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CALIFORNIA ENERGY COMMISSION
1516 NINTH STREET
SACRAMENTO, CA 95814-5512
www.energy.ca.gov

DATE: June 27, 2014

TO: Interested Parties

FROM: Joseph Douglas, Compliance Project Manager

SUBJECT: IVANPAH SOLAR ELECTRIC GENERATING SYSTEM (07-AFC-5C)
Staff Analysis of the Proposed Increase in Boiler Fuel Usage Limit

On March 26, 2014, Solar Partners I, L.L.C., Solar Partners II, L.L.C., and Solar Partners VIII, L.L.C., filed a petition with the California Energy Commission (Energy Commission) requesting to amend the Final Decision for the Ivanpah Solar Electric Generating System (ISEGS). Staff prepared an analysis of this proposed change that can be reviewed on the Energy Commission website (see below).

The ISEGS is a 370-megawatt, solar thermal, electricity-generating project that was certified by the Energy Commission on September 22, 2010, and began construction on October 7, 2010. Initial operations began in December 2013. The facility is located in the Mojave Desert, near the Nevada border, in San Bernardino County.

The proposed modifications would allow for additional fuel use during some days to compensate for intermittent cloud cover in order to maintain peak power production and prevent the steam turbine from tripping off-line. More boiler steam is needed than previously expected to operate the system efficiently and in a manner that protects plant equipment, and to maximize solar electricity generation.

Energy Commission staff reviewed the petition, assessed the impacts of this proposal on environmental quality and on public health and safety, and proposes language changes to existing Air Quality Conditions of Certification. It is staff's opinion that, with the implementation of these language changes, the facility would remain in compliance with applicable laws, ordinances, regulations, and standards and that the proposed modifications would not result in significant adverse direct or cumulative impacts to the environment (20 Cal. Code of Regs., § 1769). Energy Commission staff intends to recommend approval of the petition at the August 2014, Business Meeting of the Energy Commission.

The Energy Commission's webpage for this facility, http://www.energy.ca.gov/sitingcases/ivanpah/, has a link to the petition and the Staff Analysis on the right side of the webpage in the box labeled "Compliance Proceeding." Click on the "Documents for this Proceeding (Docket Log)" option. The Energy Commission's Order regarding this petition will also be available from the same webpage.

This notice has been mailed to the Commission's list of interested parties and property owners adjacent to the facility site. It has also been e-mailed to the facility listserv. The listserv is an automated Energy Commission e-mail system by which information about this facility is e-mailed to parties who have subscribed. To subscribe, go to the Commission's webpage for this facility, cited above, scroll down the right side of the project's webpage to the box labeled "Subscribe," and provide the requested contact information.

Agencies and members of the public who wish to provide comments on the petition or Staff Analysis are asked to submit their comments by 5:00 p.m. on July 28, 2014. To use the Energy Commission's electronic commenting feature, go to the Energy Commission's webpage for this facility, cited above, click on the "Submit e-Comment" link, and follow the instructions in the on-line form. Be sure to include the facility name in your comments. Once submitted, the Energy Commission Dockets Unit reviews and approves your comments, and you will receive an e-mail with a link to them.

Written comments may also be mailed or hand delivered to:

California Energy Commission
Dockets Unit, MS-4
Docket No. 07-AFC-5C
1516 Ninth Street
Sacramento, CA 95814-5512

All comments and materials filed with the Dockets Unit will become part of the public record of the proceeding.

If you have any questions, please contact Joseph Douglas, Compliance Project Manager, at (916) 653-4677, or by fax to (916) 654-3882, or via e-mail at: joseph.douglas@energy.ca.gov.

If you would like information on participating in the Energy Commission's amendment process, please call the Energy Commission's Public Adviser's Office at (800) 822-6228 (toll-free in California). The Public Adviser's Office can also be contacted via e-mail at publicadviser@energy.ca.gov. News media inquiries should be directed to the Energy Commission Media Office at (916) 654-4989, or by e-mail at mediaoffice@energy.ca.gov.

Enclosure

Mail to list #7255
Ivanpah Listserv

IVANPAH SOLAR ELECTRIC GENERATING SYSTEM
(07-AFC-5C)
Petition to Amend Commission Decision
EXECUTIVE SUMMARY
Joseph Douglas

INTRODUCTION

On March 26, 2014, Solar Partners I, L.L.C., Solar Partners II, L.L.C., and Solar Partners VIII, L.L.C., filed a petition with the California Energy Commission (Energy Commission) requesting to amend the Final Decision for the Ivanpah Solar Electric Generating System (ISEGS). The 370-megawatt project was certified by the Energy Commission on September 22, 2010, and began construction on October 7, 2010. It began operations in December 2013. The facility is located in the Mojave Desert, near the Nevada border, in San Bernardino County. Staff has completed its review of all materials received.

The purpose of the Energy Commission's review process is to assess any impacts the proposed modifications would have on environmental quality and on public health and safety. The process includes an evaluation of the consistency of the proposed changes with the Energy Commission's Final Decision (Decision), and if the project, as modified, will remain in compliance with applicable laws, ordinances, regulations, and standards (20, Cal. Code of Regs., § 1769).

This Staff Analysis contains the Energy Commission staff's evaluation of the affected technical area of Air Quality and Greenhouse Gas Emmissions.

DESCRIPTION OF PROPOSED MODIFICATIONS

The modification proposed in the petition would allow ISEGS to increase the maximum allowable annual fuel usage limit for boilers from 328 million to 525 million standard cubic feet (MMSCF) per power block.

NECESSITY FOR THE PROPOSED MODIFICATIONS

Operating experience since commencement of commercial operation in December 2013, has shown that more steam is needed from the auxiliary boilers than originally expected to optimize operations and maximize solar output.

- Auxiliary boilers typically need to operate an average of approximately 5 hours a day during startup (an increase from the 1-hour daily average originally expected) to ensure that steam flow is sufficient to carry excess heat from the receivers in the towers and that when weather conditions are sufficient to permit plant operation, plant equipment and systems are ready to operate as designed.

- Additional fuel is needed during some days to compensate for intermittent cloud cover to maintain peak power production and prevent the steam turbine from tripping off-line. When cloud cover is dense enough and/or persists long enough to trip the turbine off-line, steam generated by the auxiliary boilers is needed to restart solar power production.
- Auxiliary boiler operation is needed at the end of the day to stabilize or support steam turbine operation, particularly during the peak summer period, to maximize the capture of solar energy as daily solar insolation declines.

STAFF'S ASSESSMENT OF THE PROPOSED PROJECT CHANGES

The technical areas contained in this Staff Assessment indicate recommended staff changes to the conditions of certification in the Final Decision. Staff believes that by requiring the proposed changes to the existing conditions, the potential impacts of the proposed changes would be reduced to less than significant levels. Staff's conclusions reached in each technical area are summarized in **Executive Summary Table 1**.

Energy Commission technical staff reviewed the petition to amend for potential environmental effects and consistency with applicable laws, ordinances, regulations, and standards (LORS). Staff has determined that the technical or environmental areas of Biological Resources, Cultural Resources, Facility Design, Efficiency, Geological and Paleontological Resources, Hazardous Materials Management, Noise and Vibration, Public Health and Safety, Reliability, Traffic and Transportation, Transmission Line Safety and Nuisance, Transmission System Engineering, Visual Resources, Waste Management, and Worker Safety and Fire Protection are not affected by the proposed changes, and no revisions or new conditions of certification are needed to ensure the project remains in compliance with all applicable LORS.

