenium accumulation in coturnix quail fed seleno-L-methionine. Environmental Toxicology and Chemistry 29:2220-2224.

Santolo, G. M. and J. T. Yamamoto. 2009. Nest box and site use by, and selenium concentrations in, American kestrels at Kesterson reservoir, central California. Journal of Raptor Research 43: 315-324.

Santolo, G. M. 2009. Small mammals collected from a site with elevated selenium concentrations and three reference sites. Archives of Environmental Contamination and Toxicology 57:741-754.

Santolo, G.M. 2007. Selenium accumulation in European starlings nesting in a selenium-contaminated environment. Condor. 109:863-870.

Byron, E. R., H.M. Ohlendorf, G. M. Santolo, S.M. Benson, P.T. Zawislanski, T.K. Tokunaga, and M. Delamore. 2002. Ecological Risk Assessment Example: Water and Shorebirds Feeding in Ephemeral Pools at Kesterson Reservoir, California. In: Handbook of Ecotoxicology. Second Edition. D.J. Hoffman, B.A. Rattner, G.A. Burton, Jr., and J. Cairns, Jr., eds. Lewis Publishers. New York.

Pisenti, J. M., G. M. Santolo, J.T. Yamamoto, and A.A. Morzenti. 2001. Embryonic development of the American kestrel (*Falco sparverius*): external criteria for staging. Journal of Raptor Research. 35: 194-206.

Yamamoto, J. T. and G. M. Santolo. 2000. Body Condition Effects in American Kestrels Fed Selenomethionine. Journal of Wildlife Diseases. 36: 646-652.

Santolo, G. M. and J.T. Yamamoto. 1999. Selenium in Blood of Predatory Birds from Kesterson Reservoir and Other Areas of California. Journal of Wildlife Management. 63: 1273-1281.

Santolo, G. M., J.T. Yamamoto, J.M. Pisenti and B.W. Wilson. 1999. Selenium Accumulation and Effects on Reproduction in Captive American Kestrels Fed Selenomethionine. Journal of Wildlife Management. 63: 502-511.

Yamamoto, J. T., G. M. Santolo and B.W. Wilson. 1998. Selenium Accumulation in Captive American Kestrels (*Falco sparverius*) Fed Selenomethionine and Naturally Incorporated Selenium. Environmental Toxicology and Chemistry. 17: 2494-2497.

Ohlendorf, H. M. and G. M. Santolo. 1994. Kesterson Reservoir-Past, Present, and Future: An Ecological Risk Assessment. In: Selenium in the Environment. W.T. Frankenberger Jr. and S. Benson, eds. Marcel Dekker, Inc. New York.

Wahl, C., S. Benson and G. Santolo. 1994. Temporal and Spatial Monitoring of Soil Selenium at Kesterson Reservoir, California. Water, Air and Soil Pollution. 74: 345-361.

With J.T. Yamamoto and B.W. Wilson. Selenium accumulation and implications for reproduction in captive American kestrels and wild birds at Kesterson Reservoir. Presented at the Society for Environmental Toxicology and Chemistry Conference, Washington, DC. November, 1996.

With H.M. Ohlendorf. How clean is clean, and why is it important in wildlife management? Presented at the Wildlife Society Second Annual Conference, Portland, Oregon. September, 1995.

With H.M. Ohlendorf. Kesterson Reservoir: an update. Presented at the Wildlife Society Second Annual Conference, Portland, Oregon. September, 1995.

With J.T. Yamamoto and B.W. Wilson. Dietary and blood Selenium Relationships in Wild and Captive Raptors. Presented at the Raptor Research Foundation Conference, Duluth, Minnesota. November, 1995.

With P.J. Detrich. Relationships of Water Level to Bald Eagle Reproduction at Shasta Reservoir, California. Presented at the Raptor Research Foundation Conference, Flagstaff, Arizona. November, 1994.

Kesterson Reservoir: Now and Then. Risk Assessment Workshop Ecological Case Study. Presented at the CAL/EPA Workshop: Case Studies in Ecotoxicological Risk Assessments. Irvine, California. June, 1995.

With C.D. Johnson and N.J. Williams. Kesterson Reservoir: Biological Monitoring Documents Curtailment of Wildlife Impacts. Presented at the International Conference on Metals in Soils, Waters, Plants and Animals. 1990.

With D. M. Fry. The Importance of Evaluating Sub-Lethal Pesticide Effects to Wildlife: A Case Study with Compound 1080 and Turkey Vultures. Presented at the Wildlife Rehabilitation Council Conference. 1988.

With D. M. Fry and C. R. Grau. Final Report for Interagency Agreement: Effects of Compound 1080 Poison on Turkey Vultures. California Department of Fish and Game Interagency Report. 1986.

Temperature Dependence and Response of Turkey Vultures (*Cathartes aura*) to Different Levels of Compound 1080. Presented at the 56th Annual Meeting of the Cooper Ornithological Society. 1986.

With D. M. Fry. A Technique for Assessing Sublethal Effects of Compound 1080 on Vultures. Presented at the Raptor Research Foundation Symposium on the Management of Birds of Prey. 1985.

With D. M. Fry. Sublethal Effects of Agricultural Pesticides on Raptors. Presented at the Raptor Research Foundation Symposium on the Management of Birds of Prey. 1985.

Certifications and Relevant Workshops

- Swainson's Hawk Workshop
- California Tiger Salamander Workshop
- California Red-legged Frog Workshop
- Toxicity Extrapolations in Terrestrial Systems

- US Fish and Wildlife-Habitat Evaluation Procedures (HEP)
- American Red Cross Certified Instructor-Standard First Aid
- American Red Cross Certified Instructor-Community CPR
- OSHA-Site Safety Coordinator (Level D)
- OSHA-40 hour Hazardous Waste Operations and Emergency Response
- OSHA-Authorized Entrants and Attendants Confined Spaces
- San Joaquin Valley Endangered Wildlife Technical Workshop
- Resolving Endangered Species Conflicts
- Land Use and Endangered Species
- Case Studies in Ecotoxicological Risk Assessments
- The Willow Flycatcher Workshop

DECLARATION OF

Jennifer Scholl

I, Jennifer Scholl, declare as follows:

1. I am presently employed by CH2M HILL Engineers, Inc. as a Senior Technical Consultant.

2. A copy of my professional qualifications and experience are attached hereto and incorporated herein by reference.

3. I helped prepare the attached testimony on Alternatives for the Hidden Hills Solar Electric Generating System project based on my independent analysis, supplements thereto, data from reliable sources, and my professional experience and knowledge.

4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue(s) addressed herein.

5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: January 7, 2013

Signed: Jennifer Scholl

At: Santa Barbara, California

DECLARATION OF

Jennifer Scholl

I, Jennifer Scholl, declare as follows:

1. I am presently employed by CH2M HILL Engineers, Inc. as a Senior Technical Consultant.

2. A copy of my professional qualifications and experience are attached hereto and incorporated herein by reference.

3. I helped prepare the attached testimony on Land Use for the Hidden Hills Solar Electric Generating System project based on my independent analysis, supplements thereto, data from reliable sources, and my professional experience and knowledge.

4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue(s) addressed herein.

5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: January 7, 2013

Signed: Jennifer Scholl

At: Santa Barbara, California

Jennifer Scholl

Senior Technical Consultant/Regulatory Specialist

Education

B.A., University of California, Santa Barbara, Environmental Studies and Political Science International Relations

Relevant Experience

Ms. Scholl has more than 25 years of experience in working with commercial and public development project conformance with regulatory permitting requirements. This experience includes environmental planning and permitting of complex and controversial development projects, including electric power generation projects (natural gas and renewable), transmission lines, fuel supply pipelines, and civil infrastructure subject to local, state, and federal requirements. Other areas of expertise include: constraints analyses; regulatory strategy for state and federal compliance with endangered species (U.S. Fish and Wildlife Service [USFWS] and CA Department of Fish and Game [CDFG] and permitting [Bureau of Land Management [BLM]); California energy policy (California Energy Commission [CEC]), state and federal water quality and wetlands, coastal zone management (California Coastal Commission [CCC]), local government plans policies, and cultural resource requirements; agency negotiations; preparation and implementation of habitat management plans; technical staff mentoring and guest lecturing on California Environmental Quality Act (CEQA)/National Environmental Policy Act (NEPA) and technical writing; cultural and historic resources conflict resolution; green house gas emission reduction strategy; construction and operation permit compliance; site remediation; preparation and implementation of drainage and water quality protection plans and measures; visual sensitivity analyses; and business development for projects in California and the western U.S.

Representative Projects

Project/Task Management/Senior Oversight/Review; Electricity Generation Projects; Various; California; 1997-Present. Provided permitting and CEQA and NEPA (as applicable) compliance strategy, directed environmental data collection, facilitated agency review processes for authorizations from the CEC, BLM, USFWS, CDFG, drainage and erosion control, and other state and local agencies. Supported the following projects with CEC permit processing and Application for Certification (AFC) preparation: Hidden Hills Solar Energy Generating Station, Inyo County; Ivanpah Solar Energy Generating Station, Eastern San Bernardino County; NRG Carlsbad Energy Center, South Bay Replacement Project, and Otay Mesa Power Plant, San Diego County; Pastoria Energy Facility, Kern County; Redondo Beach Generating Station, Huntington Beach Generating Station, El Segundo Generating Station, and Long Beach District Energy Center Project, Los Angeles area; Mountainview and High Desert Power Plants, San Bernardino County; CalEnergy Black Rock Geothermal, Imperial County; Roseville Energy Facility, Eastshore Energy Center, GWF co-generation upgrades (Tracy, Hanford, and Henrietta), Pittsburg District Energy Facility/Los Medanos Energy Center, and Delta Energy Center, San Francisco/Sacramento area. Supported the following projects with local, state, and federal agency permitting (non-CEC) authorizations: NextEra North Sky River Wind Energy, City of Vernon Renewable Energy Lands, Delano Ethanol Facility, Kern County; Lompoc Wind Energy Project, Santa Barbara County; Modesto Irrigation District, South San Francisco Energy Center, and United American Energy, San Francisco Bay Area.

Senior Technical Reviewer; California Public Utilities Commission (CPUC) Proponent's Environmental Assessments (PEAs); California; 1997 to the Present. Managed preparation of Land Use and Socioeconomics/Environmental Justice Sections for two Southern California Edison (SCE) PEAs for the Antelope Transmission Project (now Tehachapi Renewable Transmission Project), Kern and Los Angeles counties. Provided senior oversight and review for PG&E Cabrillo-Santa Ynez 115kV Reconductoring Project, Cressey Gallo Power Line Project, and BC-CA Transmission Line Feasibility Study, SCE TRTP, Pacific Pipeline, and Carson to Norwalk Pipeline Projects.

Project Manager/Regulatory Specialist; North Sky River Wind Energy Facility, Southeastern Kern County, California. Project Manager, March 2010 through April 2011; Senior Technical Consultant, April 2011 to August 2012. Provided permitting strategy support and directed comprehensive data collection, environmental resource surveys, for a

250-MW wind energy project located in the southern Tehachapi mountain range. Facilitated Kern County environmental review and permitting, BLM, state and federal agencies (USFWS and CDFG endangered species consultations and drainage and erosion control) authorizations. Resource surveys covered rare plants, avian point counts, bat acoustic and roosting sites, aerial and ground-level raptor nest identification, passerine and riparian birds, and other special status species (desert tortoise, Mohave ground squirrel [MGS], American badger, burrowing owl, Least Bell's Vireo, Southwest willow flycatcher, and Tehachapi Slender Salamander). Other baseline data collection efforts and studies addressed ongoing site development, cultural and paleontological resources, ambient noise, sensitive aesthetics, water supply, traffic, and air quality. Prepared a BLM Plan of Development (POD) for wind turbine generators on BLM lands (withdrawn due to challenges presented by the BLM's implementation of USFWS guidelines on the bald and golden eagle) and managed compilation of 3000+ pages of technical studies, an EIR Notebook with a CEQA-compliant project description, regulatory setting, and baseline environmental information to assist Kern County in expediting permit processing. Project was approved by the County in September 2011 and is currently under construction.

Project Manager/Regulatory Specialist; City of Vernon Renewable Energy Land Development; Southeastern Kern County. Supported initial site development activities beginning in August 2008 and facilitated tasks necessary to support Kern County environmental review for proposed wind and solar development on City of Vernon-controlled land. Ongoing support included; preparation of a critical issues report, direct client representation to Kern County Planning Department, Planning Commission, and Board of Supervisors, and preparation of Kern County and BLM application packages. Additional support includes overseeing habitat reconnaissance and Spring 2011/2012 biological resources data collection efforts (rare plant, wetland, wildlife, and avian), permitting strategy, technical advice to financial institutions related to asset transfers, meteorological tower permitting, assistance with site layouts, filing applications for Kern County and a POD for access roads on BLM-managed lands. Application processing expected to occur in 2012.

AFC Project Manager; Pastoria Energy Facility; Calpine Corporation; Kern County; California. Project Manager for preparation of two AFCs (CEQA-equivalent) to the CEC for a 750 MW combined cycle and 160 MW simple-cycle addition at the Pastoria Energy Facility. Responsible for day-to-day coordination with client and CEC staff for addressing agency requirements. AFC for 750 MW submitted to the CEC in November 1999 and project commenced commercial operation in summer 2005. Also managed environmental compliance for pre-construction and construction activities, including: providing ongoing compliance support, preparing and docketing CEC license amendments, assisting with agency coordination, preparing compliance plans, managing onsite compliance monitors, providing oversight for flood control and geotechnical challenges, and providing ongoing historical support.

AFC Project Manager/AFC Task Leader/Regulatory Advisor/Siting Study Manager; CEC-jurisdiction Development Proposals in California; Numerous Clients; California. Currently supports numerous electrical power generation proposals for multiple clients in California with power plant and transmission line siting, project development, agency coordination, AFC preparation, land use permit reconnaissance and strategy for AFC filing. Previous and current projects are in the following areas in California: San Jose, Arcata, Roseville, Pittsburg, San Francisco, Los Banos, Antelope Valley, Hayward, Vernon, Otay Mesa, Redondo Beach, Riverside, Port of Long Beach, and Port of San Diego.

DECLARATION OF

IVAN SCHWAB, M.D. F.A. C. S.

I, Ivan Schwab, declare as follows:

1. I am presently employed by the University of California, Davis as a Professor Emeritus.

2. A copy of my professional qualifications and experience are attached hereto and incorporated herein by reference.

3. I prepared the attached testimony on avian ocular impacts and behavior for the Hidden Hills Solar Electric Generating System project based on my independent analysis, supplements thereto, data from reliable sources, and my professional experience and knowledge.

4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue(s) addressed herein.

5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: 1/19/2013 Signed: Ivan Schwab

At: Sacramento CA 95817

CURRICULUM VITAE

Ivan R. Schwab, M.D.

Date of Birth:	January 21, 1948
Marital Status:	Married to Nora Rowe, 1977 Children: Nathan Rowe Schwab, 1983
Education:	B.A., Summa Cum Laude
1966-1969	West Virginia University Morgantown, West Virginia
1969-1973	Medical Doctor West Virginia University Morgantown, West Virginia
Internship:	Medical - Rotating
1973-1974	Santa Clara Valley Medical Center South Bascom Avenue San Jose, California
Residency:	Ophthalmology Residency
Mar. 1977- Mar. 1980	Pacific Medical Center Department of Ophthalmology 2340 Clay at Webster San Francisco, California
Nov. 1979- Mar. 1980	Chief Resident in Ophthalmology Pacific Medical Center Department of Ophthalmology San Francisco, California
Fellowships:	
Sept. 1978- Nov. 1978	Tropical Ophthalmology International Eye Foundation Nakura Kenya, East Africa
Mar. 1980- Aug. 1980	Corneal and Reconstructive Surgery Gellert Foundation Sponsorship Pacific Medical Center Department of Ophthalmology San Francisco, California Preceptors: David W. Vastine, M.D. William Stewart, M.D.
Aug. 1980- Aug. 1982	International Ophthalmology Cornea and External Disease, Uveitis, Epidemiology and Public Health,

Proctor Foundation for Research in Ophthalmology,
University of California
San Francisco, California
Sponsors: Cecilia Vaughn Fellowship Foundation.
National Institutes of Health
Training Grant Ey-07058-01

June 1981-
July 1981 Sixteenth Graduate Summer Session in Epidemiology
University of Minnesota, Minnesota

Licensures: California License #G-27165

Board Certificates:

1974 Diplomat of the National Board of Medical Examiners

1981 American Board of Ophthalmology Certification.

2004 American Board of Ophthalmology Re-Certification

Honors:

1968 Phi Beta Kappa

1985-2003 Associate Examiner for American Board of Ophthalmology

1988 Alpha Omega Alpha

1990 Honor Award - American Academy of Ophthalmology

2000 Professor of the Millennium – UC Davis Resident Award

2001 West Virginia University Medical School "Alumnus of the Year"

2001 American Academy Ophthalmology Senior Service Award

2002 West Virginia University Academy of Distinguished Alumni

2002 First Ben Goldfeller Award of American Board of Ophthalmology for service to American Board of Ophthalmology

2002 Secretariat Award American Academy of Ophthalmology

2003-Present Director, American Board of Ophthalmology

2004 Best Resident Instructor—Resident Award

2003	Secretariat Award American Academy of Ophthalmology
2008	Best Resident Instructor—Co-winner
2010	Lifetime Teaching Award UC Davis Deptartment of Ophthalmology

Hospital Appointments:

Mar. 1975- Mar. 1977	Staff Member, Department of Medicine Kaiser Permanente San Francisco, California
Apr. 1980- Sept. 1982	Attending Physician - Ophthalmology Pacific Medical Center San Francisco, California
Mar. 1981- Sept. 1982	Attending Physician - Ophthalmology United States Public Health Hospital San Francisco, California
Sept. 1982- Sept. 1989	Full-time Faculty Member, Department of Ophthalmology West Virginia University Morgantown, West Virginia
Sept. 1989- June 1995	Associate Professor of Ophthalmology, Department of Ophthalmology University of California, Davis
July 1995 Present	Professor of Ophthalmology Department of Ophthalmology University of California, Davis

Teaching Positions:

Sept. 1982- June 1985	Assistant Professor Department of Ophthalmology Corneal and External Disease, Uveitis, Glaucoma, Contact Lenses West Virginia University School of Medicine Morgantown, West Virginia
Oct. 1982	Chief, Uveitis Service Unit West Virginia University Morgantown, West Virginia
Jan. 1983	Chief, Glaucoma Service Chief, Contact Lens Service West Virginia University

	Morgantown, West Virginia
July 1984	Chief, Cornea Unit West Virginia University Morgantown, West Virginia
July 1985- Aug. 1989	Associate Professor Department of Ophthalmology West Virginia University Morgantown, West Virginia
Dec. 1985	Vice-Chairman Department of Ophthalmology West Virginia University Morgantown, West Virginia
July 1986- July 1987	Vice Chief of Staff West Virginia University Morgantown, West Virginia
Mar. 1987- Sept. 1987	Acting Chairman Department of Ophthalmology West Virginia University
July 1987- July 1988	Chief of Staff West Virginia University Morgantown, West Virginia
July 1988- December 1995	Basic and Clinical Science Course (Committee Section 8) American Academy of Ophthalmology San Francisco, California
1988-2001	Editor, Corneal and External Disease Section: Duane's Clinical Ophthalmology
Sept. 1989	Associate Professor of Ophthalmology University of California, Davis Sacramento, California
Jan. 1991	Chair: Basic/Clinical Science Text Committee on Cornea and External Disease. American Academy of Ophthalmology textbooks.
July 1993	Professor of Ophthalmology, University of California, Davis
August 2006	Adjunct Professor University of Queensland, Brisbane Australia

Committees and Appointments:

1981-1982	Proctor Bulletin Editorial Board
1982	West Virginia University Hearing Committee

1982-1987	West Virginia University Credentials Committee
1983-1988	Medical Director, The Medical Eye Bank of West Virginia Charleston, West Virginia
1984	Committee to Review Guidelines for Chart Documentation Credentials Committee
1985	Ad Hoc Committee Standards of Care Cardiology Cardiovascular Surgery Credentials Committee
1985-1989	Continuing Medical Education Committee Ethics Committee Chairman, Promotion and Tenure Committee, Department of Ophthalmology
1985-1987	Class Agent WVU Medical School Alumni
1986	Chairman, Credentials Committee Executive Committee Medical Board of West Virginia University Operating Room Committee Vice Chief of Staff
1986-1987	Paul Keckley Hospital Marketing Committee Chairman, Legislative Committee, West Virginia Academy of Ophthalmology Chairman, Executive Committee Chairman, Medical Board of West Virginia University Hospitals, Inc. Health Sciences Planning Committee Joint Conference Commission Joint Conference Commission Clinical Council Organ Procurement Committee University/Medical Center Planning Committee Medical Records Committee Medical Corporation Bylaws Committee National Research Advisory Committee Tissue Banks International
1988-1989	Managed Care Committee Ambulatory Care Center Staffing Committee Operating Room Committee Chairman, Patient Care Review Committee Hearing Committee

	Basic and Clinical Sciences Course, American Academy of Ophthalmology Faculty/Administration Relations, Ad Hoc Committee Chairman
1990	Medical Advisor: Sierra Eye and Tissue Bank
1991	Grants and Contracts Committee, UC Davis
1993	Managed Care Committee, UC Davis
1993	Strategic Planning Committee for Marketing, UC Davis
1996 – 2003	Telemedicine Committee, UC Davis
1996	Contracts and Billing Work Group, UC Davis
1996 - Present	Media Spokesperson, American Academy of Ophthalmology
1999	Retirement Task Force
1999	Ad Hoc Committee, UCDMC, to Review Promotion of Doctor
1999	Ad Hoc Credentials Committee of Lassen Comm. Hospital
2006	Operating Room Committee University of California, Davis

Board of Directors Memberships:

1987-1988	West Virginia University Hospitals, Inc.
	Tissue Banks International Baltimore, Maryland
	West Virginia Academy of Ophthalmology Political Action Committee
	West Virginia Academy of Ophthalmology Board of Directors
1983-1989	The Medical Eye Bank of West Virginia Charleston, West Virginia
1993-2003	Ocular Microbiology and Immunology Group
2001-Present	National Advisor Board – Tissue Banks International American Board of Ophthalmology
2003-2010	American Board of Ophthalmology Board of Directors

Administrative Experience:

1983-1989	Medical Director, The Medical Eye Bank of West Virginia
1986-1987	Vice Chief of Staff West Virginia University (elected)

1987-1988	Chief of Staff (Medical Director Position) West Virginia University
Feb. 1987- Sept. 1987	Acting Chairman Department of Ophthalmology West Virginia University
May 1987- Aug. 1989	Chairman, Legislative Committee West Virginia Academy of Ophthalmology
Aug. 1988- Aug. 1989	Executive Secretary-Treasurer West Virginia Academy of Ophthalmology
June 1989-1994	President, Proctor Fellows Association
1990-1993	Program Committee - Clinical Section ARVO
1990-Present	Medical Advisor - Sierra Eye and Tissue Bank
1995-1996	President, Ocular Microbiology and Immunology Group
1996-2001	Executive Secretary, Ocular Microbiology and Immunology Group
1995-Present	Media Representative, American Academy of Ophthalmology
1998 – 2003	Chair, Alternative Therapy Committee, American Academy of Ophthalmology
2003	Director of Cornea Service, Dept. of Ophthalmology
2006	Media Group AAO

Society Memberships:

1975	The California Academy of Sciences
1978	Association for Research in Vision And Ophthalmology
1980	American Association of Ophthalmology
1981	American Academy of Ophthalmology Proctor Fellows Association
1982	American Medical Association
1982	Proctor Fellows Association
1984	Mid Atlantic Uveitis Group
1985	International Society of Geographical Ophthalmologists
1986	American Uveitis Society

1987	Fellow, American College of Surgeons
1988	Ocular Genetics Study Group
	Ocular Microbiology and Immunology Group
1989	California Medical Association
1989	Sacramento Medical Association
1990	California Cornea Club
2001	Castroviejo Corneal Society
2003-2010	American Board of Ophthalmology

Invited Participation:

June 1980	Methods of Assessment of Avoidable Blindness Conference - WHO - San Francisco, California
June 1982	National Eye Institute Conference on Cataract Epidemiology
May-June 1984	Consultant for World Health Organization for Primary Eye Care in Africa
Oct. 1984-Present	American Board of Ophthalmology, Examiner
Sept. 1987	40th Anniversary Meeting, Francis I. Proctor Foundation: Oral Acyclovir in the Management of Ocular HSV
Aug. 1988	Basic and Clinical Science Course, American Academy of Ophthalmology, Section Seven Cornea and External Disease
May 1990	Program Committee - ARVO
May 1992-1993	Program Planning Committee Chair, (Clinical Section) ARVO
October 2002	AAO Lab course – Lab Instructor for “Advanced Keratoplasty Techniques”
December 2002	Third Annual Regenerative Medicine Conference, Washington, DC

