DOCKETED	
Docket Number:	08-AFC-13
Project Title:	Calico Solar Project
TN #:	233591-1
Document Title:	CALLICO SSA PART 1a
Description:	Document was on proceeding webpage and is now moved over to the docket log. All replaces TN 58519.
Filer:	Cenne Jackson
Organization:	California Energy Commission
Submitter Role:	Commission Staff
Submission Date:	6/22/2020 12:47:09 PM
Docketed Date:	6/22/2020

CALICO SOLAR POWER PROJECT

Supplemental Staff Assessment Addendum

SEPTEMBER 2010

CALIFORNIA
ENERGY COMMISSION
Arnold Schwarzenegger, Governor

DOCKET NUMBER 08-AFC-13

CALIFORNIA
ENERGY COMMISSION
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http://www.energy.ca.gov/sitingcases/calicosolar/index.html

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CALICO SOLAR PROJECT

SUPPLEMENTAL STAFF ASSESSMENT ADDENDUM

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A – INTRODUCTION

Christopher Meyer

INTRODUCTION

The purpose of this Supplemental Staff Assessment (SSA) Addendum is to analyze impacts of the construction and operation of two reduced acreage alternatives to the Calico Solar Project, a proposed solar thermal electricity generation facility located public lands managed by the Bureau of Land Management (BLM) in San Bernardino County, California. This document does not replace the SSA or any of the errata to the SSA, but instead provides additional analysis of the new reduced acreage scenarios filed by the applicant on September 10, 2010.

When considering an energy project for licensing, the Energy Commission is the lead state agency for evaluating environmental impacts of a proposed licensing action under the California Environmental Quality Act (CEQA). The SSA, errata to the SSA, and this SSA Addendum are the result of the Energy Commission staff's environmental evaluation process, and are functionally equivalent to the preparation of an Environmental Impact Report (EIR).

Because the proposed project is located on public lands managed by the BLM, BLM is the lead federal agency for evaluating environmental impacts of the proposed right-of-way grant under the National Environmental Policy Act (NEPA). The FEIS is the BLM's environmental evaluation of the potential impacts that could result from the authorization of the requested right-of-way.

When the applicant filed separate applications with the Energy Commission and the BLM to obtain separate approvals to develop the project, it was deemed to be in the interest of both agencies and the public to share in the preparation of a joint environmental analysis of the proposed project to avoid duplication of staff efforts, to share staff expertise and information, to promote intergovernmental coordination at the local, state, and federal levels, and to facilitate public review by providing a joint SA/DEIS and a more efficient environmental review process. The Energy Commission and the BLM have been jointly conducting the state and federal environmental review for the Calico Solar Project and released a joint SA/DEIS; however, the two agencies determined that it was necessary to produce separate, but coordinated, final environmental reviews and decision documents.

This SSA Addendum is a staff document. It is neither a document of the California Energy Commission Siting Committee, nor a draft decision by the Siting Committee.

The analyses contained in this SSA Addendum are updated from the SSA and based upon additional information from the applicant, parties and the public, as well as information received at the September 9, 2010 staff workshop. The SSA Addendum presents conclusions about potential environmental impacts and conformity with LORS, as well as any changes to the previously proposed conditions of certification/mitigation measures that apply to the design, construction, operation, and closure of the facility. Each proposed change to a condition of certification/mitigation measure is followed by a proposed means of verification that the condition has been met.

BACKGROUND

Calico Solar, LLC's business model includes the development and deployment of the Stirling solar dish systems (referred to as SunCatchers) technology. It has formed the limited liability corporation Calico Solar (referred to as applicant or Calico Solar, LLC hereafter) for the purposes of filing ROW applications with the BLM for the use of public land and for filing an AFC with the Energy Commission. Calico Solar, LLC has executed Power Purchase Agreements and interconnection agreements with Southern California Edison (SCE) to deliver renewable energy to the California market.

Although the applicant originally applied for a ROW grant from the BLM to construct the Calico Solar Project on 8,230 acres of public land managed by the BLM, a review of the environmental impacts identified in the SA/DEIS prompted the resource and regulatory agencies to require a 4,000 foot buffer between the base of the Cady Mountains and the northern boundary of the project. This change reduced the proposed project to 6,215 aces, however the project would still use approximately 32 acre feet of water per year, produce a nominal 850 MW of electricity, and operate for a term of 40 years. Calico Solar, LLC has also filed an AFC with the Energy Commission. Under California law, the Energy Commission has regulatory authority for licensing applications for thermal power generating facilities 50 MW or greater in size.

On September 3, 2010, the presiding Committee issued an order directing further review of reduced footprint alternatives that minimize the proposed projects impacts to environmental resources, primarily the desert tortoise. The applicant filed six reduced acreage scenarios on September 8, 2010 for discussion at the September 9th staff workshop. As a result of the discussion at the September 9, 2010 staff workshop, the applicant modified scenario 5 into what has subsequently been referred to as reduced acreage scenario 5.5.

ORGANIZATION OF THE DOCUMENT

The SAA Addendum begins with an Executive Summary, Introduction, and Proposed Project Description (describing the new reduced acreage scenarios). The environmental, engineering, and public health and safety analyses of the proposed reduced acreage scenarios are contained in 20 separate chapters. They include the following: Air Quality, Biological Resources, Cultural Resources and Native American Values, Hazardous Materials Management, Land Use Recreation and Wilderness, Noise and Vibration, Public Health and Safety, Socioeconomics and Environmental Justice, Soil and Water Resources, Traffic and Transportation, Transmission Line Safety and Nuisance, Visual Resources, Waste Management, Worker Safety and Fire Protection, Geology Soils and Paleontological and Mineral Resources, Geologic Stability, Facility Design, Power Plant Efficiency, Power Plant Reliability, and Transmission System Engineering. These chapters are followed by the general project conditions.

As stated above, the technical discussion is limited to changes in staff's analysis and/or conclusions based on the new reduced acreage alternatives and any background from the SSA necessary to provide clarity to staff's conclusions in this SSA Addendum.

B. DESCRIPTION OF THE PROPOSED PROJECT AND ALTERNATIVES

B.1 – PROPOSED PROJECT

B.1.1 INTRODUCTION

On December 2, 2008, Stirling Engine Systems Solar One, LLC, (SES Solar Three, LLC and SES Solar Six, LLC) submitted an Application for Certification (AFC) to the California Energy Commission to construct and operate the Stirling Energy Systems Solar One Project (SES Solar One) on public land managed by the Bureau of Land Management (BLM) in San Bernardino County, California. On May 6, 2009, the Energy Commission accepted the AFC as complete. In January 2010, the project formally changed its name to the Calico Solar Project. The applicant, SES Solar Three, LLC, was merged into SES Solar Six, LLC, and that surviving entity was re-named Calico Solar, LLC. Calico Solar is a subsidiary of Tessera Solar™. The applicant's development plans have been updated several times since filing its original right-of-way (ROW) application with the BLM and/or AFC applications with the Energy Commission. The most substantial revisions are summarized as follows in the **Project Description Table 1**.

Project Description Table 1
Summary of Applicant's Updates to the Calico Solar Development Plans

Posted Date	Reference Document	Revisions to Proposed Project
07/21/2009	Data Response #49-70, 74-45, 80, 82-84, 86-91	Additional information regarding evaporation pond design.
08/25/2009	Data Response #113-127	Removes Satellite Services Complex from project scope
09/03/2009	Data Response #1-48, 81, 109-112	Reduction in Project roads, vehicle type changes, fuel type changes, revisions to construction practices, sequencing and schedule, revision to placement of support facilities, vehicle travel pattern changes
12/01/2009	Data Response #71-73, 76-79, 85, 128-141	Removal of access road alternative options 2 through 4 as discussed in the AFC; hydrogen gas to be produced on site and brought to SunCatchers via a distributed system.
12/16/2009		Updated project map
01/11/2010	Submittal	CAISO reports
01/12/2010	Submittal	Geotechnical engineering report
01/28/2010		Change of project name and applicant name
02/08/2010	Supplemental Analysis for the AFC	Cadiz Water provided as primary water source for the Project
02/17/2010	Applicant's Drainage Layout Figure	Drainage layout figure and project layout figure

Posted Date	Reference Document	Revisions to Proposed Project
02/26/2010	Applicant's Drainage Layout Figure	Drainage layout figure; depicts Project phases and other layout changes resulting from agency and public input
05/14/2010	Applicant's Supplement to the AFC	Change water source for the project from BNSF Cadiz wells to water from the Lavic Groundwater Basin adjacent to the project site.
05/14/2010	Applicant's Supplement to the AFC	Modification of project boundary to 7,130 acres to reduce impacts to biological resources.
05/14/2010	Applicant's Supplement to the AFC	Increase of on-site hydrogen storage and request to analyze both centralized and distributed systems for approval.
06/02/2010	Applicant's Alternative Site Layout #2	Modification of project boundary to 6,215 acres to reduce impacts to biological resources

B.1.2 PROJECT LOCATION

The Calico Solar Project site is proposed to be located on public land managed by the BLM. The proposed project site is approximately 37 miles east of Barstow, California, 17 miles east of Newberry Springs, 57 miles northeast of Victorville, and approximately 115 miles east of Los Angeles (straight line distances). The following sections or portions of sections in Townships 8 and 9 North, Ranges 5 and 6 East of the San Bernardino Meridian identify the project site and the planned boundary for development of the Calico Solar Project (see **Project Description Figure 1**).

The project is proposed for development in two phases. Phase I is located on approximately 2,327 acres. Phase II is located on approximately 3,888 additional acres. The total area required for both phases is approximately 6,215 acres. The site was reduced from the 8,230 acres project originally proposed to avoid impacts to environmental impacts identified by the Renewable Energy Action Team agencies.

PHASE ONE

Within Township 8 North, Range 5 East:

- the portion of the northeast quarter section of Section 11 north of the railroad ROW, and
- the portion of Section 12 north of the railroad ROW, and
- the southern one-half of the southeastern quarter of Section 2.

Within Township 8 North, Range 6 East:

- a portion of the north half of the north half of northwest quarter of Section 4,
- a portion of the south half of the south half of the southwest quarter, a portion of the north half of the north half of the northeast quarter, and a portion of the northwest quarter of the northwest quarter of the northwest quarter of Section 5,

- a portion of the south half of the south half and a portion of the north half of the north half of Section 6,
- the portion of Section 7 north of the railroad ROW,
- all of the portion of Section 8 west of the SCE Transmission ROW, except for a portion of the north half of the north half of the northeast quarter of Section 8,
- the portion of Section 9 west of the SCE Transmission ROW, except for a portion of the north half of the north half of the northwest quarter of Section 9,
- the portion of Section 17 west of the SCE Transmission ROW and north of the railroad ROW, and
- the portion of Section 18 north of the railroad ROW,

Within Township 9 North, Range 6 East:

- the southern half of Section 32

PHASE 2 (BLM ADMINISTERED LAND)

Within Township 8 North, Range 5 East:

- eastern half of Section 2, excluding the southern one-half of the southeastern quarter of Section 2,
- the south half of Section 10 and that portion of the northeast quarter lying southerly of the southerly BNSF right of way,
- the portion of the northwest quarter of Section 14 lying north of the Interstate 40 ROW and west of the east half of the east half of the east half of the northwest quarter of Section 14 along with the northeast quarter of the northeast quarter of the northeast quarter of Section 14 and the east half of the northwest quarter of the northeast quarter of the northeast quarter of Section 14,
- the north one-half and the east one-half of Section 8 lying northerly of the northerly right of way line for the Mojave Pipeline Company, and the southerly of the southerly right of way line for BNSF railroad,
- of the portion of Section 11 lying south of the southerly right of way of BNSF railroad, except for the east half of the southwest quarter of the northwest quarter, the west half of the southeast quarter of the northwest quarter, the east half of the southeast quarter of the southeast quarter of the southwest quarter, the south half of the southwest quarter of the southeast quarter and the west half of the southwest quarter of the southeast quarter of the southeast quarter,
- the portion of Section 12 south of the railroad ROW, and
- the portion of Section 15 north of the I-40 ROW.

Within Township 8 North, Range 6 East:

- the west half of Section 4, west of the SCE Transmission ROW, except for a portion of the north half of the north half of the northwest quarter,

- all of Section 5 except a portion of the south half of the south half of the southwest quarter, a portion of the north half of the north half of the northeast quarter, and a portion of the northwest quarter of the northwest quarter of the northwest quarter of Section 5,
- All of Section 6, except a portion of the south half of the south half of the southwest and southeast quarters of Section 6,
- the portion of Section 7 south of the BNSF ROW, and
- the portions of Section 18 west of the SCE Transmission ROW, south of the BNSF ROW and north of the I-40 ROW, except a portion of the southwest quarter of the northwest quarter of Section 18.

Within Township 9 North, Range 5 East:

- the southeast quarter section of Section 35

The proposed Calico Solar Project also includes a new 230-kilovolt (kV) Calico Solar Substation, 2.0 miles of electrical transmission line, an administration building, maintenance complex, onsite routes interior to the project boundaries, a site access road and bridge over the Burlington Northern Santa Fe railroad tracks. Approximately 739 feet of the 2-miles of single-circuit, 230-kV generation interconnection transmission line would be constructed off the project site but still on BLM managed land. The transmission line would connect the proposed Calico Solar Substation to the existing Southern California Edison (SCE) Pisgah Substation. The main access for traffic to the project site during construction will be from Interstate 40 (I-40) to the project entrance on Hector Road through an existing at-grade crossing of the Burlington Northern Santa Fe (BNSF) Railroad tracks. This at-grade crossing will be used during the initial phases of construction until a bridge is constructed that will span the railroad. Traffic will exit the project site at Hector Road and the existing Hector Road crossing during the initial phases of construction. Once the bridge is completed, all traffic will use the bridge for ingress egress (see **Project Description Figure 2**).

B.1.3 PROCESS DESCRIPTION

The SunCatcher™ is a 25-kilowatt-electrical (kW) solar dish Stirling system designed to automatically track the sun and collect and focus solar energy onto a power conversion unit (PCU), which generates electricity. The system consists of an approximately 40-foot-high and 38-foot in diameter solar concentrator in a dish structure that supports an array of curved glass mirror facets. These mirrors collect and concentrate solar energy onto the solar receiver of the PCU (see **Project Description Figure 3**).

The PCU converts the focused solar thermal energy into grid-quality electricity. The conversion process in the PCU involves a closed-cycle, 4-cylinder, 35-horsepower reciprocating Stirling Engine utilizing an internal working fluid of hydrogen gas that is recycled through the engine. The Stirling Engine operates with heat input from the sun that is focused by the SunCatcher's dish assembly mirrors onto the PCU's solar receiver tubes, which contain hydrogen gas. The PCU solar receiver is an external heat exchanger that absorbs the incoming solar thermal energy. This heats and pressurizes the hydrogen gas in the heat exchanger tubing, his gas in turn powers the Stirling Engine.

A generator is connected to the Stirling Engine; this generator produces the electrical output of the SunCatcher. Each generator is capable of producing 25 kW at 575 volts alternating current (VAC)/60 hertz (Hz) of grid-quality electricity when operating with rated solar input. Waste heat from the engine is transferred to the ambient air via a radiator system similar to those used in automobiles.

The hydrogen gas is cooled by a standard glycol-water radiator system and is continually recycled within the engine during the power cycle. The conversion process does not consume water. The only water consumed by the SunCatcher is for washing of the mirrors to remove accumulated dust and replenishing small losses to the cooling system radiator in a 50-50 ethylene glycol-water coolant.

B.1.3.1 SUNCATCHER COMPONENTS

This section provides an overview of the three major SunCatcher components: the foundation/pedestal, the dish assembly, and the PCU.

Foundation/Pedestal

The solar dish would typically be mounted on a foundation consisting of a metal pipe that is hydraulically driven into the ground. This foundation is preferred because no concrete is required, no spoils are generated, and the foundations can be completely removed when the project is decommissioned. When conditions are not conducive to the use of the metal pipe foundation, the foundation would consist of rebar-reinforced concrete constructed below grade. Both of these foundation designs meet all applicable structural design requirements and applicable LORS.

The SunCatcher pedestal on which the SunCatcher Dish Assembly would be secured is approximately 18 feet 6 inches in height and would be an integrated part of the metal pipe foundation or would be a separate structure fastened to the rebar-reinforced concrete foundation at ground level.

Dish Assembly

The SunCatcher Dish Assembly would be fitted with a trunnion that attaches to the pedestal. Each Dish Assembly would consist of a 38-foot in diameter, 40-foot high steel structure that supported an array of curved glass mirror facets. These mirrors would form a curved shape engineered to concentrate solar energy onto the solar receiver portion of the PCU. The Dish Assembly includes azimuth and elevation drives for tracking the sun and a PCU support boom.

The SunCatcher Dish Positioning Control System employs proprietary algorithms to track the sun. This system focuses the solar energy onto the solar receiver by controlling elevation and azimuth drives, and executes startup, shutdown, and de-track procedures. These procedures allow the dish to “wake up” from the night-stow position in the morning to focus the dish mirror facets on the solar receiver of the PCU, and then to track the sun during the daylight operating time of the project. The dish control system also communicates with and receives instructions from the central control room via the Supervisory Control and Data Acquisition (SCADA) system. The system is designed to place the dish into a “wind stow” position when sustained winds exceed 35 miles per hour to protect the system from wind damage. The system also places the dish into

"wind stow" position on loss of communications with the central control room or on receipt of a fault signal from the PCU control system.

Power Conversion Unit

The SunCatcher PCU converts the solar energy into grid-quality electricity. Hydrogen gas is used in a closed-cycle heating/expansion – cooling/compression cycle to drive a high-efficiency, 380-cubic-centimeter displacement, 4-cylinder reciprocating Solar Stirling Engine. The Stirling Engine powers an electrical generator that produces 25 kWe net output after accounting for on-board parasitic loads at 575-volt alternating current, 60 Hz of grid-quality electricity. The PCU attaches to the end of the PCU boom.

The dimensions of the PCU are approximately 88 inches (7 feet) long by 63 inches (5 feet) wide by 37 inches (3 feet) high. The PCU weighs approximately 1,400 pounds.

The PCU consists of six subsystems: solar receiver, Stirling Engine, generator, cooling system, gas management system, and the PCU control system. Each subsystem is described below.

- **Solar Receiver:** The SunCatcher solar receiver consists of an insulated cavity with an aperture that allows the solar energy to enter. Within the cavity are 4 heater heads. Each heater head forms a tube network for one quadrant of the engine. The solar flux, radiant energy from the sun, heats the metal tubes and the heat is then transferred through the tubes to the working hydrogen gas. The heat absorbed at the solar receiver drives the Solar Stirling Engine.
- **Solar Stirling Engine:** The kinematic Stirling Engine has evolved from a Kockums kinematic Stirling Engine design. The Kockums kinematic Stirling Engine is used as a propulsion source for submarines and is highly reliable, low maintenance, and highly efficient. SES has further developed and improved the engine design specifically for use in the SunCatcher.
- **Generator:** A generator is connected to the Stirling Engine to produce the electrical output of the SunCatcher. The PCU generator attached to each Solar Stirling Engine is capable of producing up to 25 kW at 575 VAC, 60 Hz of grid-quality electricity when operating with a solar input of between 250 and 1,000 W/m^2. The generator output is connected to the power collection system.
- **Cooling System:** Waste heat from the hydrogen gas within the engine is transferred to the ambient air via a radiator system similar to the type used in automobiles. The SunCatcher cooling system is made up of ethylene glycol fluid, a cooler in the gas circuit, a radiator, a fluid circulation pump, and a cooling fan. The cooling fan and circulation pump are driven by electric motors.

  The system is used to cool the hydrogen gas before the compression portion of the cycle. The pump circulates the cooling fluid through the gas cooler and radiator. Waste heat from the hydrogen gas is transferred to the ethylene-glycol fluid in the cooler. The coolant is then pumped through the radiator where the fan forces ambient air over the cooling fins to remove heat. The heat is transferred to the atmosphere via the airflow over the radiator.

- **Gas Management System:** The gas management system controls the working pressure to ensure high efficiencies. The hydrogen gas is contained within a closed and sealed cycle, yet a very small amount of the hydrogen working fluid does leak (less than 200 cubic feet per dish per year) by the rod seals and is lost to the atmosphere. As a result, an on-site distributed hydrogen system has been proposed to replenish hydrogen lost to the atmosphere.
- **Control System:** The SunCatcher PCU control system monitors, controls, and communicates PCU performance. Thermal detectors are monitored by the PCU control system and the data are used to control the thermal balancing of the PCU. Alarms and faults monitored by the PCU control system are communicated to the Dish Positioning Control System and the Project SCADA system.

B.1.4 PROJECT DESCRIPTION

The proposed Calico Solar Project would be a nominal 850-megawatt (MW) Solar Stirling Engine project. The project is proposed for development in two phases. Phase I includes 11,000 SunCatchers located on approximately 2,327 acres to produce 275 MW. Phase II would include an additional 23,000 SunCatchers on an additional approximately 3,888 acres to produce an additional 575 MW for the total 850 MW planned production. The total area required for both phases, including the area for the operation and administration building, the maintenance building, and the substation building, is approximately 6,215 acres.

Construction is planned to begin in late 2010. Although construction would take approximately 44 months to complete, power would be available to the grid as each 60-unit group of SunCatchers is completed. The project includes construction of an on-site 230-kV Calico Substation near the center of the project area, and a 230-kV transmission line from the Calico Substation that would run southeast parallel to the north side of the BNSF railroad ROW inside the project area, then cross the railroad right of way (ROW) to run southwest and parallel the SCE transmission lines to the existing SCE Pisgah Substation.

The primary equipment for the generating facility would include approximately 34,000 SunCatchers, their associated equipment and systems, and their support infrastructure. The project site covers 6,215 acres and is located on public land managed by the BLM. No private lands are located within the 6,215 acres under BLM application.

The applicant has applied for a right-of-way (ROW) grant for the project site from the BLM Barstow Field Office. Although the project is phased, it is being analyzed in this SSA as if all phases would be operational at the same time.

B.1.4.1 PROJECT SITE ARRANGEMENT

The basic building blocks for the project are 1.5-MW solar groups consisting of 60 SunCatchers. The 1.5-MW groups would be connected in series to create 3-, 6-, and 9-MW solar groups. The 3-, 6-, and 9-MW groups would be connected to overhead collection lines rated at 48 MW or 51 MW. The typical solar groups would be arranged as necessary to fit the contours of the site.

The entire project would be fenced for security, however the design of the fencing is being determined in coordination with regulatory and resource agencies to protect sensitive ecological areas and address storm flows in washes. The project would have a laydown area on 14 acres adjacent to the Main Services Complex.

During project construction and operation, the main access to the project site would be from the south, off of Interstate 40 from the Hector Road exit. The applicant proposed the development of the following roadways on the project site: approximately 25.2 miles of surface-treated roadways, approximately 168 miles of north-south access routes, and approximately 102 miles of east-west access routes. The access routes would be surface-treated to reduce fugitive dust while allowing full access to all dishes and infrastructure. Polymeric stabilizers will be used in lieu of traditional road construction materials for paved roads and/or to stabilize unpaved roads. All access to the project site would be through controlled gates.

B.1.4.2 SOLAR POWER PLANT EQUIPMENT AND FACILITIES

Project Description Table 2, Significant Structures and Equipment, lists the major equipment and significant structures required for the Calico Solar Project.

Project Description Table 2
Significant Structures and Equipment

Description	Quantity	Length (feet)	Width (feet)	Height (feet)
SunCatcher power generating system	34,000	38 diameter		40
Main Services Complex administration building	1	60	70	17
Main Services Complex maintenance building	1	70	70	17
Main SunCatcher assembly buildings	3	1,000	100	78
Well water storage tank and Fire Water 230,000 gallons	1	40 diameter		20
Demineralized water tank, 17,000 gallons	2	18 diameter		10
Potable Water Tank, 5,000 gallons	1	40 diameter		20
230kV transmission line towers, double-circuit with upswept arms	12 to 15	--	32	90 to 110
Generator collection sub-panel; distribution panel, 42 circuit, 400A, 600V, with circuit breakers in a weatherproof enclosure	2,834	1	2.67	5
Generator collection power center, 2,000-A distribution panels with six 400-A circuit breakers	567	2	3.33	7.5
Collector group generator step-up unit transformer (GSU), 1,750kVA, 575 V to 34.5kV, with taps	567	6.67	7.5	6.67
Power factor correction capacitor, 600V, 1,000kVAR, switched in five, each 200kVAR steps	567	2.5	6.67	7.5
Open bus switch rack, 35kV, 7 bay with five 35kV, 1,200-A, 40kVA INT, circuit breakers, insulators, switches, and bus work	6	105	20	30
Shunt capacitor bank, 34.5kV, 90 MVAR switched in six each 15 MVAR steps	6	15	8	20
Dynamic VAR (DVAR) compensation system in coordination with shunt capacitor banks – size to be determined by studies	1	60	12	16
Disconnect switch, 35kV, 3,000 A, 200kV BIL, group-operated	6	3	11	16
Power transformer, three phase, 100/133/167 mega volt amp, 230/132.8-34.5/19.9kV, 750kV BIL, oil filled	6	15	35	23
Power circuit breaker, 242kV, 2000A, 40 kilo amp interrupting capacity	7	12	20	16
Coupling capacitor voltage transformer for metering, 242kV, 900kV BIL, 60 Hertz, Potential Transformer ratio 1,200/2,000:1	6	1	1	25
Disconnect switch, 242kV, 2000A	9	10	25	25

Source: Calico Solar, LLC

Notes: A = ampere (amp), BIL = basic impulse level, gpd = gallons per day, HP = horsepower, Hz = hertz, INT = international, kA = kilo amps kV = kilovolt, kVA = kilovolt amps, Kvar = kilovolt amp reactive, kW = kilowatt, kWe = kilowatt-electric, MVA = megavolt amps MVAR = megavolt amp reactive MW = megawatts, V = volts, VAR = volt amp reactive W = watts

B.1.4.3 SITE GRADING AND DRAINAGE

The original layout for the Calico Solar Project site was based on avoiding major washes and minimizing surface-disturbing activities. Following the completion of the 30% engineering in April 2009, the applicant determined that it would be necessary to place some SunCatcher units in washes to attain the proposed 850 MW yield.

Brush trimming would be conducted between alternating rows and would consist of cutting the top of the existing brush while leaving the existing native plant root system in place to minimize soil erosion. To minimize shading on SunCatchers and prevent potential brush fire hazards, natural vegetation trimmings would be cleared in the area of each SunCatcher as well as on either side of the surface-treated arterial roadways.

After brush has been trimmed, blading for roadways and foundations would be conducted between alternating rows to provide access to individual SunCatchers. Blading would consist of limited removal of terrain undulations. Although ground disturbance would be minimized wherever possible, the applicant proposes that localized rises or depressions within the individual 1.5-MW solar groups would be removed to provide for proper alignment and operation of the individual SunCatchers. Surface-treated roadways would be constructed as close to the existing topography as possible, with limited cut-and-fill operations to maintain roadway design slope to within a maximum of 10%.

The layout of the proposed Calico Solar Project would maintain the local pre-development drainage patterns where feasible, and water discharge from the site would remain at the southern and western boundaries. The paved roadways would have a low-flow, unpaved swale or roadway dip as needed to convey nuisance runoff to existing drainage channels/. It is expected that storm water runoff would flow over the crown of the paved roadways, which are typically less than 6 inches from swale flow line to crown at centerline of roadway, thus maintaining existing local drainage patterns during storms. The applicant has proposed that low-flow culverts would be used on emergency access routes and all other roads would be at grade.

The applicant has proposed localized channel grading on a limited basis to improve channel hydraulics within the dry washes and to control flow direction where buildings and roadways are proposed. The Main Services Complex would be protected from a 100-year flood by berms or channels that would direct the flow around the perimeter of the building site, if required.

Arizona Crossings (roadway dips) would be placed along the roadways, as needed to cross the minor or major channels/swales. These designs would be based on Best Management Practices (BMPs) for erosion and sediment control.

Arizona Crossings (roadway dips) would be used for major washes where the channel cross section exceeds 8 feet in width and 3 feet in depth or exceeds 20 feet in width and 2 feet in depth. The roadway section at the channel flow line would be without a crown.

It is anticipated that roadway maintenance would be required after rainfall events. For minor storm events, it is anticipated that the unpaved roadway sections may need to be bladed to remove soil deposition, along with sediment removal from stem pipe risers at the culvert locations. For major storm events, in addition to the aforementioned

maintenance, roadway repairs may be required due to possible damage to pavement where the roadways cross the channels and where the flows exceed the culvert capacity. Additional maintenance may be required after major storm events to replace soil eroded from around SunCatcher pedestals located in washes.

Building sites would be developed per San Bernardino County drainage criteria, with provision for soft bottom storm water retention basins. Rainfall from paved areas and building roofs would be collected and directed to the storm water retention basins. Volume on retention or detention basins should have a total volume capacity for a 3-inch minimum precipitation covering the entire site. Volume can be considered by a combination of basin size and additional volume provided within paving and/or landscaping areas.

The retention basins would be designed so that the retained flows would empty within 72 hours after the storm to provide mosquito abatement. This design can be accomplished by draining, evaporation, infiltration, or a combination thereof.

The post-development flow rates released from the project site are expected to be less than the pre-development flow rates, thus complying with BMPs. The expected flow reduction is based on the following factors.

- Except for the building sites, roads, and two evaporation ponds, the majority of the project site would remain pervious; only a negligible portion of the site would be affected by pavement and SunCatchers foundations.
- The increased runoff expected from the building sites would be over-mitigated by capturing 100% of the runoff in a retention basin, where the storm runoff would be infiltrated and/or evaporated to the atmosphere.
- The proposed perforated risers to be constructed upstream of the roadway culverts would provide for additional detention.