Staff determined that the technical area of Air Quality would be affected by the proposed project change and has proposed revised conditions of certification to assure compliance with LORS and/or to reduce potential environmental impacts to a less than significant level. The details of the proposed condition changes can be found in the attached Air Quality Staff Analysis. Although the proposed change in the annual natural gas fuel use limit would result in a small increase in annual emissions, the increase in potential emissions does not trigger any new regulatory requirements.

Executive Summary Table 1
Summary of Impacts to Each Technical Area

TECHNICAL AREAS REVIEWED	STAFF RESPONSE			New or Modified Conditions of Certification Recommended
	Technical Area Not Affected	No Significant Environmental Impact*	Process As Amendment	
Air Quality			X	X
Biological Resources	X			
Cultural Resources	X			
Efficiency	X			
Geological Hazards & Resources	X			
Hazardous Materials Management	X			
Facility Design	X			
Land Use	X			
Noise and Vibration	X			
Paleontological Resources	X			
Public Health	X			
Reliability	X			
Socioeconomics	X			
Soil and Water Resources	X			
Traffic and Transportation	X			
Transmission Line Safety & Nuisance	X			
Transmission System Engineering	X			
Visual Resources	X			
Waste Management	X			
Worker Safety and Fire Protection	X			

*There is no possibility that the modifications may have a significant effect on the environment and the modification will not result in a change or deletion of a condition adopted by the commission in the final decision or make changes that would cause the project not to comply with any applicable laws, ordinances, regulations, or standards (LORS) (20 Cal. Code Regs., § 1769 (a)(2)).

STAFF RECOMMENDATIONS AND CONCLUSIONS

Staff concludes that the following required findings mandated by Title 20, section 1769(a)(3) of the California Code of Regulations can be made and will recommend approval of the petition to the Energy Commission:

- The proposed modification(s) would not change the findings in the Energy Commission's Final Decision pursuant to Title 20, California Code of Regulations, section 1755;

- There would be no new or additional, unmitigated, significant environmental impacts associated with the proposed modifications;
- The facility would remain in compliance with all applicable laws, ordinances, regulations, and standards;
- The modifications would be beneficial to the public and the project owner because they would enable the project owner to optimize operations and maximize solar power production.
- The proposed modification(s) are justified because there has been a substantial change in circumstances since the Energy Commission certification as the experience of actual operation has demonstrated how to make the best use of the equipment.

IVANPAH SOLAR ELECTRIC GENERATING SYSTEM
(07-AFC-5C)
Petition to Amend Annual Boiler Fuel Use Limit
AIR QUALITY
Jacquelyn Record

SUMMARY OF CONCLUSIONS

Staff finds that with the adoption of the attached conditions of certification, the modified Ivanpah Solar Electric Generating System (ISEGS) would comply with applicable federal, state, and Mojave Desert Air Quality Management District (MDAQMD or District) air quality laws, ordinances, regulations, and standards (LORS), and that the modified ISEGS would not result in significant air quality-related impacts.

INTRODUCTION

On March 26, 2014, the California Energy Commission (Energy Commission) received a petition from Solar Partners I, L.L.C., Solar Partners II, L.L.C., and Solar Partners VIII, L.L.C. (Solar Partners), requesting to amend the ISEGS's September 22, 2010, Energy Commission Decision certifying the project (CEC 2010b), as three power-tower solar generation units that would generate a total of 370 megawatts (MW). The word "unit" is defined as an individual power plant. Power plant Unit 1 is rated at a nominal 120 MW and Units 2 and 3 are rated at a nominal 125 MW each. The word "facility" will be herein defined as all three power plant units combined and as a whole. The Energy Commission Compliance Project Manager (CPM) issued a letter authorizing the start of construction on October 8, 2010, and commercial operations began at the facility in December, 2013.

Each solar unit uses a small nighttime preservation boiler rated at 6.7 million Btu per hour (mmBtu/hr) capacity and an auxiliary boiler rated at 249 mmBtu/hr capacity. Each unit's nighttime preservation boiler is used for freeze protection when the unit is not operating. Each unit's auxiliary boiler is used to reduce startup time early in the day, during operations when sunlight alone is not sufficient to maintain steam quality without damaging equipment components, and to augment electricity production late in the day after the sun has passed its peak output, while there is still need for power from the facility.

In a previously approved amendment petition, the ISEGS owners requested to increase maximum allowable daily emissions, increase the size of the auxiliary boilers, add three nighttime preservation boilers, reduced the size of the emergency generators and added emergency engines and a fire pump to the site (CEC 2013a).

The facility owners reviewed the facility design and early operations and now petition that it is necessary to change the original project description to increase the allowable annual fuel use at each solar power plant. This amendment request would:

- Increase the allowable annual fuel use by each solar power-tower generation unit from 328 million standard cubic feet (mmscf) to 525 mmscf (changes to be made in Condition of Certification **AQ-12** and Condition of Certification **AQ-34)**; and
- Revise Condition of Certification **AQSC-10**, which imposes a limit on the total annual natural gas fuel heat input to the facility.

These fuel use limits are imposed to establish effective and enforceable potential to emit (PTE) emission limits. In this analysis, staff evaluated the expected air quality impacts from the modified facility using the revised annual fuel use, the associated PTE and associated annual impacts.

LAWS, ORDINANCES, REGULATIONS, AND STANDARDS COMPLIANCE

The Energy Commission Decision certifying the ISEGS facility concluded that the facility would comply with all applicable laws, ordinances, regulations, and standards (LORS). The facility, as modified, is subject to all the applicable LORS in the October, 2009 Final Staff Assessment (FSA) (CEC 2009) and prior amendment Order No.12-0213-8 (CEC 2013a) amending various Air Quality Conditions of Certification.

SETTING

Since the preceding air quality Energy Commission amendment Order No. 12-0213-8 (CEC 2013a), federal and state ambient air quality attainment status designations have not changed significantly. The currently applicable state and federal Ambient Air Quality Standards (AAQS) are listed in **Air Quality Table 1**. As indicated in this table, the averaging times for the various standards (the duration over which they are measured) range from hourly to annually. The standards are read as a concentration, in parts per million (ppm) or parts per billion (ppb), or as a weighted mass of material per volume of air, in milligrams or micrograms of pollutant per cubic meter of air (mg/m^3 and $\mu g/m^3$).

Air Quality Table 2 summarizes the attainment status of the project area in the Mojave Desert Air Basin (MDAB) for various currently-applicable state and federal AAQS. The San Bernardino County portion of the MDAB is designated as nonattainment for the state ozone standard, and both state and federal PM10 standards. The MDAB is designated as attainment or unclassified for state and federal CO, NO_2, SO_2, and PM2.5. The U.S. Environmental Protection Agency (U.S. EPA) recently designated West Mojave Desert Portion of the San Bernardino County as nonattainment for the federal ozone standard (U.S. EPA 2014a). However, the facility site is located in the attainment or unclassified portion of the area.

Since the adoption of the ISEGS Commission Decision in 2010 (CEC 2010b) and previous amendment Energy Commission Order No. 12-0213-8 (CEC 2013a), additional ambient air quality data have become available. **Air Quality Table 3** reflects the most recent ambient air quality data for the last five years. Values above the

applicable limiting standards are shown in bold and shaded in the table. The 1-hour ozone concentration has decreased to below the state standard since 2008; the 8-hour ozone concentration and the 24-hour PM10 concentration are each still above their respective state standards, which is the same situation as in October, 2009 FSA.

As in the October, 2009 FSA, all ozone, PM10, and PM2.5 data are from the Jean, Nevada, monitoring station located approximately 17 miles northeast of the facility site; all CO data are from the Barstow monitoring station located approximately 100 miles west southwest of the facility site; all SO_2 data are from the Trona-Athol and Telegraph monitoring station located approximately 110 miles west northwest of the facility site.