Grants:

1984-1986	Clinical Investigations of Drugs and Instruments: Effect of Staphylococcal Toxins on Cultured Human Corneal Epithelium - Southern Medical Association
1986	Interferon as an Adjunct to Viroptic - Schering Corporation

	Therapeutic Ultrasound - Sonocar Corporation
	Timoptic vs. Betaxolol and Topical Norfloxacin for Bacterial Infection of the Eye - Merck, Sharp & Dohme
1987	Medical Eye Bank of West Virginia (Tear Research Grant)
1991	Chiron Ophthalmics - Study of Irrigating Solutions
1993	National Eye Institute/National Institute of Health, Herpetic Eye Disease Study, Phase II Participant
1993	National Eye Institute/National Institute of Health, Co-Investigator, Ocular Hypertensive Treatment Study - Principal Investigator James Brandt, M.D.
1994	Senju Corporation Grant Study of Aldose Reductase Inhibitor on Diabetic Epitheliopathy $250,000.00 (Principal Investigator)
1998	Santen Inc. A Clinical and Microbiological Evaluation of 0.5% Levofloxacin Ophtalmic Solution vs 0.3% Ofloxacin for the Treatment of Bacterial Conjunctivitis
2005	Research to Prevent Blindness Sabbatical Grant
2005	University of California, Davis Matching Sabbatical Grant

Instructional Courses:

Nov. 1984-1986 Annually	**Schwab IR**, Meisler D: Complications of Contact Lenses. American Academy of Ophthalmology
1985 - 2002 Annually	**Schwab IR**: The Avian Eye American Academy of Ophthalmology
Sept. 1985-1987 Annually	**Schwab IR**, Meisler D: Complications of Contact Lenses. Joint Commission on Allied Health Personnel in Ophthalmology
Nov. 1987-1989 Annually	**Schwab IR**: Iris Clues to Ophthalmic Diagnosis American Academy of Ophthalmology
Oct. 1989-1991 Annually	Basic and Clinical Science Section 8

Oct. 1990-1993 Annually	**Schwab IR**: The Challenge of HSV
Nov. 1993-Present Annually	A Festival of Light and Color
Oct. 2002-2004	Advanced Keratoplasty Techniques
Oct 2005-present Annually	Evolution's Witness

Journal Referee Positions:

1. International Journal of Leprosy
2. Current Eye Research
3. Annals of Saudi Medicine
4. Ophthalmology
5. Investigative Ophthalmology
6. Archives of Ophthalmology
7. American Journal of Ophthalmology
8. American Journal of Epidemiology
9. American Journal of Cardiology
10. The Medical Letter
11. Ocular Epidemiology
12. Cornea
13. Journal of Refractive Surgery
14. New England Journal of Medicine
15. Journal of CLAO
16. British Journal of Ophthalmology

Grant Reviewer:

1. National Science Foundation

Named or Guest Lectures:

November 18, 1986	Benedum Lecture West Virginia University The Avian Eye
April 15, 1989	Barkan Lecture Diagnosis and Management of Herpes Simplex Keratitis Pacific Medical Center San Francisco, California
November 1990	Visiting Professor King Khaled Eye Hospital, Riyadh, Saudi Arabia
	Mas Okamoto Lecture, Alta Foundation Lake Tahoe, CA

September 1991	ALTA Lecturer, Lake Tahoe, CA
October 1991	Visiting Professor West Virginia University Hutchinson Lecturer West Virginia University, Morgantown, West Virginia
May 1993	Visiting Professor University of Washington, Seattle
June 1994	G. Richard O'Connor Lecture Proctor Fellows Meeting
June 1994	Cornea Federated Societies Meeting Diagnosis of Herpes Simplex Keratitis
June 1995	Ralph M. and Sophie K. Heinz Lecture Proctor Fellows Meeting, June 24-26, 1995
September 1995	Visiting Professor University of Iowa, Iowa City
February 1996	Principal Speaker, Aspen Corneal Society
May 1996	Visiting Professor Vanderbilt University
May 1996	Visiting Professor Stanford University
June 1996	Guest Speaker American Birding Association Convention The Avian Eye
August 1996	Mexican Congress of Ophthalmology Herpes Zoster Sine Herpete
December 1996	Visiting Professor The Avian Eye Norway VII Symposium of Ophthalmology
September 1997	Visiting Professor Dartmouth Medical School
September 1997	Albert Esposito Lecturer Marshall Medical School The Avian Eye

December 1997	Visiting Lecturer UCSF Natural Festival of Light and Color
February 1999	Brazilian 22nd International Symposium Sao Paulo, Brazil
September 1999	Theodore F. Schlaegel, Jr., M.D., Lecturer Indiana University Indianapolis, Indiana
November 1999	William Spencer Lecturer California Pacific Medical Center, San Francisco
January 2000	Aravind Eye Hospital Medical Council of India Madurai, New Delhi, India Uveitis Conference
	Aravind Eye Hospital Medical Council of India Madurai, New Delhi, India Pharmaceutical Agents
September 2000	Visiting Professor Henry J. L. Van Dyk Memorial Lecture University of Utah
June 2001	Visiting Professor West Virginia University Eye Institute Bio-engineered Tissue
July – Aug. 2002	Visiting Professor Melbourne, Australia
October 2002	Visiting Professor New York University School of Medicine
December 2002	Visiting Professor University of California San Francisco Campus
February 2003	Visiting Professor Honolulu, Hawaii
March 2003	Visiting Professor New England Ophthalmological Society Recognizing and Treating Ocular Surface Disorders And Subspecialty Sessions

	Boston, MA
September 2003	Visiting Professor Casey Eye Institute Portland, OR
November 2003	Visiting Professor University of Toronto, Canada Toronto, Canada
May 2004	Visiting Professor California Pacific Medical Center San Francisco Ca
June 2004	Visiting Professor University of Pittsburgh Eye Center Pittsburgh PA
September 2004	Visiting Professor University of Colorado Denver, Colorado
April 2006	Visiting Professor Schepens Eye Institute Mass Eye and Ear Boston MA
May 2007	Hogan Lecture Cordes Society San Francisco CA
March 2009	White Coat Lecturer West Virginia University Medical School Transition
November 2012	TEDx Orange Coast Talk Evolutionary Design in Sight

Patents: Serial No: 08/118,265
Urea Ophthalmic Ointment and Solution.
Charlton JF, **Schwab IR**, Stuchell R

Serial No: Pending
Autologous Ocular Stem Cell Epithelial Growth in Autoplasty
UC Case No.: 96-131-1
UCDV-206CON
Schwab IR, Isseroff RR, Torfi H

Editorial Boards:

1995 - 2001	*Current Opinion in Ophthalmology*
1997 - 2005	*Eyenet* (AAO Monthly publication)
1998 - Present	*Cornea (journal)*, Associate Editor
1998	*Current Opinion in Ophthalmology* August Issue
1999	*Current Opinion in Ophthalmology* August Issue
2000 - 2012	*British Journal of Ophthalmology*
2000 - Present	*British Journal of Ophthalmology*, Cover Editor
2004	Special Interest Topics Group
2005-2010	Cornea Society
2013-Present	OPHTHALMOLOGY Journal, Associate Editor
2012-Present	Pan American Association of Ophthalmology, Editorial Board

PUBLICATIONS

Journal Articles:

1. Gammon JA, Joseph J, **Schwab IR**. Gentamicin resistant *Serratia marcescens* endophthalmitis. *Arch Ophthalmol*. 1980; 98:1221-1223.

2. **Schwab IR**. Thermometer lysis of symblepharon. *Amer J Ophthalmol*. 1980; 90(2):270-271.

3. Dawson CR, **Schwab IR**. Malnutrition's role in blindness. *The Lancet*. 1981; 2:812-813.

4. Dawson CR, **Schwab IR**. Epidemiology of cataract. *Bulletin of World Health Organization*. 1981; 59(4): 493-501.

5. Belmont JB, Ostler HB, **Schwab IR**, et al. Non-infectious ring-shaped keratitis associated with pseudomonas aeruginosa. *Amer J Ophthalmol*,. 1982; 93:338-341.

6. **Schwab IR**, Grabner G, Ostler HB. Interstitial linear keratitis. *Amer J Ophthalmol*. 1982; 94:606-609.

7. **Schwab IR**. Ophthalmic emergencies A guide to diagnosis and treatment. *Resident and Staff Physician*. 1983; 29:5-17.

8. Vastine DW, Stewart WB, **Schwab IR**. Reconstruction of the periocular mucous membrane by autologous conjunctival transplantation. *Ophthalmology*. 1982; 89(9): 1072-1081.

9. **Schwab IR**, Ophthalmic Emergencies. "A Guide to Diagnosis and Treatment." *Medical Times.* 5s-23s, 1982.

10. **Schwab IR**, Dawson CR, Malaty R, Korra A, Nassar E. Leprosy in a *trachomatous* population. *Arch Ophthalmol*. 1984; 102:240-224.

11. **Schwab IR**, Hoshiwara I, Szuter C, Dawson C, Knowler W. Cataract extraction in the Pima Indians: diabetes as a risk factor. *Arch Ophthalmol*. 102:208-212, 1985.

12. McCormick S, DiBartolomeo A, Raju VK, **Schwab IR**. Ocular chrysiasis. *Ophthalmology*. 1985; 92:1432-1435.

13. Morgan LW, **Schwab IR**. Age and visual acuity in men vs. women undergoing cataract extraction. *Amer J Ophthalmol*. 1986; 100:520-522.

14. Morgan LW, **Schwab IR**. Informed consent in cataract extraction. *Arch Ophthalmol*. 1986; 104:42-45.

15. **Schwab IR**, Raju VK, McClung J. Indirect immunofluorescent antibody diagnosis of herpes simplex with upper tarsal and corneal scrapings. *Ophthalmology*. 1986; 93:752-756.

16. **Schwab IR**, Schwab LT, Cavender JC. Limbal vernal with a mass lesion. *Annals of Ophthalmology*. 1987; 19:79-80.

17. **Schwab IR**. Oral acyclovir in the management of herpes simplex ocular infection. *Ophthalmology*. 1988; 95:423-430.

18. **Schwab IR**, Dawson C, Friedman G, et al: Case control study of cataract in Kaiser Permanente. *Arch Ophthalmol*. 1989; 106:1062-1065.

19. Meisler DM, Tomsak RL, **Schwab IR**. Anterior uveitis and multiple sclerosis. *Cleveland Clinic Journal.* 1989; 56:1-4.

20. Vogel R, Tipping R, **Schwab IR**. The clinical impact of changing therapy of glaucoma patients from timolol to betaxolol. *Arch Ophthalmol*. 1989; 107:1303-1307.

21. **Schwab IR**, Abbott R. Toxic keratopathy: An unrecognized problem. *Ophthalmology*. 1989; 96:1187-1193.

22. **Schwab IR**. Fuchs' heterochromic iridocyclitis. *International Ophthalmol Clinics*. 1990; 30(4): 252-256.

23. Mannis MJ, Plotnik RD, **Schwab IR**, Newton DR. Herpes simplex dendritic keratitis after keratoplasty. *Amer J Ophthalmol*. 1991; 111:480-484.

24. **Schwab IR**. The epidemiological association of ocular toxoplasmosis and Fuchs' heterochromic iridocyclitis. *Amer J Ophthalmol*. 1991; 111:356-362.

25. **Schwab IR**, Linberg JL, Benson W, Gioia V. Foreshortening of the inferior conjunctival fornix associated with chronic glaucoma medications. *Ophthalmology*. 1992; 99:197-202.

26. **Schwab IR**. Ophthalmic ciprofloxacin. *The Medical Letter*. 1991 33:52-53.

27. Silverman RH, Vogelsang B, Rondeau MJ, et al. Therapeutic ultrasound for the treatment of glaucoma. *Amer J Ophthalmol*. 1991; 111:327-336.

28. Plotnik R, Mannis M, **Schwab IR**. Therapeutic contact lenses. International Ophthalmol Clinics. Smolin G, Friedlander MH, eds. Little Brown & Company 1991; 31:35-52.

29. **Schwab IR**, Dries D, Cullor J, et al. Defensins as a preservative in corneal storage media. *Cornea*. 1992; 11:370-375.

30. Donnenfeld E, Kaufman HG, **Schwab IR**. Conjunctivitis: Update on diagnosis and treatment. *Patient Care*. 1993; 22-46.

31. Gunshefski L, Mannis M, **Schwab IR**. In vitro activity of shira-11 against ocular pathogens. *Cornea*. 1994; 13:237-242.

32. The Herpetic Eye Disease Study Group (**Schwab IR**). Herpetic eye disease study. A controlled trial of oral acyclovir for herpes simplex stromal keratitis. *Ophthalmology*. 1994; 101(12): 1871-1882.

33. The Herpetic Eye Disease Study Group (**Schwab IR**.). Herpetic eye disease study. A controlled trial of topical corticosteroids for herpes simplex stromal keratitits. *Ophthalmology*. 1994; 101(12): 1883-1896.

34. **Schwab IR**. Advances in treatment of ocular allergy. *Western J Med*. 1994; 161: 594-595.

35. Rutzen A, Ortega-Larrocoa G, **Schwab IR,** et al. Simultaneous onset of VKH in monozygotic twins. *Amer J Ophthalmol*. 1995; 119(2): 239-240.

36. de Sousa L, Mannis M, **Schwab IR**, et al. The use of cecropins D_5C in disinfecting contact lens solutions. *CLAO*. 1996; 22:114-117.

37. Charlton JF, **Schwab IR**, Stuchell R. Topical urea as a treatment for non-infectious keratitis. *Acta Ophthalmologicia Scandinavica*. 1996; 74: 391-394.

38. The Herpetic Eye Disease Study (**Schwab IR**). You can help. *Arch Ophthalmol*. 1996; 114: 89-90.

39. The Herpetic Eye Disease Study Group (**Schwab IR**). Risk factors for herpes simplex virus epithelial keratitis recurring during treatment of stromal keratitis or iridocyclitis. *Brit J Ophthalmol*. 1996; 80:969-972.

40. The Herpetic Eye Disease Study Group (**Schwab IR**). A controlled trial of oral acyclovir for iridocyclitis caused by herpes simplex virus. *Arch Ophthalmol*. 1996; 114: 1065-1072.

41. Charlton JF, **Schwab IR**, Stuchell R. Tear hyperosmolarity in renal dialysis patients asymptomatic for dry eye. *Cornea*. 1996; 15:335-339.

42. **Schwab IR**. Iridoplegic Granulomatous, Herpes Zoster Sine Eruptium. *Ophthal.* 1997; 104:1421-1425.

43. de Sousa LB, Mannis MJ, **Schwab IR**, et al. The use of two different peptides in corneal storage medium. *Invest Ophthal and Vis Sci.* 1997; 36:1017.

44. Reed JB, **Schwab IR**, Morse,LS et al: Regression of cytomegalovirus retinitis with theaddition of a protase inhibitor in the treatment of AIDS. *Am J of Ophthal.* 1997; 124: 199-205.

45. Shaikh S, **Schwab IR**, Morse LM: Association of ocular toxoplasmosis and thymona. *Retina.* 1997; 17(4): 354-356.

46. Gross RH, Poulson IS, Davitt S, **Schwab IR**, Mannis MJ: Comparison of astigmatism after penetrating keratoplasty by experienced corneal surgeons and corneal fellow. *Amer J Ophthalmol.* 1997; 123:636-643.

47. The Herpetic Eye Disease Study Group:(**Schwab IR**.) "A controlled trial of oral acyclovir for the prevention of stromal keratitis or irises in patients with herpes simplex viral epithelial keratitis." *Arch Ophthal.* 1997; 115:703-712.

48. Gordon MO, Kass MA, and the Ocular Hypertension Treatment Study Group (OHTS). Springfield; Va: National Technical Information Service. *Manual of Procedures.* 1997; Publication PB97-148308NZ.

49. Reed B, **Schwab IR**, Morse L. High-dose intravenous pulse methylprednisolone hemisuccinate in acute Behcet retinitis. *Amer J Ophthal.* 1998; 125:409-411.

50. Reed B, **Schwab IR**. Bartonella hensalae neuroretinitis in cat scratch disease: diagnosis, management, and sequelae. *Ophthalmol.* 1998; 105:459-466.

51. Marsh P, **Schwab IR.** Topology of corneal surface disease. *International Ophthalmology Clinics.* 1998; 38(4): 1013.

52. The Herpetic Eye Disease Study Group (**Schwab IR**). A randomized, placebo-controlled trial of oral acyclovir for the prevention of recurrent herpes simplex virus eye disease. *Arch Ophthalmol.* 1998; 115:703-712.

53. Farboud B, Nuccitelli R, **Schwab IR**, Isseroff R. DC electric fields induce rapid directional migration in cultured human corneal epithelial cells. *Exp Eye Res.* 2000; 70: 667-673.

54. Mannis MJ, Eghbali K, **Schwab IR.** Kerato pigmentation: A review of corneal tattooing. *Cornea.* 1999; 18:633-7.

55. Gordon MO, Kass MA, for the Ocular Hypertension Treatment Study Group. The Ocular Hypertension Treatment Study: design and baseline description of the participants. *Arch Ophthalmol.* 1999; 117: 573-583.

56. The Herpetic Eye Disease Study Group **(Schwab IR).** Acyclovir for the prevention of recurrent herpes simplex virus eye disease. *N Engl J Med.* 1998; 339:800-806.

57. Waxman E, Chechelnitsky M, Mannis MJ, **Schwab, IR**. Single culture media in infectious keratitis. *Cornea.* 1999; 18: 257-261.

58. Schwab **IR.** Cultured corneal epithelia for ocular surface disease. *Trans Am Ophthalmol Soc.* 1999; 97: 891-986.

59. O'Brien T, **Schwab IR.** A pilot multicenter evaluation of 0.5% levofloxacin in ophthalmic solution for the treatment of bacterial conjunctivitis and blepharo conjunctivitis.

60. Beck RW, Gal RL, Mannis MJ, Holland EJ, Cavanagh HD, Foulks GN, Heck EL, Lindquist T, Macsai MS, Smith RE, Stark WJ, Stulting RD, Sugar J. Is donor age an important determinant of graft survival? Cornea 1999; 18(5):503-510.

61. Barak A, Morse L, **Schwab IR.** Atypical retinal vasculitis with ticlopidine use. *Am J Ophthal***.** 2000; 129: 684-685.

62. **Schwab, IR**. Reyes M, Isseroff, R. Successful transplantation of bio-engineered tissue replacements in patients with ocular surface disease. *Cornea*. 2000; 19: 421-426.

63. Keltner JL, Johnson CA, Quigg JM, Cello KE, Gordon MO and Kass MA for the **Ocular Hypertension Treatment Study Group**. Confirmation of Visual Field Abnormalities in the Ocular Hypertension Treatment Study. Archives of Ophthalmology. 2000; 118(9):1187-1194

64. Piltz J, Gross R, Shin DH, Beiser JA, Dorr DA, Kass MA, Gordon MO for the **Ocular Hypertension Treatment Study Group**. Contralateral effect of topical ß-adrenergic antagonists in one-eyed trials in the Ocular Hypertension Treatment Study. American Journal of Ophthalmology. 2000. 130(4):441-453.

65. The Herpetic Eye Disease Study Group (**Schwab IR**). Oral Acyclovir for Herpes Simplex Virus Eye Disease: Effect on Prevention of Epithelial Keratitis and Stromal Keratitis. *Arch Ophthalmol.* 2000; 118: 1030-1036.

66. The Herpetic Eye Disease Study Group (**Schwab IR**). Psychological stress and other potential triggers for recurrences of herpes simplex virus eye infections. *Arch*

*Ophthalmol.*Vol. 2000; 118: 1617-1625.

67. The Herpetic Eye Disease Study Group (**Schwab IR**). Predictors of Recurrent Herpes Simplex Virus Keratitis. *Cornea*. 2001; 20:123-128.

68. **Schwab IR**, Ho VH, Roth A, Blankenship TN, Fitzgerald PG. Evolutionary attempts at four eyes in vertebrates. *Trans of the Am Ophthalmol Soc*. 2001; 99: 145-157.

69. Ho VH and **Schwab IR**. Social economic development in the prevention of global blindness. *Br J Ophthal.* 2001, 85: 853-7.

70. Brandt JD, Beiser JA, Kass MA, Gordon MO, for the Ocular Hypertension Treatment Study Group (OHTS). Central corneal thickness in the Ocular Hypertension Treatment Study (OHTS). *Ophthalmology*. 2001; 108: 1779-1788.

71. **Schwab IR,** Ho VH, Roth A, Blankenship TN, Fitzgerald PG. Evolutionary attempts at four eyes in vertebrates. *Trans of the Am Ophthal Soc.* 2001; 99: 145-157.

72. Ho VH and **Schwab IR.** Social economic development in the prevention of global blindness. *Br J Ophthal.* 2001; 85: 853-7.

73. Feiz V, Mannis MJ, Kandavel J, **Schwab IR,** et al. Surface keratopathy after penetrating keratopathy. *Trans Am Ophth Soc.* 2001; 99: 159-168.

74. Brandt JD, Beiser JA, Gordon MO, Kass MA for the **Ocular Hypertension Treatment Study Group**. Central Corneal Thickness in the Ocular Hypertension Treatment Study (OHTS). Ophthalmology. 2002. 108(10):1779-1788

75. Feuer WJ, Parrish RK, II, Schiffman JC, Anderson DR, Budenz DL, Wells M-C,. Hess DJ, Kass MA, Gordon MO for the Ocular Hypertension Treatment Study Group. The **Ocular Hypertension Treatment Study**: Reproducibility of Cup/Disk Ratio over time at an Optic Disc Reading Center. American Journal of Ophthalmology. 2002. 133(1):19-28

76. Johnson CA, Keltner JL, Cello KE, Edwards M, Kass MA, Gordon MO, Budenz DL, Gaasterland DE, Werner E for the **Ocular Hypertension Treatment Study Group**. Baseline visual field characteristics in the Ocular Hypertension Treatment Study. Ophthalmology. 2002. 109:432-437

77. Kass MA, Heuer DK, Higginbotham EJ, Johnson CA, Keltner JK, Parrish RK, Wilson MR, Gordon MO and the Ocular Hypertension Treatment Study Group. **The Ocular Hypertension Treatment Study**: A Randomized Trial Determines that Topical Ocular Hypotensive Medication Delays or Prevents the Onset of Primary Open Angle Glaucoma. Archives of Ophthalmology. 2002. 120(6):701-713

78. Gordon MO, Beiser JA, Brandt JD, Heuer DK, Higginbotham EJ, Johnson CA, Keltner JK, Miller JP, Parrish RK, Wilson MR, Kass MA and the Ocular Hypertension Treatment Study Group. The Ocular Hypertension Treatment Study: Baseline Factors that Predict the Development of Primary Open Angle Glaucoma. Archives of Ophthalmology. 2002. 120(6):714-720

79. Ho VH and **Schwab IR**. Infectious Scleritis Caused by Bacillus Species Bacteria. *Annals of Ophthal.* 2002, 34:52-53.

80. Han B, **Schwab IR,** Madsen TK, et al. A Fibrin-based bioengineered ocular surface with human corneal epithelial stem cells. *Cornea*. 2002; 21(5): 505-510.

81. Machado RAM, Mannis MJ, Mandel HA, Feiz V, **Schwab IR,** et al. The relationship between first post-operative day epithelial status and eventual health of the ocular surface in penetrating keratoplasty. *Cornea.* 2002; 21(6): 574-577.

82. **Schwab IR,** Yuen CK, Buyukmihci NC, et al. Evolution of the Tapetum. *Trans Am Ophthal Soc.* 2002; 100: 187-200.

83. Latkany PA, Jabs DA,…**Schwab IR** et al. Multifocal Choroiditis in patients with familial juvenile granulomatosis. *Am J Ophthalmol.* 2002; 134: 897-904.

84. Gordon MO, Beiser JA, **…** et al (OHTS). The ocular hypertensive treatment study: a randomized trial determines that topical ocular hypotensive medication delays or prevents on the onset of primary open-angle glaucoma. *Arch Ophthal.* 2002; 10: 714-720.

85. **Schwab IR,** et al. A Phase III Clinical Trial of 0.5% Levofloxacin Ophthalmic Solutionversus 0.3% Ofloxacin Ophthalmic Solution for the treatment of bacterial conjunctivitis. *Ophthalmology.* 2003; 110 (3): 457-465.