B.1.4.4 BUILDINGS

All buildings would be constructed in accordance with the appropriate edition of the California Building Code (CBC) and other applicable LORS.

The Main Services Complex would be located within the project site in a central location that provides for efficient access routes for maintenance vehicles servicing the SunCatcher solar field. The main control room would be located at the Main Services Complex.

Warehouse and shop spaces would provide work areas and storage for spare parts for project maintenance. The Main Services Complex would contain meeting and training rooms, maintenance and engineering offices, and administrative offices.

The project administration offices and personnel facilities would be located in a one-story operation and administration building. The operation and administration building would measure approximately 60 feet long by 70 feet wide by 17 feet high. This building would also contain meeting and training rooms, engineering offices, a visitor’s room, and support services.

The project maintenance facilities, shop, and warehouse storage would be located adjacent to the operation and administration building. The maintenance building would measure 70 feet wide by 70 feet long by 17 feet in height. This building would contain maintenance shops and offices, PCU rebuild areas, maintenance vehicle servicing bays, chemical storage rooms, the main electrical room, and warehouse storage for maintenance parts to service the SunCatchers.

The three assembly buildings will be located beside the Main Services Complex. Assembly buildings will be decommissioned after the project's SunCatchers are assembled and installed.

A water treatment shade structure will be located next to the Main Services Complex and to the northeast side of the Main Services Complex. The water treatment structure will house water treatment equipment and safe storage areas for water treatment chemicals. A motor control center for the water treatment equipment and pumps will be located within this structure. Two wastewater evaporative ponds designed for water treatment wastewater containment will be located just north of the water treatment structure. A control building will be located near the project substation. This building will contain relay and control systems for the substation in one room and the project operations control room in another room or rooms. A diesel-powered fire water pump and a diesel operated standby power generator will be located adjacent to the operation and administration building on the north side.

Electric service for the Main Services Complex will be obtained from SCE. Electric power will be provided via overhead service from an SCE overhead distribution line located on the north side of I-40. Communications service for the Main Services Complex will be obtained from the local phone company. Communications service will be provided via an overhead service from existing underground communications lines located on the north of I-40.

The operation and administration building, maintenance building, and Main Services Complex would be painted with a matching desert sand color and would be manufactured buildings. The water treatment building and the water holding tanks, including the potable water, raw water, and demineralized/fire protection water tanks located at the Main Services Complex would also be painted with a matching desert sand color.

SunCatcher assembly would be performed on-site in temporary structures. These buildings would be decommissioned after all project SunCatchers are assembled and installed. The assembly buildings would be located beside the Main Services Complex.

The primary purpose of the SunCatcher assembly buildings would be the assembly of the SunCatcher superstructure, the main beam assembly and trusses, the pedestal trunnion, mirrors, wire harnesses, control systems, drive position motors, and the calibration of the mirrors and control systems before field installation. Each assembly bay would be equipped with an automated platform on locating rails to move the SunCatcher through the assembly process.

The exterior material for the assembly buildings would be a fire retardant vinyl fluoride film with ultraviolet blocking characteristics and would be chemical and weather resistant. The exteriors would be painted desert sand to match the other structures.

Transport trailer storage would be located adjacent to the assembly building. The storage area would allow the project to maintain a supply of 3 to 5 days of inventory of SunCatcher parts during the assembly phase of construction.

These assembly buildings would be decommissioned and salvaged after all SunCatchers for the Project are installed.

B.1.4.5 WATER SUPPLY AND TREATMENT

The following types of water would be required for the project:

- equipment washing water,
- potable water,
- dust control water, and
- fire protection water.

When completed, the Calico Solar Project would require a total of approximately 36.2 acre-feet of raw water per year. SunCatcher mirror washing and operations dust control under regular maintenance routines will require an average of approximately 10.4 gallons of raw water per minute.

In the AFC, the applicant proposed the use of ground water from the Lavic Groundwater Basin. Calico initiated the drilling of four water wells adjacent to the project site, within the Lavic Groundwater Basin. As wells are drilled the flow rate (gallons per minute – gpm) were determined, concern over sufficiency of this water supply lead to the identification of a new primary water supply from Burlington Northern Santa Fe (BNSF). Initially, the Lavic Ground Basin wells were to be used as a backup water source since they were believed to lack the capacity to provide for construction water needs.

The applicant subsequently discovered that one of the wells within the Lavic Groundwater Basin could provide enough water for construction and operations of the proposed project and has returned to well water from the Lavic Groundwater Basin as the primary water source for the project.

The water from the Lavic Groundwater Basin well is characterized as raw water and will require treatment to remove dissolved solids for SunCatcher mirror wash water applications. The water will be required to be demineralized to prevent mineral deposits forming on the SunCatcher mirrors. Processes available for demineralization are Reverse Osmosis (RO) and ion exchange.

Calico believes that with this source, the project would obtain the water to provide an appropriate quantity and quality for mirror washing.

Potable Water: Potable water to meet plant requirements would be delivered by truck or rail and stored in a 5,000-gallon tank in the water treatment area. This tank would be

able to provide all required potable water for the operating facility for 2-3 days at which time it would need to be replenished.

Mirror Washing and Fire Protection Water: The Main Services Complex will include a location for an approximately 230,000-gallon tank that will be used to store water for SunCatcher mirror washing and fire protection applications. This volume of water will meet all LORS, including fire protection water for the Newberry Springs and the Harvard Station 46 (a County Fire Department staffed station), and for the San Bernardino Fire Department.

Dust Control Water: The water will be conveyed to the Main Services Complex via a 6 to 8-inch-diameter water line. The expected average well water consumption for the project during construction is approximately 50 acre-feet per year. Under normal operation (inclusive of mirror cleaning, dust control, and potable water usage), water required will be approximately 36.2 acre-feet per year. Emergency water may be trucked in from local municipalities. The Applicant would seek agreements at the time of the emergency.

The Calico Solar Project water supply requirements are tabulated in **Project Description Table 3**, Water Usage Rates for Operation. The table provides both the expected maximum water usage rates and the annual average usage rates.

Project Description Table 3
Water Usage Rates for Operation

Water Use	Daily Average (gallons per minute)	Daily Maximum (gallons per minute)	Annual Usage (acre feet)
Equipment Water Requirements			
SunCatcher Mirror Washing	11.8[1]	19.7[2]	16.1[3]
Water Treatment System Discharge			
Brine to Evaporation Ponds	6.0	11.1[4]	8.1
Potable Water Use			
For drinking and sanitary water requirements	3.8[5]	4.6[6]	5.2[7]
Dust Control			
Well water for dust control during operations	4.2[8]	8.3[9]	6.7[10]
Totals	**25.8**	**43.7**	**36.2**

Source: Stirling Energy Systems, Inc.

[1] Based on 34,000 SunCatchers requiring a monthly wash with an average of 14 gallons of demineralized water per spray wash and a 5-day work week (21 work days per month).

[2] During a 3-month period, all SunCatcher mirrors are given a scrub wash requiring up to three times the normal wash of 14 gallons per SunCatcher. Therefore, the Daily Maximum usage rate is based on 2/3 of the SunCatchers receiving a normal wash and one third receiving a scrub wash.

[3] Based on every SunCatcher having approximately 8 normal washes per year with one additional scrub wash.

[4] Based on the maximum amount of demineralized water required for mirror washing and assumes a decrease in raw water quality requiring an additional 20% of system discharge.

[5] Assumes 30 gallons per person per day for 182 people. [6] Max. amount assumes a 20% contingency over the Daily Avg.

[7] Assumes a 6-day work week and average daily usage. [8] Assumes 5,000 gallons per day.

[9] Assumes up to 10,000 gallons per day. [10] Assumes daily average dust control operations.

B.1.4.5 WASTEWATER AND WASTE MANAGEMENT

The water treatment wastewater generated by the reverse osmosis (RO) unit would contain relatively high concentrations of total dissolved solids (TDS). Wastewater or brine generated by the RO unit would be discharged to a polyvinyl chloride (PVC)-lined concrete evaporation pond that meets the requirements of the local Regional Water Quality Control Board. Each pond would be sized to contain 1 year of discharge flow, approximately 2.44 million gallons. A minimum of 1 year is required for the water treatment waste to undergo the evaporation process. The second pond would be in operation while the first is undergoing evaporation. The two ponds would alternate their functions on an annual basis.

After the brine has gone through the evaporation process, the solids that settle at the bottom of the evaporation pond will be tested by the applicant and disposed of in an appropriate non-hazardous waste disposal facility. The solids would be scheduled for removal during the summer months, when the concentration of solids is at its greatest due to an increase in evaporation rates, in order to achieve maximum solids removal.

Sanitary wastewater generated at the facility cannot be conveyed to an existing sewage facility or pipeline as there are no public or private entities that manage sanitary wastewater flows for locations in the vicinity of the project site. The wastewater generated at the Main Services Complex will be discharged into a sub-surface wastewater disposal system with septic tanks and leach fields, and will be designed in accordance with the applicable LORS, including San Bernardino County, California State Regional Water Quality Board, and the Department of Health Services.

The general threshold limit for a standard approval process for septic tanks and leach fields through the local Regional Water Quality Control Board (RWQCB) is 500 gallons per acre per day. The expected daily sanitary wastewater flow from Calico Solar ranges from an average of 5,500 gallons to a peak of 6,600 gallons; the required set aside area given this flow is approximately 14 acres. Given the project site area is much greater than 14 acres, the threshold limit for septic tank and leachfield applications will be met. The required leachfield area is estimated to be approximately 1,100 square-feet (0.025 acre).

B.1.4.6 HAZARDOUS WASTE MANAGEMENT

Hazardous materials used during facility construction and operations would include paints, epoxies, grease, transformer oil, caustic electrolytes (battery fluid), and products that would be generated by the construction equipment, such as waste fuel and waste oil. Several methods would be used to properly manage and dispose of hazardous materials and wastes. Waste lubricating oil would be recovered and recycled by a waste oil recycling contractor. Chemicals would be stored in appropriate chemical storage facilities. Bulk chemicals would be stored in large storage tanks, while most other chemicals would be stored in smaller returnable delivery containers. All chemical storage areas would be designed to contain leaks and spills in concrete containment areas.

B.1.4.7 HYDROGEN SYSTEM

The Applicant described the hydrogen use, supply and storage in the AFC, filed in December 2008. In the original design, it was proposed that hydrogen would be supplied to the SunCatchers through a distributed system. Each of the SCE, within the SunCatcher unit, would contain 14 cubic feet of hydrogen gas, and each SunCatcher unit would be equipped with a 196-scf k-bottle to replenish hydrogen gas lost within the gas circuit. K-bottles would be provided by a commercial hydrogen supplier. Section 4, Alternatives in the AFC described an alternative centralized hydrogen system. The Applicant responded to Energy Commission and BLM Data Requests 57-60 in July 2009, updating the hydrogen system to include a centralized hydrogen gas supply, storage and distribution system. The system included onsite generation of hydrogen through electrolysis and the storage of that hydrogen in a 36,400 scf steel storage tank. From the storage tank, the hydrogen would be piped to 95 individual compressor groups that include a compressor, a high pressure supply tank and a low pressure dump tank used to recover hydrogen from non-operational PCUs through a return line. This centralized hydrogen distribution system was the system analyzed in the SA/DEIS.

At this time, the applicant is evaluating the relative advantages between the centralized hydrogen distribution system and a distributed system that utilizes k-bottles on the PCUs of all SunCatchers. This supplement describes both systems and provides an environmental assessment of each. The details of both the centralized hydrogen system and the distributed system have evolved over time, and the May 2010 supplement to the AFC presented modifications to each system that are analyzed in this SSA.

Centralized Hydrogen System Description

The details of the centralized hydrogen system have been refined by the applicant as a result of experience from the applicant's Maricopa Solar Project and as a result of design having progressed to final engineering. The maximum amount of hydrogen stored for each SunCatcher would be increased from 3.4 to 11 scf which would accommodate two full charges of the PCU. In order to support this increased hydrogen storage at each SunCatcher, the high pressure supply tanks and low pressure dump tanks at each compressor group would accommodate 29,333 scf and 9,900 scf, respectively. In the July 2009 responses Energy Commission and BLM Data Requests 57-60, each high pressure supply tank was anticipated to be 648 scf and each low pressure dump tank was also reported to be 648 scf.

If a centralized hydrogen system is used at the Calico Solar site, the hydrogen gas would be produced through electrolysis by two redundant hydrogen generators. Each proposed hydrogen generator would be capable of producing 1,820 scfh. Although the hydrogen generators could run full time if needed to supply sufficient amount of hydrogen to the SunCatchers, the generators would be operated at off-peak electric hours using grid power and generated hydrogen would be stored onsite. Hydrogen gas produced by the onsite generators would be stored in a steel storage tank. The hydrogen tank, at approximately nine feet in diameter by 30 feet long, would be capable of storing approximately two-day supply of hydrogen (i.e., approximately 36,400 scf).

The hydrogen storage tank would distribute hydrogen fuel to 95 individual compressor groups. Each compressor group would be electrically operated and would consist of a

compressor and a high pressure supply tank with a 29,333 scf capacity, delivering gas at approximately 2,760 psi. Each compressor group would also be equipped with a low pressure dump tank with the same 9,900 scf capacity and used to recover hydrogen from non-operational PCUs through a ¼" and ½" stainless steel return line. In this option there are no other holding tanks or storage tanks in the compressor groups. Delivery of hydrogen is through pipelines.

Distributed Hydrogen System Description
If the distributed hydrogen supply system utilizing k-bottles at each SunCatcher PCU is utilized at the Calico Solar site, the system would use two redundant hydrogen generators and one steel storage tank located at the Main Services Complex as described in the centralized system. However, the system would not deliver hydrogen through pipelines. In lieu of the distribution equipment, hydrogen would be filled from the hydrogen storage tank to each individual SunCatcher through trucks. Each SunCatcher would include an 82-scf high pressure supply tank, 28-scf low pressure dump tank, and a 489-scf local storage tank. In addition, each SunCatcher unit would contain a minimum of 11-scf of hydrogen at 580 psi at all times, resulting in a total of around 610-scf of hydrogen in each SunCatcher.

The k-bottles would be delivered back to each SunCatcher, utilizing the mirror-washing truck trips included in the SA/DEIS analysis. Hydrogen refilling and replacement trips are expected occur approximately three times per year. Table 2.15-1 presents a summary of differences between each hydrogen supply system.

B.1.4.8 TRANSMISSION SYSTEM INTERCONNECTION AND UPGRADES

This section describes the on-site substation and the transmission interconnection between the Calico Solar Project and the existing SCE electric grid.

The proposed project would include the construction of a new 230-kV Calico Solar Substation approximately in the center of the project site. The proposed project substation would consist of an open air bus with 15, 35-kV collection feeder circuit breakers. Each feeder breaker would be connected to one of the 48-MW or 51-MW overhead collection lines. Additional 35-kV circuit breakers would connect to power factor correction capacitor banks located in the substation yard. This new substation would be connected to the existing SCE Pisgah Substation via an approximately 2-mile, single-circuit, 230-kV transmission line. Other than this interconnection transmission line, no new transmission lines or off-site substations would be required for the 275-MW Phase I construction.

For the 275-MW Phase I of the project, the first interconnection substation would initially consist of 2 power transformers rated at 120/160/200 megavolt amperes (MVA) each to convert the generation collection voltage from 34.5 kV to the transmission tie voltage of 230 kV. The substation would ultimately contain 6 120/160/200-MVA, 34.5-kV to 230-kV step-up power transformers. Each power transformer would serve 3 of the 15 overhead collection lines (one 48-MW line and 2 51-MW lines).

The power transformers would be protected by 230-kV power circuit breakers. Provisions would be made to expand the Calico Solar Substation from 275 to 850 MW

with the addition of 3 power transformers in Phase II of the proposed project. Each transformer would collect 150 MW of generation via 3 overhead 34.5-kV collection circuits, each protected by a 35-kV power circuit breaker. The 34.5-kV feeders would be terminated on outdoor circuit breakers.

Control, metering, and protection systems for the line, substation, and collection systems would be contained within a control building located adjacent to the Calico Solar Substation. The control building would also contain the necessary communications equipment to meet owner, California ISO, and SCE requirements. Additional substation equipment would include a 34.5-kV power-factor correction capacitor control system designed to meet the power factor and zero and low-voltage ride-through requirements of the Interconnect Agreement.

The on-site portion of the interconnection transmission line would be installed in a 100-foot ROW from the Calico Solar Project substation southeast to point of intersection with the SCE transmission ROW, then southwest to parallel the transmission ROW to the Pisgah Substation.

The transmission line towers would consist of H-Frame towers at the undercrossing of the existing 500-kV transmission line and double-circuit lattice steel towers and/or steel poles elsewhere. Both circuits of the overhead 230-kV transmission line would be constructed with one 1,590-kilo circular miles/phase, aluminum steel-reinforced conductor per line, each thermally rated to carry full project output in emergency conditions and one-half of project output in normal conditions. Two fiber optic cables would be provided for communication with SCE and the California Independent System Operator (California ISO).

B.1.5 RELATED FACILITIES (REASONABLY FORESEEABLE FUTURE ACTIONS)

This section describes reasonably foreseeable future actions related to the Calico Solar Project, that are outside of the BLM ROW grant and Energy Commission Decision addressed in this SSA. A series of upgrades for transmission capability purposes are anticipated by SCE. These projects would require additional environmental review and permitting.

B.1.5.1 SCE RELIABILITY NETWORK UPGRADES

Construction of the 275-MW Phase I of the Calico Solar Project would require an upgrade of the existing Pisgah Substation to a 500/220 kV substation designed for four 500/220 kV transformer banks. An upgrade would also be required to implement the Reduced Acreage Alternative of the Calico Solar project.

Construction of the 575-MW Phase II of the Calico Solar project, and delivery of the additional renewable power to the SCE system, would require the construction of Phase 2 Reliability Network Upgrades by SCE. The California Public Utilities Commission (CPUC) is the lead agency for CEQA compliance and the BLM is the lead agency for NEPA compliance on the Phase 2 Reliability Network Upgrades project. The SCE will

need a Certificate of Public Convenience and Necessity from the CPUC for these Network Upgrades.

The SCE Phase 2 Reliability Network Upgrades Project consists of expansion of the Pisgah Substation and installation of new power transmission facilities. The major components of the upgrades project include:

- Extension of the existing Lugo 500kV Substation East and West Buses to provide for a new 500 kV transmission line position
- Removal of 65 miles of the existing Lugo-Pisgah No. 2 220 kV transmission line between Lugo Substation and Pisgah Substation
- Construction of approximately 65 miles of new 500 kV transmission line between the Lugo and Pisgah Substations. Approximately 55 miles of the new transmission line will utilize the right-of-way (ROW) vacated by the removal of the existing 220 kV line, and approximately 10 miles will require new ROW
- Looping the existing Eldorado-Lugo 500 kV transmission line into the expanded Pisgah 500 kV Substation to form the Eldorado-Pisgah 500 kV transmission line and the Lugo-Pisgah No. 1 500 kV transmission line
- Obtaining required ROW as follows:
    i. New ROW to accommodate new 500/220 kV Pisgah Substation, estimated to require 0.6 acres adjacent to the existing substation location.

    ii. Update existing ROW to support construction of the new Lugo-Pisgah No. 2 500 kV transmission line within the existing ROW

    iii. Approximately 10 miles of new ROW (near Lugo, California) to support construction of the new Lugo-Pisgah No. 2 500 kV transmission line when use of the existing ROW is not feasible

The environmental review of SCE's Phase 2 Reliability Network Upgrades project by the BLM and CPUC has not yet been initiated although applications have been received by BLM. Therefore the discussion related to SCE network upgrades are being addressed in this document as reasonably foreseeable future actions per NEPA.

B.1.6 CONSTRUCTION

The project would be constructed in two phases. Phase I of the project would consist of up to 11,000 SunCatchers configured in 183 1.5-MW solar groups of 60 SunCatchers per group, and have a net nominal generating capacity of 275 MW. Phase II would add approximately 23,000 SunCatchers, expanding the project to a total of approximately 34,000 SunCatchers configured in 567 1.5-MW solar groups with a total net generating capacity of up to 850 MW (see **Project Description Figure 2)**.

Heavy construction for the project would be scheduled to occur between 0700 and 1900 Monday through Friday. Additional hours may be necessary to make up schedule deficiencies or to complete critical construction activities.

Some activities would continue 24 hours per day, 7 days per week. These activities include, but are not limited to, SunCatcher assembly, refueling of equipment, staging of materials for the next day's construction activities, quality assurance/control, and commissioning.

Project construction would be performed in accordance with plans and mitigation measures that would assure the project conforms to applicable LORS and would avoid significant adverse impacts. These plans that are to be developed by the applicant, for which some have already been prepared in draft and reviewed by staff to support this environmental analysis, and the necessary mitigation measures, are specified in the Conditions of Certification as appropriate of each technical area of this SSA.

B.1.7 OPERATION AND MAINTENANCE

The Calico Solar Project would be an "as-available" resource. Therefore, the project would operate anywhere between a minimum of approximately 18 MW net when the first units are interconnected to the grid during the construction period to 850 MW on completion of construction. The capability for independent operation of all 34,000 units would give maximum flexibility in operations. The applicant expects that the project would have an annual availability of 99%.

The project would be dispatched by the California ISO, through day-ahead, hour-ahead, and real-time scheduling, as required to meet the demands of the Southern California market. The market would dictate unit operations and total power requirements. The Calico Solar Project would operate approximately 3,500 hours per annum and is expected by the applicant to have an overall availability of 99% or higher. The number of available operating hours is determined by the availability of the sun's energy at greater than 250 watts per square meter. SunCatchers would be unable to generate electricity when the sun's energy is below 250 watts per square meter in the early morning or late evening hours and when cloud cover limits the sun's energy for power generation. Also, SunCatchers would be unable to generate electricity during daylight hours when the wind speed exceeds 35 miles per hour, as SunCatchers would be stowed in a safe de-track position at this wind speed to prevent damage. SunCatchers are designed to withstand wind speeds of 50 miles per hour in the operating mode and 90 miles per hour in the stowed position. Because the SunCatchers move slowly, they start moving into stow position once winds reach 35 miles per hour in order to be in stow position by the time winds reach 50 miles per hour. Because of the geographical size of the project, cloud cover and/or wind conditions may only affect a portion of the project at any given time.

It is expected that the Calico Solar Project would be operated with a staff of approximately 182 full-time employees. The project would operate 7 days per week, generating electricity during normal daylight hours when the solar energy is available. Maintenance activities would occur 7 days a week, 24 hours a day to ensure SunCatcher availability when solar energy is available.

Mirror washing would be needed approximately once every month, requiring 14 gallons of water per dish with an average washing rate of 20 minutes per washed dish pair. In

addition to monthly washing, seasonal scrubbing is anticipated. Seasonal scrubbing would occur prior to peak electricity demand season, June through September.

Maintenance of the PCU's and associated vehicle operations would be required every 6,000 hours of running time.

B.1.8 DECOMMISSIONING AND RESTORATION

Introduction

Project closure can be temporary or permanent. Temporary closure is defined as a shutdown for a period exceeding the time required for normal maintenance. Causes for temporary closure include inclement weather and/or natural hazards (e.g., winds in excess of 35 mph, or cloudy conditions limiting solar insolation values to below the minimum solar insolation required for positive power generation, etc.), or damage to the project from earthquake, fire, storm, or other natural acts. Permanent closure is defined as a cessation in operations with no intent to restart operations owing to project age, damage to the project that is beyond repair, adverse economic conditions, or other significant reasons.

Temporary Closure

In the unforeseen event that the project is temporarily closed, a contingency plan for the temporary cessation of operations will be implemented. The contingency plan will be followed to ensure conformance with applicable LORS and to protect public health, safety, and the environment. The plan, depending on the expected duration of the shutdown, may include the draining of chemicals from storage tanks and other equipment and the safe shutdown of equipment. Wastes will be disposed of according to applicable LORS, as discussed in the **WASTE MANAGEMENT** section.

Permanent Closure

The planned life of the Calico Solar Project is 40 years. However, if the project is still economically viable, it could be operated longer. It is also possible that the project could become economically noncompetitive before 40 years have passed, forcing early decommissioning. Whenever the project is permanently closed, the closure procedure will follow a plan that will be developed as described below.

The removal of the project from service, or decommissioning, may range from "mothballing" to the removal of equipment and appurtenant facilities, depending on conditions at the time. Because the conditions that would affect the decommissioning decision are largely unknown at this time, these conditions would be presented to the Energy Commission, the BLM, and other applicable agencies for review and approval as part of the decommissioning plan. The decommissioning plan would discuss the following:

- proposed decommissioning activities for the project and appurtenant facilities constructed as part of the project,
- conformance of the proposed decommissioning activities with applicable LORS and local/regional plans,

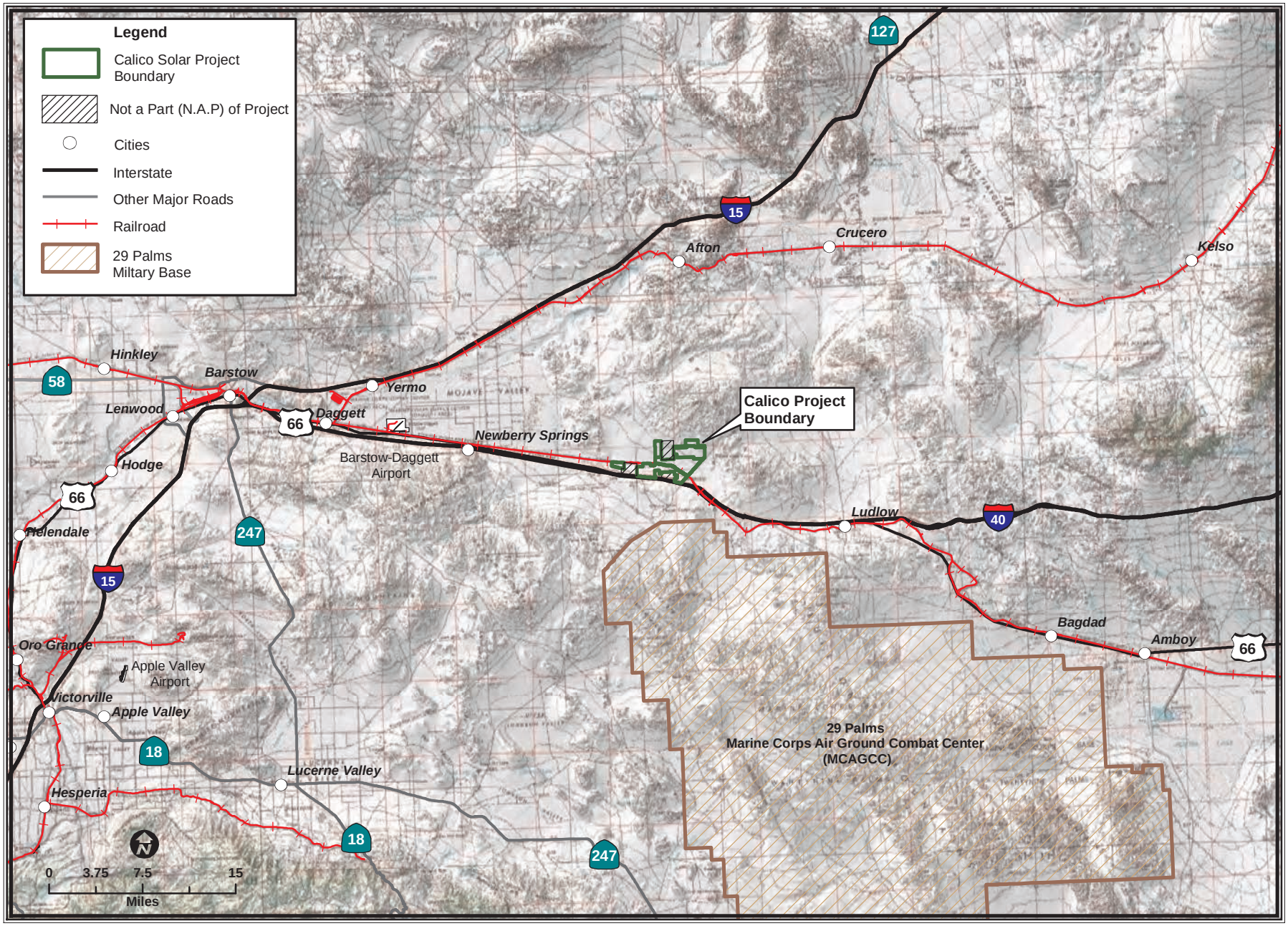
- activities necessary to restore the project site if the plan requires removal of equipment and appurtenant facilities,
- decommissioning alternatives other than complete restoration to the original condition, and
- associated costs of the proposed decommissioning and the source of funds to pay for the decommissioning.

In general, the decommissioning plan for the project would attempt to maximize the recycling of project components. Calico Solar would attempt to sell unused chemicals back to the suppliers or other purchasers or users. Equipment containing chemicals would be drained and shut down to ensure public health and safety and to protect the environment. Nonhazardous wastes will be collected and disposed of in appropriate landfills or waste collection facilities. Hazardous wastes will be disposed of according to applicable LORS. The site will be secured 24 hours per day during the decommissioning activities, and Calico Solar will provide periodic update reports to the Energy Commission, the BLM, and other appropriate parties.

Similar to project construction and facility operations, decommissioning would be performed in accordance with plans and mitigation measures that would assure the project conforms to applicable LORS and would avoid significant adverse impacts. These plans that are to be developed by the applicant, for which some have already been prepared in draft and reviewed by staff to support this environmental analysis, and the necessary mitigation measures, are specified in the Conditions of Certification as appropriate for each technical area of this SSA. The BLM would also require mitigation and restoration as stipulated in the identified Plan of Development, as well as other federal agency requirements. The authorized project would be bonded consistent with agency policy.