In the previous amendment Energy Commission Order No. 12-0213-8 (CEC 2013a) analysis, staff used the NO_2 background data from the Trona station. Thus, for purposes of this amendment analysis, staff chose to continue to use this data for the Trona station to conservatively and reasonably represent the facility site and add data for 2012.

Air Quality Table 1
Federal and State Ambient Air Quality Standards

Pollutant	Averaging Time	Federal Standard	California Standard
Ozone (O_3)	8 Hour	0.075 ppm (147 µg/m^3)	0.070 ppm (137 µg/m^3)
	1 Hour	—	0.09 ppm (180 µg/m^3)
Carbon Monoxide (CO)	8 Hour	9 ppm (10 mg/m^3)	9 ppm (10 mg/m^3)
	1 Hour	35 ppm (40 mg/m^3)	20 ppm (23 mg/m^3)
Nitrogen Dioxide (NO_2)	Annual	53 ppb (100 µg/m^3)	0.030 ppm (57 µg/m^3)
	1 Hour	100 ppb (188 µg/m^3)[a]	0.18 ppm (339 µg/m^3)
Sulfur Dioxide (SO_2)	24 Hour	—	0.04 ppm (105 µg/m^3)
	3 Hour	0.5 ppm (1300 µg/m^3)	—
	1 Hour	75 ppb (196 µg/m^3)[b]	0.25 ppm (655 µg/m^3)
Respirable Particulate Matter (PM10)	Annual	—	20 µg/m^3
	24 Hour	150 µg/m^3	50 µg/m^3
Fine Particulate Matter (PM2.5)	Annual	15 µg/m^3	12 µg/m^3
	24 Hour	35 µg/m^3 [c]	—
Sulfates (SO_4)	24 Hour	—	25 µg/m^3
Lead	30 Day Average	—	1.5 µg/m^3
	Rolling 3-Month Average	0.15 µg/m^3	—
Hydrogen Sulfide (H_2S)	1 Hour	—	0.03 ppm (42 µg/m^3)
Vinyl Chloride (chloroethene)	24 Hour	—	0.01 ppm (26 µg/m^3)
Visibility Reducing Particulates	8 Hour	—	In sufficient amount to produce an extinction coefficient of 0.23 per kilometer due to particles when the relative humidity is less than 70 percent.

Source: ARB 2014b
ppm = parts per million

Notes:

[a] To attain this standard, the 3-year average of the 98th percentile of daily maximum 1-hour average must not exceed 100 ppb.

[b] To attain this standard, the 3-year average of the 99th percentile of daily maximum 1-hour average must not exceed 75 ppb.

[c] To attain this standard, the 3-year average of the 98th percentile of daily maximum 1-hour concentrations must not exceed 35 µg/m^3.

Air Quality Table 2
Federal and State Attainment Status Facility Area in Mojave Desert Air Basin

Pollutant	Attainment Status	
	Federal	State
Ozone	Unclassifiable/Attainment[a]	Nonattainment
CO	Unclassifiable/Attainment	Unclassifiable/Attainment
NO_2	Unclassifiable/Attainment[b]	Attainment
SO_2	Unclassified	Attainment
PM10	Nonattainment	Nonattainment
PM2.5	Unclassified/Attainment	Unclassified[a]

Source: ARB 2014a, U.S. EPA 2014a

[a] For the facility site area only, not the entire MDAB.

[b] On February 17, 2012, U.S. EPA designated all of California as "unclassifiable/attainment" for the short-term NO_2 standard.

Air Quality Table 3
Criteria Pollutant Summary
Maximum Ambient Concentrations (ppm or µg/m^3)

Pollutant	Averaging Period	Units	2008	2009	2010	2011	2012	Limiting AAQS
Ozone	1 hour	ppm	0.087	ND	0.082	0.085	0.087	0.09
Ozone	8 hours	ppm	**0.078**	**0.079**	**0.075**	**0.083**	**0.083**	0.070
PM10	24 hours	µg/m^3	**96**	**81**	49	**79**	**137**	50
PM10 [a]	Annual	µg/m^3	12.7	11.9	8.5	11.8	13.1	20
PM2.5	24 hours	µg/m^3	12.9	11.3	10.1	8.6	12.5	35
PM2.5 [a]	Annual	µg/m^3	4.5	4.0	3.5	3.7	5.0	12
CO	1 hour	ppm	1.4	1.2	1.3	4.4	0.9	20
CO	8 hours	ppm	1.2	0.9	0.9	1.4	0.07	9
NO_2	1 hour	ppm	0.062	0.049	0.052	0.049	0.056	0.18
NO_2	1 hour federal	ppm	0.043	0.039	0.043	0.042	0.042	0.1
NO_2	Annual	ppm	0.004	0.004	0.005	ND	ND	0.030
SO_2	1 hour	ppm	0.009	0.009	0.008	0.011	0.011	0.075
SO_2	3 hours	ppm	0.007	0.007	0.007	0.010	0.010	0.5
SO_2	24 hours	ppm	0.004	0.003	0.003	0.006	0.003	0.04
SO_2	Annual	ppm	0.000	0.000	0.001	0.001	0.001	0.030

Source: U.S. EPA 2014b; ARB 2014b

ND = No Data

Values above the applicable limiting standards are shown in bold and shaded.

Notes:

[a] Annual average data is federal data and may not exactly represent California annual average.

Air Quality Table 4
Staff Recommended Background Concentrations (µg/m^3)

Pollutant	Averaging Time	Recommended Background	Limiting Standard	Percent of Standard
NO_2	1 hour	105	339	31%
	1 hour federal	80.8	188	43%
	Annual	9.5	57	17%
PM10	24 hour	**137**	**50**	**274%**
	Annual	13.1	20	65%
PM2.5	24 hour	12.5	35	36%
	Annual	5.0	12	41%
CO	1 hour	5,060	23,000	22%
	8 hour	1,556	10,000	16%
SO_2	1 hour	96.1	655	15%
	24 hour	15.8	105	15%
	Annual	2.7	80	3%

Source: Energy Commission Staff Analysis.

Staff recommends the background ambient air concentrations in **Air Quality Table 4** for use in the amendment impact analysis. The recommended background concentrations are based on the maximum criteria pollutant concentrations from the past three years of available data collected at the most representative monitoring stations surrounding the facility site.

The background 24-hour concentration of PM10 is above the most restrictive existing AAQS, while the background concentrations for other pollutants and averaging times are all below the most restrictive existing AAQS, which is the same as in the most recent amendment approved in February, 2013.

ANALYSIS

Solar Partners' amendment request (ESH 2014) states:

> There will be no change to maximum hourly or daily fuel use. No equipment other than the auxiliary and nighttime preservation boilers will be affected.
>
> ISEGS is unique. For some aspects of operations, the only way to fully understand how the system works has been through the experience of operating the power plants, which commenced in December, 2013. Petitioner became aware of the need to increase the allowable annual fuel use limit after the completion of construction and commencement of commercial operations. The experience gained during commercial operations indicates that more boiler steam would be needed than

previously anticipated in order to operate the system efficiently and in a manner that protects plant equipment.

Based on this experience, Petitioner has revised their annual operating scenario to account for the need to operate each unit's auxiliary boiler more often during the daily startup period, during periods of intermittent cloud cover to maintain peak output and to prevent steam turbine trips, for restarts of a power block due to extended periods of cloud cover, at the end of the day to extend the capability for solar power production, and to account for days when a system start is terminated when it becomes apparent that cloud cover precludes operation of the solar collectors.