86. **Schwab IR**, et al. Central retinal vein occulsion and renal cell carcinoma. American *Journal of Ophthalmology*. 2003 Dec; 136 (6):1185-1186

87. Johnson CA, Keltner JL, Cello KE, Edwards M, Bandermann SE, Kass MA, Gordon MO for the Ocular Hypertension Treatment Study Group. Classification of visual field abnormalities in the Ocular Hypertension Treatment Study. Archives of Ophthalmology. 2003. 121:643-650

88. Zangwill LM, RN Weinreb, CC Berry, AR Smith, KA Dirkes, AL Coleman, JR Piltz-Seymour, JM Liebmann, GA Cioffi, Trick G, JD Brandt, MO Gordon, MA Kass and the Ocular Hypertension Treatment Study Group. Racial Differences of Optic Disc Topography in Ocular Hypertensive Eyes: Results from the Confocal Scanning Laser Ophthalmoscopy Ancillary Study to the Ocular Hypertension Treatment Study. Archives of Ophthalmology. 2003. 122(1):22-28

89. Zangwill LM, RN Weinreb, CC Berry, AR Smith, KA Dirkes, JM Liebmann, JD Brandt, G Trick, GA Cioffi, AL Coleman, JR Piltz-Seymour, MO Gordon, MA Kass and the Ocular Hypertension Treatment Study Group. The Confocal Scanning Laser Ophthalmoscopy Ancillary Study to the Ocular Hypertension Treatment Study. Study Design and Baseline Factors. American Journal of Ophthalmology. 2003. 137(2):219-227

90. Yip PT, **Schwab IR**. Wendel RT, Morse LS. Treatment strategies and visual acuity outcomes in culture negative delayed-onset pseudophakic endophthalmitis. 2003.

91. Keltner JL, Johnson CA, Levine RA, Fan JJ, Cello KE, Kass MA, Gordon MO for the Ocular Hypertension Treatment Study Group. Normal visual field test results following glaucomatous visual field endpoints in the Ocular Hypertension Treatment Study. Archives of Ophthalmology. 2003. 123:1201-1206

92. Barak A, Morse LS, **Schwab I**: Leflunomide (Arava)-induced cystoid macular oedema. *Rheumatology (Oxford).* 2004 Feb; 43(2):246-8.

93. Tanhehco TY, Eifrig ED, Jr., **Schwab I**, et al: Two spontaneous mutations in the TGF-B1 gene causing granular corneal dystrophy type III (Reis-Bucklers dystrophy) Invest Ophthalmol Vis Sci. 2004;45:1520.

94. Alvarenga LS, Mannis MJ, … **Schwab IR** et al: The long-term results of keratoplasty in eyes with a glaucoma drainage device. Am J Ophthalmol. 2004; 138: 200-5.

95. Higginbotham EJ, Gordon MO, Beiser JA, Drake MV, Bennett GR, Wilson MR, Kass MA for the Ocular Hypertension Treatment Study Group. The Ocular Hypertension Treatment Study: Topical Ocular Hypotensive Medication Delays or Prevents Primary Open Angle Glaucoma in African American Individuals.Archives of Ophthalmology. 2004. 122:813-820

96. Coleman AL, Gordon MO, Beiser JA, Kass MA for the Ocular Hypertension Treatment Study Group. Baseline risk factors for the development of POAG in the Ocular Hypertension Treatment Study. American Journal of Ophthalmology. 2004. 138(4):684-685

97. Brandt, JD, Beiser JA, Gordon MO & Kass MA for the Ocular Hypertension Treatment Study Group. Central Corneal Thickness and IOP Response to Topical Ocular Hypotensive Medication in the Ocular Hypertension Treatment Study (OHTS). American Journal of Ophthalmology. 2004. 138(5):717-722

98. Kass MA, Gordon MO, Kymes SM for the Ocular Hypertension Treatment Study Group. Incorporating the results of the Ocular Hypertension Treatment Study into clinical practice. Letter to Editor. Archives of Ophthalmology. 2005. 123:1021-1022

99. Lee WB, Hamilton SM,…**Schwab IR**. Ocular complications of hypovitaminosis A after bariatric surgery. Ophthalmology. 2005; 112: 1031-4.

100. Lee WB, Darlington JK, Mannis MJ, **Schwab IR**. Dendritic keratopathy in ocular rosacea. Cornea; 2005; 24: 632-3.

101. Salehi-Had H. Alvarenga LS…**Schwab IR**. Factors modulating p63 expression in cultured limbal epithelial cells. Cornea. 2005; 24: 845-52.

102. Cornea Donor Study Group. Baseline donor characteristics in the Cornea Donor Study (CDS). Cornea 2005; 24(4):389-396.

103. Cornea Donor Study Group. An evaluation of image quality and accuracy of eye bank measurement of donor cornea endothelial cell density in the Specular Microscopy Ancillary Study. Ophthalmology 2005; 112:431-440.

104. Zangwill LM, Weinreb RN, Beiser JA, Berry CC, Cioffi GA, Coleman AL, Trick G, Liebmann JM, Brandt JD, Piltz-Seymour JR, Dirkes KA, Vega S, Kass MA, Gordon MO and the Ocular Hypertension Treatment CSLO Ancillary Study Group.Baseline topographic optic disc measurements predict the onset of primary open angle glaucoma: The Confocal Scanning Laser Ophthalmoscopy Ancillary Study to the Ocular Hypertension Treatment Study. Archives of Ophthalmology. 2005. 123(9):1188-1197

105. Parrish RK, Schiffman JC, Feuer WJ, Anderson DR, Budenz DL, Wells-Albornoz M-C, Vandenbrouke R, Kass MA, Gordon MO for the Ocular Hypertension Study Group. Test-retest reproducibility of optic disk deterioration detected from stereophotographs by masked graders. American Journal of Ophthalmology. 2005. 140:762-764

106. Sugar A, Gal RL, Beck W,… Cornea Donor Study Group. Baseline donor characteristics in the Cornea Donor Study. Cornea. 2005 May;24(4):389-96.

107. Lass JH, Gal RL, Ruedy KJ, …Cornea Donor Study Group. An evaluation of image quality and accuracy of eye bank measurement of donor cornea endothelial cell density in the Specular Microscopy Ancillary Study. Ophthalmology. 2005 Mar;112(3):431-40.

108. Tanhehco TY, Eifrig DE Jr, Schwab IR, Rapuano CJ, Klintworth GK. Two cases of Reis-Bucklers corneal dystrophy) granular corneal dystrophy type III) caused by spontaneous mutations in theTBRB1 gene. Arch Ophthalmol. 2006;124: 589-93.

109. Darlington, JK, Lee WB, Schwab IR: Corneal perforation during laser blepharoplasty. 2006 Ophthal Surg Lasers Imaging 37: 327-329.

110. Benetz BA, Gal RL, Ruedy KJ, … Cornea Donor Study Group. Specular microscopy ancillary study methods for donor endothelial cell density determination of Cornea Donor Study images. Curr Eye Res. 2006 Apr;31(4):319-27.

111. Mannis MJ, Holland EJ, Beck RW,… Cornea Donor Study Group. Clinical profile and early surgical complications in the Cornea Donor Study. Cornea. 2006 Feb;25(2):164-70.

112. Shi B, Han B, Schwab IR and Isseroff R: Ultraviolet irradiation induced changes in the 27-kDa Heat Shock Protein in Human Corneal Epithelial Cells. Cornea 2006; 25: 948-55.

113. Darlington JK, Adrean SD, Schwab IR. Trends of Penetrating Keratoplasty in the United States from 1980 to 2004. Ophthalmology. Ophthalmol 2006;113: 2171-5

114. Schwab IR, Johnson, N, Harkin D: Inherent risks associated with manufacture of bioengineered ocular surface tissue. Arch Ophthalmol 2006 124: 1734-40.

115. Schwab IR. AJO history of ophthalmology series. Thomas Young (1773-1829). Am J Ophthalmol 2006; 142: 487.

116. Cornea Donor Study Group. Clinical profile and early surgical complications in the Cornea Donor Study (CDS). Cornea 2006; 25(2):164-170.

117. Benetz BA, Gal RL, Ruedy KJ, Rice C, Beck RW, Lass JL for the Cornea Donor Study Group. Specular microscopy reading center methods in the Specular Microscopy Ancillary Study (SMAS). Current Eye Research 2006; 31:319-327.

118. Kymes SM, Kass MA, Anderson DR, Miller JP, Gordon MO for the Ocular Hypertension Study Group. Management of ocular hypertension: A cost-effectiveness approach from the Ocular Hypertension Treatment Study. American Journal of Ophthalmology. 2006.141:997-1008

119. Levine RA, Demirel S, Fan JJ, Keltner JL, Johnson CA, Kass MA for the Ocular Hypertension Study Group. Asymmetries and visual field summaries as predictors of glaucoma in the Ocular Hypertension Treatment Study (OHTS). Investigative Ophthalmology & Visual Science. 2006. 47:3896-3903

120. Keltner JL, Johnson CA, Anderson DR Levine RA, Fan JJ, Cello KE, Quigley HA, Budenz DL, Parrish RK, II, Kass MA, Gordon MO for the **Ocular Hypertension Treatment Study Group**. The association between glaucomatous visual fields and optic nerve head features in the Ocular Hypertension Treatment Study. *Ophthalmology. 2006.* 113(9):1603-1612

121. Herman DC, Gordon MO, Beiser JA, Chylack LT, Lamping KA, Schein OD, Soltau JB, Kass MA and the Ocular Hypertension Treatment Study Group. Topical Ocular Hypotensive Medication and Lens Opacification: Evidence From the Ocular Hypertension Treatment Study. American Journal of Ophthalmology. 2006. 142:800–800

122. Shi B, Han B, Schwab IR, Isseroff RR. UVB irradiation-induced changes in the 27-kd heat shock protein (HSP27) in human corneal epithelial cells. Cornea. 2006. Sep;25(8):948-55.

123. Schwab, I.R. and D.J. Maggs, *An eye for the land*. 2007. p. 855-.

124. Brudenall D, Schwab IR, Lloyd W, Giorgi, P, Graydon ML. Retinal Vascularization in the megachiroptera. Anat, Histol and Embryol. 2007; 36: 382-388.

125. Schwab IR, Sadun AA. An out-pouching of the eye? Br J Ophthalmol. 2007. Sep;91(9):1107-1108.

126. Lee WB, Schwab IR. Obesity surgery and hypovitaminosis A. Surv Ophthalmol. 2007 Sep-Oct;52(5):556-7

127. Brudenall DK, Schwab IR, Fritsches KA: Ocular morphology of the Leatherback sea turtle (Dermochelys coriacea). Vet Ophthalmol. 2008 Mar-Apr;11(2):99-110.

128. Chirila TV, Barnard Z, Zainuddin , Harkin DG, Schwab IR, Hirst LW.: Bombyx mori Silk Fibroin Membranes as Potential Substrata for Epithelial Constructs Used in the Management of Ocular Surface Disorders. Tissue Eng Part A. 2008 Apr 1 [Epub ahead of print]

129. Cornea Donor Study Investigator Group. Donor age and corneal endothelial cell loss five years after successful cornea transplantation: specular microscopy ancillary study results. Ophthalmology 2008; 115:627-632

130. Mannis MJ, Cornea Donor Study Investigator Group. The Effect of Donor Age on Corneal Transplantation Outcome: Results of the Cornea Donor Study. Ophthalmology; April; 115(4):620-626.

131. Hirst LW, Axelsen RA, Schwab IR: Pterygium and associated ocular surface squamous neoplasia. Arch Ophthalmol. 2009 Jan; 127 (1) 31-32.

132. Holland GN, Belfort R Jr, Dernouchamps JP, Franklin R, Martenet AC, Nozik RA, Nussenblatt RB, Ohno S, Palimeris G, Saari KM, Schwab IR, Secchi AG, Smith RE, Tabbara KF, Tessler HH. Uveitis in 2008: a festschrift for G. Richard O'Connor, MD. Am J Ophthalmol. 2008 Dec, 146(6):795-8

133. Chirila T, Barnard Z, Zainuddin, Harkin DG, Schwab IR, Hirst LW. Bombyx mori silk fibroin membranes as potential substrata for epithelial constructs used in the management of ocular surface disorders. Tissue Eng Part A. 2008 Jul; 14(7):1203-11.

134. Yu C, Schwab IR, Dubielzig RR. Feeding the vertebrate retina from the Cambrian to the tertiary. Journal of Zoology. 2009:1-11.

135. Bradley JC, Hernandez EG, Schwab IR, Mannis MJ. Boston Type 1 keratoprosthesis: The University of California Davis Experience. Cornea. 2009 Apr, 28(3): 321-7.

136. Dunn SP, Stark WJ, Stulting RD, Lass JH, Sugar A, Pavilack MA, Smith PW, Tanner JP, Dontchev M, Gal RL, Beck RW, Kollman C, Mannis MJ, Holland EJ on behalf of the Cornea Donor Study Investigator Group. The effect of ABO blood incompatibility on corneal transplant failure in conditions with low risk of graft rejection. American Journal of Ophthalmology 2009; 147: 432-438.

137. Powe A, Gal RL, Beck RW, Mannis MJ, Holland EJ on behalf of the Cornea Donor Study Investigator Group. The Cornea Donor Study. Vision Pan-America 2009; 8:9-12.

138. Sugar J, Tanner JP, Dontchev M, Tanner JP, et al & the Cornea Donor Study Investigator Group. Donor factors predictive of graft failure in the Cornea Donor Study. Ophthalmology, 2009. **116**(6): p. 1023-1028.

139. Lass JH, etc. for the Cornea Donor Study Investigator Group. Endothelial cell density predictive of graft failure in the Cornea Donor Study. Archives of Ophthalmology 2010 128; 63-69.

140. Bradley, JC, Yang, W, Bradley, RH, Reid, TW, Schwab, IR. *The Science of Pterygium*. Br J Ophthalmol. 2010 Jul;94(7):815-20. Epub 2009 Jun 9. Review.

141. Schwab IR, Lee WB, Bisno D. The rainbow: from ancient Greece to modern optics. Surv Ophthalmol. 2009 Nov-Dec;54(6):714-20.

142. Graue-Hernández EO, Mannis MJ, Eliasieh K, Greasby TA, Beckett LA, Bradley JC, Schwab IR: Salzmann nodular degeneration. Cornea. 2010 Mar;29(3):283-9.

143. Budenz DL, Anderson DR, Feuer WJ, Beiser JA, Schiffman J, Parrish RK, II, Piltz-Seymour JR, Gordon MO, Kass MA for the Ocular Hypertension Treatment Study Group. Detection and prognostic significance of optic disc hemorrhages during the Ocular Hypertension Treatment Study. Ophthalmology. 2006 Dec;113(12):2137-43. Epub 2006 Sep 25..

144. Mansberger SL, Hughes BA, Gordon MO, Spaner SD, Beiser JA, Cioffi GA, Kass MA and the Ocular Hypertension Treatment Study Group. Comparison of initial intraocular pressure response to topical beta-adrenergic antagonists and prostaglandin analogues in African-Americans and whites in the Ocular Hypertension Treatment Study. Arch Ophthalmol. 2007 Apr;125(4):454-9.

145. Brudenall DK, Schwab IR, Fritsches KA: Ocular morphology of the Leatherback sea turtle (Dermochelys coriacea). Vet Ophthalmol. 2008 Mar-Apr;11(2):99-110.

146. Chirila TV, Barnard Z, Zainuddin , Harkin DG, Schwab IR, Hirst LW.: Bombyx mori Silk Fibroin Membranes as Potential Substrata for Epithelial Constructs Used in the Management of Ocular Surface Disorders. Tissue Eng Part A. 2008 Apr 1 [Epub ahead of print]

147. Cornea Donor Study Investigator Group. Donor age and corneal endothelial cell loss five years after successful cornea transplantation: specular microscopy ancillary study results. Ophthalmology 2008; 115:627-632.

148. Mannis MJ, Cornea Donor Study Investigator Group. The Effect of Donor Age on Corneal Transplantation Outcome: Results of the Cornea Donor Study. Ophthalmology; April; 115(4):620-626.

149. Hirst LW, Axelsen RA, Schwab IR: Pterygium and associated ocular surface squamous neoplasia. Arch Ophthalmol. 2009 Jan; 127 (1) 31-32.

150. Holland GN, Belfort R Jr, Dernouchamps JP, Franklin R, Martenet AC, Nozik RA, Nussenblatt RB, Ohno S, Palimeris G, Saari KM, Schwab IR, Secchi AG, Smith RE, Tabbara KF, Tessler HH. Uveitis in 2008: a festschrift for G. Richard O'Connor, MD. Am J Ophthalmol. 2008 Dec, 146(6):795-8 No Abstract available.

151. Chirila T, Barnard Z, Zainuddin, Harkin DG, Schwab IR, Hirst LW. Bombyx mori silk fibroin membranes as potential substrata for epithelial constructs used in the management of ocular surface disorders. Tissue Eng Part A. 2008 Jul; 14(7):1203-11.

152. Brudenall DK, Schwab IR, Fritsches KA. Ocular morphology of the Leatherback sea turtle (Dermochelys coriacea). Vet Ophthalmol. 2008 Mar-Apr;11(2):99-110.

153. The Ocular Hypertension Treatment Study Group and the European Glaucoma Prevention Study (EGPS) Group. A validated prediction model for the development of primary open-angle glaucoma in individuals with ocular hypertension. Ophthalmology 2009

154. Sugar J, Montoya M, Dontchev M, Tanner JP, Beck R, Gal R, Gallagher S, Gaster R, Heck E, Holland EJ, Kollman C, Malling J, Mannis MJ, Woody J; Group Cornea Donor Study Investigator Group. Donor risk factors for graft failure in the cornea donor study. Cornea. 2009 Oct;28(9):981-5.

155. Bradley J, Schwab IR: Blue ear sign in relapsing polychondritis. Rheumatology 2010 Rheumatology (Oxford). 2011 Feb;50(2):427. Epub 2010 Nov 28.

156. Ainscough SL, Linn ML, Barnard Z, Schwab IR, & Harkin DG; Effects of fibroblast origin and phenotype on the proliferative potential of limbal epithelial progenitor cells. Experimental Eye research. Oct 2010 Exp Eye Res. 2011 Jan;92(1):10-9. Epub 2010 Oct 21.

157. Harkin DG, George, KA, Madden PW, Schwab IR et al: Silk fibroin in ocular tissue reconstruction. Biomaterials 2011 Apr;32(10). 2445-58 Epub 2011 Jan 19.

155. Reid B, Vieira AC, Cao L, Mannis MJ, Schwab IR, Zhao M. Specific ion fluxes generate cornea wound electric currents. Commun Integr Biol. 2011 Jul;4(4):462-5. Epub 2011 Jul 1.

156. Modjtahedi BS, Alikhan A, Maibach HI, Schwab IR. Diseases of periocular hair. Surv Ophthalmol. 2011 Sep-Oct;56(5):416-32. doi: 10.1016/j.survophthal.2011.02.003. Epub 2011 Jul 23.

157. Zeiss CJ, Schwab IR, Murphy CJ, Dubielzig RW. Comparative retinal morphology of the platypus. J Morphol. 2011 Aug;272(8):949-57. doi: 10.1002/jmor.10959. Epub 2011 May 12.

158. Rehal B, Modjtahedi BS, Morse LS, Schwab IR, Maibach HI. Ocular psoriasis. J Am Acad Dermatol. 2011 Dec;65(6):1202-12. Epub 2011 May 6.

159. Vieira AC, Reid B, Cao L, Mannis MJ, Schwab IR, Zhao M. Ionic components of electric current at rat corneal wounds. PLoS One. 2011 Feb 25;6(2):e17411.

160. Oliveira LA, Kim C, Sousa LB, Schwab IR, Rosenblatt MI. Gene transfer to primary corneal epithelial cells with an integrating lentiviral vector. Arq Bras Oftalmol. 2010 Oct;73(5):447-53.

161. Lass JH, Beck RW, Benetz BA, Dontchev M, Gal RL, Holland EJ, Kollman C, Mannis MJ, Price F Jr, Raber I, Stark W, Stulting RD, Sugar A; Cornea Donor Study Investigator Group. Baseline factors related to endothelial cell loss following penetrating keratoplasty. Arch Ophthalmol. 2011 Sep;129(9):1149-54. Epub 2011

May 9.

162. Ainscough SL, Linn ML, Barnard Z, Schwab IR, Harkin DG. Effects of fibroblast origin and phenotype on the proliferative potential of limbal epithelial progenitor cells.Exp Eye Res. 2011 Jan;92 (1):10-9. Epub 2010 Oct

163. **Schwab IR.** The Changing Spectrum of Microbial Keratitis: is microsporia increasing as a cause of microbial keratitis or is it a previously unrecognized cause?. Br J Ophthalmol. 2012 Jun; 96(6):774-5.

164. Liu J, Lawrence BD, Liu A, **Schwab IR**, Oliveira LA, Rosenblatt MI. Silk fibroin as a biomaterial substrate for corneal epithelial cell sheet generation. Invest Ophthalmol Vis Sci. 2012 Jun 26;53(7):4130-8.

165. Modjtahedi BS, Kishan AU, **Schwab IR**, Jackson WB, Maibach HI. Eyelash alopecia areata: case series and literature review. Can J Ophthalmol. 2012 Aug;47(4):333-8.

166. Schobert CS, Stiassny ML, **Schwab IR**, Zeiss C, Schelly RC, Dubielzig RR. Comparative ocular anatomy in a blind African cichlid fish, Lamprologus lethops. Vet Ophthalmol. 2012 Nov 27.

Chapters:

1. **Schwab IR**: "Microbial Resistance to Antibiotics and Sulfonamides." Antimicrobial Agents in Ophthalmology. Smolin G, Okumoto M. Masson, New York, 1983.

2. **Schwab IR**, Stewart W, Abbott R: "Corneal Complications of Eyelid Surgery and Abnormalities." Ophthalmic Plastic Surgery and Reconstructive Surgery. Edited by William Stewart. Chapter VIII, pp63-70, 1984.

3. **Schwab IR**, Ostler BH, Dawson C: "Ocular Leprosy." Duane's Clinical Ophthalmology. Chapter 63, pp1-8, 1984.

4. **Schwab IR**: "Ocular Leprosy." Chapter in Ocular Infections. Edited by Tabbara KF, Hyndiuk RA, pp613-625. Little, Brown, 1986.

5. **Schwab IR**: "Cataract and Glaucoma, Surgical Management." Open Angle Glaucoma, Contemporary Issues in Ophthalmology Series. Chapter VII, pp 109-131, 1986.

6. Powell S, **Schwab IR**: "Peripheral Corneal Changes in Malnutrition." International Ophthalmology Clinics. 26 (4): 137-146, 1986.

7. **Schwab IR**: "Surgical and Medical Management of Keratoconjunctivitis Sicca." In Surgical Intervention in Corneal and External Diseases. Ed. Richard Abbott, M.D., Grune & Stratton, Inc. Harcourt Brace Jovanovich Publishers. pp 51-58, 1987.

8. **Schwab IR**: "The Refractive Aspects of Corneal Transplantation." In Refractive Keratoplasty. Contemporary Issues in Ophthalmology Series. Chapter 7, pp 171-196. Churchill Livingstone, 1987.

9. **Schwab IR**. "Perspectives on Refractive Surgery." In Refractive Keratoplasty. Chapter 1, pp 1-16, Churchill, Livingstone, New York, 1987.

10. **Schwab IR**. "Scleroderma and the Eye." In The Eye in Systemic Disease. Lippincott, Chapter 24, pp 67-69, 1990.

11. **Schwab IR**: "Diagnostic Techniques for Ocular Viral Infections." Biomedical Foundation of Ophthalmology. Lippincott, Chapter 88, pp1-10, 1990.

12. **Schwab IR**, Dawson, C: "Conjunctiva." General Ophthalmology. Lang Publications Vaughn (Ed.). Chapter 5, pp 96-124, 1992.

13. **Schwab IR**, Dawson C, Ostler B: "Hansen's Disease of the Eye." Duane's Clinical Ophthalmology. Lippincott, Chapter 63, pp 1-9, 1992.

14. **Schwab IR**: "Ocular Leprosy." Infectious Disease Clinics. Chapter 6, pp 953-961, 1993.

15. Groos E, **Schwab IR**: "Controversies in Uveitis." Int Ophthalmol Clinic. Chapter 6, pp 109-115, 1993.

16. **Schwab IR**, Abbott, RL, Vastine DV: "Management of Ocular Surface Abnormalities." Surgery of the Eyelid, Orbit, and Lacrimal System. Ed. W. Stewart. American Academy of Ophthalmology. Chapter 8, pp 126-136, 1993.

17. **Schwab IR**, Thygeson, P: "Thygeson's Superficial Punctate Keratitis." Ocular Infections and Immunity. Ed. Pepose, Holland, Wilhelmus. Mosby, pp 403-407, 1996.

18. **Schwab IR**: "Herpes Simplex Oculodermal Disease." The Skin and the Eye. Ed. Mannis M, Huntley A, Macsai M. Lippincott-Raven, Chapter 5, pp 457-458, 1996.

19 **Schwab, IR**, Dawson C: "Conjunctiva." General Ophthalmology, Ed. Vaughan. Lang Publications, Chapter 5, pp 96-124, 1995.

20. **Schwab IR**: "Hansen's Disease of the Eye." Ocular Infections, Edited by Tabbara KF, Hyndiuk RA. Little, Brown, pp 615-624, 1996.