PROJECT DESCRIPTION - FIGURE 1

Calico Solar Project - Regional Transportation Network



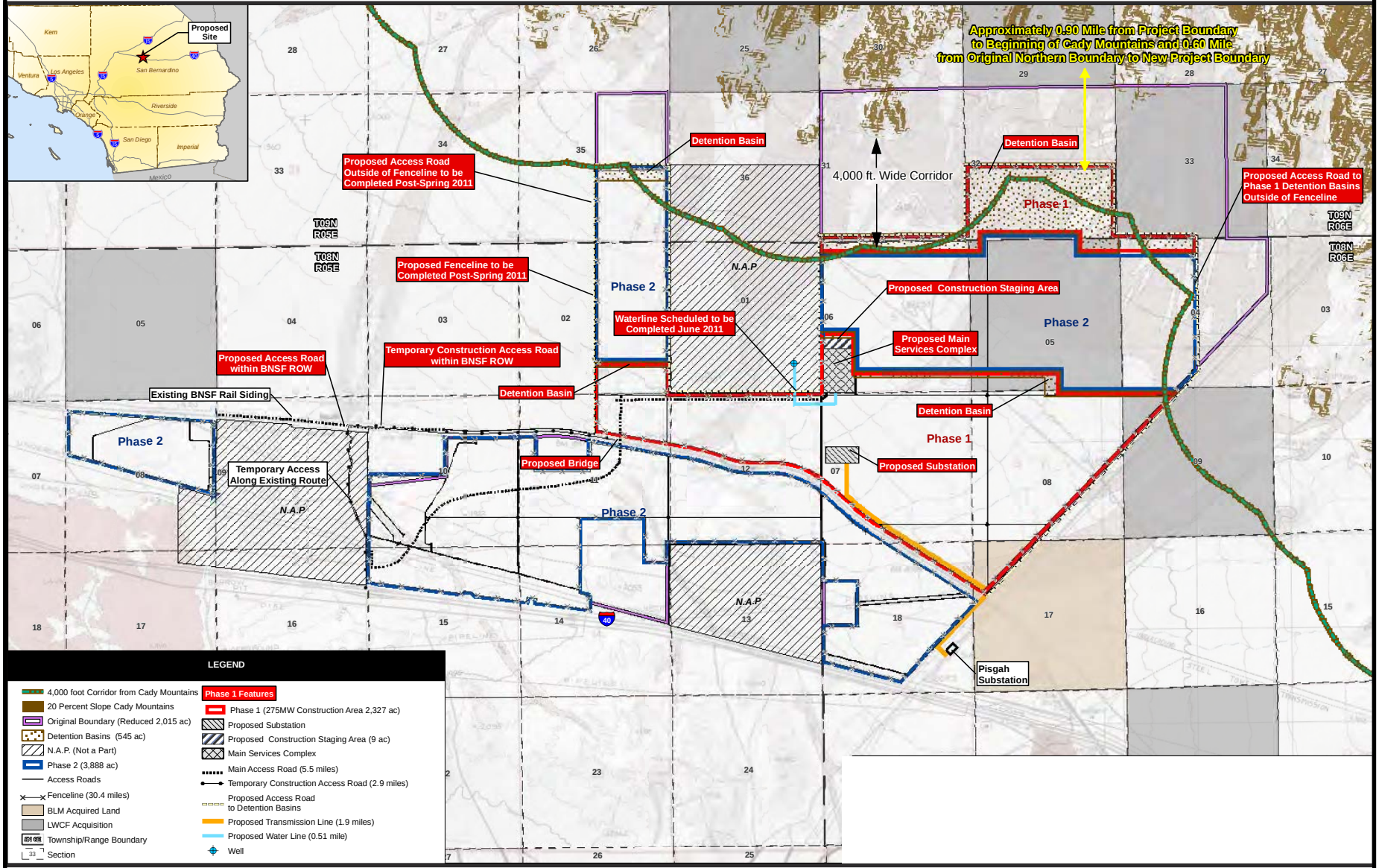
PROJECT DESCRIPTION

U.S. BUREAU OF LAND MANAGEMENT and CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION

SOURCE: California Energy Commission - Tele Atlas Data - San Bernardino County

PROJECT DESCRIPTION - FIGURE 2

Calico Solar Project - Existing Projects - Project Layout

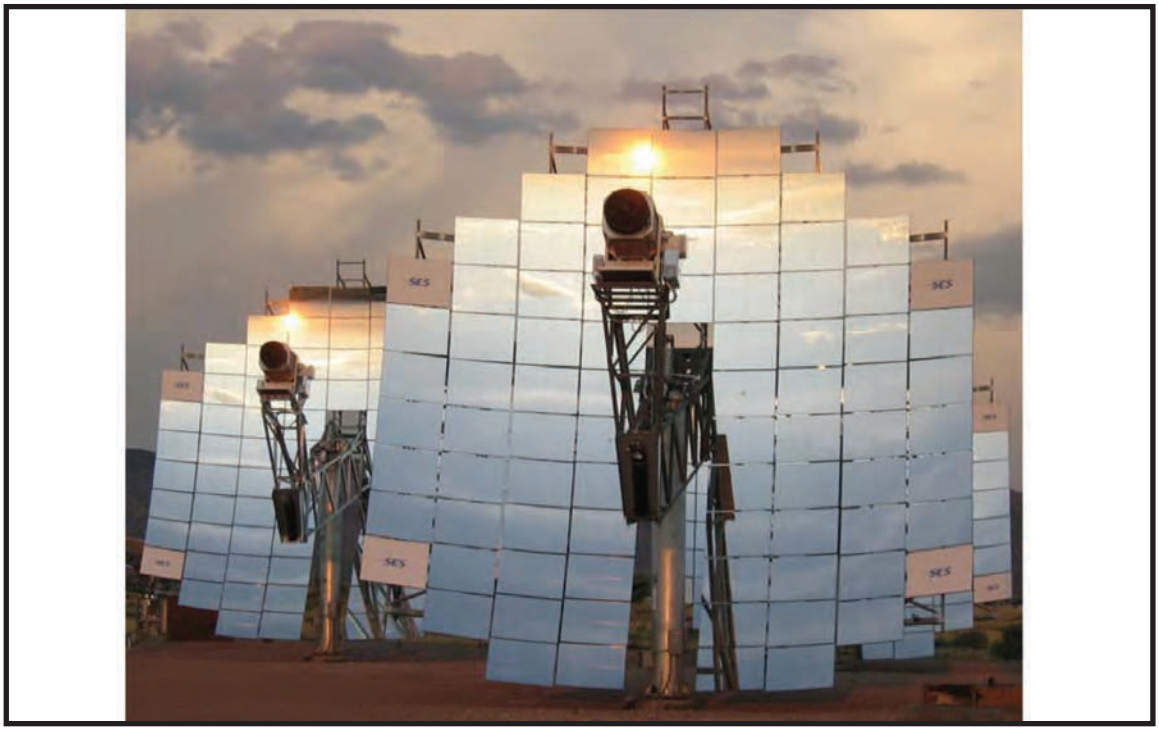


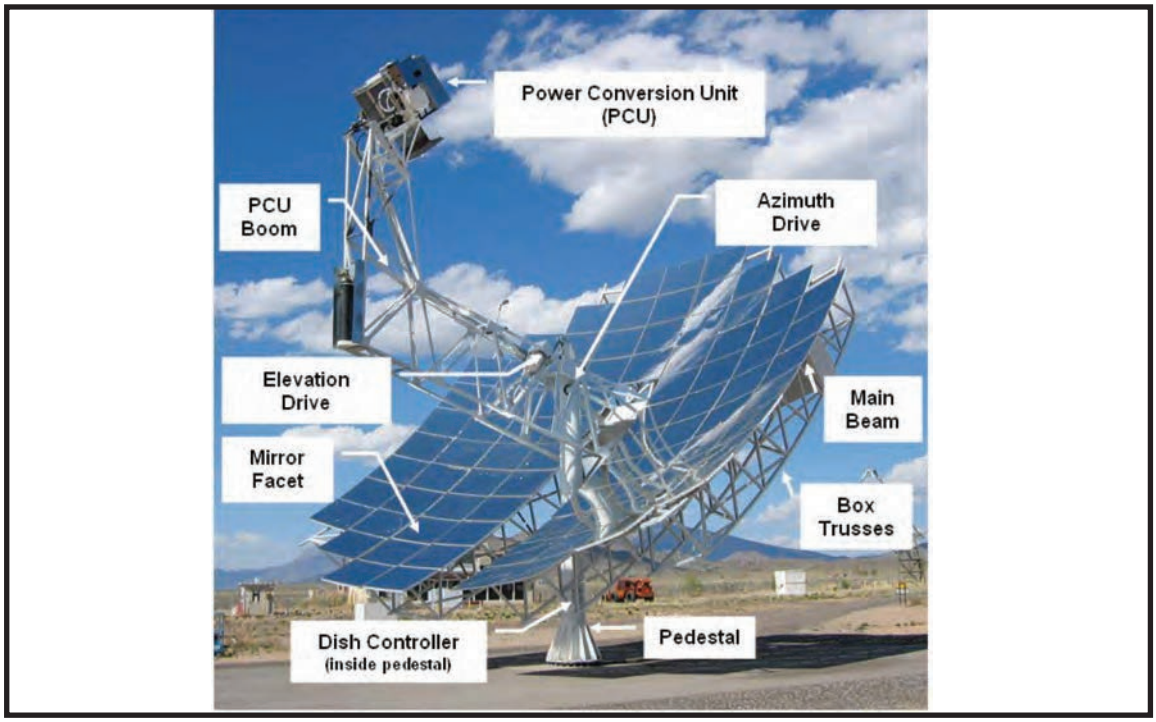
PROJECT DESCRIPTION

CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION

SOURCE: URS

PROJECT DESCRIPTION - FIGURE 3
Calico Solar Project - SunCatcher Details





CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION
SOURCE: SES Solar Two Project - AFC Photograph 1-1 and 1-2

B.2 – ALTERNATIVES

Testimony of Susan V. Lee

B.2.1 SUMMARY OF CONCLUSIONS

In this analysis of the Calico Solar Project (formerly the Stirling Energy Systems Solar One Project), 24 alternatives to the project were identified and evaluated. These include three alternative site locations or configurations, a range of different solar and renewable technologies, generation technologies using different fuels, and conservation/demand-side management. Of the 24 alternatives, two alternatives were determined to be potentially feasible by the Energy Commission and are analyzed in detail because they appeared to have the potential to substantially reduce one or more of the project's significant impacts. These two alternatives are the Reduced Acreage Alternative and Private Lands Alternative. In addition to the proposed action and the potentially feasible alternatives, the Energy Commission considered the No Project Alternative.

The Reduced Acreage Alternative would be a 275 MW solar facility located within the central portion of the proposed 850 MW project. The impacts of this alternative are analyzed in each discipline's analysis in Sections C and D. Because it would occupy about one-third of the land area required for the proposed project, it would affect substantially less native vegetation, and habitat for the Mojave fringe toed-lizard, bighorn sheep, and desert tortoise. It would also have fewer effects on the east-west movement of desert tortoise. Additionally, the Reduced Acreage Alternative would avoid impacts to lands acquired by Land and Water Conservation Funds and would comply with all laws, ordinances, regulations, and standards. The alternative would also reduce impacts to visual resources to less than significant. However, as highlighted in the Section C.1 (Air Quality), the Reduced Acreage Alternative would reduce the benefits of the proposed Calico Solar Project in displacing fossil fuel fired generation and reducing associated criteria pollutant emissions. The Reduced Acreage Alternative is considered to be potentially feasible, as solar thermal facilities of 275 MW and smaller are currently proposed in California. However, no studies have been done to evaluate its economic feasibility.

CEC staff has determined that the No Project Alternative is not superior to the proposed project because it would likely delay development of renewable resources or shift renewable development to other similar areas, and could lead to increased operation of existing power plants that use non-renewable technologies. However, the No Project/No Action Alternative is evaluated in detail in this SSA, as required by NEPA and CEQA.

The Private Land Alternative would have impacts similar to those of the proposed site in many disciplines. However, because this alternative would be on disturbed agricultural lands, the alternative site is likely to have less severe cultural, visual, and biological resources impacts than the proposed site. The Private Land Alternative presents an additional challenge: its northern section is made up of approximately 64 parcels with 27 separate landowners and the southern portion is made up of 45 parcels with 22 separate landowners. Due to the number of parcels that would have to be acquired, obtaining site control would be more challenging than at the proposed site where BLM is

the only land management entity. In addition, detailed site engineering and transmission interconnection would require additional time for this site to be developed; as a result this alternative would not meet the project objective requiring that a decision to be made in 2010.

The Avoidance of Donated and Acquired Lands Alternative was evaluated in the Staff Assessment/Draft EIS, but has been eliminated from consideration in this Supplemental Staff Assessment (SSA). This alternative was developed to avoid direct impacts to all lands within the Calico Solar Project boundary that were donated to or acquired by the Bureau of Land Management and was fully analyzed in the Staff Assessment. It would generate 720 MW and would have impacts similar to the proposed project for most resource elements, though reduced by about 15%. The alternative is eliminated because it does not appear to have the potential to substantially reduce one or more of the project's significant impacts.

Six alternative sites on federal lands were identified but were not evaluated in detail due to conflicting land use classifications and/or because they do not appear to have the potential to substantially reduce one or more of the project's significant impacts. Alternative solar thermal technologies (solar trough, solar power tower, utility scale solar photovoltaics, and linear Fresnel) are also evaluated. As compared with the proposed solar trough technology, most of these technologies would not substantially reduce one or more of the project’s significant impacts including to visual impacts, biological resources impacts and cultural impacts as all require extensive acreage. Distributed solar photovoltaic facilities would likewise require extensive acreage if deployed in the same location as the project, although it can also be installed on existing buildings, minimizing the loss of undisturbed open space. However, increased deployment of distributed solar photovoltaics faces challenges in manufacturing capacity, cost, and policy implementation. Water use varies among the technologies.

Other generation technologies (wind, geothermal, biomass, tidal, wave, natural gas, and nuclear) are also examined as possible alternatives to the project. These technologies would either be potentially infeasible at the scale of the Calico Solar Project, or would not substantially reduce one or more of the project’s significant impacts without creating their own significant impacts in other locations. A natural gas plant would contribute to greenhouse gas emissions and would not meet the project’s renewable generation objective. Construction of new nuclear power plants is currently prohibited under California law.

Conservation and demand side management programs would likely not meet the state’s growing electricity needs that would be served by the Calico Solar Project. In addition, these programs would not provide the renewable energy required to meet the California Renewable Portfolio Standard requirements. Wave and tidal technologies are not yet commercially available in the United States.

Staff’s analysis of renewable energy technology options indicates that contributions from each commercially available renewable technology will be needed to meet California’s Renewable Portfolio Standard requirements and to achieve the statewide RPS target for 2020 (between 45,000 gigawatt hours (GWhs) to almost 75,000 GWhs according to the 2009 IEPR). Wave and tidal technologies are not yet commercially

available in the United States. Therefore, the combined contribution of the alternatives of wind, distributed solar photovoltaic, geothermal, and biomass is needed to complement rather than substitute for the Calico Solar Project solar thermal contribution to meeting SCE and statewide RPS requirements. The table below indicates that each of these four alternative technology options, when considered individually, is insufficient to meet the project objectives related to the RPS.

Alternatives Table 1 lists the alternatives retained for analysis in this SSA and those eliminated, and summarizes the rationale for each conclusion.

Alternatives Table 1
Summary of Alternatives Retained and Eliminated

Alternative	Rationale for Retention or Elimination
Alternatives Retained for CEQA and NEPA analysis	
Proposed Project/Action - 850 MW - 6,215 acres - 34,000 SunCatchers	Retained. Evaluated as the applicant's proposal.
Reduced Acreage Alternative - 275 MW (up to 350 MW)[1] - 2,600 acres (41% of proposed) - 11,000 SunCatchers	Retained. Evaluated in the SSA because it would substantially reduce impacts of the Calico Solar Project while meeting most or all of the project objectives.
No Project/No Action Alternative	Retained. Required under CEQA and NEPA. Note that additional NEPA No Action Alternatives are described below under Land Use Plan Amendment Alternatives.
CDCA Plan Amendment Actions with Alternatives Evaluated under NEPA	
Authorize Calico Solar Project through a CDCA Land Use Plan amendment.	Retained as part of Proposed Action. Action would be required under the CDCA Plan of 1980, as amended, for BLM to authorize a ROW for the project location.
Authorize a reduced size project within the proposed project's boundaries through a CDCA Land Use Plan amendment (Reduced Acreage Alternative, Avoidance of Donated and Acquired Lands Alternative).	Retained as part of either action alternative. A smaller project reduces impacts; site location is an action for which an amendment to the CDCA Plan of 1980, as amended, would be required for BLM to authorize a ROW for this location.
Do not approve the ROW grant and do not amend the CDCA Land Use Plan of 1980, as amended.	Retained as the first NEPA No Action Alternative: deny the ROW application and do not amend the CDCA Land Use Plan of 1980.
Do not approve the ROW grant and amend the CDCA Land Use Plan of 1980, as amended, to make the area unavailable for future solar development.	Retained as the second NEPA No Action Alternative: deny the ROW application and amend the CDCA Land Use Plan of 1980 to make the site unavailable for any future solar development.

[1] The Calico Solar Project as described in the SA/DEIS would require approximately 10 acres per MW of power generated. Since publication of the SA/DEIS, the Calico Solar Project boundaries have been revised and the project as currently proposed would require 7.3 acres per MW generated. As such, the amount of energy generated by the Reduced Acreage Alternative could be up to 350 MW.

Alternative	Rationale for Retention or Elimination
Do not approve the ROW grant and amend the CDCA Land Use Plan of 1980 to make the area available for future solar development.	Retained as the third NEPA No Action Alternative: deny the ROW application but amend the CDCA Land Use Plan of 1980 to make the site available for future solar development.
Site Alternatives Evaluated under CEQA and not NEPA	
Private Land Alternative	Would substantially reduce impacts of the Calico Solar Project while meeting most project objectives.
Public Land Alternatives Eliminated from Detailed Analysis	
Avoidance of Donated and Acquired Lands Alternative - 850 MW[2] - 7,050 acres (over 100 % of proposed) - 28,800 SunCatchers	Would not substantially reduce impacts of the Calico Solar Project; it would create the same general impacts to Mojave fringe-toed lizard, Nelson big-horn sheep, and other wide-ranging species as the proposed Calico Solar Project.
Camp Rock Road (AS1)	Would not substantially reduce impacts of the Calico Solar Project; located in Category I desert tortoise habitat, partially located in the Johnson Valley OHV area and would require use of LWCF acquisition lands.
Upper Johnson Valley (AS2)	Would not substantially reduce impacts of the Calico Solar Project; located entirely within the Upper Johnson Valley OHV Area and in study area for MCAGCC Twentynine Palms expansion.
West of Twentynine Palms Military Base (AS3)	Would not substantially reduce impacts of the Calico Solar Project; located entirely within the Upper Johnson Valley OHV Area and in study area for MCAGCC Twentynine Palms expansion, would require use of LWCF acquired lands.
I-40 South (AS4)	Would not substantially reduce impacts of the Calico Solar Project; located in desert tortoise critical habitat, would impact approximately 3 miles of the Pisgah Crater Lava Flow, would potentially impact access to three existing mines.
Broadwell Lake (AS5)	Would not substantially reduce impacts of the Calico Solar Project; potentially located within proposed national monument; pending right-of-way grant application for the site, therefore not considered a viable alternative.
SES Solar Three Alternative	Pending right-of-way grant application for the site, therefore not considered a viable alternative.
Technology Alternatives Evaluated	
Alternative	**Rationale for Retention or Elimination**
Parabolic Trough Technology	Would not substantially reduce impacts of the Calico Solar Project
Solar Power Tower Technology	Would not substantially reduce impacts of the Calico Solar Project

[2] In the SA/DEIS the Avoidance of Donated and Acquired Lands Alternative was considered as potentially generating 720 MW. However, since the publication of the SA/DEIS, the project boundaries have been revised and the applicant now believes it is possible to locate 34,000 SunCatchers on 6,215 acres. As such, the Avoidance of Donated and Acquired Lands Alternative, which would occupy more than 7,000 acres, would generate 850 MW.

Alternative	Rationale for Retention or Elimination
Linear Fresnel Technology	Would reduce area required by 40% but would not eliminate significant impacts of the Calico Solar Project
Solar Photovoltaic Technology – Utility Scale	Would not substantially reduce impacts of the Calico Solar Project
Distributed Solar Technology	While it will very likely be possible to achieve 850 MW of distributed solar energy over the coming years, the limited numbers of existing facilities make it difficult to conclude with confidence that this much distributed solar will be available within the timeframe required for the Calico Solar Project. Barriers exist related to interconnection with the electric distribution grid. Solar PV is one components of the renewable energy mix required to meet the California Renewable Portfolio Standard requirements, and additional technologies like solar thermal generation, would also be required.
Wind Energy	While there are substantial wind resources in the region, environmental impacts could also be significant so wind would not reduce impacts in comparison to the Calico Solar Project. Also, wind is one of the components of the renewable energy mix required to meet the California Renewable Portfolio Standard requirements, so additional technologies like solar thermal generation, would also be required.
Geothermal Energy	Despite the encouragement provided by Renewable Portfolio Standards and ARRA funding, few new geothermal projects have been proposed in the California and no geothermal projects are included on the Renewable Energy Action Team list of projects requesting ARRA funds. Therefore, the development of 850 MW of new geothermal generation capacity within the timeframe required for the Calico Solar Project is considered speculative.
Biomass Energy	Most biomass facilities produce only small amounts of electricity (in the range of 3 to 10 MW) and so could not meet the project objectives related to the California Renewable Portfolio Standard. In addition, between 85 and 250 facilities would be needed to achieve 850 MW of generation, creating substantial adverse impacts.
Tidal Energy	Tidal fence technology is commercially available in Europe. However, it has not been demonstrated and proven at the scale that would be required to replace the proposed project, particularly with Pacific tides. Therefore, it would not substantially reduce impacts of the Calico Solar Project.
Wave Energy	Unproven technology at the scale that would be required to replace the proposed project; it may also result in substantial adverse environmental impacts
Natural Gas	Would not attain the objective of generating renewable power meeting California's renewable energy needs
Coal	Would not attain the objective of generating renewable power meeting California's renewable energy needs and is not a feasible alternative in California

Alternative	Rationale for Retention or Elimination
Nuclear Energy	The permitting of new nuclear facilities in California is not currently allowable by law
Conservation and Demand-side Management	Conservation and demand-management alone are not sufficient to address all of California's energy needs, and would not provide the renewable energy required to meet the California Renewable Portfolio Standard requirements

B.2.2 INTRODUCTION

Calico Solar, LLC proposes to build the Calico Solar Project on Bureau of Land Management (BLM) land, which is under the jurisdiction of the federal government. Since the BLM is a federal agency, the Calico Solar Project power plant is subject to review under the National Environmental Policy Act (NEPA) in addition to CEQA. The purpose of this alternatives analysis is to identify range of reasonable alternatives which, under CEQA, would feasibly attain most of the basic objectives of the project but would substantially lessen or avoid any potentially significant adverse impacts of the proposed project, or under NEPA, would inform decision-makers and the public of the reasonable alternatives which would avoid or minimize adverse impacts or enhance the quality of the human environment [40 CFR 1502.1]. This section summarizes the potentially significant adverse impacts of the proposed project and analyzes different technologies and alternative sites that may reduce or avoid some or all of those significant adverse impacts.

Of the 24 alternatives, two alternatives in addition to the proposed project were determined to be feasible by both the BLM and Energy Commission: the Reduced Acreage Alternative and the Avoidance of Donated and Acquired Lands Alternative. These alternatives and the no project/no action alternatives are described in Section B.2.6 and are analyzed in detail within each of the technical sections of this document. Any of these alternatives—the proposed action, one of the action alternatives, or one of the no action alternatives—may be selected by either BLM or the Energy Commission as that agency's respective Preferred Alternative.

Section B.2.7 presents analysis of the site alternatives that are evaluated under CEQA only and presents the plan amendment alternatives evaluated under NEPA only. The section also presents the discussion and analysis of all alternatives eliminated from consideration by both the Energy Commission and the BLM.

B.2.3 ALTERNATIVES DEVELOPMENT AND SCREENING PROCESS

LAWS, ORDINANCES, REGULATIONS, AND STANDARDS

Calico Solar, LLC proposes to build the Calico Solar Project on federal land within the jurisdiction of the BLM. Since the BLM is a federal agency and the California Energy Commission has State authority to license thermal power plants, the Calico Solar Project power plant is subject to review under both NEPA and CEQA.

California Environmental Quality Act Criteria

The *Guidelines for Implementation of the California Environmental Quality Act*, Title 14, California Code of Regulations, section 15126.6(a), provides direction by requiring an evaluation of the comparative merits of "a range of reasonable alternatives to the project, or to the location of the project, which would feasibly attain most of the basic objectives of the project but would avoid or substantially lessen any of the significant effects of the project." In addition, the analysis must address the No Project Alternative (Cal. Code Regs., tit. 14, § 15126.6(e)).

The range of alternatives is governed by the "rule of reason" which requires consideration only of those alternatives necessary to permit informed decision making and public participation. CEQA states that an environmental document does not have to consider an alternative the effect of which cannot be reasonably ascertained and of which the implementation is remote and speculative (Cal. Code Regs., tit. 14, § 15126.6).

National Environmental Policy Act Criteria

NEPA requires that the decision-makers and the public be fully informed of the impacts associated with the proposed project. The intent is to make decisions based on an understanding of environmental consequences, and to take actions to protect, restore, and enhance the environment.

Regulations promulgated by the Council on Environmental Quality require that an EIS rigorously explore and objectively evaluate all reasonable alternatives to a proposed action. Reasonable alternatives are those for which effects can be reasonably ascertained, whose implementation is not remote or speculative, that are feasible, effective, are not remote from reality, and those that are consistent with the basic policy objectives for management of the area. (40 CFR 1502.14; CEQ Forty Questions, No. 1A; Headwaters , Inc. v. BLM, 914 F.2d. 1174 (9th Cir. 1990)). Reasonable alternatives are dictated by the nature and scope of the proposed action. To determine reasonable alternatives, an agency must define the purpose and need of the proposal. The purpose and need of the proposed action is to be evaluated under a reasonableness standard. CEQ regulations state that an agency should include reasonable alternatives not within the jurisdiction of the lead agency [40 CFR 1502.14(c)]. BLM interprets this to apply to exceptional circumstances and limits its application to broad, programmatic EISs that would involve multiple agencies. For most actions, the purpose and need statement should be constructed to reflect BLM's discretion consistent with its decision space under its statutory and regulatory requirements. Thus, alternatives that are not within BLM jurisdiction would not be considered reasonable. Further, "[i]n determining the scope of alternatives to be considered, the emphasis is on what is 'reasonable' rather than on whether the proponent or applicant likes or is itself capable of carrying out a particular alternative..." (CEQ Forty Questions, No. 2a.)

Consideration of a No Action Alternative is mandated by NEPA. As with the CEQA No Project Alternative, this is the scenario that would exist if the proposed project were not constructed and no land use plan amendment were undertaken. Under the first NEPA No Action Alternative, the land would continue to be managed by BLM under the existing management plan as defined in the California Desert Conservation Area plan.

This SSA also evaluates two other NEPA No Action Alternatives. The second No Action Alternative would not approve the project and would approve a plan amendment to allow other solar projects on the proposed project site. The third No Action Alternative would not approve the project and would approve a plan amendment to prohibit solar or renewable project development at the site.

B.2.4 SCREENING METHODOLOGY

To prepare the alternatives analysis, the following methodology was used:

1. Develop an understanding of the project, identify the basic objectives of the project, and describe its potentially significant adverse impacts.
2. Identify and evaluate technology alternatives to the project such as increased energy efficiency (or demand-side management) and the use of alternative generation technologies (e.g., solar or other renewable or nonrenewable technologies).
3. Identify and evaluate alternative locations.
4. Evaluate potential alternatives to select those qualified for detailed evaluation. Under NEPA, explore and evaluate all reasonable alternatives, and of those reasonable alternatives, identify those that would avoid or minimize adverse impacts or enhance the quality of the human environment
5. Evaluate the impacts of not constructing the project, known as the No Project Alternative under CEQA and the No Action Alternative under NEPA.

Based on this methodology, each potential alternative was evaluated according the following criteria for its ability to:

- for CEQA purposes, avoid or substantially lessen one or more of the potential significant adverse effects of the project as described above;
- for CEQA purposes, meet most or all of the project objectives;
- for NEPA purposes, be consistent with BLM's purpose and need, and be otherwise reasonable.

B.2.4.1 APPLICANT'S PROJECT OBJECTIVES AND PURPOSE

Two primary objectives are set forth by the applicant (SES 2008a):

- to provide clean, renewable, solar-powered electricity and to assist Southern California Edison (SCE) in meeting its legislatively mandated obligations under California's Renewable Portfolio Standard Program;
- to assist SCE in reducing its greenhouse gas emissions as required by the California Global Warming Solutions Act of 2006.

Additionally, the applicant states the purpose of the project as:

- to provide 850 MW of renewable electric capacity under a 20-year power purchase agreement (PPA) to SCE;
- to contribute to the achievement of the 20% renewables RPS target set by California's governor and legislature;

- to assist in reducing greenhouse gas emissions from the electricity sector;
- to contribute to meeting California's future electric power needs, and
- to assist the California Independent System Operator (CAISO) in meeting its strategic goals for the integration of renewable resources, as listed in its Five-Year Strategic Plan for 2008-2012.