INCREASE MAXIMUM ANNUAL FUEL USAGE

The proposed change in the annual natural gas fuel use limit would result in a small increase in annual emissions due to a potential increased annual fuel use as shown in **Air Quality Table 5**. The increase in fuel use from 328 mmscf to 525 mmscf would not change the facility's ability to comply with all applicable regulations, including new source performance standards or Best Available Control Technology (BACT) requirements. For further information on the applicable thresholds and a comparison to various air quality permit review requirements, please see **Air Quality Table 9**. The auxiliary boilers are already limited to a NOx emissions level of 9 ppm, which meets the NOx limit of 125 ppm for steam generators rated above 50 MMBtu/hr required by District Rule 476–Steam Generating Equipment.

The District released Preliminary Determination of Compliance (PDOC) Revision E 05-05-14 (MDAQMD 2014a) on May 5, 2014, which incorporates the proposed changes to the facility. The District's FDOC Amendment Revision E 06-16-14 concluded that the facility owner's proposed emission levels would meet the BACT requirements. In the Final Determination of Compliance to Amendment Revision E 06-16-14, MDAQMD stated, "final permits (Authorities to Construct) shall be prepared approximately 15 days after the California Energy Commission has granted project approval" (MDAQMD 2014b).

Solar Partners have stated in their petition that the auxiliary boilers will need to operate an average of approximately 5 hours a day during daily startup (instead of the original expectation of an average of approximately 1 hour per day) in order to ensure that steam flow is sufficient to carry excess heat from the receivers in the towers and to ensure that equipment components continue to operate as designed. Based on ISEGS experience since December, 2013, Solar Partners became aware of a need for additional fuel use in the auxiliary boiler during periods of intermittent cloud cover, after the turbine tripped off-line during extensive cloud cover, and at the end of the day to extend solar power production. **Air Quality Table 5** below displays the maximum fuel usage requested in this amendment.

Air Quality Table 5
Maximum Fuel Usage Requested
(Each Auxiliary Boiler and Nighttime Preservation Boiler)

Fuel Use	Hour	Day[b]	Year
mmscf	0.244	5.86	525[a]
mmBtu	249	5976	535,500

Notes:

[a] Combined mmscf/yr in **Air Quality Table 7** equals 520; Solar Partners rounded up to 525 mmscf/yr.

[b] Maximum daily usages are derived by multiplying hourly values by 24 hrs.

The proposed increase in annual fuel usage would result in a potential increase in annual emissions. **Air Quality Table 6** shows calculated emissions based on permitted emission factors from Conditions of Certification **AQ-5** and **AQ-6**. These two conditions of certification have limits on an hourly basis, concentration limits, and a pound per mmBtu basis. This amendment request would affect maximum hourly or daily emissions which are in Conditions of Certification **AQ-5** and **AQ-6**.

Air Quality Table 6
ISEGS Emission Calculations
(Per Facility and All Three Units)

Pollutant	Emission Factor Lb/MMBtu[a]	Emissions			
		Lb/hr[a]	Lb/Day	Tons Per Year (TPY)	TPY (All Three Facilities)[b]
NOx	0.011	2.7	65.3	2.9	8.8
SOx	0.003	0.7	17.2	0.8	2.3
ROC	0.0054	1.3	31.9	1.4	4.3
PM10/PM2.5	0.007	1.7	41.8	1.9	5.6
CO	0.018	4.6	110.4	4.9	14.8

Notes:

Pollutant emission for each time period are calculated by multiplying the emissions factor by the fuel use (mmBtu) from **Air Quality Table 5**.

[a] Permitted limits set by Conditions of Certification **AQ- 5** and **AQ-6**.

[b] Includes auxiliary boilers and nighttime preservation boilers.

The basis for the requested increase in annual fuel use is shown below in the **Air Quality Table 7**. According to the facility owner, more natural gas is needed under several circumstances described as "*Weather Days,*" "*Trip Responses,*" and "*Additional Daytime Operation*" scenarios. For all operating conditions described below, the fuel gas heat content is assumed to be 1,020 British thermal units per standard cubic foot (Btu/scf).

"Normal Days" in **Air Quality Table 7** means days with routine start-ups, defined as days when a unit's auxiliary boiler operates for 4 hours at maximum load before the unit's generator has synchronized to the grid; including the need for up to 1 hour of operation at maximum load after the generator has synchronized (5 hours total), to

stabilize steam quality. During a *Normal Day,* the unit's nighttime preservation boiler operates for 12 hours at maximum load.

"Weather Days" in **Air Quality Table 7** means days when the maximum hourly average direct normal irradiance, described as the intensity of sunlight, does not exceed 800 w/m^2 (watts per square meter). If an individual unit's operation is attempted during a *Weather Day*, the unit might not achieve stable operation and the startup might have to be aborted. During such days, the auxiliary boiler is assumed to operate for 2.5 hours at maximum load, at which time planned operations for the day are aborted. The individual power plant unit's nighttime preservation boiler is assumed to operate a total maximum of approximately 21.5 hours during these weather days.

"Trip Response" in **Air Quality Table 7** means a condition that assumes a unit's auxiliary boiler operates for 5 hours during a normal day startup and then is used to support the restart of the steam turbine following a steam turbine trip. This steam turbine trip can be caused by the steam not having adequate vapor to liquid ratio, making the steam too saturated for use in the steam turbine and thus causing the turbine to trip off-line.

"Additional Daytime Operations" in **Air Quality Table 7** assume a unit's auxiliary boiler would need to operate for an additional 300 hours per year in solar boost mode during the peak summer period, primarily as an end-of-day solar boost to extend operations when the sun is past its peak. This would also include the auxiliary boiler operating up to 8 hours per year for emission source testing required by the conditions of certification.

Air Quality Table 7
Basis for Requested Fuel Use

	Auxiliary Boiler				Nighttime Preservation Boiler	
	Normal Days	**Weather Days**	**Trip Response**	**Additional Daytime Operation**	**Normal Days**	**Weather Days**
MMBtu/hr	249	249	249	249	6.7	6.7
MMSCF/hr	0.244	0.244	0.244	0.244	0.006	0.006
Hours/day	5	2.5			12	21.5
Days/year	291	54			291	54
Hours/year	1455	135	120	308	3492	1161
MMSCF/year	355	33	29	75	21	7

Source: ESH 2014

Air Quality Table 8 shows that the total annual facility-wide emissions for all three power plant units would be only slightly higher than those permitted in the current conditions of certification, which are derived either from the Energy Commission Decision approving the facility as originally proposed or from subsequent amendments. Proposed changes are shown in **bold** and **underline**, with extant values shown in ~~strikeout~~ in the table. Maximum hourly and daily emissions would not increase from their currently permitted emissions and are not shown. Annual emissions would increase

compared to the annual emissions approved in the Commission Decision and previous amendment (CEC Order No. 12-0213-8), which were based on a fuel usage rate of 328 mmscf per year in each individual unit's boilers.

Air Quality Table 8
ISEGS Annual Emissions During Operation
Proposed Changes Compared to Currently Approved Facility[1]

	Annual Emissions (Tons/Yr)					
Emission Source	**NOx**	**SOx**	**CO**	**VOC**	**PM10**	**PM2.5**
Boilers	**8.8** ~~5.5~~	**2.3** ~~1.4~~	**14.8** ~~10.9~~	**4.4** ~~2.7~~	**5.6** ~~3.5~~	**5.6** ~~3.5~~
Emitting Sources That Would Remain Unchanged[1]						
Emergency Generator Engines	1.8	0.0	1.0	0.0	0.1	0.1
Emergency Fire Pump Engines	0.1	0.0	0.1	0.0	0.0	0.0
Maintenance Vehicles (all types)	2.3	0.0	1.5	0.2	14.6	3.1
Employee and Delivery Vehicles (offsite)	1.8	0.0	17.1	1.7	1.2	0.3
Cooling Systems	**-**	**-**	**-**	**-**	0.0	0.0
Total Maximum Annual Emissions	**14.8** ~~11.6~~	**2.3** ~~1.4~~	**34.5** ~~30.6~~	**6.2** ~~4.6~~	**21.5** ~~19.5~~	**9.1** ~~7.1~~
Net Annual Emissions Change	+3.2	+0.9	+3.9	+1.6	+2.0	+2.0

Source: CEC 2013a, ESH 2014
Proposed changes are shown in **bold** and **underline**, with extant values shown in ~~strikeout~~.