21. **Schwab IR**: "Superficial Punctate Keratitis of Thygeson's." The Cornea. Ed. Krachmer J, Mannis M, Holland E, Mosby. Chapter 104, pp 1337-1339, 1997.

22. Hussein N, **Schwab IR**, Ostler HB: "Blepharitis." Duane's Clinical Ophthalmology.

Vol. 4, Chapter 22, pp 1-8, 1997.

23. **Schwab IR**: "Conjunctiva." In General Ophthalmology. 15th Ed.,Vaughn D, Ashbury T, Riordan-Eva P (editors). Appleton & Lange Publication, Chapter 5, pp 92-118, November 1998.

24. Garcia-Ferrer F, **Schwab IR**: "Diagnostic Techniques for Ocular Viral Infection." Duane's Foundation of Ophthalmology. Lippincott, Chapter 88, pp 1-12, 1998.

25. **Schwab IR,** Isseroff RR: "Ex vivo stem cell expansion." Ocular Surface Disease. Springer, New York; 2001.

26. Garcia-Ferrer F, **Schwab IR:** Application of new diagnostic techniques in cornea and external disease. Focal Points Modules: Sept. 2002, Vol XX, No. 9.

27. Garcia-Ferrer F, **Schwab IR,** Shetlar DJ. "Conjunctiva." General Ophthalmology. Lang Publications. Chapter 5, pp100-129; 2004.

28. **Schwab IR,** Adrean S. "Thygeson's Superficial Punctata Keratopathy." Cornea. Ed. Krachner J, Mannis M, Holland E, Mosby. Chapter 93 pp1183-1188; 2005.

29. Lee WB, **Schwab IR**: Lee WB, **Schwab IR**. Allergy & Medication- Induced Ocular Surface Disease. In: Agarwal A. *Dry Eye: A Practical Guide to Ocular Surface Disorders*. 2006. Chapter 8, pp 77-91.

30. Lee WB, **Schwab IR**. Limbal Stem Cell Disease and Management. In: Agarwal A. *Dry Eye: A Practical Guide to Ocular Surface Disorders*. 2006. Chapter 18, pp. 219-251.

31. Hussein N, Schwab IR: Inflammatory lid disease. Duane's Clinical Ophthalmology, Lippincott 2006

32. Lee WB, **Schwab IR**. Ocular Surface Transplantation. In: Albert DM, Jakobiec FA, eds. *Principles & Practice of Ophthalmology*, Volume 1. 2007 Edition.

33. Lee WB, **Schwab IR**. Amniotic membrane transplantation. *Basic Skills in Ophthalmology* J.P Dunn Ed. American Academy of Ophthalmology 2006.

34. Garcia-Ferrer F, Schwab IR. Conjunctiva. General Ophthalmology. Lang Publications.. 17th ed 2008 pp 98-126.

35. Feiz V, Schwab IR: Surgical Ocular Surface Reconstruction. Ophthalmology 3rd Edition Ed Yanoff and Duker 2008

36. Lee B, Schwab IR: Cornea. Color Atlas of Ophthalmology. Chapter 7 2009.

Books:

1. **Schwab IR**: Refractive Keratoplasty. Churchill Livingstone, New York, 1987.

2. **Schwab IR**: Basic and Clinical Science Committee. Cornea and External Disease, American Academy of Ophthalmology, 1994.

3. **Schwab IR:** Duane's Clinical Ophthalmology. Book 4, Cornea & External Disease Sect. 1988-2000.

4. Ostler HB, Marbach HI, Hoke AW, **Schwab IR:** Disease of the Eye and Skin. Lippincott Williams Wilkins, 2003

5. **Schwab IR:** Evolution's Witness: How Eyes Evolved. Oxford University Press 2011.

Editorials/Letters:

1. **Schwab IR**: "Informed Consent." Geriatric Ophthalmology, 3(3): 7, 1987.

2. **Schwab IR**, Plotnik, RD, Mannis, MJ: "Pemphigus and Pemphigoid." Arch Ophthalmol, Vol. 110, 1992, pp. 171.

3. **Schwab IR**: "Refractive Colonialism." Ophthalmology World News, 1995.

4. **Schwab IR:** "The Case of the Man with Megalophthalmos." Eyenet. June, 1998.

5. **Schwab IR**: "Images." Eyenet. August, 1998.

6. **Schwab IR**: "Corneal and External Disorders and Refractive Surgery." Current Opinion in Ophthalmology, 9; IV: 1-2, 1998.

7. **Schwab IR:** "Corneal and External Disorders, and Refractive Surgery." Current Opinion in Ophthalmology, 10; 227-229, 1999.

8. **Schwab IR**: "Cornea, External Disorders, and Refractive Surgery." Current Opinion in Ophthalmology; Vol. 11, No. 4; 215-216, Aug. 2000.

9. **Schwab IR**, Isseroff, R: "Bio-engineered Corneas: The Promise and the Challenge." NEJM. 343:116-8, 2000.

10. **Schwab IR**: From Eyespots to Eyeshine. *Br J Ophthal*. 83:1214, 2000.

11. **Schwab IR**, O'Connor GR. An enigmatic eye: what can we learn? Clin Exper Ophthalmol 2004; 32: 559-60.

12. **Schwab IR**. In Answer to "Who is Ivan Schwab?" Br J Ophthalmol 2005. 89(2):249.

13. Lee B, **Schwab IR**. Intestinal surgery a villain? You need A vitamin. Br J Ophthalmol Br J Ophthalmol 2006; 90: 931-2.

14. **Schwab IR**. Octopus Eyes. Natural History 2007; 116(3) 10-11.

Cover Essays:

1. **Schwab IR**: Spots Before Your Eyes. *Br J Ophthal,* 84:680, 2000.
2. **Schwab IR**: In the Pink. *Br J Ophthal,* 84:821, 2000.
3. **Schwab IR**: Your Eyes Are Bigger Than Your Stomach. *Br J Ophthal* 84:946, 2000.
4. **Schwab IR**: You Have An Eagle Eye. *Br J Ophthal* 84:1089, 2000.
5. **Schwab IR**: The Original Slit Beam**.** *Br J Ophthal* 84:1215, 2000.
6. **Schwab IR**: The Pinhole Camera. *Br J Ophthal* 84:1341, 2000.
7. **Schwab IR:** Dynamic Vestments. *Br J Ophthal* 85:109, January 2001.
8. **Schwab IR**: Double Vision in an Aerial Dynamo. *Br J Ophthal* 85:172, February 2001.
9. **Schwab IR**: How Many Eyes Do You Need? *Br J Ophthal* 85:260, March 2001.
10. **Schwab IR**: Birds of a Feather. *Br J Ophthal* 85:495, April 2001.
11. **Schwab IR**. An Eye for an Eye. *Br J Ophthal* 85:566, May 2001.
12. **Schwab IR**. A Black Eye. *Br J Ophthal* 85: 745, June 2001
13. **Schwab IR**. Not Just Another Pretty Face. *Br J Ophthal* 85:781, July 2001.
14. **Schwab IR.** Eyes in the Back of Your Head. *Br J Ophthal* 85:904, August 2001.
15. **Schwab IR.** Be on the Lookout. *Br J Ophthal,* 85:1024, September 2001.
16. **Schwab IR**. Things are Looking Up. *Br J Ophthal,* 85:1148, October 2001.
17. **Schwab IR**. A Roving Eye. *Br J Ophthal,* 85:1276, November 2001.
18. **Schwab IR**. A Ghost of a Chance. *Br J Ophthal,* 85:1405, December 2001.
19. **Schwab IR,** Brooks P. He Cries Crocodile Tears. *Br J Ophthal,* 86:23 January 2002.
20. **Schwab IR.** My What Big Eyes You Have. *Br J Ophthal,* 86:130 February 2002.
21. **Schwab IR.** These Eyes Are Hot. *Br J Ophthal,* 86:266, March 2002.
22. **Schwab IR.** The Eyes Have It. *Br J Ophthal,* 86:372, April 2002.
23. **Schwab IR.** Through a Lens Sharply. *Br J Ophthal,* 86:497, May 2002.

24. **Schwab IR.** In the Eye of the Beholder. *Br J Ophthal,* 86:604, June 2002.

25. **Schwab IR.** I'll Try to Accommodate You. *Br J Ophthal,* 86: 715, July 2002.

26. **Schwab IR.** Cure for a Headache. *Br J Ophthal,* 86:843, Aug. 2002.

27. **Schwab IR.** Double Vision. *Br J Ophthal,* 86:950, Sept. 2002.

28. **Schwab IR.** More Than Just Cool Shades. *Br J Ophthal,* 86:1075, Oct. 2002.

29. **Schwab IR.** All the Better to See You… *Br J Ophthal,* 86:1199, Nov. 2002.

30. **Schwab IR.** We Hardly Know Those Eyes. *Br J Ophthal,* 86:1329, Dec. 2002.

31. **Schwab IR.** Janus on the Mudflats. *Br J Ophthal,* 87:13, Jan. 2003.

32. **Schwab IR.** Superman on the Reef. *Br J Ophthal,* 87:132, Feb. 2003.

33. **Schwab IR.** Hiding in Plain View. *Br J Ophthal,* 87:262, Mar. 2003.

34. **Schwab IR.** Look Before You Leap. *Br J Ophthal,* 87:391, Apr. 2003.

35**. Schwab IR.** Coates MM. Is the Brain Overrated? *Br J Ophthal,* 87:525, May 2003.

36. **Schwab IR.** Heavenly Rings. *Br J Ophthalmol,* 87:681, June 2003.

37. **Schwab, IR.** A Well Armed Predator. *Br J Ophthal,* 87:812, July 2003.

38. **Schwab IR.** An Eye for the Ladies. *Br J Ophthal,* 87:936, August 2003.

39. **Schwab IR.** A Dinner Dance. *Br J Ophthal,* 87:1060, September 2003.

40. **Schwab IR.** In the Search for Stereopsis. *Br J Ophthal,* 87:1205, October 2003.

41. **Schwab IR.** Mirrors at the birth of Aphrodite. *Br J Ophthal,* 87: 1311, November 2003.

42. **Schwab IR.** Double Crossed. *Br J Ophthal,* 87:1442, December 2003.

43. **Schwab IR.** The Falcon's Stoop. *Br J Ophthal,* 88:4, January 2004.

44. **Schwab IR.** To see what you eat. *Br J Ophthal,* 88:164, February 2004.

45. **Schwab IR & Marshall J.** Blue Light Special in a Red Light District. *Br J Ophthal,* 88:318, March 2004.

46. **Schwab IR.** Everyone wants a window seat. *Br J Ophthal,* 88:455, April 2004.

47. Schwab IR, Hart NS. Halcyon days. Br J Ophthal 88: 613, May 2004

48. **Schwab IR**. Better one or two? Br J Ophthal 88: 733, June 2004.

49. **Schwab IR**. Jewels of the jungle Br J Ophthal 88: 857, July 2004.

50 **Schwab IR**. Flatlanders. Br J Ophthalmol. August 2004; 88: 988.

51. **Schwab IR**. You are what you eat. Br j Ophthalmol Sept 2004. 88: 1113.

52. **Schwab IR**. A notch in time. Br J Ophthal Oct 2004; 88: 1234.

53. **Schwab IR**. Look before you leap. Br J Ophthalmol Nov 2004; 88: 1361.

54. **Schwab IR**. If looks could kill… Dec 2004; 88: 1486.

55. **Schwab IR**, Collin SP, Pettigrew JD. Chameleon of the sea. Br J Ophthal. Jan 2005; 89: 4

56. **Schwab IR**, McMenanmin P. How do I fit in? Br J Ophthalmol. Feb 2005; 89:129.

57. **Schwab IR**, O'Connor GR. The lonely eye. Br J Ophthalmol Mar 2005; 89: 256.

58. **Schwab IR**. Colour me ultraviolet Br J Ophthalmol April 2005; 89: 399..

59. **Schwab IR**. Mirror, mirror on the wall… Br J Ophthalmol 2005; May 89: 528.

60. **Schwab IR**. Are you for real? Br J Ophthalmol June 2005; 89: 651.

61. **Schwab IR**. Can you keep a secret? Br J Ophthalmol July 2005; 89: 795.

62. **Schwab IR**. With a little help from my friends… Br J Ophthalmol August 2005; 89: 935.

63. **Schwab IR**. No end in sight. Br J Ophthalmol September 2005; 89: 1078.

64. **Schwab IR.** An Icy Stare Br J Ophthalmol October 2005; 89: 1236.

65. **Schwab IR**, Pettigrew J. A choroidal sleight of hand. Br J Ophthalmol 2005; 89: 1398.

66. **Schwab IR**, Collin SP. Are you calling me primitive? Br J Ophthalmol Dec 2005 89:1553.

67. **Schwab IR**, Pettigrew JD. With just a quiver. Br J Ophthalmol Jan 2006; 90: 10.

68. Schwab IR, Fritsches. K. Superlatives. Br J Ophthalmol. Feb 2006;90: 143.

69. **Schwab IR**, Jackson R. …deceived with ornament. Br J Ophthalmol Mar2006;90:261.

70. **Schwab IR**, Hart N. More than black and white. Br J Ophthalmol April 2006;90:406.

71. **Schwab IR**, Warrant EJ. The best of a bad situation. Br J Ophthalmol May 2006;90:533.

72. **Schwab IR**. Divine countenance or witches' brew? Br j Ophthalmol Jun 2006; 90: 672.

73. **Schwab IR,** Collin S. Bringing the eyes along. Br J Ophthalmol July 2006; 90:818.

74. **Schwab IR,** Rouse G. It's the worm's turn. Br J Ophthalmol August 2006; 90: 941

75. **Schwab IR**. From the top down. Br J Ophthalmol September 2006; 90:1086.

76. **Schwab IR.** McMenamin P. A tale of two possums. Br J Ophthalmol October 2006; 90:

77. **Schwab IR**. Shedding light on the reflections. Br J Ophthalmol November 2006; 90:1343

78. **Schwab IR**. A backseat driver Br. J Ophthalmol December 2006; 90: 1447

79. **Schwab IR**, Nilsson D-E. Low-vision device. Br J Ophthalmol 2007;91: 7

80. **Schwab IR**, McComb DM. Keeping a cool head. Br J Ophthalmol 2007;91:138

81. **Schwab IR**, Land M. Makin' do with less. Br J Ophthalmol 2007; 91: 278.

82. **Schwab IR**. Seeing out of the shell. Br J Ophthalmol 2007;91: 414.

83. **Schwab IR**. Prometheus' eye. Br J Ophthalmol 2007; 91: 569.

84**. Schwab IR**, Sadun AA. An out-pouching of the eye. Br J Ophthalmol 2007;91:569

Book Reviews:

1. **Schwab IR**: Review of Surgical Ophthalmology I, Am J Ophthalmol, 113: p. 473, 1992.

2. **Schwab IR**: Review of Diseases of the External Eye and Adnexa, Ostler HB, Ophthalmic Surgery, 22: 1991.

3. **Schwab IR**: Recent Advances in Uveitis, Dernouchamps, Am J Ophthalmol, 116:520, 1993.

4. **Schwab IR**: The Sclera, Foster, Am J Ophthalmol, 116:269-270, 1994.

5. **Schwab IR**: The Cornea, Third Edition Smolin & Thoft, Am J Ophthalmol, 118:824, 1994.

6. **Schwab IR**: Vision, Brain & Behavior in Birds, Zeigler & Bischof, Am J Ophthalmol, 118:689-690, 1994.

7. **Schwab IR**: The Cornea, ed. 3, ED. Smolin G, Thoft RA, Am J Ophthalmol, 119:824, 1995.

8. **Schwab IR**: Sarcoidosis and Other Granulomatous Diseases, Ed. James DG, Am J Ophthalmol, 120, 1995.

9. **Schwab IR**: Atlas of Iris Fluorescein Angiography, Ed: Brancato R, Bandello F, Lattanzio R, Am J Ophthalmol, 119:672-673, 1995.

10. **Schwab IR**: Posterior Uveitis: Diagnosis and Management, Tabbain and Nussenblatt, Am J Ophthalmol, 120:269-270, 1995.

11. **Schwab IR**: Color in Nature, Lamb T. and Dorrian J. Am J Ophthalmol, 120:555-556, 1995.

12. **Schwab IR:** Uveitis Fundamentals and Clinical Practice, Nussenblatt RB, Whitecup SM. Cornea

Chair of Alternative Medicine Committee for American Academy of Ophthalmology Committee publications.

1. **Schwab IR (Chair),** and all committee members: Mairjuana in the Treatment of Glaucoma. AAO. October 1999. (Available online or in print.).

2. **Schwab IR (Chair),** and all committee members: Acupuncture for Ocular Conditions and Headaches. AAO. October 1999. (Available online or in print.)

3. **Schwab IR (Chair),** and all committee members: Microcurrent Stimulation for Macular Degeneration. AAO. September 2000. (Available online or in print.)

4. **Schwab IR (Chair),** and all committee members: Vision Therapy for Learning Disabilities. AAO. September 2001. (Available online or in print.)

5. **Schwab IR (Chair),** and all committee members: Apheresis for Age-Related Macular Degeneration – Limited Revision. AAO. December 2001. (Available online or in print.)

6. **Schwab IR (Chair),** and all committee members: Anti-oxidant Vitamin and Mineral Supplements and Cataract Prevention and Progression—Limited Revision. January 2000. (Available online or in print.)

7. **Schwab IR (Chair),** and all committee members: Anti-oxidant Supplements and Age-Related Macular Degeneration. AAO. January 2002. (Available online or in print.)

8. **Schwab IR (Chair),** and all committee members: Ginkgo Biloba Extract and Ocular Conditions. AAO. October 2002. (Available online or in print).

Slide Script Program:

1. **Schwab IR**: Basic and Clinical Science Course Committee. Cornea and External Disease Slide Script Program. American Academy of Ophthalmology. San Francisco, 1994.

Special Interest Topics publications online:

Abstracts:

1. Dawson CR, **Schwab IR**: "Cataract Epidemiology." Francis I. Proctor Foundation for Research in Ophthalmology Five-Year Progress Report, 171-197, 1975-1980.

2. **Schwab IR**, Knowler WC, Dawson CR, Hoshiwara I, Szuter CF: "Cataract in Pima Indians, Diabetes as a Risk Factor." Invest Ophthalmology, 24 (Suppl) 52, 1983.

3. Raju VK, McClung J, **Schwab IR**: "Herpes Simplex Virus Diagnosis by Indirect Fluorescent Antibody." Invest Ophthalmol, 24 (Suppl) 104, 1983.

4. Raju VK, **Schwab IR**, McClung J: "Rapid Diagnosis of Herpes Simplex Virus Infections of the Eye." Invest Ophthalmol, 25 (Suppl) 2, 1984.

5. Morgan L, **Schwab IR**: "Age and Visual Acuity in Men vs. Women Undergoing Cataract Extraction." Invest Ophthalmol, 25 (Suppl) 2, 1984.

6. **Schwab IR**, Friedman G, Wong I, Wingerd J, Dawson C: "Cataract Extraction: Risk Factors in an Urban Population." Invest Ophthalmol, (Suppl) 24, 1984.

7. Raju VK, **Schwab IR**, McClung J: "Ocular Herpes Simplex Virus Diagnosis by a Tissue Culture Plus Specific Staining." Invest Ophthalmol, 24 (Suppl) 24, 1984.

8. McCormick SA, **Schwab IR**, DiBartolomeo AG: "Ocular Chrysiasis." Ophthalmology. 91 (Suppl) 81, 1984.

9. Raju VK, **Schwab IR**, McClung JE: "Diagnosis of Ocular Herpes Virus (HSV) by Tissue Culture Plus Specific Staining." Ophthalmology. 91 (Suppl) 124, 1984.

10. **Schwab IR**, Meisler D: "Contact Lens Complications." Ophthalmology. 91 (Suppl) 124, 1984.

11. Morgan LW, **Schwab IR**: "Informed Consent in Cataract Extraction." Ophthalmology. 26 (Suppl) 123, 1985.

12. **Schwab IR**, Amato RS: "Ocular and Systemic Findings in Tuberous Sclerosis." Invest Ophthalmol. 26 (Suppl): 221, 1985.

13. **Schwab IR**: "The Avian Eye." Ophthalmology. 92 (Suppl): 188, 1985.

14. McCormick S, DiBartolomeo A, Raju VK, **Schwab IR**: "Ocular Chrysiasis." West Virginia Medical Journal. 81: 12, pp267, 1984.

15. Cornelius CR, **Schwab IR**, Woolverton CJ: "Pathogenic Properties of Blepharitis Associated S. Epidermidis." Invest Ophthalmol and Vis Sci. 27 (Suppl), 1986, pp. 97.

16. **Schwab IR**, DiBartolomeo A, Farber M: "Ocular Changes in Scleroderma." Invest Ophthalmol and Vis Sci, 27 (Suppl): 1986, pp. 97.

17. Meisler DM, Tomasak RL, Weinstein MR, **Schwab IR**: "Magnetic Resonance Imaging (MRI) and HLA Typing in Patients with Peripheral Retinal Perivasculitis and Intermediate Uveitis." Invest Ophthalmol and Vis Sci, 27 (Suppl): pp121, 1986.

18. Morgan LW, **Schwab IR**: "Epidemiologic Aspects of Senile Cataract Extraction Stratified by Visual Acuity, Age, and Sex." Ophthalmology Digest, 4:9, 1986.

19. Morgan LW, **Schwab IR**: "Informed Consent (Letter)." Arch Ophthalmol, 104: 973, 1986.

20. Powell SR, **Schwab IR**: "Retinoic Acid in the Treatment of Dry Eye States." Invest Ophthalmol and Vis Sci, 28 (Suppl), pp. 308, 1987.

21. **Schwab IR**: "Fuchs' Heterochromic Iridocyclitis Associated with Ocular Toxoplasmosis." Ophthalmology, 94 (Suppl): pp. 69-70, 1987.

22. **Schwab IR**: "Oral Acyclovir in The Management of Herpes Simplex Keratitis." 94 (Suppl):82, 1987.

23. **Schwab IR**: "Iris Clues to Ophthalmic Diagnosis." 94 (Suppl): 198, 1987.

24. Feghali, JG, **Schwab IR**, Weinstein GW: "Therapeutic Ultrasound for Failed Filtration Blebs."Invest Ophthalmol and Vis Sci, 29 (Suppl): 235, 1988.

25. Charlton JF, Stuchell RN, **Schwab IR**: "Tear Osmolarity in Renal Dialysis Patients." Invest Ophthalmol and Vis Sci, 29 (Suppl): 237, 1988.

26. Viti A, Seetharama S, Snyder I, **Schwab IR**: "Bacterial Growth and the Use of Ciprofloxacin in MK Media." Invest Ophthalmol and Vis Sci. 29 (Suppl): 444, 1988.

27. **Schwab IR**: "Iris Clues to Ophthalmic Diagnosis." Ophthalmology, 95 (Suppl): 267, 1988.

28. Charlton J, Benson M, **Schwab IR**: "Review of Endophthalmitis." CLAO/ISRK Meeting. 1989, (Poster).

29. Benson W, Linberg JL, **Schwab IR**: "Foreshortening of the Fornix in Chronic Glaucoma."Invest Ophthalmol and Vis Sci, 30 (Suppl): 242, 1989.

30. Charlton J, **Schwab IR**: "Endophthalmitis in a Rural Medical Center." Invest Ophthalmol and Vis Sci, 30 (Suppl): 450, 1989.

31. McCormick SA, **Schwab IR**: "Iron and Ferritin Distribution in the Corneal Epithelium of Patients with Keratoconus." Invest Ophthalmol and Vis Sci, 30 (Suppl): 30, 1989.

32. Seetharama S, Viti A, **Schwab IR**, Snyder IS: "Potential of Ciprofloxacin in the Prevention of Ocular Infectious Following Corneal Transplantation." American Society of Microbiology Abstract. #L-13, New Orleans, May 1989.

33. **Schwab, IR**, Seetharama S, Snyder, IS: "Risk Factors in Blepharokerato-conjunctivitis." Invest Ophthal and Vis Sci, 32 (Suppl): 1221,1991.

34. Mannis, MJ, **Schwab IR**, Dries, D, Cullor J et al: "Defensins as a Preservative in Corneal A Storage Medium." Invest Ophthal and Vis Sci, 32 (Suppl): 1062, 1991.

35. Plotnik, RD, Mannis, MJ, **Schwab IR**, et al: Gel cyanoacrylate: "Corneal Bonding Characteristics, Cell Toxicity and Antimicrobial Properties." Invest Ophthal and Vis Sci, 32 (Suppl): 1161, 1991.

36. Murphy CJ, Jaynes J, Iwahashi C, Cullor J, Reid TW, Mannis MJ, **Schwab IR**: "The Odulation of Ocular Cell Growth by Cecropins." Invest Ophthal and Vis Sci, 33 (Suppl): 828, 1992.

37. The Herpetic Eye Disease Study (HEDS) (**Schwab IR**). Clinical Characteristics of Randomized Patients with Herpetic Stromal Keratitis and Iridocyclitis Prior to Initiating Treatment. Invest Ophthalmol and Vis Sci.; 33(4): 1134, 1992.