B.2.4.2 PROJECT OBJECTIVES OF THE ENERGY COMMISSION (CEQA)

After considering the objectives set out by the applicant, the Energy Commission has identified the following basic project objectives, which are used to evaluate the viability of alternatives in accordance with CEQA requirements:

- To construct and operate an up to 850 MW renewable power generating facility in California capable of selling competitively priced renewable energy consistent with the needs of California utilities;
- To locate the facility in areas of high insolation with ground slope of less than 5%.

In addition, when considering retention or elimination of alternative renewable technologies, in addition to evaluating the likelihood of reducing or eliminating the potential impacts of Calico Solar Project at its proposed site, staff evaluated whether alternative technologies could meet the following key project objectives:

- To provide clean, renewable electricity to support California's Renewable Portfolio Standard Program (RPS);
- To assist in reducing its greenhouse gas emissions as required by the California Global Warming Solutions Act;
- To contribute to the achievement of the 33% RPS target set by California's governor and legislature; and
- To complete the review process in a timeframe that would allow the applicant to start construction or meet the economic performance guidelines by December 31, 2010 to potentially qualify for the 2009 ARRA cash grant in lieu of tax credits for certain renewable energy projects.

B.2.4.3 PURPOSE AND NEED FOR PROPOSED PROJECT AND PLAN AMENDMENT (BLM)

Bureau of Land Management. Federal orders and laws require government agencies to expedite the review of energy related projects to the extent allowed by law, evaluate energy generation projects and facilitate the development of renewable energy sources. The Energy Policy Act of 2005 (EPAct) encourages the United States Department of the Interior (DOI) to approve at least 10,000 MW of renewable energy on public lands by 2015. Executive Order 13212, dated May 18, 2001, mandates that agencies expedite their "review of permits or take other actions as necessary to accelerate the completion of such projects, while maintaining safety, public health, and environmental protections" in the "production and transmission of energy in a safe and environmentally sound manner." .

Secretarial Order 3283, *Enhancing Renewable Energy Development on the Public Lands*, requires the BLM to ensure that processing and permitting of renewable energy projects complies with the requirements of the National Environmental Policy Act, Endangered Species Act, National Historic Preservation Act, and all other laws and regulations; improve efficiencies in the processing of renewable energy applications and the consistent application of renewable energy policies; and develop Best Management Practices for renewable energy projects on public lands to ensure the most environmentally responsible development of renewable energy, among other things.

Secretarial Order 3285, *Renewable Energy Development by the Department of the Interior* requires BLM to encourage the development of environmentally responsible renewable energy generation. Both of these Secretarial Orders will be considered in responding to the Calico Solar, LLC application for the proposed Calico Solar Project.

Calico Solar, LLC has filed an application with BLM for a land use right-of-way (ROW) grant pursuant to the Federal Land Policy and Management Act (FLPMA, 43 USC 1761). Under FLPMA Title V Section 501 (a)(4) (Rights-of-Way), the United States Secretary of the Interior, as delegated to the BLM, is authorized to grant ROW on lands under the jurisdiction of the BLM for the purpose of allowing systems for generation, transmission, and distribution of electric energy.

BLM Purpose and Need Statement: The BLM's purpose and need for action is to respond to the application under Title V of FLPMA for a ROW grant to construct, operate and decommission the Calico Solar Project and associated infrastructure in compliance with FLPMA, BLM ROW regulations, and other applicable federal laws. The BLM will decide whether to approve, approve with modification, or deny issuance of a ROW grant to Calico Solar for the proposed Calico Solar Project. BLM's actions will also include concurrent consideration of amending the California Desert Conservation Area (CDCA) Plan of 1980. The decision the BLM will make is whether or not to grant a ROW and, if so, under what terms and conditions, and whether or not to amend the land use plan.

As discussed in Section A, solar power facilities are an allowable use of lands under BLM jurisdiction in Multiple Use Class (MUC) L (limited use) areas. Since the site for the proposed Calico Solar Project is currently classified within an MUC L area, solar power facilities are generally allowed. However, Chapter 3, the “Energy Production and Utility Corridors Element” of the CDCA Plan requires that newly proposed sites associated with power generation or transmission facilities not already identified in the Plan will be considered through the plan amendment process. The proposed Calico Solar Project site is not currently identified in the proposed power facility and transmission line element within the Plan. As such, a plan amendment is required in order to approve the site location consistent with the CDCA Plan.

Department of Energy. Calico Solar has also applied to the United States (US) Department of Energy (DOE) for a loan guarantee pursuant to Title XVII of the EPAct. Title XVII of EPAct authorizes the United States Secretary of Energy to make loan guarantees for a variety of types of projects, including those that “avoid, reduce, or sequester air pollutants or anthropogenic emissions of greenhouse gases, and employ new or significantly improved technologies as compared to commercial technologies in

service in the United States at the time the guarantee is issued." The two principal goals of the loan guarantee program are to encourage commercial use in the United States of new or significantly improved energy-related technologies and to achieve substantial environmental benefits. The purpose and need for action by DOE is to comply with their mandate under EPAct by selecting eligible projects that meet the goals of the Act.

B.2.4.4 IMPACTS OF THE PROPOSED PROJECT

Based on the analysis presented in the technical sections of this SSA, the issues defined below have been identified as issues of greatest concern the proposed Calico Solar Project. These are the issues that most drive the development of alternatives.

- Cultural Resources: The proposed Calico project would have a significant direct impact on historically significant archaeological resources. Although the BLM plans to address cultural resources through a Programmatic Agreement (PA) negotiated amongst all federal, state, and private stakeholders, the SSA includes Conditions of Certification that would mitigate project impacts to cultural resources to a level that is not significant. Development of the PA by the BLM is underway, but will not be completed until mid-summer.
- Biological Resources: The Calico Solar Project would have major impacts to the biological resources of the Newberry Springs/Ludlow area of the Mojave Desert, affecting many sensitive plant and wildlife species and eliminating a broad expanse of relatively undisturbed Mojave Desert habitat. Implementation of the Calico Solar Project will result in adverse effects to desert tortoise. Construction of the proposed project would result in the permanent loss of approximately 6,215 acres of occupied desert tortoise habitat. In addition, the applicant has indicated that approximately 100 desert tortoises would need to be translocated outside of the Calico Solar Project site. The project would interfere with both aeolian and fluvial sand deposits on and near the site, which would result in habitat loss and degradation for the Mojave fringe-toed lizard and other sand-associated species and would result in direct impacts to occupied habitat. Golden eagles are known to nest within 5 miles of the project site and have been observed foraging over the project area. The large scale land use conversion for the Calico Solar project would in essence remove approximately 6,215 acres of foraging habitat for this species. The project would directly or indirectly affect numerous ephemeral washes that occur on the Calico Solar site. Cumulative effects to the watershed streams, desert tortoise, Mojave fringe-toed lizard, and white-margined beardtongue from the project in combination with future projects would be significant.
- Visual Resources: The proposed project would substantially degrade the existing visual character and quality of the site and its surroundings, resulting in potentially significant impacts to motorists on Highway Interstate 40 and National Trails Highway/Route 66. The anticipated visual impacts of the Calico Solar Project in combination with past and foreseeable future local projects in the immediate project viewshed, and past and foreseeable future region-wide projects in the southern California desert are considered cumulatively considerable, potentially significant, and unavoidable.
- Land Use: In an Interim Policy dated May 28, 2009, the State Director of the BLM issued an Instruction Memorandum regarding management of donated land and

lands acquired by Land and Water Conservation Funds (LWCF), which requires LWCF lands to be managed as avoidance/exclusion areas for land use authorizations that could result in surface disturbing activities (BLM 2009a). Construction and operation of the proposed project would not comply with this policy.

The alternatives analysis focuses on the consideration of these impacts and the extent to which they could be reduced or eliminated by alternatives to the proposed project as required by CEQA, and the extent to which the alternatives would avoid or minimize adverse effects or enhance the quality of the environment pursuant to NEPA.

B.2.5 SUMMARY OF SCOPING AND SCREENING RESULTS

The public scoping comment period, which occurred from June 8, 2009 to July 9, 2009, allowed the public and regulatory agencies an opportunity to comment on the scope of the SSA, and comment on the alternatives considered, and identify issues that should be addressed in the SSA. An information hearing and public site visit and BLM public scoping meeting was held in Barstow, California on June 22, 2009.The discussion below presents the key issues identified from the written and oral comments received during the scoping process on the Calico Solar Project. The specific issues regarding alternatives that were raised during the public scoping process are:

- Concerns regarding alternatives, suggestions for a reduced alternative, alternative sites, continued recreational access alternative, degraded lands, and smaller sites, alternative technologies, and distributed rooftop solar (See Section B.2.6.1, Section B.2.6.2, B.2.7.2, and B.2.8.2)
- Concerns regarding the viability of the proposed technology
- A reconfigured alternative was suggested by the Defenders of Wildlife that would removed portions northeastern part of the project and incorporate some land that is immediately west of the proposed Calico Solar Project and north of the railroad (DW 2010b) (See Section B.2.6.1 and B.2.8.1 SES Solar Three Alternative)

Scoping comments are also listed in **Introduction Table 1** of the **INTRODUCTION** section of this SSA and in the BLM's Final Scoping Report, which is available for review at BLM's Barstow Field Office as part of the EIS administrative record.

B.2.6 ALTERNATIVES EVALUATED UNDER BOTH CEQA AND NEPA

Section B.2.1 describes the requirements for evaluation of alternatives under NEPA and CEQA. This section describes the three alternatives to the proposed project that are retained for analysis: the Reduced Acreage Alternative, the Avoidance of Donated and Acquired Lands Alternative, as well as the No Project/No Action Alternative. The proposed project is described in Section B.1. The proposed project and the retained alternatives are evaluated under both NEPA and CEQA in Sections C and D (Environmental and Engineering Analysis).

B.2.6.1 REDUCED ACREAGE ALTERNATIVE

The Reduced Acreage Alternative would be a 275 MW solar facility located within the boundaries of the proposed project as defined by Calico Solar. This alternative is analyzed because (1) it eliminates about 59% of the proposed project area so all impacts are reduced, especially those related to desert washes, biological resources, and cultural resources, and (2) it could transmit the power generated without requiring an upgrade to 65 miles of the existing 220 kV SCE Pisgah-Lugo transmission line.

The Reduced Acreage Alternative would consist of 11,000 SunCatchers with a net generating capacity of approximately 275 MW (potentially up to 350 MW)[3] occupying approximately 2,600 acres of land. This alternative would retain 31% of the proposed SunCatchers and would affect 41% of the land of the proposed 850 MW project.

The boundaries of the Reduced Acreage Alternative are shown in **Alternatives Figure 1**. This area was designed to avoid sensitive cultural resources and areas that were mapped as occupied tortoise habitat (live tortoise and/or active burrows and sign). It also excludes all donated lands and lands acquired by BLM with conservation funds. The boundaries of the Reduced Acreage Alternative do not coincide with the Applicant's Phase I project boundaries.

Similar to the proposed project, the Reduced Acreage Alternative would transmit power to the grid through the SCE Pisgah Substation and would require infrastructure including water storage tanks, a transmission line, road access, a main services complex, and a substation (SES 2008a). However, as stated above, the Reduced Acreage alternative would not require the 65-mile upgrade to the SCE transmission line. SCE would complete system upgrades within existing substation boundaries to accommodate the 275 MW, and the 220 kV transmission line would be used. The main services complex, primary water well, and substation and onsite transmission line for the Reduced Acreage Alternative would remain at the location proposed for the proposed project.

According to the applicant, the alternatives analysis did not address the feasibility of the Reduced Acreage Alternative. The applicant considers this alternative to be economically infeasible because it would have higher unit costs for SunCatcher manufacturing and higher operations and maintenance costs on a "per MW basis." In addition, the applicant states that this smaller alternative would potentially put its receipt of ARRA funds at risk. The applicant states that a 275 MW project would increase costs by as much as 30 percent. However, the applicant did not provided details regarding its cost analysis for the Reduced Acreage Alternative including the internal rate of return. CEQA defines "feasible" as "capable of being accomplished in a successful manner within a reasonable period of time, taking into account economic, environmental, social, and technological factors." (Pub.Resources Code, § 21061.1.) "The fact that an alternative may be more expensive or less profitable is not sufficient to show that the alternative is financially infeasible. What is required is evidence that the additional costs

[3] The Calico Solar Project as described in the SA/DEIS would require approximately 10 acres per MW of power generated. Since publication of the SA/DEIS, the Calico Solar Project boundaries have been revised and the project as currently proposed would require 7.3 acres per MW generated. As such, the amount of energy generated by the Reduced Acreage Alternative could be up to 350 MW.

or lost profitability are sufficiently severe as to render it impractical to proceed with the project." (*Citizens of Goleta Valley v. Board of Supervisors*, 197 Cal.App.3d at p. 1181, 243 Cal. Rptr. 339.) While the applicant provided examples of how a 275 MW project might be more expensive on a “per MW basis” than the proposed 850 MW project, it did not provide evidence that the alternative is financially infeasible. A detailed feasibility analysis for a reduced-size project was not provided and would be required in order to evaluate the economic feasibility of this alternative in more detail.

As stated above, the Reduced Acreage Alternative is evaluated in this SSA because it would substantially reduce the impacts of the project. Additionally, the Reduced Acreage Alternative would allow the applicant to demonstrate the success of the Stirling engine technology and construction techniques, while minimizing impacts to the desert environment. A scaled-down project was suggested in numerous scoping comments.

B.2.6.2 NO PROJECT/NO ACTION ALTERNATIVE

CEQA No Project Alternative

The No Project Alternative under CEQA defines the scenario that would exist if the proposed Calico Solar Project were not constructed. The CEQA Guidelines state that “the purpose of describing and analyzing a ‘no project’ alternative is to allow decision makers to compare the impacts of approving the proposed project with the impacts of not approving the proposed project” (Cal. Code Regs., tit. 14 § 15126.6(i)). The No Project analysis in this SSA considers existing conditions and “what would be reasonably expected to occur in the foreseeable future if the project were not approved…” (Cal. Code Regs, tit. 14 § 15126.6(e)(2)).

If the No Project Alternative were selected, the construction and operational impacts of the Calico Solar Project would not occur. There would be no grading of the site, no loss of resources or disturbance of approximately 6,215 acres of desert habitat, and no installation of power generation and transmission equipment. The No Project Alternative would also eliminate contributions to cumulative impacts on a number of resources and environmental parameters in San Bernardino County and in the Mojave Desert as a whole.

In the absence of the Calico Solar Project, however, other power plants, both renewable and non-renewable, may have to be constructed to serve the demand for electricity and to meet RPS. The impacts of these other facilities may be similar to those of the proposed project because these technologies require large amounts of land like that required for the Calico Solar Project. The No Project/No Action Alternative may also lead to siting of other non-solar renewable technologies to help achieve the California RPS.

Additionally, if the No Project/No Action Alternative were chosen, additional gas-fired power plants may be built, or that existing gas-fired plants may operate longer. If the proposed project were not built, California would not benefit from the reduction in greenhouse gases that this facility would provide, and SCE would not receive the 850 MW contribution to its renewable state-mandated energy portfolio.

NEPA No Action Alternatives

Under NEPA, the No Action Alternative is used as a benchmark of existing conditions by which the public and decision makers can compare the environmental effects of the proposed action and the alternatives. Like the No Project Alternative described above, under the No Action Alternative, the impacts of the Calico Solar Project would not occur.

BLM is considering two separate actions (whether to approve a plan amendment and whether to approve the proposed project or an alternative). The "proposed action" includes amending the CDCA Plan to include Calico Solar Project (850 MW), and to approve the project as proposed (850 MW). The Calico Solar Project 850 MW project and ancillary facilities would be approved, a ROW grant would be issued, and the CDCA Plan would be amended to include the Calico Solar Project power generation facilities and transmission line as an approved site under the Plan. Similarly, BLM could amend the CDCA Plan to include one of the action alternatives fully analyzed in this Draft EIS (the Reduced Acreage or Avoidance of Donated and Acquired Lands alternatives), and approve the construction and operation of those alternatives. The alternative and ancillary facilities would be approved, a ROW grant for the appropriate acreage would be issued, and the CDCA Plan would be amended to include the alternative power generation facilities and transmission line as an approved site under the Plan.

BLM's alternatives related to the No Action Alternative and the Plan amendment are the following.

NO PROJECT/NO ACTION ALTERNATIVE #1

No Action on the Calico Solar Project Application and on CDCA Land Use Plan Amendment

In the No Project / No Action Alternative, the proposed action would not be undertaken. The BLM land on which the project is proposed would continue to be managed within BLM's framework of a program of multiple use and sustained yield, and the maintenance of environmental quality [43 U.S.C. 1781 (b)] in conformance with applicable statutes, regulations, policy and land use plan.

The results of the No Project / No Action Alternative would be the following:

- The impacts of the proposed project would not occur.
- The land on which the project is proposed may or may not become available to other uses (including another solar project), depending on BLM's actions with respect to the amendment of the California Desert Conservation Area Plan.
- The benefits of the proposed project in reducing greenhouse gas emissions from gas-fired generation would not occur. Both State and Federal law support the increased use of renewable power generation.

Under this alternative, the proposed Calico Solar Project would not be approved and BLM would not amend the CDCA Plan. As a result, no solar energy project would be constructed on the project site and BLM would continue to manage the site consistent

with the existing land use designation in the CDCA Land Use Plan of 1980, as amended.

Because there would be no amendment to the CDCA Plan and no solar project approved for the site under this alternative, it is expected that the site would continue to remain in its existing condition, with no new structures or facilities constructed or operated on the site and no new ground disturbance. As a result, no loss or degradations to cultural resources from construction or operation of the proposed project would occur. However, the land on which the project is proposed would become available to other uses that are consistent with BLM's land use plan, including another solar project requiring a land use plan amendment. In addition, in the absence of this project, other renewable energy projects may be constructed to meet State and Federal mandates, and those projects would have similar impacts in other locations.

If this project is not approved, renewable projects would likely be developed on other sites in the California Desert or in adjacent states as developers strive to provide renewable power that complies with utility requirements and State/Federal mandates. For example, there are large solar and wind projects proposed on BLM land along the Interstate 40 corridor within a few miles of the Calico Solar Project site. In addition, there are currently over 70 applications for solar projects covering over 650,000 acres pending with BLM in California.

NO PROJECT/NO ACTION ALTERNATIVE #2

No Action on Calico Solar Project and Amend the CDCA Land Use Plan to Make the Area Available for Future Solar Development

Under this alternative, the proposed Calico Solar Project would not be approved and BLM would amend the CDCA Land Use Plan of 1980, as amended, to allow for other solar projects on the site. As a result, it is possible that another solar energy project could be constructed on the project site.

Because the CDCA Plan would be amended, it is possible that the site would be developed with a different solar technology. As a result, ground disturbance would result from the construction and operation of the facility providing different solar technology and would likely result in a loss or degradation to cultural resources. Different solar technologies require different amounts of grading and maintenance; however, it is expected that all solar technologies require some grading and ground disturbance. As such, this No Project/No Action Alternative could result in impacts to cultural resources similar to the impacts under the proposed project.

NO PROJECT/NO ACTION ALTERNATIVE #3

No Action on the Calico Solar Project Application and Amend the CDCA Land Use Plan to Make the Area Unavailable for Future Solar Development

Under this alternative, the proposed the Calico Solar Project would not be approved and the BLM would amend the CDCA Plan to make the proposed site unavailable for future solar development. As a result, no solar energy project would be constructed on the

project site and BLM would continue to manage the site consistent with the existing land use designation in the CDCA Land Use Plan of 1980, as amended.

Because the CDCA Plan would be amended to make the area unavailable for future solar development, it is expected that the site would continue to remain in its existing condition, with no new structures or facilities constructed or operated on the site and no corresponding land disturbance. As a result, the cultural resources of the site are not expected to change noticeably from existing conditions and, as such, this No Project/No Action Alternative would not result in impacts to cultural resources. However, in the absence of this project, other renewable energy projects may be constructed to meet State and Federal mandates, and those projects would have similar impacts in other locations.

The potential impacts of each of the No Action Alternatives are addressed under each resource element of Sections C and D.

B.2.7 ALTERNATIVES RETAINED FOR ANALYSIS

In addition to the Reduced Acreage Alternative (discussed in Section B.2.6.1), one site alternative is evaluated by the Energy Commission under CEQA. The alternative site evaluated in this section (Private Land Alternative) is located on private lands. The Energy Commission does not have the authority to approve an alternative or require Calico Solar to move the proposed project to another location, even if it identifies an alternative site that meets the project objectives and avoids or substantially lessens one or more of the significant adverse effects of the project. Implementation of an alternative site would require the applicant to submit a new Application for Certification (AFC), including revised engineering and environmental analyses. This more rigorous AFC-level analysis of any of the alternative sites could reveal environmental impacts; nonconformity with laws, ordinances, regulations, and standards; or potential mitigation requirements that were not identified during the more general alternatives analysis presented herein. Preparation and review of a new AFC for the Calico Solar Project on an alternative site would require substantial additional time.

Alternatives sites for the Calico Solar Project were suggested in scoping comments as means to reduce the project impacts to undisturbed land and desert environments. The Private Land Alternative was suggested by scoping comments, and numerous scoping comments suggested consideration of a private/disturbed land alternative. Scoping comments stated that because the Stirling technology is developed in clusters, it is not necessary for the solar facility site to be on a single contiguous parcel.

The Private Land Alternative site considered in the analysis in this SSA is illustrated on **Alternatives Figure 3** at the end of this section.

B.2.7.1 SITE SELECTION CRITERIA

The following site selection criteria identified in the Calico Solar AFC were used to choose the proposed site (SES 2008a):

- facility should be located in an area of long hours of sunlight (low cloudiness), insolation should be at a level of 7 kilowatt-hours per square meter per day;

- the site should be relatively flat, site grade may be up to 5%;
- wind speed of less than 35 miles per hour 98% of the time;
- land must be available for sale or use, landowner must be willing to negotiate a long-term option agreement so that site control does not require a large capital investment until license is obtained;
- site should have ease of access and close proximity to access roads and railroads is preferred;
- site should have few or no environmentally sensitive areas (particularly biological and cultural resources) and should allow development with minimal environmental impacts;
- site should be located out of environmentally excluded areas (such as State and National Parks or areas of critical environmental concern);
- proposed use should be consisted with existing laws, ordinances, regulations, and standards;
- site should be located on property currently available at a reasonable cost.

The site criteria do not state a minimum acreage required for an 850 MW Stirling engine system facility. Within the 6,215 acres proposed for Calico Solar Project, approximately 3,270 acres would be graded for the project, including access roads and infrastructure (SES 2008a). It is assumed that additional acreage (approximately 5,000) would be required for project design and to avoid shading; however, the exact amount of total acreage required is unclear. Because the site alternatives do not contain major washes or sensitive habitat and cultural resources, it is possible that less than 6,215 acres would be required for an 850 MW facility at the Private Land site.

In a June 2009 comment letter, Audubon California and other groups defined a list of criteria for areas to avoid in siting renewable projects. This list is presented below, since it presents other factors related to site selection.

- Locations that support sensitive biological resources, including: federally designated and proposed critical habitat; significant populations of federal or state threatened and endangered species, significant populations of sensitive, rare and special status species, and rare or unique plant communities;
- Areas of Critical Environmental Concern, Wildlife Habitat Management Areas, proposed Habitat Conservation Plan and Natural Community Conservation Plan Conservation Reserves;
- Lands purchased for conservation including those conveyed to the BLM;
- Landscape-level biological linkage areas required for the continued functioning of biological and ecological processes;
- Proposed Wilderness Areas, proposed National Monuments, and Citizens' Wilderness Inventory Areas;
- Wetlands and riparian areas, including the upland habitat and groundwater resources required to protect the integrity of seeps, springs, streams or wetlands;

- National Register of Historic Places eligible sites and other known cultural resources;
- Locations directly adjacent to National or State Park units.

During the FLPMA ROW grant pre-application period, BLM worked closely with the project applicant to identify a feasible site without known environmental concerns. This effort resulting in an identification of the propose site, which does reflect many of the suggested criteria for siting indentified by Audubon California. Similarly, alternative sites considered in this SSA were selected to meet as many of these criteria as possible.

Other Sites on BLM Land

The BLM has received a large number of utility-scale solar energy project proposals for BLM-administered lands throughout California. The BLM processes solar energy ROW grant applications under its Solar Energy Development Policy (Instructional Memorandum No. 2007-097) and addresses environmental concerns for the utility-scale energy projects on a case-by-case basis in conformance with its existing policies, manuals, and statutory and regulatory authorities. Under its existing regulations, BLM determines if competing applications exist for the same facility or system. Applications that are first in time are given priority in consideration and are not considered competing applications with those filed later in time.

In addition, another site with an active pending application (Site 2) is not a reasonable alternative to a proposed project, such as Calico Solar Project. Site 2 is not a reasonable alternative because selection and approval of Site 2 in lieu of the proposed project (or one of its alternatives) is remote and speculative. If BLM were to consider Site 2 as an alternative to the proposed project, it would inherently be making a determination of reasonableness of the proposed alternative. However, an active pending application for Site 2 commands priority in consideration for that site location just as an active pending application for the Calico Solar Project site commands priority for its site location. Unless and until the active pending application for Site 2 is eliminated from consideration, the BLM would not approve the Site 2 alternative over the proposed project, in this case Calico Solar Project. Therefore, an alternative site on BLM land with an active pending application for another project is not considered a reasonable alternative to the proposed project for purposes of alternatives analysis.

The BLM and DOE are preparing a Programmatic Environmental Impact Statement (PEIS) on solar energy development in six states in the western U.S. (Arizona, California, Colorado, New Mexico, Nevada, and Utah) (USDOE 2008). As part of that PEIS, the BLM and DOE identified 24 tracts of BLM-administered land for in-depth study for solar development, some or all of which may be found appropriate for designation as solar energy zones in the future. The public scoping period on the solar energy zone maps ended in September 2009. The Draft PEIS is anticipated to be published in 2010.

B.2.7.2 PRIVATE LAND ALTERNATIVE

The proposed Calico Solar Project is described above. Multiple scoping comments requested that an alternative site be considered on disturbed land, and specifically on the agriculture lands and brownfields in the Daggett/Yermo area, thereby lessening the

potential project impacts to the desert environment. Commenters also noted that because the technology allows for distributed units, a contiguous site may not be necessary.

The applicant considered two alternatives in the AFC that included the use of some private land (Upper Johnson Valley – AS2, and I-40 South – AS4; see **Alternatives Figure 4**). These sites were eliminated from further consideration by the applicant because they lacked railroad access and major highway access and conflicted with other uses. The sites are addressed in Section B.2-8, Alternatives Considered but not Evaluated in Further Detail.

There are limited areas where undeveloped contiguous private land exists within the California desert with the slope and solarity requirements defined by the applicant. The RETI Phase 2A Draft Final Maps (9/01/09) identified private, disturbed land appropriate for solar development east of Barstow, bounded by I-15 on the north and I-40 on the south. This land also achieves most of the site selection criteria defined by Calico Solar, provided earlier in this section, and was suggested in a scoping comment. The Mojave River passes through this region, and its floodplain ranges from about 2,000 feet to one mile wide. The river parallels I-15 on a northeasterly trend.

Alternatives Figure 3 shows this area of private land. **Alternatives Figure 3A and 3B** illustrate the alternative in more detail. This alternative is made up of two separate and unconnected sections. The Private Land Alternative northern section has a total of approximately 64 parcels (27 separate landowners) making up approximately 4,000 acres. The Private Land Alternative southern section has a total of approximately 45 parcels (22 separate landowners), also comprising approximately 4,000 acres. Because each section is approximately 4,000 acres, the alternative would require two phases, each approximately 425 MW. The alternative is considered viable as an alternative site because the Calico Solar project defines construction of separate groups of SunCatchers. However, because the alternative would not be one contiguous parcel, additional major equipment and substations would be required for at this site, increasing the cost of the project.

The Private Land Alternative northern section would be located on private land with a few BLM parcels included, south of and adjacent to Interstate 15 in the community of Harvard, north of Newberry Springs. The Private Land Alternative northern section has appropriate insolation and minimal slope. The elevation of the site is approximately 1,800 feet above mean sea level. The site would be accessed via Harvard Road, off Interstate 15 at the Harvard Road exit. The California Department of Fish and Game (CDFG) owns lands located just south of the site boundary. Additionally, there are several existing structures and residences on some of this private land, and removal of houses or other structures may be required.

The Private Land Alternative southern section is located north of the National Trails Highway and BNSF railroad. This land has appropriate insolation and minimal slope and has been previously graded for agriculture use. Existing solar thermal projects (SEGS I and II) are sited immediately south of the alternative and the original U.S. DOE Solar Two project was located at this site; however, it was decommissioned in November,

2009 and the site may potentially be developed as a solar energy project. The elevation of the site is between sea level and 20 feet below sea level. The site would be accessed via I-40 at the Hidden Springs Road exit.

The Private Land Alternative would require acquisition of approximately 110 parcels, although the number of separate landowners is fewer. Due to the number of parcels that would have to be acquired, this alternative would be substantially more challenging for an applicant to obtain site control (in comparison to BLM land). The applicant would have to negotiate separately with multiple landowners. The Draft Phase 2a Report published by the Renewable Energy Transmission Initiative (RETI) in early June 2009 identified private land areas for solar development only if there were no more than 20 owners in a 2 square mile (1,280 acre) area.

The Mojave River is located in between the Private Land Alternative northern section and the Private Land Alternative southern section. The river is dry most of the year and flows only during the largest rain events. The land use character of the immediate alternative site area is open space, agriculture, and rural residential. Desert Wildlife Management Areas (DWMA) for protection of desert tortoise are located north and south of the alternative.

Approximately five residences are located within the Private Land Alternative northern section. Existing agriculture structures are located on the Private Land Alternative southern section. The Private Land Alternative would also be located adjacent to low density residential areas near Daggett and Newberry Springs. The Private Land Alternative southern section would be located adjacent to an area zoned as regional industrial.