CHANGES TO LANGUAGE OF AQ-SC10

The facility owner has proposed language changes to **AQ-SC10**. Staff has no objection to the changes as proposed. However, staff concludes this condition is no longer needed as discussed further below.

As stated by the facility owner, the 5 percent annual natural gas use limit in **AQ-SC10** was originally proposed by Energy Commission staff "to finalize the applicant's stipulation that '[h]eat input from natural gas will not exceed 5 percent of the heat input from the sun, on an annual basis,' which also generally corresponds [to] the amount of operation included in the applicant's air dispersion modeling impact analysis."[2]

For purposes of evaluating Solar Partners' request to increase annual natural gas fuel use, the previous modeling impact analysis was scaled for the increase in annual fuel use. The proposed increase would only affect the allowable annual fuel use, and this change would only affect potential annual average impacts, not short-term impacts.

[1] CEC amendment Order No. 12 (CEC 2013).

[2] Ivanpah Solar Electric Generating System Final Staff Assessment, Air Quality Section, November 2009, pp.1-17.

However, **Air Quality Table 10** shows short-term and long-term impacts for completeness, and, even with the increased fuel use, all pollutant impacts from operations would remain well below their respective AAQS except for 24-hour PM10 impacts. For 24-hour PM10 impacts, however, ambient air quality impacts would not increase, as shown by comparing **Air Quality Table 10** to **Air Quality Table 4**.

The facility owner has stated that maximum impacts from the current permitted emission rates have been modeled as part of previous permit applications. The maximum modeled annual NO_2 impact from the facility under the current permit is 0.007 µg/m^3; about two-thirds of this impact is due to emissions from the boilers. If the contribution from the boilers is scaled up to reflect the increased allowable annual fuel use, the maximum annual projected NO_2 impacts would still round down to 0.0 ug/m^3. Therefore, the proposed boiler fuel usage increase will not change the facility's worst-case annual NO_2 impacts.

Currently permitted operations have a maximum modeled annual average PM10/PM2.5 impact of 0.03 µg/m^3 from all sources; almost all of this impact is due to emissions from the boilers. If the contribution from the boilers is scaled up as a result of the increased allowable annual fuel use, the maximum annual facility PM impacts would still round down to 0.0 ug/m^3. Therefore, the proposed boiler fuel usage increase will not change the facility's worst-case annual PM10 or PM2.5 impacts (ESH 2014).

The Energy Commission addressed the amount of fossil fuel that renewable facilities can use while still qualifying as a renewable facility.[3] The Renewable Energy Program applicant for each multifuel facility is required to provide their facility's monthly energy input for each fuel measured in British Thermal units (BTUs) by March 31 of each year to cover the prior calendar year.[4] Failure to report fuel use would mean that the electric utility purchasing renewable energy credits from the facility would not be able to receive these credits because Energy Commission staff would not be able to verify they are eligible for the Renewables Energy Program. These requirements define the allowable amount of natural gas that can be used at a qualifying renewable facility and are sufficient to ensure that the proposed facility would continue to qualify as a renewable facility. Since the individual units are subject to the RPS, staff believes that Condition of Certification **AQ-SC10** is no longer needed and proposes that it be removed rather than revised.

COMPLIANCE WITH APPLICABLE RULES AND REGULATIONS

This section discusses the applicability of the following air quality rules and regulations: federal Prevention of Significant Deterioration (PSD), New Source Performance Standards, Best Available Control Technology (BACT), and Offsets.

[3] The topic is discussed under the headings, "Measuring Renewable Energy Generation from Multifuel Facilities" and "*De Minimis* Quantity of Nonrenewable Fuels or Energy Resources" (CEC 2013b, p. 42 and p. 46).

[4] The topic is discussed under the heading, "Accounting for Nonrenewable Fuel Use" (CEC 2013b, p. 48 and 49).

Air Quality Table 9 shows the emissions rates that would trigger the need for air quality reviews. The proposed new potential emission levels would not trigger any of these requirements. The increase in allowable fuel use would be a modification under District rules. MDAQMD has stated: "[The District] agrees with the applicant's summary and conclusion regarding BACT; the Auxiliary Boilers, which are the boilers that will use the additional fuel allotment, were already BACT-compliant based on daily emissions that exceeded the 25 pound/day thresholds for criteria pollutants. Emissions from the Night-time Preservation Boilers will continue to not trigger BACT (MDAQMD 2014b)."

For PSD requirement applicability to the proposed changes, New Source Performance Standards and Offsets thresholds in **Air Quality Table 9** show that emissions for all pollutants would remain below their triggering thresholds if the petition is approved.

Air Quality Table 9
ISEGS Operation
Comparison of Maximum Emissions to Various Thresholds

Pollutant	Maximum Emissions			MDAQMD BACT Threshold Rule 1303 (Lb/Day)	Offset and Major Source Threshold Rule 1303(B) (Tons/Yr)	PSD Major Source Threshold (Tons/Yr)	Facility-Wide BACT Threshold (Tons/Yr)
	Auxiliary Boiler (Lb/Day, each)	Facility (permitted sources) (Tons/Yr)					
NOx	65	10.7		25	25	100	25
SOx	17	2.3		25	25	100	25
ROC	32	4.4		25	25	100	25
PM10	42	5.7		25	15	100	25
CO	110	16.0		N/A	100	100	N/A

SOURCE: ESH 2014

OPERATION IMPACTS

The facility owner revised the air pollution dispersion modeling to demonstrate that the proposed facility changes do not affect the conclusions in the previous analysis. Staff reviewed the adjusted maximum modeled impacts provided by the facility owner. Thus, staff believes the facility owner has provided conservative impacts analysis for the increase in fuel use.

Air Quality Table 10 compares annual impacts from the facility as permitted against impacts due to the proposed changes. The adjusted modeled annual impacts reflect the estimated impacts from increased annual fuel usage in the auxiliary boilers. Because the maximum annual impacts for all pollutants are less than 0.05 $\mu g/m^3$ these values have been round down to 0.0 $\mu g/m^3$ and are unchanged from the original air quality impact values.

Staff calculated new total impacts by adding the new facility incremental impacts to staff recommended background data from **Air Quality Table 4**. All of the total impacts are

below applicable state and federal AAQS except the 24-hour PM10 value. It should be noted that existing 24-hour average PM10 background concentrations already exceed the state AAQS. Any small increment of the PM10 impact is considered to be significant by staff under the California Environmental Quality Act (CEQA) and must be mitigated. Condition of Certification **AQ-SC6** in the Commission Decision is used to mitigate on-site maintenance vehicle emissions and Condition of Certification **AQ-SC7** is used to mitigate operating period fugitive dust emissions. Continued use of these conditions would ensure that the potential PM10 CEQA impacts are mitigated to be less than significant during the operation of the facility.