38. Mannis MJ, Gunshefski L, Cullor J, Jaynes J, Maybry E, **Schwab IR**: "The Use of Synthetic Cecropin (Shiva-11) for the Eradication of Ocular Pathogens." Invest Ophthal and Vis Sci, 33 (Suppl) 936, 1992.

39. Gunshatski L, Macsai M, Mannis M V, **Schwab IR**: "Are Synthetic Cecropins (Shiva-11) Effective Against Gentamicin Resistant Organisms." Invest Ophthal and Vis Sci, 34 (Suppl) 850, 1993.

40. Mannis MJ, Gunshatski L, Cullor J, **Schwab IR**: "The Use of Synthetic Cecropin (Shiva-11) in Preservative-Free Timolol and Contact Lens Solutions." Invest Ophthalmol and Vis Sci, 34 (Suppl) 946, 1993.

41. **Schwab IR**, Cornelius C, O'Connor PJ: "Ocular Abnormalities in Navajo Neuropathy." Invest Ophthalmol and Vis Sci, 34 (Suppl) 946, 1993.

42. Galustian J, **Schwab IR**: "Pinhole Glasses." Invest Ophthalmol and Vis Sci, 34 (Suppl): 1422, 1993.

43. **Schwab IR**, Cornelius C: "Navajo Neuropathy." Ophthalmology, 100(Suppl): 105, 1 1993.

44. **Schwab IR**: "Iridoplegic Granulomatous Iridocyclitis: Herpes Zoster Sine Erupticum. "Ophthalmology, 100(Suppl): 134, 1993.

45. Gruzensky W, Mannis MJ, **Schwab IR,** et al: "The Use of a Cecropin Analog Hecate Against canthamoeba In Vitro." Invest Ophthalmol and Vis Sci, 35: 1337, 1994.

46. **Schwab IR**, de Sousa LB, Mannis MJ, et al: "The Use of Defense Peptides in Corneal Storage Medium." Invest Ophthalmol and Vis Sci, 36:S1017, 1995.

47. Mannis MJ, de Sousa LB, **Schwab IR,** et al: "The Use of Synthetic Cecropin (D_5C) in Disinfecting Contact Lens Solution Against P. Aeruginosa." Invest Ophthalmol and Vis Sci, 36:S1018, 1995.

48. de Sousa LB, Mannis MJ, **Schwab IR**, et al: "The Use of Synthetic Cecropin (D_5C) in Disinfecting Contact Lens Solutions." Invest Ophthalmol and Vis Sci, 36:S1018, 1995.

49. Hosotani H, **Schwab IR**, Chang S, et al: Clincial Application of Tandem Scanning Confocal Microscopy. Invest Ophthalmol and Vis Sci, 36:S38, 1995.

50. Mannis MJ, de Sousa LB, Cullor J, **Schwab IR**, Jaynes J: "The Use of Cecropin Analogs as Anti-microbials in Ophthalmology." International Conference on Ocular Infections, Jerusalem, Israel, June 1995.

51. Gross RH, Mannis MJ, **Schwab IR**, et al: Astigmitism After Penetrating Keratoplasty by Experienced Surgeon compared with Corneal Fellows. Invest Ophthal and Vis Sci, 37:S5550, 1996.

52. Garcia-Ferrer FJ, Pepuse JS**, Schwab, IR**. Use of Polymerese Chain Reaction PCR for the diagnosis of Acanthomoeba Keratitis. Invest Ophthal and Vis Sci. 38: 9230. 1997.

53. Reed JB, **Schwab IR**, Gordon J, Morse LS: Regression of Cytomegeloviris Retinitis with the Addition of a Protease Inhibitor in the Treatment of AIDS. Invest Ophthal and Vis Sci. 38: 5915,1997.

54. Sousa LB, Mannis MJ, **Schwab IR**, et al. The Use of Two Different Peptides in Corneal Storage Medium. Invest Ophthal and Vis Sci. 36:1017, 1997.

55. Tomii S, **Schwab IR**, Mannis MJ, et al. Evaluation of Human Corneal Epithelium in Diabetic Patients with Keratitis by In Vivo Confocal Microscopy. Invest Ophthal and Vis Sci. 39:S1032, 1998.

56. **Schwab IR**, Izquierdo L, Reyes M. Composite Amniotic Membrane and Corneal Epithelial Cell Grafts. Invest Ophthal and Vis Sci.1999; 40:S578.

57. **Schwab IR,** Yip P, Barak A, et al. Treatment Strategies and Visual Acuity Outcomes in Culture Negative Chronic Postoperative Endophthalmitis. Invest Ophthal and Vis Sci 2000; 41:S354.

58. Han B, **Schwab IR**, Isseroff R: "UV-B Induces Phosphorylation of the Small Heat Shock Protein (HSP27) in Human Cornea Epithelial Cells." Mol Biol Cell, 2000, 11:566a.

59. Schwab IR, Han B, Madsen TK et al: Fibrin-based bioengineered ocular surface with human epithelial stem cells. Invest Ophthal and Vis Sci 2002; 43: S80.

60. Tanhehco TY, Eifrig DE, Schwab I et al: Two spontaneous mutations in the TGF B1 gene casing Granular Corneal dystrophy type III (Reis-Buckles dystrophy(Invest Ophthal and Vis Sci 2004; 45: S63.

61. Darlington J, Adrean S, Schwab I. Age adjusted rates of corneal transplant. American Academy of Ophthalmology 2004.

62. Darlington J, Adrean S, Schwab I. Rates of Keratoplasty Cornea Society Meeting 2005.

63. Schwab IR, Johnson N, Harkin D. Invest Ophthalmol and Vis Sci 2006:

64. Ainscough L. Invest Ophthalmol and Vis Sci 2006.

65.

DECLARATION OF

Lynne Sebastian

I, Lynne Sebastian, declare as follows:

1. I am presently employed by the SRI Foundation as Director of Historic Preservation Programs.
2. A copy of my professional qualifications and experience are attached hereto and incorporated herein by reference.
3. I helped prepare the attached testimony on Cultural Resources for the Hidden Hills Solar Electric Generating System project based on my independent analysis, supplements thereto, data from reliable sources, and my professional experience and knowledge.
4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue(s) addressed herein.
5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: 1/10/13

Signed: Lynne Sebastian

At: Rio Rancho, New Mexico

Curriculum Vitae

Lynne Sebastian

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(505) 892-5587, f ax (505) 896-1136, email: lsebastian@srifoundation.org

EDUCATION

B.A., English and Secondary Education, University of Michigan, 1969
M.A., English Literature, University of Utah, 1977
Ph.D., Anthropology, University of New Mexico, 1988

SERVICE TO THE PROFESSION

2012 – present	President, Register of Professional Archaeologists
2010 – 2012	President-elect, Register of Professional Archaeologists
2007 – 2011	Technical Expert, Historic and Cultural Resources, *American Association of State Highway and Transportation Officials, Center for Environmental Excellence*
2006 - 2009	Member, Resource Advisory Council, *USDI Bureau of Land Management New Mexico*
2007	Chair, Nominating Committee, *The Society for American Archaeology*
2003-2005	President, *The Society for American Archaeology*
2001-2002	Editor, Insights column, *The SAA Archaeological Record*
2001-2002	Chair, Government Affairs Committee, *The Society for American Archaeology*
2000-2006	Member, Committee on Historic and Archaeological Preservation in Transportation (A1F05), *Transportation Research Board, The National Academy of Sciences*
1997-1999	Secretary, *The Society for American Archaeology*
1992-1996	Public Education Committee, *The Society for American Archaeology*
1998-present	Registered Professional Archaeologist
1990-present	Adjunct Associate Professor of Anthropology, University of New Mexico

HONORS AND AWARDS

2009	Charles R. McGimsey III – Hester A. Davis Distinguished Service Award from the Register of Professional Archaeologists
2000	New Mexico Heritage Preservation Award
2000	Award of Honor, *New Mexico Archeological Council*
1999	Government Award, *American Cultural Resources Association*

CURRENT POSITION

Director , Historic Preservation Programs, SRI Foundation (2001-present)

Responsibilities: oversee continuing professional education and regulatory compliance and technical assistance programs; develop and teach continuing professional education and continuing legal education courses in cultural resource management; provide technical assistance and expert testimony for Section 106 and other historic preservation compliance topics; research and develop best-practices information on cultural resource management issues; carry out public education and outreach projects.

HISTORIC PRESERVATION EXPERIENCE

Director, Continuing Education, Senior Archaeologist, Statistical Research, Inc. 2000-2001

Responsibilities: develop and manage continuing professional education program in cultural resource management; provide expertise in historic preservation planning and legal compliance; provide project management for compliance with federal historic preservation laws and regulations; carry out synthetic and interpretive archaeological research.

State Historic Preservation Officer, State of New Mexico, 1997-1999

Responsibilities: Director of the State Historic Preservation Division of the Office of Cultural Affairs. Staff size: 28; budget $1.7 million. Administer state and federal historic preservation laws; provide technical assistance to federal, state, and local government agencies; maintain and make available information concerning historic and prehistoric properties and surveys; maintain the National and State Registers of historic properties; public education and outreach; technical assistance and preservation incentives for owners of historic and prehistoric sites.

New Mexico State Archaeologist, 1992-1997

Responsibilities: review state undertakings for effect on archaeological resources; issue and monitor permits for archaeological work on state lands; prepare scholarly and popular publications about the archaeology of New Mexico; develop and carry out public archaeology and archaeological education programs; maintain statewide archaeological site and survey data base; serve as steward of and advocate for the archaeological resources of New Mexico.

Deputy State Historic Preservation Officer, State of New Mexico, 1987-1997

Responsibilities: Review of Section 106 compliance process; consultation with federal, state, and local agencies and with Native Americans and other traditional communities about preservation planning, archaeological research designs, and mitigation plans; planning and organization of public education activities; supervision of publications program; office administration.

ARCHAEOLOGICAL FIELDWORK

1978 University of Utah Archaeological Field School

Position: student

Nature of fieldwork: Received intensive instruction in excavation, note-taking, mapping, photography, and preliminary laboratory analysis; some write-up responsibility as well. Project involved preliminary excavations at a large Fremont village in central Utah.

1979-1980 Dolores Archaeological Project

Position: assistant crew chief, crew chief.

Responsibilities: directed excavation of a Pueblo I hamlet, comprising a 21-room roomblock, two large pitstructures, and an intact midden, in southwestern Colorado.

1981 University of New Mexico Archaeological Field School

Position: teaching assistant

Responsibilities: established site grid, prepared plan, topographic, and architectural features maps; taught plane table mapping and use of surveying instruments to field school students. The project involved salvage excavations at LA 282, a large, badly vandalized Pueblo IV Piro site near Socorro, New Mexico.

1981-1982 University of New Mexico Office of Contract Archeology, Navajo Mine Archeological Program

Position: crew chief

Responsibilities: directed excavation of 12 Pueblo I - Pueblo III sites slated for destruction by coal strip mining. Write-up responsibilities included both site reports and synthetic chapters about the nature of the Anasazi occupation in the region. Sites ranged from sherd and lithic scatters through field houses to a small pueblo with kivas; northern San Juan Basin, New Mexico.

1983 University of New Mexico Archaeological Field School

Position: teaching assistant

Responsibilities: assisted in teaching mapping with EDM; ran field laboratory processing and labeling artifacts; supervised preliminary lithic analysis. Project involved continuing excavations at Rowe Pueblo, a large Pueblo IV site near Pecos, New Mexico.

1983 University of New Mexico Office of Contract Archeology

Position: project director

Responsibilities: Perform and report on small Cultural Resource Management surveys on a contract basis.

1984-1985 University of New Mexico Office of Contract Archeology, Turquoise Trail Project

Position: crew chief, project director

Responsibilities: Supervise test excavations and write up testing results for three sites small Pueblo II-IV sites; direct excavation of a multicomponent BMIII/PII site containing multiple pitstructures, surface rooms, and extramural features; supervise artifact analysis; write excavation report.

Project carried out to mitigate effects of road construction, Hopi Reservation, northeastern Arizona.

1986 University of New Mexico Office of Contract Archeology Chacoan Outlier Stabilization Evaluation Project

Position: project director

Responsibilities: Supervise a crew evaluating two Chacoan outliers slated for stabilization and backfilling; high resolution mapping, both topographic and architectural, and detailed architectural evaluation of great house structures at Twin Angels (near Bloomfield, NM) and Kin Nizhoni (near Grants, NM).

1987 University of New Mexico Office of Contract Archeology Bolack Excavation Project

Position: project director

Responsibilities: Supervise two crews carrying out excavation of two early Navajo sites with structures and one PII/PIII pueblo with roomblock, kivas, pithouse, and extramural work area; partial responsibility for write-up. Sites were part of a BLM land exchange.

ARCHAEOLOGICAL RESEARCH

1985-1986 Office of Contract Archeology, University of New Mexico

Class I Overview of the Roswell BLM District, New Mexico

Nature of Research: Review and synthesis of previous archaeological and historical research in the Roswell District of southeastern New Mexico. Covers Paleoindian, Archaic, Ceramic, Protohistoric, Spanish Colonial, Mexican, and Angloamerican periods and offers syntheses of major adaptations for each period.

1985-1986 National Park Service, Southwest Region

Settlement Pattern Study for the Chaco Additions Survey

Nature of Research: Study of settlement patterns and demography within four areas added to the Chaco Culture National Historical Park. Includes

discussions of functional site typologies, temporal and spatial trends, demography, and site location with respect to environmental variables.

1985-1988 Bureau of Land Management, Denver Service Center

Archaeological Predictive Modeling Project

Nature of Research: A multiauthored study of the theory, methods, practice, and applications of predictive modeling to archaeology in general and to cultural resource management in particular. I wrote one chapter and served as general volume editor for the book.

PRESENTED PAPERS

1980 *The definition of Fremont: a failure of the materialist perspective?* Paper presented at the Great Basin Anthropological Conference, Salt Lake City, September 1980.

1990 *Chaco Canyon and the Anasazi Southwest: Changing Views of Sociopolitical Organization.* Paper presented at the 55th Annual Meeting of the Society for American Archaeology, Las Vegas, April 1990.

1990 *Productive Potential and Cultural Complexity in Chaco Canyon.* With Patrick Hogan. Paper presented at the American Association for the Advancement of Science Meetings, New Orleans, February 1990.

1991 *New Mexico Heritage Preservation Week: Friendly Advice from Those on the Front Lines*. Paper presented with David Cushman at the 49th Annual Plains Anthropological Conference, Lawrence, Kansas, November 1991.

1991 *Traditional Cultural Properties and the Section 106 Process.* Paper presented at the Advisory Council on Historic Preservation Conference on Traditional Cultural Properties, Denver, November 1991.

1993a *Protecting Traditional Cultural Properties Through the Section 106 Process.* Paper presented at the 58th Annual Meeting of the Society for American Archaeology, St. Louis, April 1993.

1993b *Taking Charge in Chaco: The Evolution of Political Structure.* Paper presented at the 1993 Chacmool Conference, Calgary, November 1993.

1994a *What is Section 106? How Did I Get Into This? What Am I Supposed to Do About It?* Paper presented at ***Federal & Indian Lands Development: Accommodating Historic & Cultural Resources Under Federal Law***. American Bar Association Section on Natural Resources, Energy, and Environmental Law, San Antonio, September 1994.

1994b *Relations of Social Power in Chacoan Society.* Paper presented at the 59th Annual Meeting of the Society for American Archaeology, Anaheim, April 1994.

1995 *History, Contingency, and Process: Ways of Thinking about Change in the Past.* With Randall H. McGuire. Keynote address at the Durango Conference on Southwestern Archaeology, Durango, Colorado, September 1995.

2000a *Power, Politics, and Rational Self-Interest: the Chaco Case.* With John Kantner. Paper presented at ***The Dynamics of Power***, The 17th Annual Visiting Scholar Conference Southern Illinois University, Carbondale, March 2000.

2000b *Preservation Strategies for Archaeological Sites.* Paper presented in session on *Preserving Southwestern Prehistory* at the National Trust for Historic Preservation Conference 2000, Los Angeles, November 2000.

2000c *An Update on Historic Preservation.* Paper presented at the 2000 National Mining Association Mining Lawyers Conference, Santa Fe, September 2000.

2001a *Significance Determinations for Interstate Highways.* Paper presented at ***Discover the Past, Plan for the Future***, the summer workshop of the Transportation Research Board committee on Historic and Archaeological Preservation in Transportation, Key West, July 2001.

2001b *Training in CRM: Students, Professionals, and Practitioners*. With Jeffrey H. Altschul. Paper presented at the 100th Annual Meeting of the American Anthropological Association, Washington, D.C., November 2001.

2002a *The Conservation Model Today: Bill Lipe and Historic Preservation*. Paper presented in the symposium *William D. Lipe: Researcher in Southwestern Archaeology, Leader in Public Archaeology*. The 67th Annual Meeting of the Society for American Archaeology, Denver, March 2002.

2002b *Large-Scale Feasting and Politics: An Essay on Power in Precontact Southwestern Societies*. With David A. Phillips, Jr. Paper presented in the

symposium ***Feasting and Commensal Politics in the Prehispanic Southwest***, Southwest Symposium, Tucson, January 2002.

2002c *Historic Preservation and Local Communities: Who Cares?* Paper presented in a session *on Cultural Resources Challenges and Communities*, 2002 Federal Highway Administration Southern Resource Center Environmental Conference, Santa Fe, June 2002.

2007 *Archaeology, Information, Eligibility, and Significance.* Paper presented in the symposium *New Knowledge for Old Sites: the Value of Revisiting Sites and their Collections*. 72nd Annual Meeting of the Society for American Archaeology, Austin, April 2007.

2009 *Creative Mitigation? How Would THAT Help Readiness?* Presentation at The Department of Defense 2009 Sustaining Military Readiness Conference, Phoenix, August 2009.

2010 *Flag and Avoid: The Perception and the Reality.* Presentation in a forum entitled: ***Facing Up to Avoidance: A Hard Look at Flag-and-Avoid Archaeology,*** 75th Annual Meeting of the Society for American Archaeology, St. Louis, April 2010.

PUBLICATIONS

1978a *Rock art in Moqui Canyon*. In ***Archaeological Research in Glen Canyon, 1977***, by Alan R. Schroedl. National Park Service, Midwest Archeological Center, Lincoln, Nebraska.

1978b *Rock art*. In ***Survey and evaluation of archeological and historical resources, Central Utah Project, 1977***, edited by Edward B. Sisson. Report to the National Park Service, Department of Anthropology, University of Utah.

1980 *The variants of the Fremont: a methodological evaluation*. With Patrick Hogan. ***Utah Division of State History, Antiquities Section Selected Papers*** Volume 7:13-16.

1982 *Site structure and Nunamiut ethnoarcheology*. With Martha Graham and Carol Raish. ***Haliksa'i, University of New Mexico Contributions to Anthropology*** 1.

1983a *Anasazi site descriptions*. In ***Economy and Interaction along the Lower Chaco River,*** edited by Patrick Hogan and Joseph C. Winter. pp. 105-188. University of New Mexico Office of Contract Archeology, Albuquerque.

1983b *Anasazi site typology and chronology*. In ***Economy and Interaction along the Lower Chaco River***, edited by Patrick Hogan and Joseph C. Winter. pp. 403-420. University of New Mexico Office of Contract Archeology, Albuquerque.

1983c *Regional interaction: the Puebloan adaptation.* In ***Economy and Interaction along the Lower Chaco River***, edited by Patrick Hogan and Joseph C. Winter. pp. 445-452. University of New Mexico Office of Contract Archeology, Albuquerque.

1983d *Digging Out the Hidden Past*. With Patrick Hogan. ***Professional Surveyor*** Volume 3 Number 3.

1984 *Site PAO-83-31, Site PAO-83-32, and Site PAO-83-33.* In ***Archeological Excavation along the Turquoise Trail: The Testing Program***, by Patrick Hogan, pp. 27-68. University of New Mexico Office of Contract Archeology, Albuquerque.

1985 ***Archeological Excavation along the Turquoise Trail: The Mitigation Program.*** University of New Mexico Office of Contract Archeology, Albuquerque.

1986 *Excavations at Prince Hamlet (5MT2161), a Pueblo I Habitation Site.* In ***Dolores Archaeological Program: Anasazi Communities at Dolores: Early Small Settlements in the Dolores River Canyon and Western Sagehen Flats Area***, compiled by Timothy A. Kohler, William D. Lipe, and Allen E. Kane, pp. 331-442. USDI Bureau of Reclamation Engineering and Research Center, Denver.

1987 ***Historic Structure Evaluation Report: The Chacoan Outliers of Twin Angels and Kin Nizhoni.*** With H. Wolcott Toll. University of New Mexico Office of Contract Archeology, Albuquerque.

1988a ***Leadership, Power, and Productive Potential: A Political Model of the Chaco System.*** PhD Dissertation, Department of Anthropology, University of New Mexico, Albuquerque.

1988b ***Quantifying the present and predicting the past: Theory, method, and application of archaeological predictive modeling.*** Edited with W. James Judge. Bureau of Land Management, Denver.

1989 *Living on the Land: 11,000 Years of Human Adaptation in Southeastern New Mexico.* With Signa Larralde. ***Cultural Resource Series*** No. 6, New Mexico Bureau of Land Management, Santa Fe.

1990a *Looting and the Law: The View from New Mexico.* ***Archaeology*** 43(6):52.

1990b *Review of Archaeology and the Methodology of Science by Jane H. Kelley and Marsha P. Hanen*. ***New Mexico Historical Review*** July pp. 397-398.

1991a ***Archeology of the San Juan Breaks: The Anasazi Occupation.*** With Patrick Hogan. Office of Contract Archeology, University of New Mexico, Albuquerque.

1991b *Sociopolitical Complexity and the Chaco System.* In ***Chaco and Hohokam: Regional Systems in the American Southwest,*** edited by Patricia L. Crown and W. James Judge, pp. 109-134. School of American Research, Santa Fe.

1992a ***The Chaco Anasazi: Sociopolitical Evolution in the Prehistoric Southwest.*** Cambridge University Press, Cambridge.

1992b *New Mexico Heritage Preservation Week.* With David W. Cushman. In ***State Archaeological Education Programs,*** edited by William B. Butler, pp. 36-42. National Park Service, Rocky Mountain Region, Division of National Preservation Programs, Denver.

1993 *Chaco Canyon and the Anasazi Southwest: Changing Views of Sociopolitical Organization*. In ***Anasazi Regional Organization and the Chaco System***, edited by David E. Doyel, pp. 23-31. ***The Maxwell Museum of Anthropology Anthropological Papers*** No. 5. Albuquerque.

1993 *Protecting Traditional Cultural Properties Through the Section 106 Process*. ***CRM*** 16:22-26. National Park Service.

1996a *Population Aggregation in the Prehistoric North American Southwest.* With Timothy A. Kohler. ***American Antiquity*** 61:3:597-602.

1996b *Taking Charge in Chaco: The Evolution of Political Structure.* In ***Debating Complexity:*** *Proceedings of the 26th Annual Conference of the Archaeological*

Association of the University of Calgary, edited by D.A. Meyer, P.C. Dawson, and D.T. Hanna.

1999 *I am an Archaeologist*. In ***Lessons from the Past: an Introductory Reader in Archaeology***, edited by Kenneth L. Feder. Mayfield Publishing, Mountain View California.

2000 ***Fort Craig: The United States Fort on the Camino Real,*** *collected papers of the First Fort Craig Conference.* Edited with Charles Carroll. USDI Bureau of Land Management. Socorro NM.

2001b ***Examining the Course of Southwestern Archaeology: The Durango Conference, September 1995***, edited with David A. Phillips, Jr., ***New Mexico Archeological Council Special Publication 3***. Albuquerque.

2001b *History, Contingency, and Process: Ways of Thinking about Change in the Past.* With Randall H. McGuire. In ***Examining the Course of Southwestern Archaeology: The Durango Conference, September 1995***, edited by David A. Phillips, Jr., and Lynne Sebastian, ***New Mexico Archeological Council Special Publication 3***. Albuquerque.

2001 *Review of* Indigenous Archaeology: American Indian Values and Scientific Practice *by Joe Watkins.* ***Journal of Anthropological Research*** 58:170-171.

2002 **Preserving America's Past: Cultural Resource Management and Federal Historic Preservation Laws.** Society for American Archaeology MATRIX Project. Washington DC.

2002 *Settlement Patterns and Demography*. With Jeffrey Altschul. In ***An Archaeological Survey of the Additions to Chaco Culture National Historical Park,*** edited by Ruth Van Dyke and Robert Powers. Draft on file National Park Service, Santa Fe, and Chaco Culture NHP, Nageezi, New Mexico.

2003a *The Awful Truth About Archaeology.* **The SAA Archaeological Record** 3(2):35-37.

2003b *Challenging Road: Recognizing History in Our Interstate Highway System.* **Common Ground** Spring 2003, pp. 12-17.