Transmission Interconnection. The SCE Coolwater-Dunn Siding 115 kV transmission line runs through the Private Land Alternative northern and southern sections. The Private Land Alternative sites would require either an upgrade of the SCE Coolwater-Dunn Siding 115 kV transmission line or the construction of a new 10-mile 230 kV transmission line that would follow the existing corridor southwest to the Coolwater Substation. Both the Private Land Alternative sections would require substations; however, one transmission line could be used for both sites.

Environmental and Engineering Assessment of the Private Land Alternative

Air Quality

Environmental Setting. Like the proposed Calico Solar Project, the Private Land Alternative would be located within the Mojave Desert Air Basin, regulated by the Mojave Desert Air Quality Management District (MDAQMD). The Private Land Alternative would be located in the Western Mojave Desert where ozone and particulate matter violate ambient standards, despite the low population density east of Barstow (USEPA 2008).

Environmental Impacts. Exhaust emissions from heavy-duty diesel and gasoline-powered construction equipment and fugitive particulate matter (dust) would be essentially the same at any site. Exhaust emissions would also be caused by workers

commuting to and from the work sites, from trucks hauling equipment and supplies to the sites, and crew trucks (e.g., derrick trucks, bucket trucks, pickups). Workers and trucks hauling equipment and supplies would have to commute up to 20 miles (to Barstow) or 60 miles (to Victorville) to reach the Private Land Alternative. The proposed Calico Solar Project site is located approximately 37 miles east of Barstow. Appropriate mitigation at the Private Land Alternative site would likely involve similar, locally oriented recommendations such as the conditions of certification presented in the **AIR QUALITY** section of this SSA.

Comparison to Proposed Project. The construction and operational emissions at the Private Land Alternative would be similar to those of the Calico Solar Project site. The emissions caused by workers commuting to the work site would be slightly reduced at the Private Land Alternative.

Biological Resources

Environmental Setting. Barstow is located in the Mojave bioregion, encompassing nearly all of San Bernardino County, most of Inyo County, the southeastern tips of Mono and Tulare Counties, the eastern end of Kern County, the northeastern desert area of Los Angeles County, and a piece of north-central Riverside County (California Environmental Resources Evaluation System [CERES] 2010).

The Mojave bioregion is one of the largest bioregions in California, and is part of the vast desert that covers Southern Nevada, the southwestern tip of Utah, and almost one quarter of California in the southeast. Much of the Mojave bioregion lies on a high plateau averaging 2,000 to 3,000 feet above mean sea level (AMSL); however, it also includes the lowest elevation in North America (located in Death Valley) as well as isolated peaks that can exceed 7,000 feet. Common habitats include desert wash, Mojave creosote bush scrub, desert saltbush scrub, Joshua tree scrub, alkali scrub, palm oasis, juniper-pinyon woodland, and some hardwood and conifer forests at higher elevations. Summers are hot and dry, and winters are cool to cold (CERES 2010).

The Mojave bioregion supports a diverse array of plant and animal species. Rare animals include the Mohave ground squirrel (*Spermophilus mohavensis*), prairie falcon (*Falco mexicanus*), Le Conte's thrasher (*Toxostoma lecontei*), Nelson's bighorn sheep (*Ovis canadensis nelsoni*), desert tortoise (*Gopherus agassizi*), pale big-eared bat (*Corynorhinus townsendii*), and Mohave tui chub (*Gila bicolor mohavensis*). Rare plants include white bear poppy (*Arctomecon merriamii*), Barstow woolly sunflower (*Eriophyllum mohavense*), alkali mariposa lily (*Calochortus striatus*), Red Rock poppy (*Eschscholzia minutiflora* ssp. *twisselmannii*), Mojave monkeyflower (*Mimulus mohavensis*), and Stephen's beardtongue (*Penstemon stephensii*; CERES 2010).

The Private Land Alternative is located in the desert region of unincorporated San Bernardino County within the BLM West Mojave Planning Area. The western Mojave Desert comprises a distinct area of the Mojave Desert biome, and flora and fauna have adapted to local conditions and formed distinct natural communities. Freezing temperatures occur on a limited basis in the winter, and summer temperatures regularly exceed 100 degrees. The desert habitat of San Bernardino County includes soils that are predominantly sandy gravel, as well as major dune formations, desert pavement, and dry alkaline lake beds (San Bernardino County 2007). The Mojave Desert region is

characterized by arid conditions with low precipitation, and the eastern portion of the West Mojave Planning Area is crossed by expansive alluvial washes.

The West Mojave Planning Area supports a diverse array of plant and wildlife species because of the varied topography and landforms within the planning area (BLM 2005a). The predominant aspect of the West Mojave is a flat, sparsely vegetated region interspersed with mountain ranges and dry lakes. The characteristic creosote bush and saltbush plant communities bloom during years of above-normal winter rainfall, and up to 90% of the flora is comprised of annual plants (BLM 2005a).

The Private Land Alternative would be located immediately north and immediately south of the Mojave River. The Mojave River is in many ways the most prominent landscape feature of the West Mojave desert (BLM 2004). The now-dry river and playas of the historic Mojave River supported species of invertebrates, fish, amphibians, and pond turtles, and attracted migratory birds dependent on water. Remnant populations of these animals are still present today, and comprise many of the rare species in the vicinity of the river. The ancient river and lakes formed sandy beaches and prevailing winds carried the finer particles to the east, forming hummocks and dunes. These blowsand areas now support unique species of insects, plants, and reptiles, including the Mojave fringe-toed lizard, whose entire distribution can be traced to the former path of the ancient Mojave River and Amargosa River (BLM 2004).

The Private Land Alternative would be located on habitat that is considered suitable for the Mohave Ground Squirrel but is outside of the Mohave Ground Squirrel Historic Range (CDFG 2005, CDFG 2009). The Mohave Ground Squirrel is restricted to the Mojave Desert in San Bernardino, Los Angeles, Kern and Inyo Counties and populations have been reduced by urban development, off-road vehicle use, and agriculture. Populations in the southwestern San Bernardino County appear to be extirpated (CDFG 2005).The Mohave Ground Squirrel was not identified in the CNDDB data for this site.

Private Land Alternative northern section. The Private Land Alternative northern section would be located immediately north of the CDFG Camp Cady Wildlife Area (BLM 2004). Camp Cady supports mesquite thickets and riparian forest, and protects western pond turtle, summer tanager, yellow-breasted chat, and a variety of birds of prey, especially in winter. Camp Cady includes habitat for Mojave tui chub, hawks, songbirds and shorebirds. Adjacent public and private lands west of Camp Cady including the Private Land Alternative contain blowsand deposits with Mojave fringe-toed lizard habitat (BLM 2004).

A reconnaissance survey of the biological resources of the Private Land Alternative northern section was conducted on August 16, 2009 from public access roads which allowed visitation throughout the site. The two dominant habitat types of the Private Land Alternative northern section are Mojave creosote bush scrub and atriplex scrub. The Private Land Alternative northern section also included some lands dominated by fallow and ruderal fields and developed areas. During this survey, a number of habitat characteristics were used to rate the quality of the habitat and the capacity to support desert tortoises. These include topography, soil texture, dominant shrubs, herb layer, plant diversity, likelihood of desert tortoise occurrence, likelihood of other special status

species occurrence, quality of surrounding habitat, overall habitat quality for wildlife, and overall habitat quality for desert tortoise. Results of the survey show that the Private Land Alternative northern section has varying habitat quality for desert tortoise and wildlife and is generally made up of unsuitable to medium quality habitat for desert tortoise.

The Private Land Alternative northern section had poor quality habitat for rare plants, except on Harvard Hill (where no impacts would be expected due to unbuildable slopes). Much of the Mojave River lacks any notable riparian vegetation. Even where riparian vegetation is good, impacts to wildlife using the river vegetation during breeding season from a solar facility up on the ridge of private lands was expected to be low. There is a buffer of perhaps 300-500 feet from river vegetation/active channel to buildable flats to north where the Private Land Alternative could be expected to be built.

Private Land Alternative southern section. The Private Land Alternative southern section consists mostly of active and fallow agricultural land. A major Los Angeles Department of Water and Power transmission line traverses the central portion of the site from the southwest to the northeast, and an existing solar facility is located at the western site boundary. Surrounding lands, in addition to the airport, are comprised of active and inactive agriculture, a salt pond and a solar facility, private residences, and undeveloped lands. Topography on site is relatively flat, with elevation ranging from approximately 1,804 to 1,969 feet AMSL. Soils mapped for the Private Land Alternative southern section are comprised mostly of Cajon sand and Cajon loamy sand, with smaller patches of Halloran sandy loam, Kimberlina loamy fine sands, and Kimberlina gravelly sandy loam. These soil types are classified as prime farmland.

One small manmade pond surrounded by riparian habitat occurs adjacent to a private residence at the northwestern site perimeter. It is vegetated with wetland species (i.e., giant reed [*Arundo donax*]) and areas with extant wetland vegetation would potentially be considered jurisdictional to the CDFG and ACOE. A focused delineation would be necessary to confirm that this is the case.

Additionally, a small portion of the site (owned by BLM) in the northwestern corner is immediately adjacent to or overlaps with the southern bank of the Mojave River floodplain, but does not contain wetland vegetation. It is likely that the floodplain would be considered waters of the state under the jurisdiction of the CDFG and could potentially be considered waters of the U.S. under the jurisdiction of the ACOE. Similarly, a focused delineation may be necessary to confirm that this is the case.

Although access to the site was restricted primarily to public roads, a variety of animal species were detected or observed on site. Common animal species included harvester ants (*Pogonomyrmex* sp.), coyote (*Canis latrans*), black-tailed jackrabbit (*Lepus californicus*), and various resident and migratory bird species, such as western meadowlark (*Sturnella neglecta*), Say's phoebe (*Sayornis saya*), common raven (*Corvus corax*), yellow-rumped warbler (*Dendroica cornata*), greater roadrunner (*Geococcyx californianus*), European starlings (*Sturnus vulgaris*), and white-crowned sparrow (*Zonotrichia leucophrys*). Also observed in the northwestern portion of the site were a loggerhead shrike (*Lanius ludovicianus*), prairie falcon (*Falco mexicanus*), and red-tailed hawk (*Buteo jamaicenis*). Several small burrows (0.5 to 2") were noted during

the reconnaissance on the BLM portions of the site, many of which were inactive. The burrows are likely used by kangaroo rats, lizards, and snakes.

The Barstow-Daggett County Airport bordering the central-south portion of the site, in addition to the I-40 further south and I-15 further north of the site, may potentially restrict wildlife movement for species using the site.

Agriculture, Mohave creosote bush scrub, and desert saltbush scrub are the three primary vegetation communities on the Private Land Agriculture southern section. Additionally, a small area of stabilized sand dunes occurs in the northeastern portion of the site owned by BLM, and the small manmade pond contains riparian vegetation. Areas that are developed (i.e., solar facility and rural residences) or comprised of disturbed habitat occur adjacent to agricultural fields.

Agriculture occurs on approximately 2,602 acres (approximately 53%) of the Private Land Alternative southern section. The active and inactive agriculture is comprised of hay fields, fallow fields, and associated infrastructure. In addition, approximately 296 acres of developed land and 292 acres of disturbed habitat occur adjacent to the agricultural fields. Altogether, agricultural and developed land consists of approximately 65% of the site. Small areas of highly disturbed native habitat, comprised of Mohave creosote bush scrub and desert saltbush scrub, also occur adjacent to the agricultural fields.

Mojave creosote bush scrub occurs on approximately 1,258 acres of the Private Land Alternative southern section and is dominated by varying densities of creosote bush (*Larrea tridentata*), white bur-sage (*Ambrosia dumosa*), and buckwheat (*Eriogonum* spp.). Occassional species observed within the Mojave creosote bush scrub include desert saltbush (*Atriplex polycarpa*), cholla (*Cylindropuntia echionocarpa* and *C.ramosissima*), ephedra (*Ephedra trifurca*), button brittlebush (*Encelia frutescens*), and annual species such as cryptantha (*Cryptantha* sp.), dune primrose (*Oenethera deltoids*), and brown-eyed primrose (*Camissonia claviformis*). Disturbed areas of the Mojave creosote bush scrub are characterized by sparse vegetative cover and greater densities of Russian thistles (*Salsola paulsenii* and *S.tragus*) and Sahara mustard (*Brassica tournefortii*). The northwestern portion of the site, owned by BLM and adjacent to the Mojave River floodplain, contains higher quality Mohave creosote bush scrub. The small area of disturbed Mojave creosote bush immediately adjacent to the BLM-owned areas and north of the manmade pond showed signs of having been burned.

Desert saltbush scrub occurs in small patches on approximately 399 acres of the Private Land Alternative southern section and is comprised primarily of desert saltbush, Russian thistle, and Mediterranean grass (*Schismus barbatus*), with a few creosote bush sometimes present. The largest area of contiguous desert saltbush scrub on site occurs in the southeastern corner between the agricultural fields.

Stabilized sand dunes support species found in Mojave creosote bush scrub and occur on approximately 12 acres of the Private Land Alternative southern section. The riparian habitat near the small pond (< 2 acres) is comprised primarily of non-native vegetation (i.e., giant reed and athel tamarisk [*Tamarix aphylla*]) with native species Fremont cottonwood (*Populus fremontii*), arroweed (*Pluchea sericea*), and pine (*Pinus* sp.).

Two California species of special concern (SSC) were observed during the site reconnaissance: a single loggerhead shrike observed on a shrub adjacent and south of Valley Center Road, and a single prairie falcon observed on a powerline pole at the intersection of Valley Center Road and Hidden Springs Road. CNDDB species records for the site include two locations for prairie falcon at the southeastern corner adjacent to an agricultural field. There is some potential for all species observed on the proposed project site to occur on (or migrate through) the Private Land Alternative southern section, particularly in the native vegetation communities; however, sensitive plants are unlikely to occur on site due to extensive disturbance from agriculture activities.

The following sensitive species occur in the vicinity of the Private Land Alternative southern and northern sites (CNDDB, 2009). Several species are noted because of the proximity to the Mojave River, which flows rarely.

Alternatives Table 2 California Natural Diversity Database Records for Special Status Species within Five Miles of the Private Land Alternative Sections

Common Name *Scientific Name*	Status State/Fed/CNPS/BLM	Occurrence Within 5 Miles of Private Land Alternative Sections
PLANTS		
Crucifixion thorn *Castela emoryi*	--/--/List 2.3/--	Reported approximately 1 mile west of the site.
Barstow woolly sunflower *Eriophyllum mohavense*	--/--/List 1B.2/--	Reported approximately 2 to 3 miles northwest of the site.
Creamy blazing star *Mentzelia tridentate*	--/--/List 1B.3/--	Reported approximately 1 mile south of the site and 1 mile west of the site.
Mojave monkey flower *Mimulus mohavensis*	--/--/List 1B.2/--	Reported approximately 1 mile southwest of the site.
Parish's phacelia *Phacelia parishii*	--/--/List 1B.1/--	Reported approximately 2 miles northwest of the site.
ANIMALS		
Southwestern pond turtle *Actinemys marmorata*	--/SSC/--/S	Reported approximately 1 mile north of the site.
Pallid bat *Antrozous pallidus*	SC/SC/--/S	Reported approximately 3 miles northeast of the site.
Prairie falcon *Falco mexicanus*	--/--/--/--*	Reported on site in the southeastern corner of the site.
Desert tortoise *Gopherus agassizii*	ST/FT/--/S	Reported approximately 2 miles northwest of the site and approximately 0.75 mile southwest of the site.
Yellow-breasted chat *Icteria virens*	--/SSC/--/--	Reported approximately 1 mile north of the site.
Mojave ground squirrel *Spermophilus mohavensis*	SC/ST/--/S	Reported less than 0.5 mile south of the site.
Townsend's big-eared bat Plecotus townsendii	--/SSC/--/S	Reported approximately 2 to 3 miles northwest of the site.
Vermilion flycatcher *Pyrocephalus rubinus*	--/SSC/--/--	Reported approximately 2 to 3 miles northeast of the site.

Common Name *Scientific Name*	Status State/Fed/CNPS/BLM	Occurrence Within 5 Miles of Private Land Alternative Sections
Le Conte's Thrasher *Toxostoma lecontei*	--/SSC/--/--	Reported approximately 1 mile north of the site and 1.5 miles southeast of the site.
Nelson's bighorn sheep *Ovis canadensis nelson*	FE/ST/--/S	Reported approximately 1 to 2 miles south of the site.

*Formerly a California Species of Special Concern but no longer is of special status.
Source: CDFG 2009.

Status Codes:

Federal FE - Federally listed endangered: species in danger of extinction throughout a significant portion of its range

FT - Federally listed threatened: species likely to become endangered within the foreseeable future

State SE - State listed endangered

ST = State listed threatened

SSC = Species of special concern

California Native Plant Society

List 1B - Rare, threatened, or endangered in California and elsewhere

List 2 - Rare, threatened, or endangered in California but more common elsewhere

List 3 - Plants which need more information

List 4 - Limited distribution – a watch list

0.1 - Seriously threatened in California (high degree/immediacy of threat)

0.2 - Fairly threatened in California (moderate degree/immediacy of threat)

0.3 - Not very threatened in California (low degree/immediacy of threats or no current threats known)

BLM S **=** Sensitive

BLM Manual § 6840 defines sensitive species as "…those species that are (1) under status review by the FWS/NMFS; or (2) whose numbers are declining so rapidly that federal listing may become necessary, or (3) with typically small and widely dispersed populations; or (4) those inhabiting ecological refugia or other specialized or unique habitats." <www.blm.gov/ca/pdfs/pa_pdfs/biology_pdfs/SensitiveAnimals.pdf>

Environmental Impacts. Approximately 650 acres of the Private Land Alternative northern section and 3,400 acres of the Private Land Alternative southern section are disturbed agricultural land. Approximately 3,950 acres of Mojave creosote scrub and other native plant communities would be permanently lost by vegetation clearing, grading, and construction of the solar facilities, potentially affecting special status animal species. It is expected that the entire Private Lands Alternative northern and southern

sections and all of the vegetation communities on them (i.e., agriculture, Mojave creosote bush scrub, desert saltbush scrub, stabilized sand dunes) as well as any potential jurisdictional areas (e.g., manmade pond and associated riparian habitat, bank of Mojave River floodplain) would be permanently lost as a result of vegetation clearing, grading, and construction of the solar facilities. It is also assumed that there would be additional impacts by transmission lines; however, data for a transmission line was not available for the alternative site.

Impacts to listed or sensitive plant species would result from direct or indirect loss of known locations of individuals or direct loss of habitat. Indirect loss of individuals may occur in instances such as sediments transported (e.g., from cleared areas during rain events) that cover adjacent plants or changes in a plant's environment that cause its loss (e.g., adjacent shrubs that provided necessary shade are removed). In addition, this alternative is located near the Mojave River, so conditions of certification to protect river corridor species and habitat would be important.

Impacts/Mitigation to Wildlife—Overview

Building a solar facility at the Private Land Alternative sites would potentially have an adverse effect on listed and sensitive wildlife species and their habitats either directly or through habitat modifications. Any wildlife residing within the alternative sites would potentially be displaced, injured, or killed during project activities. Animal species in the project area could fall into construction trenches, be crushed by construction vehicles or equipment, or be harmed by project personnel. In addition, construction activities may attract predators or crush animal burrows or nests. Few impacts to special status animal species would be expected at the Private Lands Alternative southern section because the site is largely active and inactive agricultural land. However, both the loggerhead shrike and prairie falcon were observed using the southern section, and would be affected. Also, the burrowing owl, which is known to use agricultural land for foraging, may be affected if it is present.

Migratory/Special Status Bird Species. Mojave creosote bush scrub at the alternative provides foraging, cover, and/or breeding habitat for migratory birds, including special-status bird species that may be present at the sites. Project construction and operation could impact nesting birds in violation of the Migratory Bird Treaty Act. Preconstruction surveys and avoidance of nesting birds could reduce such impacts.

Desert Tortoise. The Private Lands Alternative is located in habitat of varying quality for desert tortoise. Although the habitat/plant community varies somewhat with elevation, slope, and soils, many areas have been heavily disturbed and some are actively farmed. The majority of the Private Land Alternative southern section and portions of the Private Land Alternative northern section are unsuitable for desert tortoise. Portions of the Private Land Alternative northern section range between low and medium quality habitat for desert tortoise. It is anticipated that the Private Land Alternative also provides unsuitable to medium quality habitat for other special status species that are known to occur in the area. This site is of less value to desert tortoise than the Calico Solar Project site. Critical habitat and ACEC for the desert tortoise is located approximately 1 mile south of the Private Lands Alternative southern section, and desert tortoise has been reported to the CNDDB in between the southern and

northern sections and approximately 0.75 mile southwest of the Private Land Alternative southern section.

The Mojave River is located approximately one-half mile from the site. There are patches of well developed riparian habitat and areas of no and poorly developed riparian habitat. The proximity of the river to the project sites would most likely result in increased bird activity in the area but this increase is not expected to result in significant impacts.

This notwithstanding, construction and operation activities may result in direct or indirect impacts to the desert tortoise or its occupied habitat and mitigation measures similar to those required for the proposed Calico Solar Project site would be required should the project be build at the Private Land Alternative.

Human activities in the Private Land Alternative project area potentially provide food or other attractants in the form of trash, litter, or water, which draw unnaturally high numbers of tortoise predators such as the common raven, kit fox, and coyote. Predation could be reduced through the preparation of a Raven Management Plan and other avoidance and minimization measures such as the conditions of certification presented in the **BIOLOGICAL RESOURCES** section of the SSA.

Mohave Ground Squirrel. Construction and operation activities may result in direct or indirect impacts to the Mohave ground squirrel or its occupied habitat. The project would result in potential take of individuals and permanent loss of up to 4,000 acres of habitat on the solar facility site. The project could also result in disturbance to nearby populations should there be any and increased road kill hazard from construction and operation traffic.

Furthermore, there is some potential for Mojave fringe-toed lizard, golden eagle, California horned lark, Bendire's thrasher, Le Conte's thrasher (Toxostoma lecontei), American badger, and desert kit fox (among other species that could be present) to be impacted on the Private Lands Alternative site because potential habitat for these species is also present and would be impacted.

Finally, wildlife movement across the site is already affected by the disruption in native vegetation communities from agriculture, and the Barstow-Daggett Airport and the I-15 and I-40 to the north and south of the Private Lands Alternative sections, and hence, development of the Private Lands Alternative site would likely only significantly affect the movement of avian species.

Spread of Noxious Weeds. Construction of a solar facility at the Private Land Alternative could result in the introduction and dispersal of invasive or exotic weeds. The permanent and temporary earth disturbance adjacent to native habitats increases the potential for exotic, invasive plant species to establish and disperse into native plant communities, which leads to community and habitat degradation. A weed reduction program could potentially reduce and mitigate impacts.

Noise. Noise from construction activities could temporarily discourage wildlife from foraging and nesting immediately adjacent to the project area. Many bird species rely on vocalization during the breeding season to attract a mate within their territory. Noise

levels from certain construction, operations, and demolition activities could reduce the reproductive success of nesting birds.

Lighting and Collisions. The SunCatchers at the Private Land Alternative would potentially include FAA-required lighting and a lightning pole. Lighting may increase the collision risk because lights can attract nocturnal migrant songbirds. Bright night lighting close to the ground at the alternative sites could also disturb wildlife that occurs adjacent to the project site (e.g., nesting birds, foraging mammals, and flying insects).

Operation of a 10-mile transmission line could result in increased avian mortality due to collision with new transmission lines. Mitigation could include installing the transmission line in accordance with the Avian Powerline Interaction Committee (APLIC) Guidelines designed to minimize avian-power line interactions.

Definite conclusions about the potential for significant impacts to biological resources cannot be made in the absence of site-specific survey and project design information.

Comparison to Proposed Project – Biological Resources

Definitive conclusions about the amount of potential adverse impacts to biological resources in the absence of site-specific survey and project design information for the Private Land Alternative site cannot be made. However, development of a solar project at the Private Land Alternative site would impact fewer biological resources compared to the Proposed Project site because development of the Private Land Alternative site would occur partially on agricultural land, whereas development of the Proposed Project site would occur primarily on land supporting native vegetation communities. The Private Land Alternative southern section consists primarily of active and fallow agricultural lands, but also supports smaller areas of native habitat: Mojave creosote bush scrub, desert saltbush scrub, and stabilized sand dunes; most of which is disturbed. The Private Land Alternative northern sections consists of varying habitat quality for desert tortoise and wildlife and is generally made up of unsuitable to medium quality habitat compared with the proposed Calico Solar Project site which supports primarily Mojave creosote bush scrub and one small patch of desert saltbush scrub.

Apart from bird species that may use the agricultural lands for foraging, general wildlife use of the Private Land Alternative also would be expected to be less than for the Proposed Project since much of it is active agricultural lands, while the proposed Project site supports primarily native desert scrub habitat.

Overall, development of a solar project on the Daggett Agriculture alternative site would have fewer impacts to biological resources than the Proposed Project site. Given that most of this alternative (approximately 50%) is agricultural land, disturbed habitat, and developed land it may be possible to site facilities such that most or all of the sensitive biological resources on site would be avoided, making this an even more biologically preferable alternative. The Private Land Alternative is preferred over the Calico Solar Project for impacts to biological resources.

Cultural Resources

Environmental Setting. The Private Land Alternative is located on a combination of agricultural land, undeveloped BLM land, and open space private land in San

Bernardino County, California. The alternative site is located in the Mojave Desert adjacent to the Mojave River. The California desert has been inhabited for at least 8,000 to 12,000 years and perhaps longer (BLM 2005a). Prehistoric settlement was often centered on lakes, now the dry playas characteristic of the Mojave Desert and Great Basin. The lakes and marsh environments along the edges had abundant plant and animal species providing food, fibers, medicines, tools, clothing, and ritual objects required for daily life (BLM 2005a). The Mojave River was a significant focus of prehistoric settlement and the principal corridor for prehistoric travel and trade, particularly during the Protohistoric Period (A.D. 1200 to ca. A.D. 1850) (Moratto 1984, pp. 426–430).

From 8,000 to 6,000 years before present, climatic change caused the lakes to dry, and food gathering and land use patterns began that continued into the historic period, including a use of a greater variety of habitats, plants, and animals (BLM 2005a). The bow and arrow may have appeared around 2,000 years ago as evidenced by a shift in projectile point types, and the expansion of bow-and-arrow technology is evidenced by the late prehistoric introduction of the Desert Side-Notched and Cottonwood Triangular points found through the California desert (BLM 2005a). A pattern of exploitation of seasonally available resources resulted in the use of large areas by relatively small populations and left archaeological sites widely scattered (BLM 2005a).

The first documented exploration of the Mojave Desert by nonindigenous people occurred in the mid-1700s by Francisco Garces, a Spanish Franciscan priest looking for a route from Arizona to Northern California (BLM 2005a). Much of the history of this region is because of its use as a corridor, one used by fur trappers and caravans. California was annexed in 1848, the same year that gold was discovered, leading to an influx of prospectors (BLM 2005a). Roads were established to transport goods, people, livestock, food, and ore between the Mojave Desert and Los Angeles, and the western Mojave Desert began to have a large mining industry.

Railroad surveys began in 1853; the San Pedro, Los Angeles, and Salt Lake Line, predecessor to the Union Pacific through the Mojave Desert, was completed in 1905, and the Tonopah and Tidewater finished its line from Ludlow to Beatty, Nevada, in 1907 (BLM 2005a). In 1914, a road was completed to parallel the tracks of the Atlantic & Pacific Railroad, which was the precursor to U.S. 66 (National Trails Highway).

Military bases were established in the desert prior to World War II, and large tracts were set aside for military use, including the MCAGCC (BLM 2005a). Further information regarding this region can be found in the **CULTURAL RESOURCES** section of the SSA.

One California State Historical Landmark is located immediately south of the Private Land Alternative northern section. Camp Cady (No. 963-1) was located on the Mojave Road which connected Los Angeles to Albuquerque. Non-Indian travel on this and the nearby Salt Lake Road was beset by Paiutes, Mohaves, and Chemehuevis defending their homeland. To protect both roads, Camp Cady was established by U.S. Dragoons in 1860. The main building was a stout mud redoubt. Improved camp structures were built 1/2 mile west in 1868. After peace was achieved, the military withdrew in 1871. This protection provided by Camp Cady enabled travelers, merchandise, and mail using

both roads to boost California's economy and growth (OHP 2009). Much of the camp has been destroyed, and unrelated wooden structures exist onsite. The Camp Cady site today is bare of apparent evidences of early use, because a flood in 1938 washed away all traces of the original adobe structures.

A records search for the Private Land Alternative at the San Bernardino Archeological Information Center of the California Historical Resources Information System reveals that the alternative, which is in and adjacent to the Mojave River floodplain, is in a landscape context that has a moderately high frequency of prehistoric archaeological sites. Energy Commission staff conducted the records search on August 5, 2009, focusing on the Private Land Alternative and areas 4 miles to the east and west along the Mojave River. The records search documents the presence of diverse archeological site types on the alluvial terraces that flank the river. The site types include habitation areas, village sites, and campsites, each of which may have food processing, lithic reduction, burial, and cremation components. Other site types typical on and beyond the terraces include lithic quarry sites, rock art sites, ceramic scatters, and trails.

The known prehistoric archaeological site distribution across the area of the Private Land Alternative reflects both the frequency and the diversity of the site types in adjacent areas. Roughly 27% of the Private Land Alternative appears to have been subject to reliable pedestrian surveys. The surveys document three prehistoric archaeological sites in or immediately adjacent to the area of the alternative, a moderately complex habitation area on the alternative that includes three food processing areas, one campsite, and one ceramic scatter (P1801-14), a village site found adjacent to the alternative in 1966 and destroyed by agriculture prior to 1980 (CA-SBR-2689), and a lithic quarry site related to the exploitation of toolstone available on Harvard Hill on the western portion of the alternative (CA-SBR-1933). The extrapolation of the archaeological site frequency for the known, roughly 27% sample of the alternative would appear to indicate the potential presence of three to four times the number of known archaeological sites on the alternative.