Air Quality Table 10[a]
ISEGS Operation Impacts

Pollutants	Avg. Period	Current Facility Impacts (µg/m^3)	Adjusted Maximum Modeled Impacts (µg/m^3)[b]	Background[c] (µg/m^3)	New Total Impacts (µg/m^3)	Standard (µg/m^3)	Percent of Standard
NO_2	1-hr	99.1	99.1	105	204	339	60%
	1-hr Federal[d]	25	25	80.8	105.8	188	56%
	Annual[e]	0.0	0.0	9.5	9.5	57	17%
PM10	24-hr	0.4	0.4	**137**	**137.4**	**50**	**274%**
	Annual[e]	0.0	0.0	13.1	13.1	20	65%
PM2.5	24-hr	0.4	0.4	12.5	13	35	37%
	Annual[e]	0.0	0.0	5.0	5	12	42%
CO	1-hr	80	80	5,060	5,140	23,000	22%
	8-hr	3.5	3.5	1,556	1,560	10,000	7%
SO_2	1-hr	3	3	96.1	99.1	665	15%
	24-hr	0.0	0.3	15.8	15.9	105	15%
	Annual[e]	0.0	0.0	2.7	2.7	80	3%

Source: ESH 2014, staff's independent analysis

Notes:

[a] Short-term impacts are from *ISEGS Application for Permit Amendment*, February 23, 2012. The District permit application was an attachment to the Petition to Amend (PTA) submitted to the Energy Commission in February, 2012. Short-term impacts are not affected by the PTA.

[b] Adjusted modeled annual impacts reflect the estimated impacts from increased annual fuel usage in the three auxiliary boilers. Because the maximum annual impacts for all pollutants are less than 0.05 µg/m^3, they round down to 0.0 µg/m^3 and are unchanged from original values.

[c] Energy Commission staff-recommended background values from **Air Quality Table 4**.

[d] Three-year average of 98th percentile of daily maximum 1-hour modeled facility impacts combined with staff-recommended background values from **Air Quality Table 4**.

[e] Current annual facility impacts are from modeling performed during evaluation of the February, 2012 PTA.

CUMULATIVE IMPACTS

The proposed amendment would not change any facility mitigation measures used to reduce potential air quality impacts from the facility to less-than-significant levels. All the air quality impacts would be lower than applicable federal and state AAQS except PM10. However, the background PM10 concentrations already exceed the state standard. The Stateline Solar Farm Project, a 300 MW solar photovoltaic project, was

approved by the Bureau of Land Management in a Record of Decision dated February 18, 2014 and was issued a Right of Way Grant on March 21, 2014. The Stateline site is located just east of ISEGS and construction could potentially cause cumulative PM10 impacts, although they are required to use mitigation measures very similar to those required for Energy Commission projects. As shown in **Air Quality Table 10**, operating impacts from ISEGS are only 0.4 µg/m^3 compared to a background value of 137 µg/m^3 and are considered less than significant whether or not the amendment request is granted. Thus, ISEGS is not expected to contribute significantly to PM10 concentrations with or without the current amendment request.

Staff expects no cumulative adverse impacts would occur as a result of the proposed changes to the ISEGS facility after implementation of the mitigation measures approved by the Commission Decision (CEC 2010b) and prior amendment Order No.12-0213-8 (CEC 2013a).

CONCLUSIONS AND RECOMMENDATIONS

The requested facility changes would comply with applicable federal, state, and MDAQMD air quality laws, ordinances, regulations, and standards. Compliance with all District Rules and Regulations was demonstrated to the District's satisfaction in the FDOC Revision E 06-16-14 (MDAQMD 2014b). The increase in potential emissions does not trigger any new regulatory requirements. The amended facility changes would not cause significant air quality impacts, provided that all conditions of certification from the original Commission Decision and preceding amendments continue to apply with the following revised conditions of certification as shown below.

PROPOSED MODIFICATIONS TO CONDITIONS OF CERTIFICATION

Below is a list of all conditions of certification, including those that must be revised from those in effect as of the Energy Commission Decision (CEC 2010b) and Energy Commission Order No. 12-0213-8 (CEC 2013a). Energy Commission staff recommends deleting Condition of Certification **AQ-SC10**. Changes to Condition of Certification **AQ-12** and **AQ-34** would be consistent with current MDAQMD permit conditions (MDAQMD 2014b). ~~Strikethrough~~ is used to indicate deleted language and **<u>underline and bold</u>** is used for new language.

~~**AQ-SC10** The ISEGS 1, ISEGS 2, and ISEGS 3 boilers shall not exceed a total annual natural gas fuel heat input that is more than 5 percent of the total annual heat input from the sun for ISEGS1, ISEGS2, and ISEGS 3, respectively.~~

~~Annual natural gas fuel heat input data and annual solar heat input data for the ISEGS 1, ISEGS 2, and ISEGS 3 units showing compliance with this condition shall be provided in the Annual Compliance Report (**COMPLIANCE-7**). The Annual Compliance Report shall include this data separately for ISEGS 1, ISEGS 2, and ISEGS 3.The initial Annual Compliance Report shall include documentation of the methodology used to~~

~~verify compliance with the Condition. The documentation shall include a heat balance diagram, engineering analysis, assumptions and supporting data.~~

DISTRICT CONDITIONS OF CERTIFICATION

Conditions applicable to Ivanpah 1, 2, and 3 (three (3)) auxiliary boilers, MDAQMD application numbers/permit numbers: 00009311 (B010375), 00009314 (B010376), and 00009320 (B010377), each consisting of**:**

Rentech D-type water tube boilers, each equipped with Todd-Coen Ultra Low-NOx Burners rated at a maximum heat input of 249 MMBTU/hr, and flue gas recirculation (FGR or EGR), fueled exclusively on utility grade natural gas. Equipment shall use 242,500 cu-ft/hr of fuel and provide 75,000 lb/hr of steam. Each boiler is equipped with a stack that is 130 feet high and 60 inches in diameter.

AQ-12 The combined fuel use from the auxiliary boilers and nighttime preservation boilers shall not exceed **525** ~~328~~ MMSCF of natural gas in any calendar year; combined fuel use is the sum total of natural gas combusted from Boilers with MDAQMD permit numbers B010375 and B011544 (Ivanpah 1), B010376 and B011572 (Ivanpah 2), B010377 and B011573 (Ivanpah 3).

Verification: During site inspection, the project owner shall make all records and reports available to the Mojave Desert Air Quality Management District, the Air Resources Board, the U.S. Environmental Protection Agency, or Energy Commission staff.

Conditions applicable to Ivanpah 1, 2, & 3 (three (3)) nighttime preservation boilers, MDAQMD application numbers/permit numbers: MD100000063 (B011544), MD100000064 (B011572), and MD100000065 (B011573), each consisting of:

Equipped with Low-NOx Burners rated at a maximum heat input of less than 10.0 MMBTU/hr, fueled exclusively on utility grade natural gas. Equipment shall use 9,730 cu-ft/hr of fuel and provide 5,000 lb/hr of steam.

AQ-34 The combined fuel use from the auxiliary boiler and the nighttime preservation boiler shall not exceed **525** ~~328~~ MMSCF of natural gas in any calendar year; combined fuel use is the sum total of natural gas combusted from Boilers with MDAQMD permit numbers; B010375 and B011544 (Ivanpah 1), B010376 and B011572 (Ivanpah 2), B010377 and B011573 (Ivanpah 3).

Verification: During site inspection, the project owner shall make all records and reports available to the District, ARB, U.S. EPA or Energy Commission staff.

REFERENCES

ARB 2014a—California Air Resources Board. Air Designation Maps. http://www.arb.ca.gov/desig/adm/adm.htm. Accessed April, 2014.

ARB 2014b—California Air Resources Board. California Ambient Air Quality Data Statistics. http://www.arb.ca.gov/adam/welcome.html. Accessed April, 2014.