2003c *Programmatic Agreement Tool Kit for State Departments of Transportation Environmental Projects and Programs*. With Terry H. Klein. American

Association of State Highway and Transportation Officials, Center for Environmental Excellence.

2004a *Archaeology and the Law*. In ***Legal Perspectives on Cultural Resources,*** edited by Jennifer R. Richman and Marion P. Forsyth, pp. 3-16. Altamira Press, Walnut Creek, California.

2004b *Large-Scale Feasting and Politics: An Essay on Power in Precontact Southwestern Societies*. With David A. Phillips, Jr. [2]. In ***Identity, Feasting, and the Archaeology of the Greater Southwest,*** edited by Barbara J. Mills, pp. 233-258. University Press of Colorado, Boulder.

2004c ***Predictive Modeling in the Military: Similar Goals, Divergent Paths***. With Jeffrey H. Altschul [2] and Kurt Heidelberg. SRI Foundation Preservation Research Series 1. Rio Rancho, New Mexico.

2004d *Understanding Chacoan Society*. In ***In Search of Chaco***, edited by David Grant Noble, pp. 93-99. School of American Research, Santa Fe.

2005a ***Adaptive Management and Planning Models for Cultural Resources in Oil and Gas Fields: The New Mexico Pump III Project***. With [1] Jeffrey H. Altschul, Chris M. Rohe, Scott Thompson, and William E. Hayden. SRI Foundation Preservation Research Series 5.

2005b ***Managing Archaeological Investigations: A Synthesis of Highway Practice.*** With Terry H. Klein, [2], Samantha M. Ruscavage-Barz, Stephanie Ford, and Joe E. Watkins. **NCHRP Synthesis 347**. Transportation Research Board, Washington D.C.

2005c ***A Working Conference on Enhancing & Streamlining Section 106 Compliance & Transportation Project Delivery.*** With Terry H. Klein [2]. SRI Foundation Preservation Research Series 3. Rio Rancho, New Mexico.

2005d ***A Workshop on Predictive Modeling & Cultural Resource Management on Military Installations.*** With Jeffrey H. Altschul and Terry H. Klein, [3]. SRI Foundation Preservation Research Series 4. Rio Rancho, New Mexico.

2006a *The Chaco Synthesis*. In ***The Archaeology of Chaco Canyon: An Eleventh-Century Regional Pueblo Center***, edited by Stephen H. Lekson, pp. 393-422. School of American Research Press, Santa Fe.

2006b *The Conservation Model Today and Historic Preservation.* In ***Tracking Ancient Footsteps: William D. Lipe's Contributions to Southwestern Prehistory and Public Archaeology***, edited by R.G. Matson and Timothy A. Kohler, pp. 109-125. Washington State University Press, Pullman.

2007 *Good Colleagues, Good Neighbors.* **SAA Archaeological Record** 7(5):11-13.

2008a Foreword. In ***Cultural Transmission and Archaeology: Issues and Case Studies,*** edited by Michael J. O'Brien, pp. v-vi. The SAA Press, Washington D.C.

2008b ***Integrating Archaeological Models: Management and Compliance on Military Installations.*** With David W. Cushman [2]. SRI Foundation Preservation Research Series 7. Rio Rancho, New Mexico.

2010a ***Archaeology & Cultural Resource Management: Visions for the Future***, edited with [1] William D. Lipe, SAR Press, Santa Fe.

2010b *Archaeology and Historic Preservation Law: Twenty-Five Years of Interesting Times*. In ***Voices in American Archaeology***, edited by Wendy Ashmore, Dorothy T. Lippert, and Barbara J. Mills, pp. 160-177. The SAA Press, Washington D.C.

2010c *Deciding What Matters: Archaeology, Eligibility, and Significance*. In ***Archaeology & Cultural Resource Management: Visions for the Future***, edited by Lynne Sebastian and William D. Lipe, pp. 91-114. SAR Press, Santa Fe.

2010d *The Future of CRM Archaeology.* In ***Archaeology & Cultural Resource Management: Visions for the Future***, edited by Lynne Sebastian and William D. Lipe, pp. 3-18. SAR Press, Santa Fe.

2010e *Perspectives from the Advanced Seminar*. With Willliam D. Lipe [2]. In ***Archaeology & Cultural Resource Management: Visions for the Future***, edited by Lynne Sebastian and William D. Lipe, pp. 283-297. SAR Press, Santa Fe.

2012a ***Modeling of Archaeological Site Location and Significance at White Sands Missile Range, New Mexico.*** With Michael Heilen, Jeffrey H. Altschul, Phillip Leckman, and Adam Byrd. Technical Report 12-06, Statistical Research, Inc., Tucson.

2012b *Secrets of the Past, Archaeology, and the Public*. In ***Archaeology in Society: Its Relevance in the Modern World***, edited by Marcy Rockman and Joe Flatman. Springer, New York.

in preparation *A Storied Landscape: The Administrative History of Chaco Culture National Historical Park*, with Carla R. Van West.

DECLARATION OF

W. Geoffrey Spaulding

I, W. Geoffrey Spaulding, declare as follows:

1. I am presently employed by CH2M HILL, Inc. as a Senior Technical Consultant in, among other disciplines, arid-lands plant ecology.

2. A copy of my professional qualifications and experience are attached hereto and incorporated herein by reference.

3. I helped prepare the attached testimony on Biological Resources for the Hidden Hills Solar Electric Generating System project based on my independent analysis, supplements thereto, data from reliable sources, and my professional experience and knowledge.

4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue(s) addressed herein.

5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: January 17, 2013 Signed: W. Geoffrey Spaulding

At: Henderson, Nevada

W. Geoffrey Spaulding, Ph.D.

Biological Resources Team Member

Education

Ph.D., Geology (Paleobiology)
M. S., Geology (Palynology & Vertebrate Paleobiology)
B. A., Anthropology

Distinguishing Qualifications

- Specialist Arid Lands Field Ecology and Phytogeography
- Expert in Paleoecology and Geomorphology of Western North America

Relevant Experience

Dr. Spaulding received his advanced degrees at the University of Arizona where for seven years he was a research assistant at the Desert Laboratories, the former Carnegie Institute Desert Botanical Laboratory on Tumamoc Hill, west of Tucson. While at Arizona, Dr. Spaulding engaged in field and laboratory studies that focused on the floristics, plant ecology, and paleoecology of the warm deserts of America (the Mojave, Sonoran, and Chihuahuan deserts). He spent several years studying plant ecological analysis methods appropriate to understanding plant community responses to environmental change. His doctoral and postdoctoral research was supported by the National Science Foundation, the U.S. Geological Survey, the Department of Energy, and the State of Nevada, and focused on the phytogeography and paleoecology of the Mojave Desert. His major findings in arid-lands plant ecology and the phytogeographic history of the Mojave Desert are published in his 1985 Geological Survey Professional Paper, his 1986 paper in *Nature* with Lisa Graumlich, 1990 synthesis in the journal *Quaternary Research*. Many of his contributions to science are summarized by D. K. Grayson in *The Desert's Past (*1993, Smithsonian Press).

In 1979 Dr. Spaulding accepted a position as a Research Associate in the faculty of the College of Forest Resources at the University of Washington, Seattle. Two years later he was appointed to the faculty of the Department of Botany as a Research Professor. He taught Introductory Ecology for non-majors as well as lectured in phytogeography, plant ecology, paleoecology and paleoclimatology of western North America. He maintained the Laboratory of Arid Lands Paleoecology as a resident scientist in the Quaternary Research Center. He has authored and coauthored papers in the premier scientific journals of the English speaking world, *Science* and *Nature*, and is sole author of a U.S. Geological Survey Professional Paper. In 1990 Dr. Spaulding accepted a position with Dames & Moore in their Las Vegas, Nevada office, and in 2001 joined the professional staff of CH2M HILL.

Representative Projects

Ivanpah Solar Electric Generating System EIS/AFC, Eastern Mojave Desert. Perform senior review of plant ecology and botanical reports, and coauthor Weed Management Plan. Provide senior guidance for field methodology development, as well as bio-climatic characterizations of the project area. Senior team lead for the project Revegetation, Rehabilitation and Restoration Plan. Prepare appropriate revegetation plan sections including the succulent salvage plan for BLM EIS and California Energy Commission Application for Certification. Provide responses and plan additions in response to data requests.

Edison Mission Energy Habitat Inventory and Mapping, Western Mojave Desert. Provide senior guidance in the development of methodology for remote imagery mapping of natural habitats on seventeen large land parcels in the western Mojave Desert. Conducted field reconnaissance with staff biologists, and assisted in the implementation of field ground-truthing of habitat identifications. This work included both desert scrub plant ecology as well as physical habitat designations.

SolarReserve Habitat Mapping, vicinity of Quartzite, Eastern Mojave Desert of Arizona. Developed criteria and application techniques for the remote imagery analysis of sand-dune habitats on the La Posa Plain of western Arizona. Ground-truthed initial remote imagery interpretations and provided geomorphic model explaining the

distribution of different habitats which, in turn, were used to predict the presence/absence of an endangered species.

City of Henderson Landfill Revegetation Plan, eastern Mojave Desert of Nevada. Senior team lead on the preparation an implementation of a revegetation plan for a large site in the Mojave Desert of southern Nevada. Identify plant species best adapted to xeric climate and soils conditions, and those likely to provide the greatest success rate during revegetation. Prepare weed control strategies as well as sensible revegetation strategies using native but nevertheless disturbance-adapted plant species.

Selected Publications

2008 - A Late Holocene Record of Vegetation and Climate from a Small Wetland In Shasta County, California. (with R. S. Anderson, S. J. Smith, and R. B. Jass). *Madroño* 55(1): 15–25.

2004 - Development of Vegetation in the Central Mojave Desert of California during the Late Quaternary. (with P. A. Koehler and R. S. Anderson). *Palaeogeography, Palaeoclimatology, Palaeoecology* 215:297-311.

2001 - Ploidy Race Distributions since the Last Glacial Maximum in the North American Desert Shrub, *Larrea tridentata* (with K.L. Hunter, J.L. Betancourt, B.R. Riddle, T.R. Van Devender, and K.L. Cole). *Global Ecology & Biogeography* 10: 521-533.

2000 - A Molecular Analysis of Ground Sloth Diet through the Last Glaciation (with M. Hofreiter, H. N. Poinar, K. Bauer, P.S. Martin, G. Possnert, and S. Paabo). *Molecular Ecology* 9: 1975-1984.

1995 - Environmental change, ecosystem responses, and the Late Quaternary development of the Mojave Desert. In *Quaternary Environments and Deep Time: Papers in Honor of Paul S. Martin* (D. S. Steadman and J. I. Mead, eds.), p 225-256. Fenske Printing, Inc., Rapid City, SD.

1990 - Vegetational and climatic development of the Mojave Desert. In *Packrat middens: The last 40,000 years of biotic change*, edited by J. L. Betancourt, P. S. Martin, and T. R. Van Devender, pp. 166-199. University of Arizona Press, Tucson.

1986 - The last pluvial climatic episodes in the deserts of southwestern North America (with L. J. Graumlich). *Nature* 320:441-444.

1979 - Development of vegetation and climate in the western United States (with T. R. Van Devender). *Science* 204: 701-710.

DECLARATION OF

W. Geoffrey Spaulding

I, W. Geoffrey Spaulding, declare as follows:

1. I am presently employed by CH2M HILL, Inc. as a Senior Technical Consultant in, among other disciplines, geoarchaeology.

2. A copy of my professional qualifications and experience are attached hereto and incorporated herein by reference.

3. I helped prepare the attached testimony on Cultural Resources for the Hidden Hills Solar Electric Generating System project based on my independent analysis, supplements thereto, data from reliable sources, and my professional experience and knowledge.

4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue(s) addressed herein.

5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: January 7, 2013 Signed: W. Geoffrey Spaulding

At: Henderson, Nevada

W. Geoffrey Spaulding

Geoarchaeology

Education

Ph.D., Geosciences (Quaternary Paleobiology & Geochronology), University of Arizona, 1981
M. S., Geosciences (Palynology), University of Arizona, 1974
B. A., Anthropology (Archaeology), University of Arizona, 1972

Certifications

Reviewed under Secretary of the Interior's Guidelines by the California Energy Commission, State of California and Approved as a Geoarchaeologist

Distinguishing Qualifications

- Specialist in Site Formation Processes, Geoarchaeology, Quaternary Geology
- Specialist in Cultural Resources Management
- Expert in the Quaternary Paleoenvironments of Western North America
- Captain, Signal Corps, U. S. Army Reserve (Retired)

Relevant Experience

Dr. Spaulding is a senior scientist and geoarchaeologist with CH2M HILL with extensive experience in geomorphology, geoarchaeology, archaeobotany, paleobiology and historic archaeology. He also is accomplished in the study of site formation processes, and in age determinations of archaeological and paleontological sites in the western United States. Along with his experience in archaeology, he has more than three decades of technical experience in the Earth and Life sciences focusing on the archaeology and Quaternary environmental history of North America. Representative projects that he has managed or in which he has played a key role are listed below. Prior to joining private industry, he was a Research Professor at the University of Washington, Seattle, with his office and laboratory housed in the Quaternary Research Center. During this time he was also an Adjunct Professor at the Laboratory of Remote Imagery. During his preceding graduate student tenure at the University of Arizona, the pre-eminent PaleoIndian geoarchaeologist C. Vance Haynes, Jr., sat on Dr. Spaulding's Ph.D. committee. Dr. Spaulding accumulated extensive field experience in archaeology concurrent with his undergraduate studies in anthropology in volunteer and paid positions with the Arizona State Museum and the Minnesota Historical Society.

Cultural Resources Management and Geoarchaeologist, BrightSource Energy Solar Installations, Mojave Desert, California and Nevada. Direct and participate in tasks ranging from geoarchaeological investigations to historic roads and trails studies. Consult with cultural resources managers from state and federal agencies and develop and implement testing plans. Design and conduct aerial surveys for Native American traditional cultural properties. Develop site formation models that incorporate detailed knowledge of latest Pleistocene and Holocene environments, and that provide explicit test implications for archaeological data recovery. Employ detailed ethnographic, archaeological and botanical knowledge to identify and categorize subsistence resources and likely subsistence strategies. Direct and participate in the preparation of reports ranging from more or less standard testing reports, to specialty studies ranging from resource inventories to geoarchaeological assessments.

Preconstruction and Construction-Phase Geoarchaeological Studies, Almond 2 Power Plant and Gas Transmission Line, Stanislaus County, California. Design and execute Geoarchaeological studies along an approximately 23-mile gas pipeline right-of-way, including a crossing of the culturally sensitive San Joaquin River floodplain. Conduct preliminary historic archaeological and geomorphological investigations to identify the limits of culturally sensitive pipeline segments. Design a subsurface sampling program to test the robustness of those predictions, and execute that program in the field. Identify human remains and their stratigraphic context, and implement a human remains discovery plan. Perform geochronological testing and provide paleoecological reconstructions to explain the presence of as well as limits of the distribution of sensitive cultural material. Use these findings to constrain the amount of cultural resources monitoring necessary.

Subsurface Geoarchaeological Investigations, Multiple California Energy-Generation Sites. Working to address concerns of the staff of the California Energy Commission, Dr. Spaulding has provided geoarchaeological support to test the subsurface archaeological sensitivity of sites in a wide variety of settings, from the Central Valley to the Salton Sink. Beginning with desk-top research and analysis of published geomorphological and stratigraphic data, in some cases these studies progress to subsurface testing and dating of sediments to determine their age and cultural sensitivity.

Nellis Air Force Range Three Lakes Valley Archaeological Survey & Subsistence Modeling. A multi-phase project involving site formation analysis and paleohydrologic modeling and, in cooperation with project archaeologists, the development of an integrated subsistence and settlement model to predict the occurrence and density of prehistoric sites in a large desert valley. Managed the subsequent survey of an approximately 3,000 acre area to test and refine the predictive model, and relate site occurrences to Holocene pluvial climatic events.

Yosemite National Park Cultural Resources Management Plan & Research Design. Assist in the preparation of the twenty-year update of the National Park Service's Archaeological Research Design. Review, evaluate, and provide a comprehensive summary of research on the terminal Pleistocene and Holocene paleoecology, geology, and tephrachronology of the Yosemite area, and the broader central and southern Sierra Nevada. Prepare sections of the park-wide Research Design to address postglacial environmental change and the geochronology of Yosemite Valley as they both affect and inform the prehistoric archaeological record.

Nellis Air Force Range Complex, General Site & Rock Art Inventories. Manage and participate in the design and execution of a multi-phase archaeological recordation project over an area larger than the state of Vermont. The second phase included the relocation and recording of twelve Archaic to Late Prehistoric rock art sites in remote areas of the U.S. Air Force's Nellis Range. Included in this effort was the contracting and management of specialist subconsultants in rock art, development of illustration techniques, and preparation of draft and final reports in consultation with the Base Archaeologist.

Metropolitan Water District of Southern California, West Valley Lateral and Eastside Reservoir Projects, Cultural and Paleontological Resources Support Services. Design and conduct archaeobotanical, paleoecological, and paleoclimatic studies in support of paleontological and cultural resources testing and mitigation programs for a large reservoir development program. Manage and participate in paleobotanical and archaeobotanical research programs; direct subconsultants in palynological investigations. Develop pioneering reconstructions of inland southern California's climatic and ecological history over the last 40,000 years; consider these in the context of regional environmental changes and the archaeological record.

Molycorp, Inc., Ivanpah Valley Geoarchaeological Studies. Plan for and contribute to cultural resources surveys and Phase 2 Testing and Evaluations for a large project involving over 30 Archaic to Late Prehistoric archaeological sites within and on the margins of a presently dry lake bed. Develop and implement special studies in geoarchaeology, paleohydrology, and paleoenvironmental reconstruction. Manage biological resources surveys and monitoring in support of a multiyear remediation effort; consult with land management agencies to assure compliance on behalf of the client.

Pacific Gas & Electric, Pit 3,4,5 Project, Cultural Resources Support Services. Archaeobotanical, paleoecological, and paleohydrologic studies in support of cultural resource mitigation efforts in the vicinity of Lake Britton, California. Develop a 7,000-year paleoecological record directly applicable to the study area. Contract and direct subconsultants in the development of a 1,000-year dendrohydrologic reconstruction of the flow of the Middle Pit River. Compare and contract paleoenvironmental and archaeological records to determine possible environmental drivers of cultural change.

Kern River Pipeline Cultural & Paleontological Resources Compliance, California, Nevada, and Utah. Coordination and implementation of cultural resources mitigation and monitoring efforts along a 678-mile pipeline corridor involving up to 160 personnel operating in three states. Consult with state and federal agencies (FERC, Advisory Council on Historic Preservation Bureau of Land Management), and coordinate with client representatives. Direct and participate in state-wide field compliance programs. Participate in and direct technical

studies of sites ranging in age from PaleoIndian to Formative Periods. Manage the preparation of reports perform the task of senior report editor.

DECLARATION OF

W. Geoffrey Spaulding

I, W. Geoffrey Spaulding, declare as follows:

1. I am presently employed by CH2M HILL, Inc. as a Senior Technical Consultant in, among other disciplines, Paleontological Resources Management.

2. A copy of my professional qualifications and experience are attached hereto and incorporated herein by reference.

3. I prepared the attached testimony on Paleontological Resources for the Hidden Hills Solar Electric Generating System project based on my independent analysis, supplements thereto, data from reliable sources, and my professional experience and knowledge.

4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue(s) addressed herein.

5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: January 7, 2013 Signed: W. Geoffrey Spaulding

At: Henderson, Nevada

W. Geoffrey Spaulding, Ph.D.

Paleontologic Resources Specialist

Education

Ph.D., Geology (Paleobiology)
M.S., Geology (Palynology & Vertebrate Paleobiology)
B.A., Anthropology

Registrations

- Approved Paleontologic Resources Specialist by the California Energy Commission
- Nevada State and California State Bureau of Land Management Paleontological Resources Use Permits
- Reviewed by the California Energy Commission and Approved as a Geoarchaeologist under Secretary of the Interior's Guidelines

Relevant Experience

Dr. Spaulding is a senior scientist and paleontologist with CH2M HILL with extensive experience in paleobiology, paleontology, and paleoecology. He also is accomplished in the study of site formation processes, and the age determinations of archaeological and paleontologic sites in the western United States. He has more than three decades of technical experience in the Earth and Life sciences focusing on the deserts of western North America and on California. Representative projects that he has managed in the last 20 years are listed below. Prior to joining private industry, he was on the research faculty of the University of Washington, Seattle.

Representative Projects

Hidden Hills Solar Electric Generation Station Fatal Flaw and AFC/FSA-EIS, Inyo County, California and Clark and Nye Counties, Nevada. Project Senior Technical Consultant, Paleontological Resources Specialist, California Cultural Resources Task Lead, and Geoarchaeologist. Provide senior technical review and task leadership in support of the site selection and then licensing of a 3,100 acre concentrated solar power generation facility in the northeastern Mojave Desert. Consult with client, project management, and agency personnel, design field programs, and direct resources surveys. Prepare and provide senior and peer-review of archaeological, paleontological, biological resources and jurisdictional waters studies. Prepare the overall paleontological and geoarchaeological assessments of the project area, as well as assist in directing cultural resources studies. Provide input to client and project management regarding local conditions and constraints based on in-depth. Adapt remote imagery analysis to the task of locating historic resources potentially affected by project development.

Ivanpah Solar Energy Generation Station AFC/FSA-EIS and Implementation. Project Senior Technical Consultant, Paleontological Resources Specialist, Revegetation Ecology Lead, Geoarchaeologist**.** In support of the licensing and construction of a 3,400 acre solar powered electrical generation facility in the eastern Mojave Desert. Conduct records review and literature search, field reconnaissance and subsequent pedestrian field survey of paleontologically sensitive areas, and record new paleontological sites. Model pluvial lake fluctuations and alluvial fan surface development to determine distribution of paleontologically and archaeologically sensitive sediments, and prepare geoarchaeological assessment of the project area. Design and participate in an aerial survey of the surrounding mountains. Prepare appropriate Paleontological, Cultural and Biological Resources sections for BLM and California Energy Commission Staff. Prepare Technical Basis Document and long term (30 years) Restoration, Revegetation and Rehabilitation Plan to meeting the specification of the Bureau of Land Management

AFC and Implementation Phase Mitigation for Turlock Irrigation District's Almond 2 Power Plant, California. Paleontologic Resources Specialist and Geoarchaeologist. Perform detailed paleontologic resources assessments and impacts analyses, and subsurface archaeological sensitivity assessment. Design archaeological resources testing plan and implement that plan. Develop and manage paleontologic resources monitoring and mitigation program for the construction of the Walnut Energy Center south of Modesto, California. Prepare Paleontologic Resources Management and Discovery Plans, the Paleontologic Resources Module of the worker education program, and visual

aids for worker education. Direct the recovery of discovered paleontologic resources (Quaternary vertebrate remains), and consult with the California Energy Commission on the adequacy of mitigation efforts. Develop site-specific stratigraphic framework to identify paleontologically sensitive sediments, and to provide client and the CEC with guidance regarding what construction activities need and need not be monitored.

AFCs for Walnut Creek Energy Park and Sun Valley Energy Project, Edison Mission Energy, City of Industry/Romoland, California. Provided support for two Applications for Certification before the California Energy Commission for similarly designed 500-MW natural gas-fired peaking power plants using the GE LMS100 advanced gas turbine technology. These applications were prepared in parallel and were filed at the Energy Commission within one week of one another. The AFCs were filed in December of 2005 and the projects are scheduled to begin construction in 2007.

AFC for AES Highgrove Power Project. Paleontologic Resources Specialist. Develop a Paleontologic Resources Assessment and prepare appropriate documentation on paleontologic resources for the projects' Application for Certification before the California Energy Commission. Determine the relative levels of paleontologic sensitivity of Mesozoic through Quaternary rock units in the context of the geological history of the Perris Plain and Riverside area, develop the scope for and direct the field survey, and prepare the resource specific documentation.

AFC and Implementation Phase Mitigation for Turlock Irrigation District's Walnut Energy Facility, California. Paleontologic Resources Specialist. Develop and manage paleontologic resources monitoring and mitigation program for the construction of the Walnut Energy Center south of Modesto, California. Prepare Paleontologic Resources Management and Discovery Plans, the Paleontologic Resources Module of the worker education program, and visual aids for worker education. Direct the recovery of discovered paleontologic resources (Quaternary vertebrate remains), and consult with the California Energy Commission on the adequacy of mitigation efforts. Develop site-specific stratigraphic framework to identify paleontologically sensitive sediments, and to provide client and the CEC with guidance regarding what construction activities need and need not be monitored.

Potrero and Contra Costa Applications for Certification, and Implementation Phase Paleontological Resources Monitoring and Mitigation, California. Conduct literature reviews, record searches, and site surveys; and prepare appropriate sections of Applications for Certification according to the format and data requirements of the California Energy Commission. Respond to CEC staff questions and requests for additional data. Provide cost-control strategies to client. In support of the relicensing efforts for two power plants in the Bay Area of California. Implement 2-year monitoring program that takes into account on-going improvement in geology and paleontological sensitivity and agency coordination to adjust monitoring strategy and reduce overall paleontological monitoring costs.