Environmental Impacts. The construction and operation of a solar facility on the site of the Private Land Alternative would appear likely to destroy one whole known prehistoric archaeological site and part of a second, and may destroy components of a third, and has the further potential to wholly or partially destroy a number of other prehistoric archaeological sites on portions of the alternative that have not yet been subject to pedestrian survey. One would need to establish the historical significance of the three known resources above and any additional ones that would be found as a result of the complete pedestrian survey of the alternative to comment more definitively on whether any of these resources would qualify for treatment under Federal and State regulatory programs. Given the historic significance of the Mojave River corridor during most of prehistory and the character of the diverse archaeological site types known for the Private Land Alternative and adjacent areas, it is, however, reasonable to conclude that the alternative would most likely have the potential to destroy significant prehistoric archaeological deposits. Federal and State regulatory programs would require treatment for all such deposits.

One historical archaeological site, Camp Cady (California State Historical Landmark No. 963-1), is known in the vicinity of the Private Land Alternative. As the resource is

roughly one half of a mile to the south of the alternative, it is relatively unlikely that the presence of a solar facility would result in a significant impact to the particular values for which the resource may be significant. The primary value of the resource probably relates to the information that the careful excavation of the historical archaeological deposits that make up the camp would produce. The construction and operation of a solar facility on the Private Land Alternative would not disturb or destroy any of these deposits. The historical archaeological deposits of Camp Cady could also potentially be found to have historical value for the association of the deposits with significant events or patterns in history. Were the deposits found to have such value, the potential for a nearby solar facility to degrade the visual integrity of the resource would have to be taken into account. The resolution of this issue would require further study.

There are a number of known built environment resources (buildings, structure, and linear infrastructure elements) in and near the Private Land Alternative. The former San Pedro, Los Angeles, and Salt Lake Railroad, now the Union Pacific Railroad, and segments of the Old Spanish Trail, the Mormon Trail, and the Mojave Road are thought to run through the area of the alternative. Camp Cady Ranch is roughly one half of a mile south of the alternative. The presence of the trail and road segments on the alternative is presently unconfirmed, and the integrity of the railroad, trail and road segments, or Camp Cady Ranch is similarly unconfirmed. Further study of the resources could reveal that a solar facility on the Private Land Alternative would have significant physical and visual impacts on historically significant railroad, road, and trail segments that contribute respectively to the historic significance of each overall transportation route, and have a visual impact to Camp Cady Ranch.

Comparison to Proposed Project. The development of a solar facility on the site of the Private Land Alternative would most likely have fewer cultural resource impacts those of the Calico Solar Project. The construction and operation of a solar facility on the Private Land Alternative has the real potential to wholly or partially destroy a number of significant prehistoric archaeological sites. The partial destruction or visual degradation of historical archaeological resources and built environment resources are other potential significant impacts of such a facility. More site-specific information about the cultural resources on the Private Land Alternative would serve to better qualify this comparison.

Hazardous Materials

Environmental Setting. The topography of the Private Land Alternative sites is essentially flat, as are the immediately surrounding areas. Sensitive receptors are present within and adjacent to the Private Land Alternative.

Private Land Alternative northern section. Access to the Private Land Alternative northern section would likely be via Interstate 15 from Barstow to the Harvard Road exit. At Harvard Road, transport would likely turn south onto Harvard Road and would continue southeast for approximately 1 mile through primarily undisturbed land and agriculture land. A religious camp is located adjacent to the southeast corner of the Private Land Alternative northern section.

Private Land Alternative southern section. Access to Private Land Alternative southern section would likely be via Interstate 40 from Barstow to the Hidden Springs

Road exit. At Hidden Springs Road, transport would likely turn north for approximately 1.5 miles through agriculture land adjacent to the Barstow/Daggett airport. A residential community is located north of Private Land Alternative southern section.

Environmental Impacts. Hazardous materials use at the Private Land Alternative, including the quantities handled during transportation and disposal, would be the same as those of the proposed project. As stated in the **HAZARDOUS MATERIALS** discipline for the proposed project, hazardous materials used during the construction phase of the project would include gasoline, diesel fuel, motor oil, lubricants, and small amounts of solvents and paint. No acutely toxic hazardous materials would be used on site during construction, and none of these materials pose a significant potential for off-site impacts as a result of the quantities on site, their relative toxicity, their physical states, and/or their environmental mobility.

Transportation of hazardous materials to the Private Land Alternative sites would require passing near residences located in the town of Barstow, Daggett, and Newberry Springs approximately 20 miles from the Private Land Alternative. However, the transportation would be primarily on either Interstate 15 or Interstate 40 and not on smaller road with residences.

Comparison to Proposed Project. The hazardous materials that would be used at the Private Land Alternative sites would be the same as those used at the proposed Calico Solar Project site; however, the Private Land Alternative has sensitive subgroups within 1,000 feet. As such, the potential impacts at the Private Land Alternative would likely be somewhat greater. Compared to the proposed project, selecting the Private Land site would result in similar impacts from transportation of hazardous materials because the transportation route through Barstow, Daggett, and Newberry Springs would be essentially the same. With adoption of the proposed conditions of certification, the Private Land Alternative would comply with all applicable laws, ordinances, regulations, and standards (LORS) and result in no significant impacts to the public.

Land Use

Environmental Setting. The Private Land Alternative would be located on private undisturbed land containing a few rural residences, industrial land, and on agricultural lands. The Private Land Alternative would include approximately 900 acres of unclassified BLM land. The San Bernardino General Plan Land Use designation for the area is Rural Living. The intended use of Rural Living is to provide sites for rural residential uses, incidental agriculture uses, and similar and compatible uses. The primary purpose of the Rural Living Land Use District is to identify areas and encourage appropriate rural development, and prevent inappropriate demands for urban services. Electrical power generation is an allowed use on Rural Living land with a Conditional Use Permit (San Bernardino 2009).

Private Land Alternative northern section. The Private Land Alternative northern section would be located on approximately 320 acres of Prime Farmland and approximately 150 acres of Farmland of Statewide Importance (DOC 2006). Approximately 650 acres of the Private Land Alternative northern section are or were used for agricultural purposes; no lands under Williamson Act contracts would be

impacted. The zoning designation for the Private Land Alternative northern section is Rural Living and Resource Conservation.

Approximately 900 acres of the Private Land Alternative northern section are BLM land, and approximately 2,450 acres are private undisturbed lands. The BLM land is within the BLM Western Mojave Planning Area, the purpose of which is to develop management strategies for the desert tortoise, Mohave ground squirrel and over 100 other sensitive plants and animals throughout the western Mojave Desert.

Approximately five rural residences exist on the Private Land Alternative northern section; however, during a site visit it appeared that some of the residences may not be occupied. There is a large private religious camp (Ironwood) located near the alternative site.

Private Land Alternative southern section. The Private Land Alternative southern section would be located on approximately 780 acres of Prime Farmland, approximately 1,760 acres of Farmland of Statewide Importance, approximately 320 acres of Unique farmland, and approximately 320 acres of grazing (DOC 2008). Approximately 3,680 acres of the Private Land Alternative southern section are or were used for agricultural purposes; however, no lands under Williamson Act contracts would be impacted (DOC 2008). The Private Land Alternative southern section would be located immediately east of the Coolwater Generating Station and would include some land zoned as regional industrial.

The Private Land Alternative southern section would be located immediately adjacent to two solar power plants (SEGS I and II), the Blythe-Daggett Airport, and the Coolwater Generation Station.

Environmental Impacts. The Private Land Alternative would be located within San Bernardino County Land Use designation Rural Living. As stated above, electrical power generation is an allowed use in an area designated as Rural Living with a Conditional Use Permit which would require a General Plan Amendment to apply the Energy Facilities Overlay (San Bernardino 2009).

Based on the site review, there are approximately 3,650 acres of agricultural land at the Private Land Alternative of which approximately 780 acres are considered Prime Farmland. The construction and/or operation of the proposed project would result in a removal of approximately 2,650 acres of actively-used agriculture land (2,000 acres in the Private Land Alternative southern section and 650 acres in the Private Land Alternative northern section). The construction and operation of the solar power plant would eliminate existing agricultural operations and foreseeable future agricultural use. This loss of agricultural lands is a potentially significant impact, and would require a condition of certification potentially requiring purchase of an equivalent number of acres of farmland.

Like the Calico Solar Project proposed site, a key land use plan affecting this project is the U.S. Bureau of Land Management's California Desert Conservation Area (CDCA) Plan of 1980, as amended. The Private Land Alternative, as stated above, is located within areas of the CDCA West Mojave Plan on land that has not been classified by the

BLM. Unclassified lands consist of scattered and isolated parcels of public land in the CDCA which have not been placed within the multiple-use classes. Unclassified land is managed by the BLM on a case-by-case basis. As such, at this time it cannot be concluded whether the project is in conformance with the CDCA Plan.

The Private Land Alternative would be build on land that currently has approximately five houses and numerous agricultural facilities. It is not certain if the houses are currently occupied and some of the housing structures appeared abandoned. The Newberry Springs area has a total of 1,522 housing units (US Census, 2009). The five houses within the Private Land Alternative represent less than 1% of the housing units in the Newberry Springs area. If this area were purchased for the purpose of constructing a solar project, the residences would likely be demolished. The landowners cannot be compelled to sell, since BrightSource does not have eminent domain powers, and the current owners would be compensated based on the negotiated sale price of the property. Therefore, while the removal of the five homes by the project would result in a loss of residential dwelling units and associated agricultural facilities, this impact is not considered to be significant.

One group of residences is located immediately north of the Private Land Alternative southern section, at the intersection of Minneola Road and Valley Center Road. One additional sensitive receptor, a Christian camp, is located within 1,000 feet of the Private Land Alternative northern section, east of the intersection of Troy Road and Cherokee Street. Construction activities for the alternative would create temporary disturbance to these residential areas (i.e., heavy construction equipment on temporary and permanent access roads and moving building materials to and from construction staging areas). Conditions of certification to reduce noise and air quality impacts are presented in the Noise and Air Quality sections for the proposed Calico Solar Project site. However, these measures would not eliminate the disturbance to nearby residences. While this disturbance would be temporary at any one location, impacts would be significant if construction was not carefully managed and residents not kept informed.

Comparison to Proposed Project. Selecting the Private Land Alternative site would result in greater impacts to land use than would the Calico Solar Project site because approximately five residences would potentially require demolition. Additionally, approximately 3,650 acres of agricultural land would no longer be available as agriculture land and there would be construction and operational impacts to the nearby religious camp. Additional conditions of certification to offset loss of agricultural lands would be required.

Recreation and Wilderness

Environmental Setting

Private Land Alternative northern section. The Private Land Alternative northern section would be located immediately adjacent to the California Department of Fish and Game Cady Camp Wildlife Area. The Cady Camp Wildlife Area is approximately 1,870 acres of desert riparian habitat with opportunities for hiking and bird watching along with dove, quail, and rabbit hunting (DFG 2009). Camping is allowed at the Cady Camp headquarters and at the Harvard Road “dove” field. Cady Camp Wildlife Area hosts a

variety of Game Bird Heritage Program Special Hunts such as a Junior Pheasant Hunt and a Family Pheasant Hunt in the 2007-2008 season (DFG 2009).

A number of man-made water ski lakes are located in the vicinity of the Private Land Alternative sites. The nearest lake is located southeast of the eastern border of the Private Land Alternative northern section adjacent to the Cady Camp Wildlife Area.

The BLM Manix ACEC is located approximately 2 miles east of the Private Land Alternative. The Manix ACEC was established in 1990 by the BLM to protect paleontological and cultural resources. The site also contains terminus of the Mojave Road, which is used by off-highway vehicles.

Private Land Alternative southern section. The Private Land Alternative southern section would be located immediately adjacent to industrial land, an airport, some BLM land and residential areas, and agriculture lands. No recreation or wilderness lands or opportunities are available within 1,000 feet of the site.

Environmental Impacts. The Private Land Alternative southern section would create no impacts to recreation and wilderness areas.

The Private Land Alternative northern section would be located adjacent to the CDFG Cady Camp Wildlife Area, and one to 3 miles north of ski lakes in the Newberry Springs area. Because of the flat topography and the close proximity of the Private Land Alternative northern section to the Cady Camp Wildlife Area, the solar power plant would be visible from the Wildlife Area.

Project construction activities would create a number of temporary conditions that may dissuade recreationists from visiting the Cady Camp Wildlife Area. Noise, dust and heavy equipment traffic generated during construction activities would negatively affect a visitor's enjoyment of the recreation area. The location of construction equipment may temporarily preclude access to recreation areas, especially in the vicinity of Harvard Road and in the Harvard Road "dove" field. Disturbances to recreational activities would potentially cause a temporary reduction of access and visitation during construction activities.

Construction of the 4,000 acres of Stirling engine systems would change the character of the Cady Camp Wildlife Area. While the wildlife area is located in an area that is zoned Rural Living, few residences are located immediately adjacent to the wildlife area except on the eastern border. Presence of the Stirling engines would significantly contrast with the existing open space and agriculture areas north of the Cady Camp Wildlife Area. The facility would also result in a long-term visual impact to travelers and recreationists in this region. The noise and activity of the solar power plant may potentially scare hunting prey and preclude hunting at the Cady Camp Wildlife Area.

Comparison to Proposed Project. Both the proposed site and the Private Land Alternative northern section are located in areas with existing recreational use. The proposed site is adjacent to the Pisgah Crater lava Flow and south of the Cady Mountains Wilderness Study Area open to camping and some off-highway vehicle use. Additionally, the proposed project would preclude the use of some off-highway vehicle routes that traverse the proposed project area. Recreation and wilderness impacts

would be similar at the Private Land Alternative than at the Calico Solar Project site because of the close proximity between the Private Land Alternative and the Cady Camp Wildlife Area and the recreational water ski lakes in the communities of Newberry Springs and Harvard. No natural or man-made feature would block the alternative site from view at the wildlife area. Use of the wildlife area as a hunting ground may no longer be possible should the Private Lands Alternative be chosen. Overall, recreation impacts at the two sites would be similar.

Noise and Vibration

Environmental Setting

Private Land Alternative northern section. Generally low levels of ambient noise exist along the southern portion of the Private Land Alternative northern section, as this portion of the site is primarily undeveloped land. Low noise levels under 50 dBA generally are expected to occur on these lands, which are used for agriculture and recreation with scattered rural residences. Noise levels would be elevated along the northern boundary of the project due to the presence of heavily traveled Interstate 15 and a railroad track. For the majority of the Interstate 15 freeway corridor, a 65 dBA contour extends approximately 100 to 150 feet in either direction from the centerline (FRA 2009).

Intermittent noise is expected to occur at the eastern side of the Private Land Alternative northern section where the alternative site is located near a small religious camp. Nearby sensitive receptors include the camp community adjacent to the Private Land Alternative northern section and the Cady Camp Headquarters which is also used for camping.

Private Land Alternative southern section. The Private Land Alternative southern section is adjacent to BNSF railroad tracks to the south, a conventional power plant and substation to the west, and the Barstow/Daggett airport to the southeast. These existing land uses increase the noise levels of the surrounding areas.

Nearby sensitive receptors include the residential communities north and east of the Private Land Alternative southern section. The nearest residential area would be about 500 feet from the alternative site boundary, immediately north of the site between the alternative and the Mojave River.

Environmental Impacts. As stated in the Noise section of this SSA, the construction of the Calico Solar Project plant would create noise, or unwanted sound. The character and loudness of this noise, the times of day or night at which it is produced, and the proximity of the facility to sensitive receptors combine to determine whether the facility would meet applicable noise control laws and ordinances and whether it would cause significant adverse environmental impacts.

The noise experienced at any specific receptor during operation of a solar facility on this site would depend on which facility components were closest to the receptor. The Stirling engines would not create operational noise, but the power block would create more noticeable noise.

If built in accordance to conditions of certification similar to those proposed for the Calico Solar Project site, adverse noise impacts to sensitive receptors from construction and operation would be reduced to less than significant levels.

Comparison to Proposed Project. Given the proximity of the Private Land Alternative sites to freeways, an airport, and a railroad the baseline noise levels are elevated at these locations than at the proposed Calico Solar Project site. However, the Private Land Alternative northern section would be in a location adjacent to sensitive receptors, so impacts would be more severe at the proposed Calico Solar Project site.

Public Health and Safety

Environmental Setting

Private Land Alternative northern section. The Private Land Alternative northern section is located in an isolated desert area. The nearest small community, a religious camp, is located approximately 500 feet southeast of the site.

Private Land Alternative southern section. The Private Land Alternative southern site is located in an area primarily dedicated to agricultural, solar power production, and fossil fueled power plants. The nearest residences are immediately north of the site along Valley Center Road.

Environmental Impacts. While the meteorological conditions and topography at the site are not exactly the same as at the applicant's proposed site, they are similar enough that the results of air dispersion modeling and a human health risk assessment for the Private Land Alternative would be similar to that found for the proposed site. The cancer risk and hazard indices are much below the level of significance at the point of maximum impact, so the project would be unlikely to pose a significant risk to public health at this location.

Comparison to Proposed Project. There is no significant difference between this location and the proposed site for public health & safety.

Socioeconomics and Environmental Justice

Environmental Setting. Like the proposed Calico Solar Project site, the Private Land Alternative is located in San Bernardino County. The demographic characteristics of San Bernardino County are described in the **SOCIOECONOMICS AND ENVIRONMENTAL JUSTICE** discipline of the SSA.

Environmental Impacts. Because of the limited population in Daggett and Newberry Springs, construction workers would most likely be from larger nearby cities such as Victorville and Barstow. The construction workers would most likely have to commute 20 to 50 miles or more daily to reach the construction sites due to the limited housing availability in the Daggett and Newberry Springs region. There are no hotels in Daggett or Newberry Springs, although RV camp sites are available. An additional option would be to erect temporary housing in the immediate area of the Private Land Alternative; however, this would increase the construction impacts and require provision of additional services such as electricity, water, and food. Because it is unlikely that the construction workers would relocate to the Daggett or Newberry Springs region, the

Private Land Alternative would not cause a significant adverse socioeconomic impact on the area's housing, schools, police, emergency services, hospitals, and utilities.

There would be no adverse socioeconomic impacts since most of the construction and operation workforce is within the regional labor market area, and construction activities are short-term. Benefits from the Calico Solar Project, should it be built at the Private Land Alternative, are likely to be similar to the benefits from project at the proposed site. Benefits include increases in sales taxes, employment, and income for San Bernardino County.

Comparison to Proposed Project. The socioeconomic impacts of the Calico Solar Project at the Private Land Alternative sites would be similar to building and operating the project at the proposed site. Workers would have a longer commute to reach the proposed site than to reach the alternative site. Air quality impacts from commute traffic are addressed in the Air Quality Section above.

Soil and Water Resources

Environmental Setting. Soils in the San Bernardino County Desert Region are primarily sandy gravel with low runoff coefficients and fast percolation (San Bernardino County 2006). The desert habitat of San Bernardino County includes soils that are predominantly sandy gravel and include major dune formations, desert pavement, and dry alkaline lake beds (San Bernardino County 2007).

The entire region is crossed by alluvial wash deposits. Desert soils are susceptible to erosion where disturbed due to the limited vegetation and low moisture content, as well as common high winds and infrequent high-intensity rainfall events that may occur (San Bernardino County 2006).

The Private Land Alternative lies within the Lower Mojave River Valley Groundwater Basin (DWR 2004b). The Lower Mojave River Valley Groundwater Basin underlies an elongate east-west valley with the Mojave River flowing occasionally through the valley from the west across the Waterman fault and the existing valley to the east through Afton Canyon. Precipitation is between 4 to 6 inches with the average for the basin near 4 inches. Water-bearing deposits in this basin are predominantly unconfined (DWR 2004b). Wells yield range from 100 to 4,000 gpm and the average yield is about 480 gpm. The basin is bounded by the Camp Rock-Harper Lake, Calico-Newberry and Pisgah fault zones which form barriers or partial barriers to groundwater flow. Historically springs were located on the west side of many of these faults but most are no longer flowing because of a decline in the water table (DWR 2004b). In the northeastern portion of the basin relatively shallow clay layers result in shallow water levels near Camp Cady.

The published total storage capacity of the Lower Mojave River Valley Groundwater Basin varies. DWR calculated the total storage capacity for the Troy and Daggett storage units as 7,950,000 acre feet (DWR 2004b). The Mojave Water Agency calculated a total storage capacity of approximately 9,010,000 acre feet for the Lower Mojave River Valley Groundwater Basin (DWR 2004b). The site is located in a FEMA Flood Zone D, defined as areas with possible but undetermined flood hazards, no flood hazard analysis has been conducted (FEMA 2009).

An existing lined evaporation pond is located immediately west of the Private Land Alternative southern section and is used by the SEGS I and II (now owned by Cogentrix Energy, LLC) and Coolwater Generation Station.

Environmental Impacts

Soil Erosion Potential by Wind and Water. As stated in the **SOIL AND WATER RESOURCES** discipline of this SSA, construction activities can lead to adverse impacts to soil resources including increased soil erosion, soil compaction, loss of soil productivity, and disturbance of soils crucial for supporting vegetation and water-dependent habitats. Activities that expose and disturb the soil leave soil particles vulnerable to detachment by wind and water. Soil erosion results in the loss of topsoil and increased sediment loading to nearby receiving waters. Access to the Private Land Alternative would be via the Harvard Road exit off I-15 and via the Hidden Springs Road exit off I-40. Additional access would not be required to reach the site. While the volume of earth movement is unknown at this time, the topography and slopes of the Private Land Alternative and the Calico Solar Project site are similar. Therefore, it is expected that the footprint would be similar at both the Private Land Alternative and Calico Solar Project site, and similar erosion and sedimentation control methods would be used at both sites. However, because approximately 4,000 acres of the Private Land Alternative has been used for agricultural purposes, grading requirements would likely be reduced at the Private Land Alternative. Because of the high erosion potential of the desert soil, impacts to the soils at the Private Land Alternative would likely be significant and require mitigation similar to the mitigation required at the Calico Solar Project site. A Storm Water Pollution Prevention Plan (SWPPP) and a Drainage Erosion and Sediment Control Plan (DESCP) would be required. While grading plans, a SWPPP, and a DESCP would potentially reduce impacts to a less than significant level, near final grading plans, the SWPPP, and the DESCP would need to be prepared and reviewed to be certain this would be feasible.

Storm Water. As stated in the **SOIL AND WATER RESOURCES** discipline, potentially significant water quality impacts could occur during construction, excavation, and grading activities if contaminated or hazardous soil or other materials used during construction were to drain off site. The Private Land Alternative is in primarily undeveloped area and farmland. Brush would be cleared prior to grading. The storm water runoff percolates either into the soil or into flows overland off site. Impacts from storm water runoff would likely be similar to those at the Calico Solar Project site because of the high volume of earth displacement and the long duration for construction. Similar conditions of certification would be required.

Project Water Supply. It is unlikely that groundwater would be encountered during grading activities as the recorded depth to groundwater in the Lower Mojave River Valley Groundwater Basin is between 50 and 800 feet. However, as stated above relatively shallow clay layers result in shallow water levels near the Private Land Alternative northern section. The volume of groundwater required for construction would be similar to that required for constructing the projects at the Calico Solar Project location; however, there is a general trend in this basin for declining groundwater levels. While it is unknown at this time if there is sufficient groundwater available in the Lower Mojave River Valley Groundwater Basin to meet the construction and operation requirements of the Private Land Alternative, staff expects that water use associated

with current agriculture practices would be higher than the annual volume of water required of the project. Because the Private Land Alternative site includes 4,000 acres of farmland, the existing water use for agriculture is expected be greater than the average project construction and operational water demand.

Wastewater. Groundwater would be needed during construction of the SunCatchers at the Private Land Alternative. Once used, this water would be reused to the extent possible and then discharged as wastewater. Improper handling or containment of construction wastewater could cause a broader dispersion of contaminants to soil or groundwater. The discharge of any nonhazardous wastewater during construction would be required to be in compliance with regulations for discharge. Water that could not be reused would be transported to an appropriate treatment facility. With implementation of required regulations, impacts would likely be less than significant.

Comparison to Proposed Project – Soil and Water Resources

Due to the large footprint and extensive grading required for the solar facility at both the Calico Solar Project and Private Land Alternative, similar erosion and sedimentation control methods would be required. Impacts to soil and water erosion would be similar at the two sites, although approximately 4,000 acres of the Private Land Alternative have been previously graded for agricultural use and may reduce the amount of grading required for the project. Based on the current water used for agriculture at the Private Land Alternative, sufficient water availability is expected at the Private Land Alternative.

Traffic & Transportation

Environmental Setting

Private Land Alternative northern section. The Private Land Alternative northern section would be located adjacent to Interstate 15. Access to this site would be via Interstate 15 to the Harvard Road exit in Harvard, then approximately 1 mile south on Harvard Road. The Private Land Alternative northern section entrance would most likely be from Harvard Road. A Union Pacific railroad track is located adjacent to Interstate 15.

Workers employed to construct the project at this alternative site would most likely commute from Barstow (20 miles) or Victorville (60 miles). Given the freeway access, there would not likely be added traffic on the Interstate 15 east of the sites (towards Las Vegas).

Private Land Alternative southern section. The Private Land Alternative southern section would be located approximately one mile north of I-40. Access to the site would be via I-40 from the Hidden Springs Road exit. The site is approximately 1 mile south of the Union Pacific terminal at Yermo and 1 mile north of the BNSF track 7200. The Private Land Alternative southern section is located approximately 1,000 feet from the Barstow/Daggett airport. The Barstow/Daggett airport has two runways and receives approximately 36,500 annual operations or approximately 100 flights per day.

Environmental Impacts. Before construction could occur for the Private Land Alternative sites, a construction traffic control and transportation demand implementation program would need to be developed in coordination with Caltrans. This analysis

may result in the need to limit construction-period truck and commute traffic to off-peak periods to avoid or reduce traffic and transportation impacts. These impacts would likely be similar to those of the proposed project because construction at the Private Land Alternative would also require travel on I-40. Use of the Private Land Alternative would also require travel on I-15 which operates at a congested level on Friday afternoons. As with the proposed Calico Solar Project site, construction equipment could travel to the Private Land Alternative via railroad.

The project would potentially impact the Union Pacific right-of-way because it would be located immediately south and north of an active railroad right of way. Impacts to rail operations would be less than significant through proper coordination with local agencies.

The Private Land Alternative southern section would be less than 1 mile from the Barstow/Daggett airport. This may require additional marking and lighting along the Stirling engines in order to ensure safety of aircraft.

Comparison to Proposed Project. Impacts to traffic and transportation at the Private Land Alternative would be similar to those at the proposed Calico Solar Project site; including the use of Interstate 40 east of Barstow and potential use of the BNSF to transport materials. The Private Land Alternative site would require the use of Interstate 15 east of Barstow; however, this would be unlikely to cause a significant impact because of its location closer to sources of workers in the Victor Valley and Barstow.

Transmission Line Safety and Nuisance

Environmental Setting. The Private Land Alternative would connect with the SCE transmission system by two possible options. The first would be through an interconnection with the existing SCE 115 kV transmission line that crosses the sites; this would potentially require a transmission line upgrade to 230 kV. The second option would be to construct a 230 kV transmission line for approximately 10 miles southwest to the existing SCE Coolwater Substation in Daggett. The new transmission line would follow the existing 115 kV corridor. The Private Land Alternative is in uninhabited open space, agriculture land, and some rural residences crossed by a BLM utility corridor. BLM utility corridors are typically between 2 and 5 miles wide to provide flexibility in selecting alternative routes for rights-of-way (BLM 1999).

Environmental Impacts. Similar to the proposed project, this alternative would not be likely to cause transmission line safety hazards or nuisances. As stated in the **TRANSMISSION LINE SAFETY AND NUISANCE** section, the potential for nuisance shocks would be minimized through grounding and other field-reducing measures that would be implemented in keeping with current standard industry practices, and the potential for hazardous shocks would be minimized through compliance with the height and clearance requirements of CPUC's General Order 95. Compliance with Title 14, California Code of Regulations, section 1250, would minimize fire hazards, while the use of low-corona line design, together with appropriate corona-minimizing construction practices, would minimize the potential for corona noise and its related interference with radio-frequency communication in the area around the route. As with the proposed Calico Solar Project transmission lines, the public health significance of any related field exposures cannot be characterized with certainty. The only conclusion to be reached

with certainty is that the proposed lines' design and operational plan would be adequate to ensure that the generated electric and magnetic fields are managed to an extent the CPUC considers appropriate in light of the available health effects information.

Comparison to Proposed Project. The transmission line safety and nuisance impacts at the Private Land Alternative sites would be similar to building and operating the project at the proposed Calico Solar Project site. The Private Land Alternative would potentially require a longer transmission line interconnection with the SCE transmission system should a new transmission line be built. The Private Land Alternative would not require an upgrade to the Lugo-Pisgah No. 2 220 kV transmission line.

Visual Resources

Environmental Setting. The alternative site parallels Interstate 15 and Interstate 40, and a 115kV transmission line crosses the alternative sites from southwest to northeast.

Private Land Alternative northern section. Few buildings are located in the area of the Private Land Alternative northern section; they include scattered rural residences and the Cady Camp Headquarters. The transmission line and the freeway introduce a more developed and industrial feature to the otherwise rural setting.