BSE2007a—Bright Source Energy/ Solar Partners I, LLC/ J. Woolard (tn: 42174). Application for Certification, Volumes I and II, for the ISEGS Solar Electric Generating System. Dated August 8, 2007. Submitted to CEC/Docket Unit August 31, 2007.

CEC 2010a—California Energy Commission. Final Staff Assessment Addendum, Ivanpah Solar Electric Generating System (07-AFC-5). Dated March, 2010.

CEC 2010b—California Energy Commission. Ivanpah Solar Electric Generating System (07-AFC-5) Commission Decision. Dated September, 2010.

CEC 2013a—California Energy Commission (TN 699080).Order 12-0213-8, Approving Petition to Modify Air Quality Conditions of Certification for Ivanpah Solar Electric Generating System (07-AFC-5). Dated:February 13, 2013. Submitted to CEC on 3/13/13.

CEC 2013b—California Energy Commission. Renewables Portfolio Standard Eligibility, Commission Guidebook, Seventh Edition, (CEC-300-2013-005-ED7-CMF). Dated April, 2013.

ESH 2014—Ellison, Schneider & Harris L.L.P. (tn: 201928). Ivanpah Petition to Amend No. 4. Dated March 26, 2014.

MDAQMD 2014a—Mojave Desert Air Quality Management District. Ivanpah Solar Electric Generating System PDOC Amendment to Rev E 05-05-14. Dated May 5, 2014.

MDAQMD 2014b—Mojave Desert Air Quality Management District. Ivanpah Solar Electric Generating System FDOC Amendment to Rev E 06-16-14. Dated June 16, 2014.

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U.S. EPA 2012a—U.S. Environmental Protection Agency. The Green Book:Nonattainment Areas for Criteria Pollutants, http://www.epa.gov/oar/oaqps/greenbk/index.html. Accessed, 2012.

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IVANPAH SOLAR ELECTRIC GENERATING SYSTEM
(07-AFC-5C)
APPENDIX AIR-1
Petition to Amend Annual Boiler Fuel Use
GREENHOUSE GAS EMISSIONS
Jacquelyn Record

SUMMARY OF CONCLUSIONS

Staff concludes that the proposed changes to the Ivanpah Solar Electric Generating System (ISEGS or project) would increase greenhouse gas (GHG) emissions slightly but that continued operation of the facility would result in a net reduction in greenhouse gas (GHG) emissions across the electricity system, providing energy and capacity to California. Thus, staff concludes that the proposed changes would result in a cumulative overall reduction in GHG emissions from power plants, would not worsen current conditions, and would not result in impacts that are cumulatively significant under the California Environmental Quality Act (CEQA). As a solar facility, ISEGS would not be subject to the requirements of SB 1368 (Chapter 11, Greenhouse Gases Emission Performance Standard, Article 1, section 2900, et. seq.) or the recently proposed federal New Source Performance Standard (NSPS). Nonetheless, the ISEGS facility, even with an increase in annual fuel use by each of the three auxiliary boilers, would easily comply with the requirements of SB 1368 and the NSPS. The increased fuel use would cause an insignificant facility-wide increase in fuel use and GHG emissions.

INTRODUCTION

On March 26, 2014, the California Energy Commission (Energy Commission) received Petition to Amend from Solar Partners I, LLC; Solar Partners II, LLC; and Solar Partners VIII, LLC (Solar Partners) to modify the certification for Ivanpah Solar Electric Generating System (ISEGS), which was originally certified by the Energy Commission on September 22, 2010 (CEC 2010b), as three units that would generate a total of 370 megawatts (MW). Operations at the facility began in December, 2013. The facility owner reviewed the facility design and early operations and now petitions that it is necessary to change the original facility description to increase the allowable annual fuel use at each solar power plant unit. The amendment request would increase the allowable annual fuel use at each unit from 328 mmscf to 525 mmscf. In this amendment, staff evaluates the expected GHG emissions from the modified facility.

LAWS, ORDINANCES, REGULATIONS, AND STANDARDS COMPLIANCE

The proposed modifications result in slightly increased emissions of criteria pollutants (see Air Quality section) and GHGs. GHGs are known to contribute to the warming of the earth's atmosphere. These include primarily carbon dioxide (CO_2), nitrous oxide (N_2O, not NOx, which is commonly known as oxides of nitrogen), and methane (CH_4).

The facility would continue to be required to comply with any future GHG reductions or trading requirements imposed by the California Air Resources Board (ARB).

Greenhouse Gas Table 1 lists all currently applicable laws, ordinances, regulations, and standards (LORS) with regard to GHGs. The increased GHG emissions associated with this amendment request do not trigger Prevention of Significant Deterioration (PSD) requirements, as described below. However, the facility is required to report their GHG emissions to both the U. S. Environmental Protection Agency (U.S. EPA) and to ARB.

Greenhouse Gas Table 1
Laws, Ordinances, Regulations, and Standards (LORS)

Applicable Law or Regulation	Description
Federal	
40 Code of Federal Regulations (CFR) Parts 51, 52, 70, and 71	This rule "tailors" GHG emissions to prevention of significant deterioration (PSD) and Title V permitting applicability criteria.
40 Code of Federal Regulations (CFR) Parts 51 and 52	A new stationary source that emits more than 100,000 short tons per year (TPY) of greenhouse gases (GHGs) is considered to be a major stationary source subject to Prevention of Significant Determination (PSD) requirements. For permits issued on or after July 1, 2011, PSD applies to GHGs if the source is otherwise subject to PSD (for another regulated NSR pollutant), and the source has a GHG potential to emit (PTE) equal to or greater than 75,000 TPY CO_2e. The proposed facility modifications would be under the 75,000 TPY CO_2e threshold.
40 Code of Federal Regulations (CFR) Part 98	This rule requires mandatory reporting of GHG emissions for facilities that emit more than 25,000 metric tons of CO_2 equivalent emissions per year. This requirement applies to this facility.
State	
California Global Warming Solutions Act of 2006, AB 32 (Stats. 2006; Chapter 488; Health and Safety Code sections 38500, et seq.)	This act requires the California Air Resource Board (ARB) to enact requirements to reduce GHG emission to 1990 levels by 2020. Electricity production facilities are included. A cap-and-trade program became active in January 2012, with enforcement beginning in January, 2013. Cap-and-trade is expected to achieve approximately 20 percent of the GHG reductions expected under AB 32 by 2020.
California Code of Regulations, Title 17, Subchapter 10, Article 2, sections 95100, et. seq.	These ARB regulations implement mandatory GHG emissions reporting as part of the California Global Warming Solutions Act of 2006 (Stats. 2006; Chapter 488; Health and Safety Code sections 38500 et seq.) This requirement applies to this facility.
Local	
Prevention of Significant Deterioration for Greenhouse Gases (Mojave Desert Air Quality Management District does not have PSD delegation).	Presently the Mojave Desert Air Quality Management District (MDAQMD) does not have PSD delegation from the U. S. EPA; however, the thresholds referenced in the applicant's analysis are consistent with U. S. EPA PSD threshold's and are also consistent with other air districts that presently have PSD delegation. ISEGS would not be a major stationary source, PSD review does not apply to the proposed modified facility.

ISEGS, as a GHG cap-and-trade participant, is consistent with California's landmark Global Warming Solutions Act (AB 32), which is a state-wide program to reduce GHGs to their 1990 levels by 2020 and beyond. Market participants such as ISEGS are required to report their GHG emissions and to obtain GHG emissions allowances (and offsets) for those reported emissions, by purchasing allowances from the capped market and offsets from outside the AB 32 program.