DECLARATION OF

W. Geoffrey Spaulding

I, W. Geoffrey Spaulding, declare as follows:

1. I am presently employed by CH2M HILL, Inc. as a Senior Technical Consultant in, among other disciplines, paleohydrology and arid-lands plant ecology.

2. A copy of my professional qualifications and experience are attached hereto and incorporated herein by reference.

3. I am adopting the attached testimony on Water Supply for the Hidden Hills Solar Electric Generating System project based on my independent analysis and my professional experience and knowledge.

4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue(s) addressed herein.

5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: January 7, 2013 Signed: W. Geoffrey Spaulding

At: Henderson, Nevada

W Geoffrey Spaulding

Quaternary Geology, Paleohydrology

Education

Ph.D., Geosciences (Paleobiology & Quaternary Geology), University of Arizona, 1981
M. S., Geosciences, University of Arizona, 1974
B. A., Anthropology, University of Arizona, 1972

Distinguishing Qualifications

- More than ten years experience in the geohydrology of the northern Mojave Desert
- Panel member of former National Academy of Sciences Panel on Yucca Mountain groundwater hydrology
- Specialist in Quaternary Geology and vegetation ecology of Arid America

Relevant Experience

Dr. Spaulding is a senior scientist and Quaternary geologist with CH2M HILL with extensive experience in geomorphology, paleohydrology, paleobiology and paleoecology. He has more than three decades of technical experience in the Earth and Life sciences focusing on the Quaternary paleoenvironments and geological processes of western North America including California. His particular region of specialization is the Mojave Desert of California and adjacent Nevada, and he has published numerous papers in scientific journals on Quaternary environmental change in America's arid interior. His professional history includes eight years of research on the paleohydrology and paleoclimatology of the Yucca Mountain area, culminating in a three-year tenure on the National Academy of Science, National Research Council's Panel on Coupled Hydrologic/Tectonic/Hydrothermal Systems at Yucca Mountain. Prior to joining private industry, Dr. Spaulding was a Research Professor at the University of Washington, Seattle, with his office and laboratory housed in the Quaternary Research Center. His research was supported chiefly by the U.S. Geological Survey and the National Science Foundation. Representative projects include:

Representative Projects

U.S. Geological Survey Yucca Mountain Site Characterization Studies. Multiple contracts for field and laboratory research, report preparation and review focusing on the timing and magnitude of past hydrologic and climatic changes in the Nevada Test Site, Yucca Mountain, and the Amargosa Desert. Assessment of millennial scale variability of groundwater levels and their potential effect on performance criteria for a high-level nuclear waste repository, as well of geomorphic process affecting paleoenvironmental data.

National Academy of Sciences, National Research Council Panel On Coupled Hydrologic, Tectonic, and Hydrothermal Processes. Appointed by the National Academy of Sciences to an interdisciplinary panel assembled to review and evaluate evidence for changes in water-table elevation in the vicinity of the proposed Yucca Mountain Nuclear Waste Repository. The geohydrology of southern Nevada and the processes that contribute to major changes in groundwater elevation were the subject of this panel's study and the focus of detailed inquiries into the research of the U.S. Geological Survey and Department of Energy, among others.

Metropolitan Water District of Southern California, West Valley Lateral and Eastside Reservoir Projects, Cultural and Paleontological Resources Support Services. Design and conduct paleoecological, and paleoclimatic studies in support of a large reservoir development program. Manage and participate in paleobotanical and archaeobotanical research programs; direct subconsultants in palynological investigations. Develop pioneering reconstructions of inland southern California's climatic and ecological history over the last 40,000 years; consider these in the context of regional environmental changes and the archaeological record.

Molycorp, Inc., Ivanpah Playa Paleohydrologic and Geoarchaeological Studies. Plan for and contribute to cultural resources surveys and Phase 2 Testing and Evaluations for a large project involving over 30 Archaic to Late Prehistoric archaeological sites within and on the margins of a presently dry lake bed. Develop and implement

special studies in geoarchaeology, paleohydrology, and paleoenvironmental reconstruction. Manage testing and direct resources surveys in support of a multiyear remediation effort; consult with land management agencies to assure compliance on behalf of the client.

Pacific Gas & Electric, Pit 3,4,5 Project, Paleohydrologic and Paleoclimatic Reconstructions. Paleoecological, paleoclimatic and paleohydrologic studies in support of cultural resource mitigation efforts in the vicinity of Lake Britton, California. Develop a 7,000-year paleoecological record directly applicable to the study area. Contract and direct subconsultants in the development of a 1,000-year dendrohydrologic reconstruction of the flow of the Middle Pit River. Compare and contract paleoenvironmental and archaeologoical records to determine possible environmental drivers of cultural change.

Salton Sea Ecosystem Restoration Project EIR. Geological and paleontological literature review, records search including consultations with California State Paleontologist, to develop large scale paleontological sensitivity assessment of the Salton Trough. Develop impact assessment and mitigation measures for Environmental Impact Report. Develop mitigation measures for eight different action alternatives, and respond to comments on the PEIR.

Southern Nevada Water Authority's Intake No. 3 Clean Water Act Compliance Assistance. Manage and participate in site survey and permit application preparation for a $600 million critical-path water project. The scope of this on-going effort includes the delineation of jurisdictional waters of the U.S., preparation of an Individual Permit application to the U.S. Army Corps of Engineers including all exhibits and appendices, and preparation of three separate application packages to the Nevada Division of Environmental Protection. Support of the applicant's agency consultations is a continuing component of this work.

Hanford Nuclear Reservation Barrier Development Program Peer Review Panel. Reviewing research strategies, team organization, and prototype designs for protective barriers intended for use on high-level and mixed waste repository sites. Reviewing studies of past and potential future environmental change.

U. S. Nuclear Regulatory Commission, Advisory Committee on Nuclear Waste. Preparation of briefing documents, participation in panel meetings, and presentation of oral evaluations of governmental studies on the characterization, data acquisition, and model evaluation of climatic and hydrologic conditions at the proposed Yucca Mountain Nuclear Waste Repository.

DECLARATION OF
SUSAN STRACHAN

I, Susan Strachan, declare as follows:

1. I am presently the Principal at Strachan Consulting, LLC.

2. A copy of my professional qualifications and experience are attached hereto and incorporated herein by reference.

3. I helped prepare the attached testimony on Project Description; Facility Design, Power Plant Efficiency and Power Plant Reliability; and Transmission System Engineering for the Hidden Hills Solar Electric Generating System project based on my independent analysis, supplements thereto, data from reliable sources, and my professional experience and knowledge.

4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issues addressed herein.

5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: 21 January 2013 Signed: _____

At: Davis, CA

SUSAN STRACHAN

Susan Strachan has over 20 years of both public and private sector project management experience in the permitting and compliance activities associated with large industrial projects. She has extensive experience managing the environmental permitting of power plant, transmission, and pipeline projects. Her experience includes conducting due diligence investigations and fatal flaw analyses, permitting strategies, preparing permit applications and other project environmental documentation, negotiating permit conditions and other project related issues with regulatory agencies, conducting public outreach, developing compliance plans, and managing compliance activities.

PROFESSIONAL HISTORY

Strachan Consulting, LLC
Principal, June 1998-Present

Sacramento Municipal Utility District
Mgr., Project Permitting and Licensing - March 1992-May 1998

Assemblymember Lloyd Connelly
Senior Assistant - 1990 to 1992

Santa Barbara County
Hazardous Materials Section Manager - 1987 to 1990
Environmental Planner 1985 to 1987

PROFESSIONAL EXPERIENCE

Brightsource Energy – Ms. Strachan serves as Permitting Coordinator for the Hidden Hills Solar Electric Generating System (HHSEGS) currently before the California Energy Commission. The HHSEGS is a 500 MW solar thermal project located in Inyo County.

Pacific Gas & Electric – Ms. Strachan served as Environmental Project Manager for the Humboldt Bay Generating Station project (HBGS). The HBGS is a 163 MW power plant located in Humboldt Co. Her responsibilities included: overseeing the preparation of the application to the California Energy Commission (CEC); responding to Data Requests; interfacing with the California Coastal Commission and other regulatory agencies, reviewing the Preliminary and Final Staff Assessments; preparing for and participating in Evidentiary Hearings; and managing initial construction compliance activities. Ms. Strachan also prepared CEC license amendments for the project.

Ms. Strachan serves as a permit coordinator for the decommissioning of the PG&E Humboldt Bay Power Plant, managing the acquisition of Coastal Development Permits from the California Coastal Commission

Praxair Inc. Ms. Strachan represented Praxair Inc. as Environmental Project Manager for its Contra Costa Pipeline Project, a 21.5-mile hydrogen pipeline in Contra Costa County. Her responsibilities include: conducting the fatal flaw analysis and permitting strategy, overseeing the preparation of the application materials to the applicable local, state, and federal agencies, advising the client on environmental permitting and CEQA issues; coordinating with local, state, and federal agencies and the County's EIR consultant, participating in public environmental meetings; ensuring proper compliance with CEQA; participating in agency meetings.

Turlock Irrigation District – Ms. Strachan provided Environmental Project Management Services to the Turlock Irrigation District for its Almond 2 Power Plant and Walnut Energy Center, located in Ceres and Turlock, CA, respectively. Her responsibilities included: assisting in site selection, overseeing the preparation of the applications to the CEC; participating in public outreach activities; responding to Data Requests; interfacing with the regulatory agencies, reviewing the Preliminary and Final Staff Assessments; and preparing for and participating in Evidentiary Hearings.

Ms. Strachan also served as Environmental Compliance Manager for the Almond 2 Power Plant and Walnut Energy Center. Her responsibilities included: preparing compliance documents, preparing and processing CEC license amendments, ensuring compliance with all environmental regulatory requirements; managing the activities of the environmental monitors; and maintaining communication with the environmental regulatory agencies. Ms. Strachan continues to provide ongoing compliance assistance to TID for these projects.

Ms. Strachan also managed the preparation of the EIR for TID's Hughson-Grayson 115-kV Transmission Line and Substation Project.

Modesto Irrigation District - Ms. Strachan provided Environmental Project Management services to the Modesto Irrigation District for the Woodland 2 Generation Station, an 80 MW combined cycle power plan, located in San Joaquin Co. She

also prepared CEC amendments for the Woodland 2 project. Ms. Strachan also managed the permitting of the Modesto Irrigation District Electric Generation Station Ripon project, a 95 MW simple-cycle power plant, located in San Joaquin Co. Her responsibilities included: managing the preparation of the application, providing project coordination with regulatory agencies, and resolving issues/concerns of the agencies. Ms. Strachan also provided compliance support to MID.

Calpine Corporation – Ms. Strachan served as the Environmental Project Manager for several natural gas-fired power plants developed by Calpine Corporation. These include the following:

- Delta Energy Center – Contra Costa Co.
- King City LM600 Project – Monterey Co.
- Gilroy City Phase I LM6000 Project – Santa Clara Co.
- East Altamont Energy Center – Alameda Co.

Her responsibilities included obtaining the CEC licenses for the projects and obtaining permits from other regulatory agencies such as the U.S. Fish and Wildlife Service, California Department of Fish and Game, State Lands Commission, and U.S. Bureau of Reclamation. She has also provided permitting assistance to Calpine on its Sutter and Metcalf Energy Center projects.

Calpine Corporation – Compliance Ms. Strachan also assisted Calpine Corporation in compliance activities associated with projects licensed before the CEC. Her activities have included the preparation of several amendments to the project licenses for the Delta Energy Center and Los Medanos Energy Center.

Calpine Corporation – Due Diligence Ms. Strachan conducted the environmental due diligence investigation for Calpine's acquisition of the Los Medanos Energy Center and Otay Mesa projects.

Sacramento Municipal Utility District - Ms. Strachan served as the Manager, Project Permitting and Licensing, responsible for overseeing permitting and compliance activities before the California Energy Commission (CEC) for the following projects:

- Sacramento Cogeneration Authority at Procter & Gamble – Sacramento, Co.
- Sacramento Power Authority at Campbell Soup – Sacramento Co.

- Carson Ice-Gen – Sacramento Co.
- SEPCO – Sacramento Co.
- SMUD Cogeneration Pipeline – Sacramento Co., and Yolo Co.

In this position, Ms. Strachan worked closely with the CEC while the projects moved through the licensing process. Her responsibilities included preparation of the Applications for Certification, responding to data requests, negotiating permit conditions, working with members of the public, and participating in hearings. Ms. Strachan was also responsible for acquiring permits from other agencies including the Sacramento Metropolitan Air Quality Management District, Regional Water Quality Control Board, U.S. Fish and Wildlife Service, and Army Corps of Engineers.

Construction Compliance - As project manager for Sacramento Power Authority at Campbell Soup project, Ms. Strachan managed the compliance activities associated with the CEC's conditions of certification for the project. This included preparation of CEC license amendments, interface with the CEC during construction of the project, preparation of submittals to the CEC in compliance with permit conditions, and responding to and addressing local community concerns associated with the project.

Cosumnes Power Plant – Ms. Strachan provided environmental project management support/advice to SMUD for the CEC licensing of the Cosumnes Power Plant project, located in Sacramento Co.

EDUCATION

B.A., Political Science
University of California, Santa Barbara

DECLARATION OF

Chifong Thomas

I, Chifong Thomas, declare as follows:

1. I am presently employed by BrightSource Energy, Inc. as a Senior Director, Transmission and Strategy.

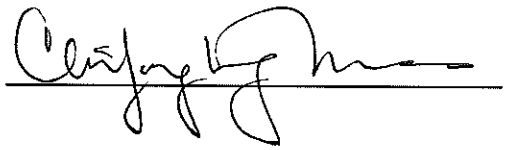
2. A copy of my professional qualifications and experience are attached hereto and incorporated herein by reference.

3. I helped prepare the attached testimony on Alternatives for the Hidden Hills Solar Electric Generating System project based on my independent analysis, supplements thereto, data from reliable sources, and my professional experience and knowledge.

4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue(s) addressed herein.

5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: 1/18/2013 Signed: 

At: Oakland, California

CHIFONG L. THOMAS

BrightSource Energy, Inc.
1999 Harrison Street, Suite 2150
Oakland CA 94612
January 2013

SUMMARY

- 42 years of electric utility experience, more than 40 of which in electric transmission planning
- 2012 - Present: Senior Director, Transmission and Strategy in BrightSource Energy.
- 1999 - 2012: Principal Consulting Engineer (Interconnected Grid Planning Section, Electric Planning, Strategy & Engineering) in PG&E.
- 1971 - 1999: Held various positions in PG&E.

Developed and recommended to upper management strategies to enable interconnection and achievement of deliverability status for planned generation projects. Supervised and conducted various studies to develop and recommend transmission plans for electric systems 60 kV through 500 kV. Participated in the development of strategic transmission plans and department budget. Provided technical support for policy decisions and contract negotiations and for various regulatory filings. Served as witness in CEC, CPUC and in court proceedings. Sponsored testimony in FERC proceedings. Interfaced with various public agencies and utilities within the California and in NERC and WECC. Served on various NERC Drafting Teams and WECC Subcommittees and Task Forces, and on CEC and EPRI Industry Advisory Committees. Co-developed the concept and methodology to calculate the Location Attribute for the PG&E system adopted in the CPUC Biennial Resource Plan Update (BRPU). Developed the concept and implemented Transmission Ranking Cost Report adopted in the CPUC Transmission and RPS Proceedings to assist in the ranking of renewable resource bids in response to Requests for Offer (RFO). Technical Lead for the CEC-PIER Project, Regional Integration of Renewables for Northern California. Coordinated WECC comments and responses on NERC Planning Standards development and compliance.

LICENSE: California Professional Registration in Electrical Engineering Number 8977

EDUCATION: BSEE, Washington State University, 1971
Completed 30 hours towards MSEE Degree in University of Santa Clara Graduate Program
Completed various management and technical seminars sponsored by PG&E and professional organizations.

TECHNICAL PAPERS: Co-authored the following IEEE papers:

- "Valuation of the Transmission Impact in a Resource Bidding Process", presented at the IEEE/PES 1990 Winter Power Meeting, Atlanta, Georgia.
- "Optimal Power Flow Sensitivity Analysis", presented at the IEEE/PES 1990 Winter Power Meeting, Atlanta, Georgia.
- "Cost of Transmission Transactions: An Introduction", presented at the IEEE/PES 1991 Winter Power Meeting, New York, New York.
- "Bulk Transmission System Loss Analysis", presented at the IEEE/PES 1992 Winter Power Meeting in New York, New York.

AWARDS:

1984, Performance Recognition Award -Transmission Planning Department, for developing and producing the Users' Guide to GE Optimal Power Flow Program (Version 2.3) to augment the GE Users' Manual.

1987, Performance Recognition Award - Transmission Planning Department and Power Contracts Department, for technical support in negotiating the Facilities Connection Agreement with Sacramento Municipal Utility District (SMUD).

1989, Performance Recognition Award - Transmission Planning Department, for successfully managing three complex studies that resulted in three well-written, well documented reports in the planning of the California-Oregon Transmission Project in a very short time.

1992, Wall of Fame Award, Electrical Supply Business Unit, for conceptualizing and developing a methodology in evaluating transmission impact in a resource bidding process. The "LOCATION" program was in use in PG&E's Biennial Resource bidding process.

2005, Performance Recognition Award – Transmission Asset Strategy Department, for development and successful implementation of Transmission Ranking Costs (TRC), timely filing of the TRC Report and support in PG&E's Renewable Resource Bid Evaluation.

2008, Performance Recognition Award – Transmission and Substation – Strategy and Planning Department, for successful development and launch of the CEC-PIER Project, Regional Integration of Renewables by putting together a coalition of Transmission Planning entities in northern California

APPOINTMENT:

- Vice Chair of the Technical Advisory Committee (Electrical Engineering) to California Board of Registration for Professional Engineers and Land Surveyors (1991)
- Vice Chair (2001-2003) and Chair (2003-2005) of the Technical Studies Subcommittee (TSS) in Western Electricity Coordinating Council (WECC)
- Chair of the NERC Standard Authorization Request (SAR) Drafting Team on determination of Facility Ratings, System Operating Limits and Transfer Capability (2002-2003)
- Secretary (2009 – 2011) of the Planning Coordination Committee (PCC) in WECC
- Chair (2010 – 2012) of the WECC PCC-Transmission Expansion Planning Policy Committee (TEPPC) Coordination Task Force

AFFILIATIONS: Institute of Electrical and Electronic Engineers - Senior Member
Power Engineering Society

WORK EXPERIENCE:

1973 - Present – Transmission Planning

A. Current Major Responsibilities:

- Develop and recommend to upper management strategies to enable achievement of Full Capacity Deliverability Status for BrightSource Projects.
- Supervise and review various studies relating to the interconnection of planned BrightSource generating plants at various Points of Interconnection.
- Represent BrightSource in various regulatory and industrial forums. Review and comment on network upgrade requirements, budget for interconnection requests; participate in the development of the transmission plans by the CAISO, comment on CAISO Tariff filings at FERC, and on utility resource requirements from the CPUC.
- Provide testimony and serve as witness to support BrightSource project permitting at the CEC.
- Chair the WECC-PCC Path Concept Task Force.

B. Past Major Responsibilities:

System Planning and Operations

- CEC – PIER Project: Lead Investigator on the Regional Integration of Renewables - Assessment of Northern California Sub-Regional Renewable Transmission Integration Priorities Beyond 2010.
- Lead transmission planner in the development PG&E's Transmission Ranking Cost Report (TRCR) and represent PG&E - Transmission to support PG&E's renewables RFO process.
- Lead transmission planner for the California Clean Energy Transmission (C3ET) Project (formerly Midway – Gregg 500 kV Project). Project objectives are to increase pump storage flexibility at Helms which would help in storing off peak wind energy for on peak use, improve reliability to Yosemite/Fresno Area, and increase Path 15 capability to bring in more renewable energy from southern California.
- Supervised studies that recommended to PG&E Management transmission expenditures of up to $125 millions. Examples include the San Luis Obispo 70 kV Reinforcement Project; the McCall and Herndon 230/115 kV Transformer Capacity Increase Projects; the 500 kV Series Capacitor Replacement Project; the Bulk System Reactive Support Project to rebuild or replace 19 synchronous condensers, the Bay Area Voltage Support Project, the Greater Fresno Voltage Support Project, Generation Interconnection studies for two generation projects connecting to the PG&E's 500 kV system and the Tesla 500/230 kV Capacity Increase Project to install a new 1122 MVA 500/230 kV transformer bank and replace fourteen 230 kV circuit breakers at PG&E's Tesla Substation
- Supervised various studies to determine operating limits or develop operating solutions. Examples include studies to determine the reliable levels of power transfer at the COI during 500 kV facility outages; the Cottonwood Bus

Differential Relay Scheme Study; the voltage collapse studies on the PG&E Northern Region; planning studies to determine the levels of load that could be supported during the extended outage of one of the generating units in the Humboldt area; operating studies to determine the Remedial Action Schemes to enable the increase in transfer capability from 3200 MW to 4800 MW from Oregon to California; the San Francisco Near-Term Transmission Reinforcement Project to avoid voltage collapse in San Francisco, and studies to determine the most economic reinforcement for the San Francisco Bay Area. Conducted various studies on PG&E's transmission system including distribution capacitor allocation studies.

- Served on the Industry Advisory Committee in the EPRI Research Project on a methodology to determine bulk transmission losses. Served on the Steering Committee on the Transmission RFP sponsored by the California Independent System Operator (CAISO) to develop Principles and Methodologies for Evaluation and Justification of Transmission Projects for economic benefits, PG&E's representative on the CAISO Local Capacity Requirement Advisory Group and on the advisory group to develop the CAISO's California South Regional Transmission Plan.
- Represented PG&E in the joint study with the CAISO, Western Area Power Administration (WAPA), Transmission Agency of Northern California (TANC) and SMUD to determine and recommend transmission plans to relief overloads on WAPA's Tracy 500/230 kV transformer. Represented PG&E on Sacramento Area Transmission Planning Group.
- Co-authored the WSCC Undervoltage Load Shedding Guidelines, the WSCC Voltage Stability Methodology Summary, the Western Electricity Coordinating Council (WECC) Voltage Stability Guide – March 30, 2006 and the WECC Voltage Ride-through Whitepaper. Chair the WECC-Technical Studies Subcommittee (TSS) NERC Task Force to effect revision of NERC Planning Standards through due process, Member of the WECC-TSS Wind Generation Task Force, Chair of the WECC TSS Reactive Margin Work Group;

Technical Support

- Chair for the WECC PCC-Transmission Expansion Planning Policy Committee (TEPPC) Coordination Task Force to 1) build consensus on the roles and responsibilities and develop synergies, and 2) clarify PCC documents on WECC project coordination and rating processes.
- Chaired the NERC SAR Drafting Team and later served on the Standard Drafting Team for NERC Standards FAC-008 through FAC-014. Served on the NERC SAR Drafting Team on Assess Future Transmission Needs and Generation Verification and Credible Multiple Contingency SAR. PG&E's representative on the WECC-Planning Coordination Committee (PCC). NERC Compliance – Coordinate comments and responses within PG&E for compliance
- Participated in the Western Regional Load and Resource Study sponsored by Idaho Power Company; the Task Force on Regional Planning to develop the WSCC Regional Planning Process; and the Regional Planning Process for COTP - South of Tracy Expansion.
- Supervised studies involving transmission plans for the PG&E and other transmission systems and provided support for various contract negotiations.
    - Supervised studies for the increased power schedules between Southern California and PG&E to support Power Contracts in PG&E's negotiations with LADWP; transmission studies and sponsored testimony to support PG&E's filing at the FERC for rate changes to the Northern California Power Agency (NCPA)-PG&E Interconnection Agreement (Docket Number ER90-350).
    - Supported negotiation efforts on interconnection contracts between SMUD and PG&E. Sponsored testimony in FERC proceedings to support the SMUD-PG&E Interconnection Agreement, SMUD-PG&E Facilities Connection Agreement and the SMUD Interconnection Rate Schedule (Docket Number ER89-475). Provided support in negotiating the Western-PG&E Interim Transmission Service Agreement for the construction of the California Oregon Transmission Project (COTP). Supervised the studies and report preparation as required by the California Integration Work Group of the COTP.
    - Coordinated studies needed to intervene in the NOI and AFC proceedings for the Geysers Public Power Line (GPPL) and served as expert witness before the CEC.
    - Supervised the study on the transmission requirements for DWR pump load increase at Delta Pumps, provided support for contract negotiations with CDWR.
    - Serve as witness for PG&E in Griswold Creek/POPI Litigation. Witness support in PG&E's Transmission Owner's Tariff at FERC.