Nearby views from the Private Land Alternative northern section to the south, west and east are of undisturbed desert landscape crossed by a few unpaved roads, some agriculture lands, and some rural residential areas. A berm crosses the alternative along the northern boundary, along which are located railroad tracks, approximately one mile south of I-15. Further views become more residential once the community of Newberry Springs is in view. Elevation rises to the east of the site, eventually becoming the foothills of the Cady Mountains. More rural communities are located north of Interstate 15 within viewing distance of the site in addition to a number of other major transmission lines paralleling the freeway.

Private Land Alternative southern section. The Private Land Alternative southern section parallels Interstate 40 and the same 115kV transmission line crosses the alternative sites from southwest to northeast. The site is located adjacent to SEGS I and II, now owned and operated by Cogentrix Energy, LLC. The site is also adjacent to the existing Coolwater Generation Station, a natural gas fired station comprised of 4 units. Units 1 and 2 are conventional steam turbine/boiler units with a total capacity of 146 megawatts and are of 1961 and 1964 vintages, respectively. Constructed in 1978, both Units 3 and 4 are combined cycle gas turbine units with a total capacity of 462 megawatts. The Barstow/Daggett airport is located immediately southeast of the site.

Nearby views from the Private Land Alternative southern section are of agriculture landscape crossed by a few unpaved roads and some rural residential areas. Views to the south also include the Barstow/Daggett airport. Views to the west are industrial in nature, including solar facilities, fossil fuel facilities, railroad tracks, and a lined evaporation pond. Further views become more residential once the community of Daggett and Newberry Springs come into view. Elevation rises to the east of the site, eventually becoming the foothills of the Cady Mountains.

Environmental Impacts. As stated in the **VISUAL RESOURCES** section, the Energy Commission staff, in coordination with BLM, applied the BLM Visual Resource Management (VRM) system of visual assessment to the proposed Calico Solar Project site. The existing visual setting baseline under the VRM methodology is characterized in terms of Visual Resource (VR) Classes. Under the VRM system, areas of the project viewshed are delineated and mapped based on broadly uniform characteristics of visual quality, viewers' sensitivity, and distance from project to viewers. These delineated areas are then assigned a VR Class (from I through IV). VR Classes are analogous to Overall Sensitivity ratings under the Energy Commission method and are used to determine an area's visual objective, that is, the level of project-caused contrast that is acceptable, above which contrast could constitute a potentially significant adverse impact. The BLM land areas considered for the Private Land Alternative have not been assigned a VR Class so a formal impact determination under BLM's system cannot be made.

For the non-BLM land (the bulk of the Private Land Alternative), visual impact analysis would be based on a comparison of the area's visual sensitivity with the industrial features added by the solar project at this location. With the addition of the project in the Private Land Alternative northern section, views of the desert and rural communities would change from a relatively undisturbed desert landscape to a substantially more industrial, highly altered one, dominated by roughly 6 square miles of SunCatchers, graded areas, and retention ponds, as well as light rays reflected off ambient atmospheric dust and the bright glow of the receiving portions of the solar collectors.

The site would be prominently visible from Interstate 15, for both westbound and eastbound traffic. Travelers would see the site from a distance although the berm that is located along the northern boundary of the project would potentially block some of the SunCatchers from view. Additionally, because of the shape of the site (see Alternatives – Figure 3A, Interstate 15 would run the entire length of the solar power plant making the visible components more visually intrusive to westbound and eastbound traffic.

For the Private Land Alternative southern section, views of agriculture lands would change to a more industrial, highly altered one as well. However, because the views immediately west of the Private Land Alternative southern section are industrial in nature and views south of the site include the Barstow-Daggett airport, this change would be less prominent and viewers would be less sensitive to the change. The site would be prominently visible from Interstate 40, for both westbound and eastbound traffic. As with the northern section, because of the shape of the site (see Alternatives – Figure 3B), Interstate 40 would run the entire length of the solar power plant making the visible components more intrusive to westbound and eastbound traffic.

The linear facilities associated with the Private Land Alternative include a potential 230-kV transmission line approximately 10 miles long. The transmission line would follow the existing utility corridor and would roughly parallel an existing 115 kV transmission line for 10 miles until reaching the SCE Coolwater Substation and would be prominently visible from Interstate 15. The Private Land Alternative interconnection would introduce additional industrial character to the Interstate 15 corridor.

Comparison to Proposed Project. The Private Land site is preferred over the proposed Calico Solar Project site. While the SunCatchers at the Private Land Alternative site would be visible to more riders along Interstate 15 than along Interstate 40, it would be located in a more urban setting near existing communities and some of the project components would be potentially blocked by an existing berm. The proposed Calico Solar Project site would be visible to recreation areas including wilderness study areas. While the Private Land site would be prominently visible to the Cady Camp Wildlife Area, views from this camp to the south and east are already relatively built up due to the communities of Harvard and Newberry Springs which surround the site. As a result, a large solar project in the Calico Solar Project area would create a more dramatic change to the visual environment than would occur at the Private Land site.

The Private Land Alternative transmission line would create a visual impact similar to that of the Calico Solar Project transmission interconnection. The interconnection transmission line at the Private Land Alternative would be longer than the transmission interconnection, but would be located adjacent to an existing line in an existing corridor.

Waste Management

Environmental Setting. As discussed in the **WASTE MANAGEMENT** section of this SSA, hazardous and nonhazardous solid and liquid wastes, including wastewater, would be generated at the Calico Solar Project site during construction and operation of the solar power plant. Waste would be recycled where practical and nonrecyclable waste would be deposited in a Class III landfill. The Private Land Alternative would use the same waste recycling/disposal facilities as the Calico Solar Project site.

The hazardous waste generated during project construction could include scrap wood, steel, glass, plastic or paper, solvents, used oils, paints, oily rags, cleaners and adhesives, waste oil, spent batteries, concrete particles, and empty hazardous waste material containers (SES 2008a). The two Class I landfills that accept hazardous wastes in California are the Clean Harbor Landfill (Buttonwillow) in Kern County and the Chemical Waste Management Landfill (Kettleman Hills) in Kings County (SES 2008a). The Kettleman Hills facility also accepts Class II and Class III wastes. In total, there is in excess of 11 million cubic yards of remaining hazardous waste disposal capacity at these landfills, with approximately 30 years of remaining operating lifetimes (SES 2008a).

Environmental Impacts. Construction at the Private Land Alternative site would require excavation of fill material that underlies the site similar to that of the proposed project. Both nonhazardous and hazardous wastes would be created by the construction of the project at the Private Land Alternative in similar quantities as at the proposed Calico Solar Project site and would be disposed of at appropriate facilities. As with the proposed Calico Solar Project site, the applicant would be required to obtain a unique hazardous waste generator identification number for the site prior to starting construction and would be required to comply with similar conditions of certification. The project would produce minimal maintenance and plant wastes.

All nonhazardous wastes would be recycled to the extent possible, and nonrecyclable wastes would be regularly transported off site to a local solid waste disposal facility.

Generation plant wastes include: oily rags, broken and rusted metal and machine parts, defective or broken electrical materials, empty containers, and other miscellaneous solid wastes, including the typical refuse generated by workers. As with the proposed project, all construction and operation activities would need to be conducted in compliance with regulations pertaining to the appropriate management of wastes. The total amount of nonhazardous waste generated from the project is estimated to be 40 cubic yards per week of solid waste from construction, and approximately 10 cubic yards per week from operation. The disposal of the solid wastes generated by the Calico Solar Project facility can occur without significantly impacting the capacity or remaining life of any of these disposal facilities.

Like nonhazardous wastes, hazardous wastes would be recycled to the extent possible. The 1 cubic yard per week of hazardous waste from the Calico Solar Project requiring off-site disposal would be far less than the threshold of significance and would therefore not significantly impact the capacity or remaining life of the Class I waste facilities. Similar to the proposed project, the project would need to implement a comprehensive program to manage hazardous wastes and obtain a hazardous waste generator identification number (required by law for any generator of hazardous wastes).

Comparison to Proposed Project. The environmental impacts of waste disposal at the Private Land Alternative site would be similar to those at the proposed Calico Solar Project site.

Worker Safety and Fire Protection

Environmental Setting. The Private Land Alternative would be located within an area that is open space and agriculture lands. The area is currently served by the San Bernardino County Fire Department. See the **WORKER SAFETY AND FIRE PROTECTION** section for more information regarding the San Bernardino County Fire Department. The fire risks of this alternative would be similar to those of the proposed Calico Solar Project site as both have similar habitat and desert conditions and both sites are adjacent to a heavily used transportation corridor.

Environmental Impacts. Similar to the proposed Calico Solar Project, it would be appropriate for a solar plant at Private Land Alternative to provide a Project Demolition and Construction Injury and Illness Prevention Program and a Project Operations Safety and Health Program in order to ensure adequate levels of industrial safety. The applicant would also be required to provide safety and health programs for project construction, operation, and maintenance, similar to the requirements for the proposed Calico Solar Project site. Also similar to the proposed project, the San Bernardino County fire department would be contacted to assure that the level of staffing, equipment, and response time for fire services and emergency medical services are adequate.

Comparison to Proposed Project. The environmental impact of worker safety and fire protection at the Private Land Alternative site would be similar to that at the proposed Calico Solar Project site.

Engineering Assessment for Private Land Alternative

There would be no difference in the assessment of facility design, power plant efficiency, and power plant reliability, so these areas are not addressed here.

Geology, Paleontology and Minerals

Environmental Setting. The Private Land Alternative is located in an area mapped as Pleistocene nonmarine, dune sand, and alluvium along with limited undivided Miocene nonmarine areas (USGS 2008). Portions of the Private Land Alternative southern section are known to contain fossil resources (San Bernardino County 2007). No known active mineral resources are located at the Private Land Alternative.

The Manix fault, a left-lateral, strike slip located on the southeast side of and sub-parallel to Interstate 15 in the community of Manix between Barstow and Baker, crosses the site (USGS 2008, FTA 2009). The Manix fault is active; in April 1947 a M6.5 earthquake occurred on the Manix fault (FTA 2009). The length of the surface rupture was approximately 3 miles and the maximum slip was approximately 5 centimeters.

The Bedrock Peak Ground Acceleration (10% in 50 years) at the Private Land Alternative is 0.27g (CGS 2009). This includes faults within 100 miles of the solar plant site and estimates of potential seismic ground motion. An active fault runs through the Private Land Alternative site which has experienced a M6.5 earthquake and the fault is considered capable of producing a M7.0 earthquake (FTA 2009).

Environmental Impacts. Seismic ground shaking is probable at the alternative site because the Manix fault crosses the site. The severity and frequency of ground shaking associated with earthquake activity at the Private Land Alternative is slightly higher than at the proposed Calico Solar Project site. As such, more stringent design criteria may be required for the Private Land Alternative in accordance with a design-level geotechnical report and California Building Code (2007) standards. Adequate design parameters for the facility would need to be determined through a site-specific evaluation by a Certified Engineering Geologist or Geotechnical Engineer. Impacts due to seismic hazards and soil conditions would be addressed by compliance with the requirements and design standards of the California Building Code. The potential for liquefaction exists in San Bernardino County in areas where relatively loose, sandy soils exist with high groundwater level during long duration, high seismic ground shaking. While few areas within the desert region of the county have potential for liquefaction, there is potential for liquefaction along the Mojave River and along the Private Land Alternative (San Bernardino 2009).

The paleontological sensitivity and potential to encounter significant paleontological resources in Quaternary alluvium at the alternative site and the Calico Solar Project site is similar. As stated in the **GEOLOGY AND PALEONTOLOGY** discipline, construction of the proposed project will include grading, foundation excavation, utility trenching, and possibly drilled shafts. There exists the probability of encountering paleontological resources. As with the Calico Solar Project site, the proposed conditions of certification are designed to mitigate any paleontological resource impacts to a less-than-significant level.

Comparison to Proposed Project. With the exception of stronger ground shaking and potential for liquefaction, the Private Land Alternative site is subject to geologic hazards of similar magnitude as the Calico Solar Project site. Strong ground shaking could be effectively mitigated through facility design. The potential to encounter geologic resources and significant paleontological resources at the alternative sites is similar to the Calico Solar Project site. The conditions of certification provided in the **GEOLOGY AND PALEONTOLOGY** section would be applicable to the Private Land Alternative.

Transmission System Engineering

Locating a solar facility at the Private Land Alternative would require re-evaluating the capacity of the SCE transmission lines that would be used for interconnection. This alternative may cause adverse effects to the SCE transmission system and require system upgrades at the Coolwater Substation. However, the Private Land Alternative would not require the 65-mile upgrade to the Lugo-Pisgah No. 2 220 kV transmission line that would be required by the Calico Solar Project.

Summary of Impacts. The Private Land Alternative would have impacts similar to the proposed Calico Solar Project site at for air quality, hazardous materials management, recreation, public health, socioeconomics, transmission line safety and nuisance, waste management, worker safety and fire protection, facility design, power plant efficiency, geology and paleontology, and power plant reliability.

The Private Land Alternative would be preferred to the proposed Calico Solar Project site for biological resources, cultural resources, visual resources, and potentially transmission system engineering. The Private Land Alternative would be less preferred than the proposed Calico Solar Project site for land use (including agriculture) and noise.

It is believed that impacts to soils and water at the Private Land Alternative would be similar to those at the proposed Calico Solar Project site; it is assumed that there is groundwater available at the Private Land Alternative site because of the existing irrigated agriculture that would be replaced by the solar project.

The alternative is potentially feasible and would reduce impacts in comparison with the proposed project. However, due to the number of parcels that would have to be acquired, this alternative would make obtaining site control more challenging at this location. In addition, detailed site engineering and transmission interconnection would require additional time for this site to be developed; as a result this alternative would not meet the project objective requiring that a decision to be made in 2010.

B.2.8 ALTERNATIVES CONSIDERED BUT NOT EVALUATED IN FURTHER DETAIL

This section considers potential alternatives to the proposed Calico Solar Project that were evaluated, and determined to not be feasible for meeting key project objectives, they are not yet commercially available, or they would not result in lesser impacts than the proposed action. Because these alternatives would not avoid or substantially reduce the adverse impacts of the proposed Calico Solar Project or because they do not meet

project objectives, the purpose and need for the project, or are otherwise not reasonable alternatives, they are not analyzed in further detail in this SSA.

B.2.8.1 PUBLIC LAND SITE ALTERNATIVES

The following sites located largely on public land managed by the BLM were identified by the Applicant as alternatives for analysis in its Application for Certification. They were evaluated here and, based on the findings of those analyses, were not carried forward for detailed evaluation in this SSA:

- Avoidance of Donated and Acquired Lands Alternative
- Camp Rock Road (Site AS1)
- Upper Johnson Valley (Site AS2)
- West of Twentynine Palms (Site AS3)
- I-40 South (Site AS4)
- Broadwell Lake (Site AS5)
- SES Solar Three

Each site is discussed in the following paragraphs.

Avoidance of Donated and Acquired Lands Alternative

The Avoidance of Donated and Acquired Lands Alternative would be an approximately 720 MW solar facility located within the boundaries of the proposed project. It was retained for analysis in the SA/DEIS. However, after a detailed analysis it was found that the alternative would not substantially reduce significant impacts of the proposed 850 MW project. As such, the alternative was eliminated in the SSA.

This alternative was considered because it would not require use of any lands that were donated to BLM or acquired by BLM through the Land and Water Conservation Fund program. This alternative would be consistent with the May 27, 2009 BLM Interim Policy Memorandum (CA-2009-020) on donated and acquired lands. The Interim Policy Memorandum (CA-2009-020) states the following.

- *Lands acquired by BLM under donation agreements, acquired for mitigation/ compensation purposes and with LWCF funds, are to be managed as avoidance/exclusion areas for land use authorizations that could result in surface disturbing activities.*
- *Should BLM –California managers have use authorizations applications pending, or receive new applications on lands that meet the above criteria, they are required to notify the State Director and set up a briefing to address how to respond to those applications.*
- *Should managers have inquiries related to pre-application activities for any land use authorizations on lands that meet the above criteria, please notify applicants regarding the location of these lands as soon as possible and advise them to avoid these lands or provide details on how they would plan to operate or mitigate their*

project in a manner consistent with the values of the lands donated or acquired for conservation purposes.

The Avoidance of Donated and Acquired Lands Alternative would contain approximately 28,800 SunCatchers with a net generating capacity of approximately 720 MW occupying approximately 7,050 acres of land. This alternative would retain 85% of the proposed SunCatchers and would affect 85% of the land of the proposed 850 MW project.

The boundaries of the Avoidance of Donated and Acquired Lands Alternative are shown in **Alternatives Figure 2**. The easternmost parcel of the alternative is bordered by LWCF acquired lands to the north, south, and west. Because this parcel could not be reached via project lands, access to this section would be limited to use of the existing transmission line access road that forms the eastern boundary of the parcel, therefore avoiding any new direct impacts to LWCF lands.

The Avoidance of Donated and Acquired Lands Alternative would transmit power to the grid through the SCE Pisgah Substation and would require infrastructure including water storage tanks, transmission line, road access, main services complex, and substation. Because the Avoidance of Donated and Acquired Lands Alternative would generate approximately 720 MW of power, it would require a 65-mile upgrade to the SCE Pisgah-Lugo transmission line. The main services complex, primary water well, and substation, and transmission line for the Reduced Acreage Alternative would be at the same locations as for the proposed project.

Environmental Assessment. After detailed analysis of this alternative in the SA/DEIS, the alternative was not found to substantially reduce impacts of the proposed project. For most resource elements, the alternative was found to have impacts similar to the proposed project. For elements with significant impacts, the Avoidance of Donated or Acquired Lands would not substantially reduce these impacts.

Biological Resources. As discussed in detail in Section C.2.4.2, the proposed project would result in the loss of native vegetation communities, impacts to special status plants, impacts to common wildlife, and impacts to special status wildlife. Implementation of the Avoidance of Donated and Acquired Lands Alternative would have the same types of effects as described for the proposed project, but they would be of lower magnitude than the proposed project because of the reduced footprint of 1,180 acres (i.e., a 15% reduction). However, even with this reduction the resulting site boundary includes a large parcel of LWCF lands purchased from Catellus that would be entirely enclosed within the developed solar field (see **Alternatives Figure 2**). Although this parcel would remain undeveloped and direct impacts would not occur, as a result of being surrounded by solar development, this area would be subject to indirect effects and would lose much of its value as wildlife habitat due to fragmentation. Indirect effects to vegetation within this parcel could include altered hydrologic regimes due to the construction of a drainage system and retention basins on the developed solar site, dust, and the spread of non-native and invasive weeds. This area would also become isolated and would likely result in the loss of special status species, including desert tortoise over time. Because of the exclusion fencing, tortoises trapped within the donated and acquired lands would likely require translocation in order to provide for the preservation of the animals. Indirect effects related to noise, changes in vegetation due

to altered hydrology and the spread of invasive plants, and general human disturbance would also occur to within this parcel.

Impacts to other wide-ranging species in the project area, including American badger, desert kit fox, and special-status bats would also be reduced, but not in proportion to the reduction in size of this alternative because of the large habitat fragment that would occur as a result of the LWCF lands purchased from Catellus that would be entirely enclosed within the developed solar field. Therefore, impacts to these species would be only slightly reduced in magnitude and extent.

Additionally, while the alternative would reduce impacts to donated and acquired lands, it would still indirectly disrupt current wilderness areas and recreational activities in established federal and state areas, which would result in adverse effects on recreational users of these lands.

Cultural Resources. The Avoidance of Acquired and Donated Land alternative would result in a reduction of impacts to cultural resources. However, given the high quantity and density of cultural resources present, cultural resources cannot be completely avoided by the alternative construction. The alternative is anticipated to have significant effects per NEPA, CEQA, and an adverse effect per Section 106 of the National Historic Preservation Act of 1966.

Land Use. The Avoidance of Donated and Acquired Lands Alternative would eliminate any construction on LWCF lands. In contrast to the proposed project, this alternative would comply with all applicable LORS, in particular the BLM's Interim Policy Memorandum regarding management of donated LWCF mitigation lands. Otherwise, the impacts associated with this alternative would be similar to the proposed project, but proportionally less intense.

Visual Resources. The impacts of avoidance alternative would not differ in a meaningful way from those described in Section C.13.4.2 for the proposed project. The vast size of the site would be reduced, but not in a way that would be readily perceptible to most viewers, in particular those on the highways. Because there would be no readily perceptible reduction in visual impact, the impacts would remain significant, as described for the proposed project in Section C.13.4.3.

Rationale for Elimination

The Donated and Acquired Lands Alternative was eliminated because it was found to have impacts similar to the proposed project for most resource elements. The alternative avoids direct impacts to all lands within the Calico Solar Project boundary that were donated to or acquired by the Bureau of Land Management, but because a large parcel of lands purchased from Catellus would be entirely enclosed within the developed solar field, indirect impacts to this parcel would occur and the parcel would lose much of its value as wildlife habitat. The Avoidance of Donated and Acquired Lands Alternative would create the same general impacts to biological resources, cultural resources, and visual resources and would not reduce the significance of the impacts to these resources. Additionally, the Avoidance of Donated and Acquired Lands Alternative would reduce the benefits of the proposed Calico Solar Project in displacing fossil fuel fired generation and reducing associated criteria pollutant emissions.

Camp Rock Road AS1

Camp Rock Road (Site AS1) was identified by the Applicant in the AFC as a potential alternative site for the proposed project. Camp Rock Road is located on nine sections, southwest of T6NR2E north of Camp Rock Road and bisected by an existing transmission line corridor. Two of the sections in the alternative site were acquired by the National Park Service Land & Water Conservation Fund (LWCF) which provides matching grants to States and local governments for the acquisition and development of public outdoor recreation areas and facilities (NPS 2009). The LWCF Act provides legal protection for areas or facilities for which LWCF assistance was obtained and ensures that the Federal investments in LWCF are maintained in public outdoor recreation use unless the National Park Service approves substitution property of reasonably equivalent usefulness and location and of at least fair market value [36 CFR §59.3]. The **LAND USE** discipline of this SSA discusses the BLM policy regarding LWCF acquired lands in more detail.

The Camp Rock Road site is located adjacent to and partially on the Johnson Valley Off Highway Vehicle (OHV) Area. The OHV area is a 154,700-acre off-highway vehicle area. All forms of motorized vehicle use are allowed within the boundaries of the area. Staging and camping areas include Anderson Dry Lake, Soggy Dry Lake, Cougar Buttes, and the Rockpile. Competitive events are often held in Johnson Valley. As an example, over 25 OHV events were scheduled in Johnson Valley in 2009 (BLM 2009).

Slopes at the site range from 3 to 6%. Existing access to the site is from a county-maintained road although access would require an additional 3-mile access road to Harrod Road (SES Data Response Set 2 Pt 1). Additionally, there is no railroad within 10 miles. The entire site is classified as Category I Desert Tortoise habitat and is within the Ord-Rodman DWMA (SES Data Response Set 2 Pt 1).

Camp Rock Road was not pursued by the applicant as a possible site for the proposed project because of the lack of railroad access and lack of major highway access and because the site is located on designated critical habitat for Desert Tortoise (SES 2008a). Camp Rock Road is located southwest of the proposed Calico Solar Project site; see **Alternatives Figure 4**.

Environmental Assessment. As with the proposed Calico Solar Project site, Camp Rock Road would require use of a vast amount of land and would result in the permanent loss of approximately 5,750 acres of desert habitat, including Category I desert tortoise habitat, and would likely result in impacts to biological and cultural resources. Additionally, because the site would require a 3-mile access road to reach the site, the alternative would like result in a greater amount of earth movement than the proposed project which is located adjacent to an existing access road.

Impacts to land use and recreation at Camp Rock Road would potentially be significant as it is adjacent and partially located on the Johnson Valley Off Highway Vehicle (OHV) Area and on lands acquired with LWCF funding. Use of the Camp Rock Road Alternative would potentially conflict with the CDCA Recreation Element goals and with the use of lands acquired with LWCF funds and would require appropriate conditions of certification or mitigation such as those required for the proposed project in the **LAND USE** discipline.

Both the proposed Calico Solar Project site and Camp Rock Road would have a large footprint and require extensive grading, potentially resulting in erosion and runoff. Camp Rock Road is within one mile of Lucerne Valley and would likely be visible from this area. Given the size of the power plants and the approximately 40-ft tall SunCatchers, visual impacts would be considerable and similar to those at the proposed Calico Solar Project site.

Rationale for Elimination

Camp Rock Road would likely cause biological and cultural resources impacts due to the extensive grading required for the 850 MW solar power plant. Additionally, because of Camp Rock Road is in Category I desert tortoise habitat, compared with the proposed site which is Category II desert tortoise habitat, impacts to desert tortoise would be expected to more severe than at the proposed Calico Solar Project site. Because Camp Rock Road would be partially located on an OHV area and on lands acquired with LWCF funds, the project would conflict with the use of this land. Under CEQA, the alternative site was eliminated because it would not substantially lessen the significant effects of the proposed Calico Solar Project, and because a portion of the site is not a viable alternative because of conflicts with OHV areas.

The Camp Rock Road alternative site location was not found to be a reasonable alternative for the proposed project because of the land classification of the alternative site. The alternative site is located within a recreational use area which was established pursuant to BLM's multiple use and sustained yield management plan, the CDCA Plan of 1980, as amended over time, in conformance with FLPMA section 601 [43 U.S.C. 1781 (b)]. Without an additional land use plan amendment, which BLM could initiate, solar energy facilities within a designated Off-Highway Vehicle open area are precluded. While the BLM could initiate a land use plan amendment to accommodate the Camp Rock Road alternative site location, the alternative site does not avoid or minimize impacts to recreational interests, desert tortoise habitat, cultural resources, or approved CDCA plan land use.

Upper Johnson Valley AS2

Upper Johnson Valley (Site AS2) was identified by the Applicant in the AFC as a potential alternative site for the proposed Calico project. The site would be located on nine sections, three of which are owned by SCE. The site is located on Category III desert tortoise habitat. The site is located east of Lucerne Valley and north of Bessemer Mine Road. Slopes range from 3 to 5%. Access to the site would be on a county maintained road although it would require an additional 9.5-mile access road to State Hwy 247 (SES Data Response Set 2 Pt 1). Additionally, there is no railroad within 10 miles of the alternative site.

The site would be located on six sections of land that are part of the Upper Johnson Valley OHV Area and would be entirely surrounded by the OHV area. It would be located 8 miles east of Marine Corps Air Ground Combat Center Twentynine Palms (MCAGCC Twentynine Palms).

The site was not pursued by the applicant as a possible site for the proposed project because of the lack of railroad access, lack of major highway access, and because it is

located on BLM OHV use area. Upper Johnson Valley site is located southwest of the proposed site; see **Alternatives Figure 4**.

Rationale for Elimination

The Upper Johnson Valley Alternative site location was not found to be a reasonable alternative for the proposed project because of the land classification of the alternative site. The alternative site is located within a designated recreational use area which was established pursuant to BLM's multiple use and sustained yield management plan, the CDCA Plan of 1980, as amended over time, in conformance with FLPMA section 601 (43 U.S.C. 1781 (b)). Without an additional land use plan amendment, which BLM could initiate, solar energy facilities within a designated Off-Highway Vehicle open area are precluded. While the BLM could initiate a land use plan amendment to accommodate the Camp Rock Road alternative site location, the alternative site does not avoid or minimize impacts.

Additionally, the purpose and need statement for the proposed action was developed by BLM consistent with its statutory and regulatory responsibilities. Thus, the portion of the alternative that is not within BLM jurisdiction would not be considered reasonable.

West of Twentynine Palms Military Base (AS3)

West of Twentynine Palms Military Base (Site AS3) was identified by the Applicant in the AFC as a potential alternative site for the proposed project. This site is located on eight sections of land that are part of the Upper Johnson Valley OHV Area and would be entirely surrounded by the OHV area. Additionally, the alternative is immediately west of MCAGCC Twentynine Palms and two of the sections are LWCF acquisition lands. MCAGCC Twentynine Palms is currently considering a Training Land/Airspace Acquisition Study. The DEIS for this study is expected to be released in October 2010. The West of Twentynine Palms Military Base Alternative site would be located within the West Study Area.

Access to the site would require an 11.5-mile access road to I-40 (SES Data Response Set 2 Pt 1). Additionally, there is no railroad within 10 miles of the alternative site. The alternative site was not located in any identified critical habitat land.

The alternative was not pursued as an alternative to the proposed site by the applicant because of land use conflicts, lack of railroad and major highway access, and distance from existing transmission corridors. West of Twentynine Palms Military Base Alternative is located due west of MCAGCC Twentynine Palms and south of the proposed site as shown on **Alternatives Figure 4**.

West of Twentynine Palms Military Base is located in the CDCA Planning area and includes use of lands acquired with LWCF funds.

Rationale for Elimination

The West of Twentynine Palms Military Base Alternative was not found to be a reasonable alternative for the proposed project because the land classification of the alternative. The alternative site is located within a designated recreational use area which was established pursuant to BLM's multiple use and sustained yield management

plan, the CDCA Plan of 1980, as amended over time, in conformance with FLPMA section 601 (43 U.S.C. 1781 (b)). Without an additional land use plan amendment, which BLM could initiate, solar energy facilities within a designated Off-Highway Vehicle open area are precluded. While the BLM could initiate a land use plan amendment to accommodate the Camp Rock Road alternative site location, the alternative site does not avoid or minimize impacts.

I-40 South (AS4)

The I-40 South Alternative site was suggested by the applicant. The site is located on twelve sections of land both federal and private. The site is traversed by the Lugo-Pisgah No. 2 transmission line and is located approximately 2 miles south of I-40. Access to the site would require a .5-mile access road to I-40 (SES Data Response Set 2 Pt 1). Slopes at the site range from 3 to 5%. Three sections of the alternative site (T7N R5E Sections 4, 5, and 6) are located within the Ord-Rodman unit of desert tortoise critical habitat which would limit their use for energy development. CNDDB data indicate the purple-nerve cymopterus (CNPS List 2.2) is present on the site (SES Data Response Set 2 Pt 1).