ANALYSIS

Greenhouse Gas Table 2 compares the GHG emissions as permitted in the Energy Commission Order 12-0213-8 approving the ISEGS Petition to Modify Air Quality Conditions of Certification (CEC 2013) and new GHG emissions based on the proposed changes (ESH 2014).

Solar Partners requests an increase in annual fuel use in the nighttime preservation and auxiliary boiler for each of the three units, from 328 mmscf/yr to 525 mmscf/yr. The basis for requested additional fuel use is the list of operating scenarios in **Air Quality Table 7**. GHG emissions from all other sources besides the boilers, which are listed in the **Greenhouse Gas Table 2**, remain the same. The requested increase in fuel use would lead to estimated GHG emissions from each unit's stationary sources increasing from 23,734 metric tonnes carbon dioxide equivalent ($MTCO_2e$) to approximately 28,774 $MTCO_2E$ per year per unit, excluding vehicle emissions. Expressed in English units, this constitutes an increase from 26,162 short tons per year (TPY) to 31,718 short TPY of carbon dioxide-equivalent (CO_2e) emissions per unit. Facility level stationary source annual CO_2 emissions would increase from 71,202 $MTCO_2E$ to 86,322 $MTCO_2E$. In English units, facility-level stationary source, annual CO_2 emissions (excluding vehicle emissions) would increase from 78,487 short TPY to 95,154 short TPY. For PSD purposes, staff excluded vehicle emissions since those emissions are not required as part of the PSD permitting process for determining whether or not a project would trigger PSD review. (See the PSD subsection of this analysis for the applicability of PSD requirements to this project.)

The facility GHG emission rate with all stationary sources and vehicle-related emissions would be 0.034 $MTCO_2E/MWh$ from the proposed project changes instead of the permitted level of 0.028 $MTCO_2E/MWh$. As a solar project with a nightly shutdown that would operate at a less than 60 percent capacity factor, ISEGS is not subject to the requirements of SB 1368. Nonetheless, the ISEGS facility would easily comply with the requirements of SB 1368 emission performance standards (EPS) of 0.5 $MTCO_2/MWh$, if it applied. It should be noted in **Greenhouse Gas Table 2** that the results are reported in carbon dioxide-equivalents, although the GHG Emissions Performance Standard is for carbon dioxide only. Staff notes that generally carbon dioxide is the largest contributor to a power plant's CO_2E, therefore CO_2E in the table is fairly representative of CO_2 emissions from this project. Similarly, the federal NSPS, which is more restrictive for a larger facility, is equivalent to 0.454 $MTCO_2$ per MWh. The rule is currently in draft form and undergoing public comments. Although ISEGS would not be subject to the

NSPS rule for GHG emissions, for comparison purposes, even with the increased fuel use, ISEGS would be well below the NSPS standard at 0.454 $MTCO_2$ per MWh.

Greenhouse Gas Table 2
ISEGS Operating Greenhouse Gas Emissions
(Per Power Plant Unit)

	Permitted CO_2-Equivalent ($MTCO_2E$ per Year)	**New CO_2-Equivalent ($MTCO_2E$ per Year)**
Boilers	23,549	28,589
Emergency Generator Engines (no change)	166	166
Fire Pump Engines (no change)	19	19
Stationary Sources Total GHG Emissions (PSD)—$MTCO_2E$	**23,734**	**28,774**
Maintenance Vehicles (no change)	385	385
Worker Vehicles (no change)	1,118	1,118
Delivery and Waste Haul Vehicles (no change)	22	22
Equipment Leakage (SF_6) (no change)	10	10
Stationary Sources and All Vehicle Total GHG Emissions—$MTCO_2E$	**25,269**	**30,309**
Facility MWh per year (no change)	888,000	888,000
Permitted Sources and All Vehicle GHG Emission Rate ($MTCO_2E$/MWh)[a]	0.028[b]	0.034[b]

Notes:

[a] This result is reported in carbon dioxide-equivalents although the GHG Emissions Performance Standard is for carbon dioxide, which would be slightly lower. However, staff did not have the information needed to report only the carbon dioxide portion, and the reported value is well below this limit.

[b] Emission rate includes all sources of GHGs including vehicle-related GHG emissions.

PSD FOR GREENHOUSE GASES

Presently the Mohave Desert Air Quality Management District (MDAQMD) does not have PSD delegation from the U.S. EPA; however, the thresholds referenced in the applicant's analysis are consistent with U.S. EPA's PSD thresholds and are also consistent with other air districts that presently do have PSD delegation. ISEGS would not be considered a major stationary source subject to PSD review. The proposed modification would not have an increase in GHG emissions of greater than 75,000 TPY CO_2e, nor would the project exceed 100,000 TPY of GHG emissions for all stationary sources threshold. Furthermore, on June 23, 2014, the United States Supreme Court issued a decision rendering the "Tailoring Provision" invalid. GHG emissions *are not* subject to PSD as part of the permit modification review.

CUMULATIVE IMPACTS

The cumulative impacts of the facility were evaluated in the October, 2009 Final Staff Assessment (FSA) (CEC 2009). While ISEGS would emit some GHG emissions and the

requested changes would increase these emissions somewhat, ISEGS's contribution to the system build-out of renewable resources in California would result in a net cumulative reduction of GHG emissions from new and existing fossil fuel resources.

The facility is already required to report annual GHG emissions to both the U. S. EPA and to ARB. ARB's cap-and-trade requirements also apply to facilities whose emissions equal or exceed 25,000 metric tonnes of carbon dioxide equivalents ($MTCO_2e$) and these requirements already apply to this facility. Thus, the facility will continue to be required to acquire GHG emissions allowances and offsets to comply with the requirements of the Global Warming Solutions Act. Due to this requirement, the facility is part of a programmatic approach to meeting GHG reduction requirements. Thus, staff believes that the modified facility with improved reliability would result in a cumulative overall reduction in GHG emissions from power plants, does not worsen current conditions, and would not result in impacts that are cumulatively significant.

CONCLUSIONS AND RECOMMENDATIONS

The requested project changes would comply with applicable federal, state, and local air quality laws, ordinances, regulations, and standards related to greenhouse gas emissions. ISEGS is required to participate in California's GHG cap-and-trade program. This cap-and-trade program is part of a broad effort by the State of California to reduce GHG emissions as required by AB 32. The facility owner will continue to be required to report annual GHG emissions. Federal mandatory GHG reporting requirements would apply only to stationary emissions sources.

The ISEGS proposed modification would emit an increased amount of GHG emissions, on a per unit basis, of around 5,040 $MTCO_2E$ per year, which is equivalent to an increase of 5,555 short TPY. Staff concludes that the increased use of natural gas will improve the facility's reliability and availability and is necessary to compensate for the effects of unanticipated circumstantial factors, including:

- Intermittent cloud cover (to maintain peak power production and prevent the steam turbine from tripping off-line);
- End of day (to stabilize and support steam turbine production, particularity during the peak summer period); and
- As daily solar insolation declines (to maximize the use of available solar energy).

The requested modification would have GHG impacts that would be less than significant.

As a solar project, ISEGS is not subject to the requirements of SB 1368 EPS or the proposed federal NSPS. Nonetheless, the ISEGS project would easily comply with the requirements of SB 1368 EPS of 0.5 $MTCO_2$/MWh, and the NSPS of 0.454 $MTCO_2$/MWh, if either applied.

PROPOSED MODIFICATIONS TO CONDITIONS OF CERTIFICATION

No conditions of certification related to greenhouse gas emissions are in the Commission Decision. Solar Partners would have to comply with any future applicable GHG regulations formulated by the ARB, such as GHG reporting or emissions cap and trade markets.

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