Strategic Planning

- Supervised studies to investigate transmission reinforcements between Central and Southern California for future markets. Participated in efforts to formulate and recommend to PG&E Management a plan on Transmission Business Investment Strategy.
- Participated in PG&E's effort to implement a multi-attribute bidding system for purchasing resources from independent producers. Co-developed the concept and methodology to quantify the Location Attribute used in the CPUC Biennial Resource Plan Update and provided support in the proceedings.
- Participated in the Transmission Pricing Task Force to study transmission service pricing alternatives.
- Coordinated the study to examine PG&E's northern transmission constraint area after upgrades for the 1150 MW of Northern Area QFs became operational.

Regulatory Compliance

- Supervised studies to estimate energy losses for development of loss adjustment factors in cost of service filings with the CPUC and FERC.
- Served on the Advisory Committee of the Garamendi Transmission Evaluation Project sponsored by the CEC. Prepared testimony, slide presentation and publication for the CPUC En Banc Hearing on transmission issues
- Performed the study used for calculating the Loss Adjustment Factors for QFs. Participated in the joint study group between PG&E, CPUC staff and QF representatives on the methodology for determining QF losses. Developed the capacity loss adjustment factor for non-remote QFs used in Standard Offer Contracts.

1971 - 1973 -- Design Drafting

Substation Design

- Selected hardware and prepared drawings for the modification of transmission and distribution substations.

DECLARATION OF

TIM THOMPSON

I, Tim Thompson, declare as follows:

1. I am presently employed by Cardno ENTRIX as a Senior Consultant.

2. A copy of my professional qualifications and experience is attached hereto and incorporated by reference herein.

3. I helped prepare the attached portion of the Water Supply testimony for the Hidden Hills Solar Electric Generating System project based on my independent analysis and my professional experience and knowledge.

4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue(s) addressed herein.

5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: January 7, 2013 Signed: 

At: Santa Barbara, CA

Timothy J. Thompson, PG

BrightSource Role
Project Manager

Current Position
Senior Consultant / Vice President / Hydrogeologist

Discipline Areas
> Assessment of groundwater basin yield, water quality, natural recharge, and sustainability
> Conjunctive use, groundwater storage / banking, artificial recharge, and constructed wetlands
> Groundwater exploration, development, and management
> Groundwater well design, construction, and maintenance
> Litigation support and expert testimony
> Stormwater treatment, water quality compliance, and TMDL development
> Water resource issues: supply, quality, modeling, and management

Years' Experience
27

Joined Cardno
2007

Education
> MS, Geological Sciences, University of California, Santa Barbara, 1987
> BS, Geological Sciences, *cum laude*, University of California, Los Angeles, 1984

Professional Registrations
> CA Professional Geologist 5297
> CA Certified Hydrogeologist 332
> AZ Registered

www.cardnoentrix.com
www.cardno.com

Summary of Experience

Mr. Thompson's 27 years of professional background and education provide a broad base of experience in water resource science, regulatory issues, and project management. He has extensive knowledge of local, state, and federal regulations and policies and a detailed understanding of the roles and responsibilities of governmental agencies at various levels. He is active in numerous water resource projects, focusing on water quality and water supply for public-sector and private-sector clients. These projects typically involve technical analysis of a range of data types; coordination and negotiation with regulatory or other entities; consideration of budgetary and timeline constraints; and the need for robust scientific integrity and quality. Historically; his projects have involved issues related to regional groundwater basin analysis; development and implementation of long-term monitoring programs; water quality degradation; water rights disputes; water resource planning; water quantity and water quality modeling; reclaimed water utilization; conjunctive use and artificial recharge; constructed wetlands; stormwater and surface water quality modeling and monitoring; stormwater treatment, TMDL, and BMP evaluation; cost evaluations; and regulatory compliance. He provides leadership in all facets of corporate management, client development, technical program development, and project administration.

Significant Projects

Project Manager – Bright Source LLC, Hidden Hills Solar Electric Generating Station, Inyo County, CA
Mr. Thompson managed an effort to conduct a comprehensive aquifer investigation, yield testing, energy-facility permitting assistance, evaluation of water right offsetting alternatives, analysis of potential regional basin effects, and support at status conferences and public meetings.

Project Manager – PG&E, Diablo Canyon Nuclear Power Plant, San Luis Obispo County, CA
Mr. Thompson conducts comprehensive aquifer investigation, groundwater-surface water interaction assessment, well testing and rehabilitation, and regulatory consulting services for this facility. Projects include (a) bedrock aquifer evaluation, site selection and installation of two deep bedrock wells, extensive aquifer and well testing, evaluation of water quality challenges, and determination of potential connection between groundwater pumping and flows in nearby Diablo Creek and (b) groundwater characterization in "Power Block" area to identify flow directions, fate of groundwater present beneath the reactor vessels, and installation of monitoring wells downgradient of powerblock.

Project Manager – City of Fillmore, Ventura County, CA
Mr. Thompson directed groundwater basin analysis, safe yield evaluations, municipal well site selection, basinwide water quality and water supply modeling, analysis of depth-related groundwater water quality changes, water quality considerations regarding recycled water use, and well design, installation-oversight, and permitting evaluation of new water supply well field proposed by this groundwater-dependant city. Services also included groundwater-surface water interaction analyses, analysis of water quality vulnerability to effects of recharge associated with proposed changes to overlying land uses, water quantity, and water quality modeling for evaluation of potential impacts to groundwater resulting from Regional Board-required modifications to the city's drinking water and wastewater treatment systems.

Geologist 28138
> Private Pilot

Affiliations

> American Water Works Association
> Association of California Water Agencies
> Geological Society of America
> Groundwater Resources Association of California
> National Groundwater Association
> Ventura County Association of Water Agencies

Project Manager / Technical Lead – Apex Industrial Park, Las Vegas, Clark County, NV

Mr. Thompson was a project manager for this regional groundwater exploration and permitting effort resulting in installation of two deep bedrock wells (2,450-foot production well and 1,400-foot monitoring well), regional hydrogeologic evaluations, water rights filing, and water supply planning. His duties included regional geologic research and well site selection, driller selection and contracting, well logging, water quality sampling and analysis, drilling oversight, contract administration, well testing (design, operation, monitoring, and evaluation),well completion design and supervision, and preparation of final technical report. He also conducted well site selections and regional hydrogeologic analyses in four separate groundwater basins throughout the area north of Las Vegas, along with extensive water rights and federal agency coordination and planning.

Project Administrator – Shea Homes RiverPark Development, Ventura County, CA

Mr. Thompson is responsible for design and environmental analysis of stormwater treatment systems and numerous groundwater issues for this large (2,400+ homes and 2.5 million square feet of commercial development) southern California development that has redeveloped an aggregate mining property. The work included extensive CEQA documentation and technical report preparation, water rights assessments, groundwater-surface water interaction, design and modeling of complex stormwater treatment facilities, groundwater modeling to determine vulnerability from nearby contaminated site flow, evaluation of future water quality constraints, compliance with TMDL limitations, large-scale groundwater dewatering plan design and Regional Board permitting, monitoring well installation, water quality analysis of surface water-groundwater interactions, assessment of adjacent MTBE contaminated zones issues and impacts, and coordination with local agencies.

Groundwater Technical Lead – California American Water Co, Carmel River, Monterey County, CA

Mr. Thompson was responsible for hydrogeologic technical evaluations in response to Endangered Species Act (ESA) litigation, including evaluations of historic groundwater usage and determination of a season-specific relationship between groundwater pumping and flows within the adjacent Carmel River. He worked in tandem with legal counsel, a surface water hydrologist, and a fisheries biologist to identify linkages between groundwater pumping (timing and rates) and river flow (volume, depth, and timing relative to seasonal migration). Business reference name and phone number:

Water Resources Technical Lead – Sonoma County Permit & Resource Management Department, Sonoma County, CA

Mr. Thompson is responsible for the water resources and water quality sections of the Preservation Ranch EIR for a 19,000-acre vineyard development. Key project work requires determination of project impacts on water resources, including groundwater, water quality, stormwater, TMDLs, and other water resources considerations. An initial component evaluated potential groundwater-surface water interactions by conducting a diagnostic pumping test to evaluate effects of groundwater pumping on flow in nearby springs. Local creeks and rivers (including Gualala River) are habitat for Endangered Species (including steelhead trout), and project evaluation includes specific analyses to identify potential impacts.

Technical Manager – City of Mesquite, Clark County, NV

Mr. Thompson oversaw the groundwater-surface water interaction component of the lower Virgin River Habitat Conservation Plan as required for regulatory compliance with Section 7 of the Endangered Species Act. His role includes preparation and implementation of the Hydrological Monitoring and Mitigation Plan, which constitutes a long-term monitoring program developed to determine if groundwater pumping effects flows in the adjacent Virgin River. Initial work (currently pending) involves collection of substantial existing data, analysis of groundwater conditions, initial assessment of groundwater-surface water

interaction, review of a newly prepared groundwater model of the area, and coordination with client and local agencies.

Project Administrator / Technical Lead – City of Avondale, Maricopa County, AZ
Mr. Thompson oversaw the design, permitting, and construction of a 15,000 AFY constructed wetlands and groundwater recharge project. The constructed wetlands facility treats surface water from agricultural runoff and recycled water collected by the regional SRP canal system to standards acceptable for groundwater recharge and subsequent potable reuse. This project included all aspects of project management, groundwater modeling, facility design, technical work for permit acquisition, installation (including design, logging, sampling, and testing of monitoring wells), system startup, and preparation of a comprehensive operations and maintenance manual, and ongoing technical support services.

Project Manager – Lake Arrowhead Community Services District, San Bernardino County, CA
Mr. Thompson was responsible for this regional groundwater exploration and development project, including well site selection, structural geologic mapping and analysis, well design, contractor selection assistance, and permitting (county and CEQA). He conducted installation of five deep bedrock wells (600 to 800 feet deep in fractured granitic bedrock), well logging, oversight of geophysical logging, water quality testing, and well completion. Follow-on work included evaluation of future drilling targets, environmental compliance support, and identification of optimal future exploration approach and targets.

Project Manager – City of Santa Barbara, Santa Barbara, Santa Barbara County, CA
Mr. Thompson directed a feasibility study and implementation of a groundwater recharge project involving well injection of potable water. The project involved review of all viable city wells to determine the suitability of each for conversion to an injection well. Two wells were selected for extensive well testing and performance evaluation for conversion to dual use injection-extraction wells. The evaluation also included geochemical modeling of potential effects of mixing surface water and groundwater of differing chemistries.

Project Manager – City of Santa Barbara, Santa Barbara County, CA
Mr. Thompson managed the drought mitigation well drilling program, including extensive groundwater exploration and development in multiple locations including:

> Mission Creek – Site selection, well logging, water quality testing, well performance testing, and well completion of three deep bedrock production wells (1,300 foot, 1,100 foot, and 900 foot) tapping new water supplies. The project included installation of pipeline for water conveyance and extension of power lines for pumping needs and all associated permitting and agency coordination.

> North Portal of Mission Tunnel Site selection, driller contracting, well logging, water quality testing, well performance testing and well completion of deep bedrock production well (1,250 foot) tapping new water supplies and conveyed to North Portal of Mission Tunnel for augmentation of City water supply.

> Gibraltar Reservoir – Groundwater exploration under emergency drought-related demands, including regional hydrogeologic investigations, well site selection, driller contracting, well logging, water quality testing, and well performance testing. The project resulted in completion of five shallow alluvial production wells (80 to 130 feet) tapping water supplies beneath reservoir bottom silts and muds during drought period when reservoir was completely dry. Well site selection was based on geophysical analysis of subsurface materials, primarily employing time-domain electromagnetic geophysical techniques.

Project Manager – Gillibrand Aggregate Mine, Ventura County, CA
Mr. Thompson is providing comprehensive aquifer investigation, safe yield investigations, water supply assessment development, groundwater-surface water interaction

assessment, water quality, and regulatory consulting services in association with the planned expansion of this facility.

Technical Manager – Gorman Post Ranch, Los Angeles County, CA
Mr. Thompson provided comprehensive aquifer investigation, sustainable yield investigations, water supply assessment document development, groundwater recharge assessment, water quality, and regulatory consulting services in association with a large planned residential development.

Project Manager – City of Santa Clarita, Los Angeles County, CA
Mr. Thompson performed analysis and mitigation of flooding in a residential area caused by high surficial recharge rates that generate occasional high groundwater conditions. The project included hydrogeologic evaluation and well siting work leading to the installation of two monitoring wells, one new production well, and retrofit of an existing production well to allow dewatering and associated water-level monitoring of groundwater conditions. Tasks included aquifer flow analysis, well permitting, contractor selection, well logging, water quality testing, performance testing, well design and completion, and overall project management.

Project Manager – Goleta Water District, Santa Barbara County, CA
Mr. Thompson managed the feasibility study, design, and grant funding application for well injection of potable water into six existing District wells for this aquifer recharge project. The grant was fully funded and was one of the two highest scoring applications submitted statewide for the early 2002 round of Proposition 13 Water Bond funding.

Due Diligence Support

HerbThyme Farms, San Luis Rey River, Oceanside, CA
In support of pre-acquisition due diligence being conducted by The Riverside Company, Mr. Thompson conducted expert review and support services related to water supply alternatives, water rights, surface water-groundwater interaction, and reverse-osmosis treatment system design alternatives and costs.

Teasdale Quality Foods, Atwater, CA
In support of pre-acquisition due diligence, Mr. Thompson conducted expert review and support services related to this cannery's groundwater production, including reliability of yield, integrity of well and pumping facilities, vulnerability to regional groundwater contamination issues impacting clients' wells, Regional Water Quality Control Board NPDES permitting considerations for facility effluent, considerations related to partial conversion to City water supplies, and cost analysis of various physical and institutional water supply alternatives.

Fontana Property, Fontana, CA
In support of a confidential client's interest in developing water rights investment opportunities, Mr. Thompson executed a purchase agreement for a 200-acre parcel for groundwater recharge using treated effluent from Cucamonga County Water District. Due diligence investigations included site recharge performance testing, 4-mile pipeline routing, water quality considerations, Chino Basin adjudication issues (related to obtaining recharge credits), and financial and economic projections.

Chino Basin, CA
Mr. Thompson provided technical analysis, permitting evaluation, and agency coordination for an investor-funded project focused on determining opportunities for recharge of imported or local water supplies into the adjudicated Chino Basin.

Las Posas Basin, Moorpark, CA
In support of a confidential client's interest in developing water rights investment opportunities, Mr. Thompson conducted extensive analyses of groundwater recharge

options in an over-drafted portion of this large southern California groundwater basin for determination of groundwater recharge volumetric potential and water rights investment opportunities. The evaluation involved extensive review and analysis of existing wells, planned wells, water quality information, water rights, and groundwater modeling conducted by USGS and Ventura County.

Summit Engineering, Reno, NV

Mr. Thompson conducted detailed groundwater recharge calculations for an investor-based EcoVision project encompassing an entire northern half of the State of Nevada. He developed a robust GIS-based methodology to calculate natural recharge to the numerous, vast groundwater basins from natural precipitation, including considerations of 30+ years of rainfall, snowpack, runoff, and evapotranspiration data. He developed a modified approach to the soil-moisture balance technique to determine long-term recharge amounts in support of demonstrating to the Nevada Division of Water Resources State Engineers Office the presence of surplus, unallocated groundwater. The project concept included intention to wheel water down Humboldt River for sale to potential buyers in Reno and Carson City areas.

Legal & Expert Witness

> Sierra Club v. California American Water Co – Expert Witness retained by CalAm to evaluate groundwater usage and effects on flows within the adjacent Carmel River related to fisheries 'take' issues triggered by Endangered Species Act law.

> Southern California Edison (SCE) v. Sunrise Growers – Retained by SCE to provide expert witness services in evaluation of historical groundwater use and reporting case.

> Sleepy Valley Water Company v. Rainmaker Water Systems – Retained by Sleepy Valley to provide technical support in water rights evaluations of groundwater resource in a small basin with direct connection to the surface water resource of overlying Creek, including preparation of a Water Availability Analysis, and testimony at LA County Regional Planning Board of Supervisors hearings.

> Ladd Construction v. Ventura County Public Works – Retained by Ventura County as expert witness to provide deposition and testimony in formal arbitration hearing related to technical and permitting issues on $6 million construction costs dispute lawsuit.

> Santa Barbara Channel Keeper v. Venoco – Provided litigation support related to evaluating potential water quality issues associated with a proposed onshore well drilling program.

> Keller et al v. DR Horton Homes – Deposed as fact witness for land ownership lawsuit related to technical matters associated with timing of entitlements associated with RiverPark Development in Oxnard, California.

> Spiekerman v. City of Avondale – Deposed as a fact witness for construction timing and delays lawsuit related to timing of design document, permitting completion, and public agency review turnaround-time issues on a $15 million construction project involving constructed wetlands, artificial recharge basins, and residential development.

DECLARATION OF
SUSAN WALZER

I, Susan Walzer, declare as follows:

1. I am presently employed by BrightSource Industries Israel as a Director of Performance.

2. A copy of my professional qualifications and experience are attached hereto and incorporated herein by reference.

3. I helped prepare the attached testimony on Facility Design, Power Plant Efficiency, and Power Plant Reliability for the Hidden Hills Solar Electric Generating System project based on my independent analysis, supplements thereto, data from reliable sources, and my professional experience and knowledge.

4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue(s) addressed herein.

5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: January 6, 2013 Signed: Susan Walzer

At: Jerusalem, Israel

Susan B Walzer
PO Box 304
90917 Givat Zeev, Israel
swalzer@brightsourceenergy.com

RELEVANT PROFESSIONAL EXPERIENCE

2006 - Bright Source Industries Israel (BSII), Israel
Job Title: Director of Solar Performance
Job Description: Responsible for the following: Weather Data collection and analysis. Feasibility studies for BrightSource solar power plants worldwide. Computer modeling of the solar power plant, including cost / benefit analysis for sizing and design of solar fields from conception through operations inclusive; including meetings with potential customers, independent third party engineers and investors. Projecting and tracking the performance of the various components of power plants for internal study and Warranty requirements.

1992-2006 Independent Consultant
Job Description: Warranty analysis for the existing solar fields in California. Provide computer modeling techniques to Solel Industries (solar thermal technology. Generate performance projections for solar power plant feasibility studies worldwide, including the weather assessment and plant design. Provided cost / benefit studies for the above mentioned plants.

1986-1991 Luz Industries Israel
Job Title: Performance Analyst
Job Description: Detailed analysis of the electrical production of all the SEGS power plants in Southern California. Report on solar and boiler production in comparison to the forecasts and warranty obligations. Evaluate the causes for discrepancies between actual and projected output. Outlined changes to operating strategy and possible improvements to the solar field, based on analysis of operating conditions and actual output. Maintained and amended modeling program, used for design, tracking and warranty purposes.

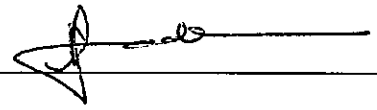
PERSONAL
Born in 1957, in NJ USA
Degree in Engineering, Northeastern University, Boston MA
Fluent in English and Hebrew

DECLARATION OF
FATUMA YUSUF

I, FATUMA YUSUF, declare as follows:

1. I am presently employed by CH2M HILL Incorporated as a Senior Economist.
2. A copy of my professional qualifications and experience are attached hereto and incorporated herein by reference.
3. I prepared the attached testimony on Socioeconomics for the Hidden Hills Solar Electric Generating System project based on my independent analysis, supplements thereto, data from reliable sources, and my professional experience and knowledge.
4. It is my professional opinion that the prepared testimony is valid and accurate with respect to the issue(s) addressed herein.
5. I am personally familiar with the facts and conclusions related in the testimony and if called as a witness could testify competently thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: January 7, 2013 Signed: 

At: Sacramento, CA

Fatuma Yusuf, Ph.D.

Socioeconomic Resources Task Lead

Education

Ph.D., Agricultural Economics
M.S., Statistics
M.A., Agricultural Economics
B.Sc., Range Management

Relevant Experience

Dr. Yusuf is an economist and statistician. She has conducted economic analyses for energy, water supply, water quality, agriculture, transportation, and recreation projects; evaluated project feasibility; and assessed economic impacts associated with project implementation. She has experience in preparing socioeconomic analysis, regional economic impact analysis, benefit-cost analysis, and rate impact analysis. She has been an economics task lead and task manager for a number of Environmental Impact Statements/Reports (EIS/R) including some on water facility improvements, highway development or expansion, and high speed and light rail development. She has extensive experience in preparing the socioeconomic analysis for power plant permitting. She also has experience in the development of statistical predictive models for condition assessments involving pipeline deterioration and factors leading to pipeline deterioration.

Representative Projects

Ivanpah Solar Electric Generating System, San Bernardino County, California. Socioeconomics Task Lead. Prepared the socioeconomics analysis section of the AFC. Also, analyzed the regional economic impacts of the project on employment and income.

Mariposa Energy Project (MEP) Application for Certification (AFC); Mariposa Energy, LLC. Prepared the socioeconomics section for the MEP AFC. The MEP will be a natural gas-fired, simple-cycle generating facility with a nominal capacity of 200-megawatts.

Economic Impact Analysis for the Teanaway Solar Reserve, Kittitas County, Washington. Economics Task Lead. Provided screening-level economic, socioeconomic and fiscal impact analyses of the construction and operation associated with the Teanaway Solar Reserve project in Kittitas County, Washington.

Lodi Energy Center, NCPA; Lodi, San Joaquin County, California. Socioeconomics Task Lead. Prepared the socioeconomics analysis section of the AFC. Also, analyzed the regional economic impacts of the project on employment and income.

Chula Vista Energy Upgrade Project, MMC Energy, San Diego County, California. Socioeconomics Task Lead. Prepared the socioeconomics analysis section of the AFC. Also, analyzed the regional economic impacts of the project on employment and income.

Application for Certification, Eastshore Energy Project, Hayward, California. Socioeconomics Task Lead. Prepared the socioeconomics analysis section of the AFC. Also, analyzed the regional economic impacts of the project on employment and income.

AFCs for Walnut Creek Energy Park and Sun Valley Energy Project, Edison Mission Energy, City of Industry/Romoland, California. Provided support for two Applications for Certification before the California Energy Commission for similarly designed 500-MW natural gas-fired peaking power plants using the GE LMS100 advanced gas turbine technology. These applications were prepared in parallel and were filed at the Energy Commission within one week of one another. The AFCs were filed in December of 2005 and the projects are scheduled to begin construction in 2007.

AFC for Roseville Energy Park, Roseville Electric, Roseville, California. Provided support for Application for Certification before the California Energy Commission for a 160-MW natural gas-fired power plant in Roseville, California.

Socioeconomic Study Plan for the UARP Iowa Hill Pumped Storage Development Project; Sacramento Municipal Utility District (SMUD); Sacramento, CA. Socioeconomic Task Lead. Prepared the socioeconomic study plan and evaluated the socioeconomic impacts associated with the Iowa Hill Pumped Storage Development Project as part of the SMUD Upper American River Project Hydroelectric relicensing application. Analyzed the regional economic impacts of the project on employment and income.

Economic Analysis for the Calpine LNG Facility and Power Plant in Eureka, CA. Project Manager and Economics Task Lead. Provided screening-level economic, socioeconomic and fiscal impact analyses of the construction and operation associated with the Calpine LNG and Power Plant Projects in Eureka, CA.

AFC for AES Highgrove Power Project. Economics Task Lead. Prepared the socioeconomics analysis section of the AFC. Also, analyzed the regional economic impacts of the project on employment and income.

Application for Certification the Walnut Energy Facility in Turlock, California. Economics Task Lead. Prepared the socioeconomics analysis section of the AFC. Also, analyzed the regional economic impacts of the project on employment and income.

Application for Certification for Los Esteros Critical Energy Facility, San Jose, California. Prepared the socioeconomics analysis section of the AFC. Also, analyzed the regional economic impacts of the project on employment and income.

Application for Certification for the San Francisco Electric Reliability Project, California. Economics Task Lead. Prepared the socioeconomics analysis section of the AFC. Also, analyzed the regional economic impacts of the project on employment and income.

San Joaquin Valley Energy Center AFC, Calpine Corp., San Joaquin, California. Economics Task Lead**.** Prepared the socioeconomics analysis section of the AFC. Also, analyzed the regional economic impacts of the project on employment and income.

East Altamont Energy Center AFC, California. Prepared the socioeconomics analysis section of the AFC. Also, analyzed the regional economic impacts of the project on employment and income.

Salton Sea Unit 6 Geothermal Project, California. Prepared the socioeconomics analysis section of the AFC. Also, analyzed the regional economic impacts of the project on employment and income.

SMUD Cosumnes Power Plant AFC. Prepared the socioeconomics analysis section of the AFC. Also, analyzed the regional economic impacts of the project on employment and income.

Socioeconomics Lead, Industrial Siting Application for a number of energy projects in Wyoming including the Medicine Bow Coal to Liquid Project, Wygen III Unit 5, Seven Mile Hill and Glenrock Wind Energy Projects. Analyzed the regional economic impacts of the projects on employment and income.