Three existing mining claims, the National Mine, Silver Bell Mine, and Silver Cliffs Mine, are located within one mile of the alternative site. Access roads to the existing mines cross the alternative site. MCAGCC Twentynine Palms would be located immediately southwest of the alternative site. Rodman Mountains Wilderness would be located one mile west of the alternative site. Additionally the project would be located on approximately 3 miles of the Pisgah Crater Lava Flow. The Pisgah Crater Lava Flow includes what may be the youngest pahoehoe basalts found in California and are open to visitors on BLM managed land.

Environmental Assessment. As with the proposed Calico Solar Project site, the I-40 South Alternative would require use of a vast amount of land and would result in the permanent loss of approximately 7,600 acres of desert habitat. The project would require extensive grading and would likely result in impacts to biological and cultural resources. The project would be located on approximately 1,920 acres of critical desert tortoise habitat and would likely result in significant biological impacts.

Impacts to land use and recreation at I-40 South would potentially be significant as it includes a portion of the Pisgah Crater Lava Flow and has potential conflicts with existing land uses including a number of mines. The project would deny access to three existing mines, and new access routes would be required. The I-40 South would potentially conflict with the MCAGCC Twentynine Palms which is located immediately southeast of the alternative site.

Both the proposed Calico Solar Project site and I-40 South site would have a large footprint and require extensive grading, potentially resulting in erosion and runoff. As with the proposed Calico Solar Project site, the I-40 South site would be within 2 miles of the I-40 and given the size of the power plants and the approximately 40 foot tall SunCatchers, visual impacts to travelers along the I-40 would be considerable. Additionally, the project would likely be visible from the Rodman Mountains Wilderness and potentially visible from the Rodman Mountains ACEC.

Rationale for Elimination

I-40 South Alternative would likely cause biological and cultural resources impacts due to the extensive grading required for the 850 MW solar power plant. Additionally, the alternative site is located on desert tortoise critical habitat and would potentially result in more significant impacts to the species.

As with the existing project, the I-40 South Alternative would impede access to existing uses and alternative access routes would be required. Approximately 3 miles of the Pisgah Crater Lava Flow would be impacted by the project. Impacts to visual resources would likely be severe given the proximity of the project to I-40 and the Rodman Mountains Wilderness. Under CEQA, the alternative site was eliminated because it would not substantially lessen the significant effects of the proposed Calico Solar Project, and because a portion of the site is not a viable alternative because it is located on desert tortoise critical habitat.

Broadwell Lake (AS5)

The Broadwell Lake Alternative site was considered by the applicant because it was near the SCE Lugo-Pisgah No. 2 transmission line. The site is located on 12 sections of BLM land approximately 9 miles north of I-40. The site would be located approximately 5 miles east of the proposed Calico Solar Project site. The site would be east of the Cady Mountain Wilderness Study Area and north of the Sleeping Beauty mountain range and within the proposed national monument. CNDDB data indicate the presence of desert tortoise (Federally and State listed threatened), emory's crucifixion-thorn, small-flowered androstephium (CNPS List 2.2), white-margined beardtongue (CNPS List 1B.2/ BLM Sensitive), and Mojave Fringe-toed Lizard (State species of concern) (SES Data Response Set 2 Pt 1).

Rationale for Elimination

In March 2009, Senator Feinstein announced intention of introducing new legislation to establish a national monument. The proposed national monument would connect the Joshua Tree National Park and Mojave National Preserve and would potentially include the former Catellus Lands donated by the Wildlands Conservancy to the BLM. The proposed Mojave Trails National Monument boundary was released in December 2009 and includes the Broadwell Lake Alternative Site.

Additionally, in January 2007, DPT Broadwell Lake, LLC (BrightSource) submitted an application to the BLM for use of the majority of the land identified in Broadwell Lake (AS5) for the construction and operation of a 500 MW solar power tower facility (BLM 2009). BrightSource has stated that it will not move forward with this application until questions are resolved about whether the land would be included in the national monument (Press Enterprise 2009). However, the application has not been formally withdrawn from the BLM queue. As discussed earlier, under its existing regulations, BLM determines if competing applications exist for the same facility or system. Applications that are first in time are given priority in consideration and are not considered competing applications with those filed later in time. An alternative site on BLM land with a pending application for another project is not considered a reasonable alternative to the proposed project for purposes of alternatives analysis. Therefore, an alternative site on BLM land with a pending application, such as Broadwell Lake, would

not be a reasonable alternative for the proposed Calico Solar Project unless that other application is timely rejected or withdrawn.

SES Solar Three Alternative

As suggested by the Defenders of Wildlife, the Stirling Energy System (SES) Solar Three Alternative site was considered in conjunction with the Reduced Acreage Alternative because it would allow for additional development of solar power while avoiding resources of greatest concern. In November 2006, SES Inc. Solar Three, LLC filed an application with the BLM for use of 6,779 acres of land immediately west of Calico Solar Project. Approximately 2,500 acres of the land within the SES Solar Three boundaries show no tortoise sign present, as illustrated in applicant figure 5.6-4 and was considered as a potential alternative to the proposed project.

Rationale for Elimination

SES withdrew the Solar Three application in December of 2009 and the case file for SES Solar Three was closed by the BLM. Prior to the withdrawal of the SES Solar Three application, a second-in-line application had filed for the site. As discussed earlier, under its existing regulations, BLM determines if competing applications exist for the same facility or system. Applications that are first in time are given priority in consideration and are not considered competing applications with those filed later in time. An alternative site on BLM land with a pending application for another project is not considered a reasonable alternative to the proposed project for purposes of alternatives analysis. Therefore, an alternative site on BLM land with a pending application, such as Solar Three, would not be a reasonable alternative for the proposed Calico Solar Project unless that other application is timely rejected or withdrawn.

B.2.8.2 ALTERNATIVE SOLAR GENERATION TECHNOLOGIES

In addition to the range of alternative sites discussed earlier, several alternative solar generation technologies were identified by the Energy Commission and evaluated as potential alternatives to the proposed Calico Solar Project. Although alternative solar generation technologies would achieve most of the project objectives, each would have different environmental or feasibility concerns. BLM did not find these alternatives to be consistent with the project purpose and need, and they are therefore not analyzed in detail under NEPA. The following solar generation technologies were considered in this analysis:

- parabolic trough technology
- solar power tower technology
- linear Fresnel technology
- photovoltaic technology

Alternatives Table 2
Summary Characteristics of Solar Technologies

Technology	Parabolic trough	Solar Power Tower	Stirling Engine	Linear Fresnel	Photovoltaic
Water Use/ 100 MW (Assumes dry cooling)	~65 AFY	~20 AFY	~5 AFY	~12 AFY	~2-10 AFY
Acres per MW	6-7	10	9	4	8-12
Low Impact Construction Possible	No	Yes	Yes	No	Yes
Tallest component (does not include cooling towers or Transmission Line)	25 feet – trough	300 - 650 feel	38 feet - engine	56 feet	10 -15 feet (+ inverter station)
Slope requirements	2% or less	5% or less, can use LID	6% or less, can use LID	1% or less	3% or less, can use LID
Siting restrictions	Troughs are 1300 feet long, requires contiguous land	Heliostats must be in concentric circles around power tower	Can be sited in irregular shapes	Requires rectangles, requires contiguous land	Can be sited in irregular shapes
Heat Transfer Fluid (do not include water)	Yes	No	No	No (water used)	No

Among the solar thermal technology alternatives, the linear Fresnel alternative has the potential for least impacts due to its more compact configuration (reducing ground disturbance); however, the technology is proprietary and is not available to other applicants or developers. Additionally, in February 2009 Ausra, the proprietary owner of the linear Fresnel technology, changed focus to exit the business of building solar-power plants and instead serves other developers with solar thermal energy systems for industrial use and utility-scale generation. As such, the linear Fresnel technology will only be addressed briefly below.

The distributed solar alternative would have fewer impacts than the proposed Calico Solar Project because it would be located on already existing buildings or on already disturbed land. However, achieving 850 MW of distributed solar PV or solar thermal would depend on additional policy support, manufacturing capacity, and lower cost than currently exists to provide the renewable energy required to meet the California Renewable Portfolio Standard requirements so additional technologies, like utility-scale solar thermal generation, would be necessary.

These analyses assumed that the alternative technologies would be implemented on the site for the proposed Calico Solar Project, east of Newberry Springs.

Parabolic Trough Technology

A parabolic trough system converts solar radiation to electricity by using sunlight to heat a fluid, such as oil, which is then used to generate steam. The plant consists of a large field of trough-shaped solar collectors arranged in parallel rows, normally aligned on a north-south horizontal axis, see **Alternatives Figure 5**. Each parabolic trough collector has a linear parabolic-shaped reflector that focuses the sun's direct beam radiation on a linear receiver, also referred to as a heat collection element located at the focus of the parabola. Heat transfer fluid within the collector is heated to approximately 740 degrees Fahrenheit (°F) as it circulates through the receiver and returns to a series of heat exchangers where the fluid is used to generate high-pressure steam. The superheated steam is then fed to a conventional reheat steam turbine/generator to produce electricity.

A solar trough power plant generally requires land with a less than 2% grade. On average, 5 to 8 acres of land are required per MW of power generated. A parabolic trough power plant would include the following major elements:

- **Parabolic Trough Collectors**. The parabolic trough collectors would rotate around the horizontal north/south axis to track the sun. Reflectors, or mirrors, would focus the sun's radiation on a linear receiver located along the length of the collector.
- **Solar Boiler.** Solar boilers are designed differently than conventional gas-fired boilers in that they are fueled with hot oil instead of hot gases. This design is similar to any shell and tube heat exchanger in that the hot heat transfer fluid is circulated through tubes and the steam is produced on the shell side.
- **Heat Transfer Fluid Oil Heater**. Due to the high freezing temperature of the solar field's heat transfer fluid (54°F), to eliminate the problem of oil freezing, an oil heater would be installed to protect the system during the night hours and colder months.

Parabolic trough power plants are the currently the most established type of large solar generator. Existing facilities are located in several places, including the following:

- **Nevada SolarOne** (shown in **Alternatives Figure 5**) near Boulder City, Nevada, has been operating since June 2007. It cost over $260 million and generates 64 MW. It is the largest concentrating solar power plant to be built in the last 17 years and is the third largest plant of its kind in the world (Nevada SolarOne 2008).
- **Sunray Energy, Inc. Solar Energy Generating System** is located in Daggett, California adjacent to an abandoned power tower facility. It generates 44 MW and is shown in **Alternatives Figure 5**.
- **Kramer Junction Solar Energy Generating System** is located about 30 miles west of Barstow, California. The project is a series of utility-scale solar thermal electric power plants, which were designed and developed in the mid-1980s by LUZ Industries. The facility can produce 165 MW at full capacity (Solel 2008).

Environmental Assessment. Approximately 4,250 to 6,800 acres of land would be required for a 850 MW solar trough power plant, resulting in a permanent loss of natural desert habitat.

If the solar trough technology were used at the Calico Solar Project site, slightly less acreage would be required. However, parabolic troughs require a more level ground surface, so the entire site would need to be graded for the solar trough power plant, removing all vegetation from the area. This results in a somewhat more severe effect on biological and cultural resources than the Calico Solar Project, which would not require grading the entire site.

The size and height of the solar trough mirrors (each approximately 28 feet high) would cause visual impacts from I-40 Highway and Cady Mountains Wilderness Study Area. While the solar trough technology would be slightly lower to the ground than the Stirling Engine SunCatchers, the number of solar troughs and the large acreage required would introduce prominent and reflective structures, industrializing the area.

Solar trough plants require water to generate the steam that powers the turbines. The technology uses a closed-loop circulation that requires some boiler make-up water to replace water lost in the system. Water is also required to wash the mirrors for both types of technologies. If wet cooling were used, the cooling towers would require approximately 600 acre-feet/year (AFY) per 100 MW of capacity. Dry cooling would use significantly less water, approximately 18 AFY per 100 MW (NRDC 2008a).

Because of the extensive grading required for a solar trough plant, soil erosion and air emissions during construction could be more severe than with the Calico Solar Project.

Summary of Impacts. The land area needed for a solar trough power plant would likely be less than required for the proposed Calico Solar Project, but more intensive in terms of ground disturbance. Because of the more intensive use of the land and the grading required to achieve a 2% grade, there could be more severe impacts to biological and cultural resources than would occur with the Stirling engine facility. Use of a heat transfer fluid as would be conveyed in miles of pipelines from the parabolic trough collectors to the solar boiler would create a potential for spills of hazardous materials into soil or water, which would not be present with the proposed Calico Solar Project engine.

Rationale for Elimination

Solar trough technology is a viable renewable technology and could potentially reduce the footprint of the project between 10 and 45%. However, due to its requirement for a nearly flat, graded site, it would require more construction with greater air emissions and more erosion potential. With a minimum size of nearly 4,000 acres, solar trough technology would not eliminate any of the significant impacts of the Calico Solar Project. Therefore, this alternative technology was eliminated from further consideration in this SSA.

Solar Power Tower Technology

The solar power tower technology converts thermal energy to electricity by using heliostat (mirror) fields to focus energy on a boiler located on power tower receivers near the center of each heliostat array. Each mirror tracks the sun during the day. The heliostats would be 7.2 feet high by 10.5 feet wide. See **Alternatives Figure 5** for an illustration. The solar power towers can be up to 459 feet tall with additional 10-foot tall

lightening rods. The solar power tower would receive heat from the heliostats then convert the heat into steam by heating water in the solar boilers. A secondary phase would convert the steam into electricity using a Rankine-cycle reheat steam turbine electric generator housed in a power block facility at each of the plants.

In general, a solar power tower power plant requires 5 to 10 acres of land per MW of power generated. An 850 MW solar power tower field would require from 4,250 acres to 8,500 acres of land.

Site preparation involves grading the heliostat field and grading the access roads required for maintenance. Each heliostat field has the following primary components.

- **Heliostats.** The heliostat mirrors are arranged around each solar receiver boiler. Each mirror tracks the sun throughout the day and reflects the solar energy to the receiver boiler. The heliostats are approximately 7.2 feet high by 10.5 feet wide. They are arranged in arcs around the solar boiler towers asymmetrically.
- **Power Tower.** The power tower structure height is up to 459 feet. Primary thermal input is via solar receiver boilers, superheater and reheaters at the top of the distributed power towers.
- **Steam Turbine Generator (STGs)**. The steam turbine system consists of a condensing steam turbine generator with reheat, gland steam system, lubricating oil system, hydraulic control system, and steam admission/induction valving. Power will be generated by the STGs at 19 kV (hydrogen cooled) and then stepped up by transformers for more efficient transmission across the grid.

Environmental Assessment. The land area required for an 850 MW solar power tower plant is similar to that required for the proposed Calico Solar Project. Grading of almost the entire Calico Solar Project site would be required along with grading of permanent access roads due to the need for regular washing of the mirrors. This grading would cause removal of vegetation. Additionally, because the proposed Calico Solar Project site is crossed by several desert washes, the installation of the heliostats and power towers could require a larger total acreage of land, resulting in a greater loss of habitat.

Due to the size and height of the solar power towers and mirrors, impacts to visual resources would be greater than those of the Calico Solar Project. The grading of approximately 4,250 to 8,500 acres required for a 850 MW of power along with the approximately 459 foot tall towers would introduce an industrial character to this site and the surrounding areas.

Because of the height of the solar power towers, there may be concerns regarding any nearby aviation or military operations. While the solar power tower technology built at the Calico Solar Project site would not be located in the military no fly/no build areas, it would be located in a DOD Airspace Consultation Area and conflicts with the nearby MCAGCC Twentynine Palms may arise.

Rationale for Elimination

The area needed for a solar power tower plant would be comparable to the land requirement for the Calico Solar Project. Grading requirements for the solar power

tower would be similar to the proposed Stirling technology because both technologies require access roads in between the rows of heliostats or engines. For these reasons, recreation and land use, biological resources, cultural resource and soil erosion impacts would be similar to those of the Calico Solar Project facility. In addition, due to the extent of the facility and the height of the power towers, visual impacts would like be greater for this alternative. Additionally, the height of the power tower would create potential impacts with the adjacent military facilities.

Because no substantial reduction in impacts would occur under this alternative technology, the solar power tower technology was eliminated from further consideration in this SSA as an alternative technology.

Linear Fresnel Technology

A solar linear Fresnel power plant converts solar radiation to electricity by using flat moving mirrors to follow the path of the sun and reflect its heat on the fixed pipe receivers located about the mirrors. During daylight hours, the solar concentrators focus heat on the receivers to produce steam, which is collected in a piping system and delivered to steam drums located in a solar field and then transferred to steam drums in a power block (Carrizo 2007). The steam drums transferred to the power block will be used to turn steam turbine generators and produce electricity. The steam is then cooled, condensed into water, and recirculated back into the process.

Each row-segment is supported by large hoops that rotate independently on metal castors. Rotation of the reflectors would be driven by a small electrical pulse motor. Reflectors are stowed with the mirror aimed down at the ground during the night. The major components are:

- **Compact Linear Fresnel Reflector (CLFR) Solar Concentrator.** A solar Fresnel power plant would use Ausra's CLFR technology which consists of slightly curved linear solar reflectors that concentrate solar energy on an elevated receiver structure. Reflectors measure 52.5 by 7.5 feet (Carrizo 2007). There are 24 reflectors in each row. A line is made up of 10 adjacent rows and operates as a unit, focusing on a single receiver (Carrizo 2007).
- **Receiver Structure.** The receiver structure is approximately 56 feet tall (Carrizo 2007). It would carry a row of specially coated steel pipes in an insulated cavity. The receiver would produce saturated steam at approximately 518°F from cool water pumped through the receiver pipes and heated (Carrizo 2007). The steam would drive turbines and produce electricity.

Rationale for Elimination

The Fresnel solar technology is a proprietary technology owned by Ausra, Inc. However, Ausra, Inc. has changed its focus to being a technology and equipment provider rather than an independent power developer and owner and will focus on medium-sized (50 MW) solar steam generating systems for customers including steam users, such as food processors and enhanced oil recovery firms and utilities for power augmentation systems that deliver steam into existing fossil-fuel power plants. A project of 850 MW is theoretically possible, and would require smaller acreage per megawatt.

However, at nearly 4,000 acres for 850 MW, this technology would not eliminate the significant impacts of the proposed SES technology at this site.

Solar Photovoltaic Technology – Utility Scale

A solar photovoltaic (PV) power generation facility would consist of PV panels that would absorb solar radiation and convert it directly to electricity. PV facilities have been suggested using two general technologies:

- Thin film installed on fixed metal racks, as proposed by First Solar, Inc. (see **Alternatives Figure 6**)
- Concentrating photovoltaics installed in elevated groups of panels that track the sun. These technologies are available from companies such as SunPower and Amonix. SunPower's PowerTracker technology consists of a single-axis mechanism that rotates the PV panels to follow the sunlight. The Amonix technology allows tracking on two axes. See **Alternatives Figure 6**.

Examples of existing utility scale PV facilities are:

- El Dorado Energy (Boulder City, NV): First Solar built a 10 MW facility using thin film technology for Sempra Energy demonstrating the commercial viability of its technology. The facility consists of over 167,000 solar modules on 80 acres of land and was completed in December 2008. (Sempra 2008). Additionally, Sempra Generation will begin expanding the facility by 48 MW in January 2010. All 58 MWs would be purchased by PG&E (Sempra 2009).
- NRG Solar (Blythe, CA): NRG Solar acquired a 21 MW thin film PV project in Blythe, CA. Commercial operation of the facility began in December 2009 and the electricity generated by the project is being sold to SCE under a 20 year power purchase agreement (NRG 2009).

Because PV technologies vary, the acreage required per MW of electricity produced from a large solar PV power plant is wide ranging and likely to change as technology continues to develop. The land requirement varies from approximately 3 acres per MW of capacity for crystalline silicon to more than 10 acres per MW produced for thin film and tracking technologies (NRDC 2008c). Therefore, a nominal 850 MW solar PV power plant would require between 2,550 and 8,500 acres.

Utility-scale solar PV installations require land with less than 3% slope. Solar photovoltaics do not require water for electricity generation. Because some water will be required to wash the solar panels to maintain efficiency, approximately 2-10 AFY of water is estimated to be required for a 100 MW utility solar PV installation or 15 to 75 AFY for a 850 MW installation (NRDC 2008c). The SunPower-CA Valley Solar Ranch states that the facility would use approximately 11.6 AFY for a 250 MW PV facility, or approximately 40 AFY for an 850 MW PV facility (SLO 2009).

Solar PV arrays and inverters would be approximately 15 to 20 feet high; however, some components of the solar PV facility, such as collector power lines or a transmission interconnection may be substantially taller (SLO 2009).

As with any large solar facility, additional operational components may be required. The SunPower-California Valley Solar Ranch would require such operational components such as electrical equipment, collector power lines, access roads, a substation, an operation and maintenance building, and water tanks (SLO 2009).

Environmental Assessment. A utility scale solar PV facility would create a number of substantial adverse effects similar to those created by the proposed Calico Solar Project facility. If utility scale solar PV technology were built at the Calico Solar Project site, approximately 2,550 to 8,500 acres may be required, depending on the technology. Because the proposed site is crossed by several desert washes, it is likely that additional acreage would be required to site the solar PV arrays away from the major washes. Additionally, because solar PV technology requires ground surface with less than 3% slope, most of the site would be graded, removing all vegetation from the area. This results in a somewhat more severe effect on biological and cultural resources than the Calico Solar Project, which would not require grading the entire site.

The size and height of the solar PV arrays would likely be visible from nearby areas, such as I-40 and the Cady Wilderness Study Area due to the large size of the solar PV facility. The large number of solar PV arrays, access roads, and interconnection power lines required for a 850 MW solar facility would introduce prominent industrial features; however, the solar PV technology would not introduce components as tall as the 40-foot Stirling SunCatchers. Additionally, because most PV panels are black to absorb sun, rather than mirrored to reflect it, glare would be lessened.

Because the solar PV technology does not require any water for cooling or steam generation, the technology uses less water than solar concentrating technologies. Water would be required for washing the solar PV arrays. Approximately 40 AFY would be required (SLO 2009). This is similar to the amount of water required by the Calico Solar Project which estimates use of approximately 36.2 AF annually.

More extensive grading would be required for a PV facility than the proposed Calico Solar Project facility. Because solar PV facilities require land with only 3% slope and the solar panels are grouped more densely together, it is likely that more grading would be required for a solar PV facility. Additionally, many miles of permanent access roads would be required for washing and maintenance of the solar panels. The extensive grading would likely create erosion concerns similar to those of the Calico Solar Project.

Summary of Impacts. The large land area required for PV development would result in similar impacts to recreation, land use, biological and cultural resources, and likely greater impacts to soil and water resources as those of the Calico Solar Project facility. A utility scale PV project would reduce impacts to glare and would require minimal water for washing of the PV panels.

Rationale for Elimination

While utility scale solar PV technology is a viable renewable technology, its use would not reduce major impacts of the proposed Calico Solar Project facility because the extent of land and access roads required, and the more extensive grading and stormwater management system required. Due to its requirement for a nearly flat, graded site, it would require more construction with greater air emissions and more

erosion potential. With a minimum size of nearly 2,500 acres, solar PV technology would not eliminate any of the significant impacts of the Calico Solar Project. Therefore, this alternative technology was eliminated from further consideration in this SSA.

Distributed Solar Technology

There is no single accepted definition of distributed solar technology. The *2009 Integrated Energy Policy Report* (IEPR) defines distributed generation resources as "grid-connected or stand-alone electrical generation or storage systems, connected to the distribution level of the transmission and distribution grid, and located at or very near the location where the energy is used."

Distributed solar facilities vary in size from kilowatts to tens of megawatts but do not require transmission to get to the areas in which the generation is used. Distributed solar generation is generally considered to use photovoltaic (PV) technology although at slightly larger scales it is also being implemented using solar thermal technologies. Both technologies are considered below.

Distributed Solar PV Systems

A distributed solar alternative would consist of PV panels that would absorb solar radiation and convert it directly to electricity. The PV panels could be installed on residential, commercial, or industrial building rooftops or in other disturbed areas such as parking lots or disturbed areas adjacent to existing substations. To be a viable alternative to the proposed Calico Solar Project, there would have to be sufficient newly-installed panels to generate 850 MW of capacity.

California currently has over 500 MW of distributed solar PV systems which cover over 40 million square feet (CPUC 2009). During 2008, 158 MW of distributed solar PV was installed in California, doubling the amount installed in 2007 (78 MW), and with 78 MW installed through May 2009, installation data suggests that at least the same amount of MW could be installed in 2009 as in 2008 (CPUC 2009).

Rooftop PV systems and parking lot systems exist in small areas throughout California. Larger distributed solar PV installations are becoming more common. Examples of distributed PV systems are:

- Nellis Air Force Base (AFB, Nevada): Over 72,000 solar panels, generating 14 MW of energy, were constructed in 2007, by SunPower Corp. on 140 acres of Nellis AFB land (Whitney 2007). Energy generated is used at the Nellis AFB.
- Southern California Edison (Fontana, CA): SCE has installed over 3 MW of distributed solar energy in two phases on over 1 million square-foot commercial roof using thin film PV technology provided by First Solar. This is the beginning of a planned installation of 3.5 million PV panels that would generate 250 MW of capacity (SCE 2009).
- San Diego Gas & Electric (San Diego, CA): SDG&E's Solar Energy Project is designed to install up to 80 MW of solar PV, which would include PV installation on parking structures and tracking systems on open land (SDG&E 2008).

- Pacific Gas & Electric (San Francisco, CA): PG&E launched a 5-year program to develop 500 MW of solar PV power. The program would consist of 250 MW of utility-owned PV generation and an additional 250 MW to be built and operated by independent developers under a streamlined regulatory process. PG&E's program targets mid-sized projects, between 1 to 20 MWs, mounted on the ground or rooftops within its service area (PG&E 2009).
- City of San Jose (San Jose, CA): The City of San Jose is considering the development and implementation of 50 MW of renewable solar energy on city facilities and/or land (San Jose 2009). San Jose's Green Vision lays out a goal of achieving 100% of the city's electricity from renewable energy by 2020 and plans to implement strategies of a 24-month period to increase solar installations in San Jose by 15%. The City anticipates that City facilities with appropriate solar access including parking lots, garages, lands and landfills would be eligible for solar installation and San Jose received ARRA funding for the project.

Like utility-scale PV systems, the acreage of rooftops or other infrastructure required per MW of electricity produced is wide ranging. As stated above, California has approximately 40 million square feet (approximately 920 acres) of distributed solar PV accounting for 500 MW installed (CPUC 2009). However, based on SCE's use of 600,000-square-feet for 2 MW of energy, 250 million square feet (approximately 5,700 acres) would be required for 850 MW.

Most rooftop PV systems in California are crystalline systems, and result in approximately 15% of sunlight converted to energy (SB 2009). The newer technology is thin film, which converts approximately 5 to 10% of sunlight to energy.

San Bernardino County is estimated to have the technical potential for over 2,000 MW of distributed solar PV (CEC, 2007b). However, the location of the distributed solar PV would impact the capacity factor of the distributed solar PV.[4] The capacity factor depends on a number of factors including the insolation[5] of the site. Because a distributed solar PV alternative would be located throughout the state, the insolation at some of these locations may be less than in the Mojave Desert. The Renewable Energy Transmission Initiative (RETI) assumed a capacity factor of approximately 30% for solar thermal technologies and tracking solar PV and approximately 20% capacity factor for rooftop solar PV which is assumed to be non-tracking, , for viable solar generation project locations (B&V 2008; CEC 2009). Tracking distributed solar PV would have a higher capacity factor as well.

Distributed Solar Thermal Systems

Solar thermal technology, specifically Concentrated Solar Power (CSP) technology, has also been adapted for use at distributed locations. In August 2009, eSolar began operations of a new distributed solar power tower technology. This technology uses small, flat mirrors which track the sun and reflect the heat to tower-mounted receivers that boil water to create superheated steam (eSolar 2009). An example of the eSolar

[4] The capacity factor of a power plant is a percentage that tells how much of a power plant's capacity is used over time (CEC 2008a)

[5] Insolation is the total amount of solar radiation striking a surface exposed to the sky (CEC 2008a).

system is the Sierra SunTower, located in Lancaster, CA, which will produce 5 MW of energy for SCE on 20 acres of land (eSolar 2009). Each eSolar module locates one tower, one thermal receiver, and 12,000 mirrors on 10 acres of land and produces 2.5 MW of power. Additionally, eSolar has developed a larger module, a 46 MW CSP plant that would include sixteen towers, a turbine generator set, and a steam condenser which would be located on approximately 160 acres (eSolar 2009).

Another solar thermal technology, the solar trough technology, could also be used as distributed technology. The Andasol 1 power plant in Spain generates 50 MW of power on approximately 127 acres (not including ancillary facilities) and went online in November 2008 (Solar Millenium 2008). The Andasol plant includes thermal storage systems which absorb a portion of the heat produced in the solar field during the day and can run the turbines for approximately 7.5 hours at full load, regardless of the solar conditions at the time (Solar Millenium 2008).

Both the solar thermal technologies have been implemented recently and are described here as an example of the evolving distributed solar technologies.

Environmental Assessment. Installations of 850 MW distributed solar PV would require up to 255 million square feet (approximately 5,700 acres). Distributed solar PV is assumed to be located on already existing structures or disturbed areas so little to no new ground disturbance would be required and there would be few associated biological and cultural resources impacts.

Minimal grading or new access roads would be required and relatively minimal maintenance and washing of the solar panels would be required. As such, it is unlikely that the rooftop solar PV alternative would create erosion impacts. Relatively large amounts of water would be required to wash the solar panels, especially with larger commercial rooftop solar installations; however, the commercial facilities would likely already be equipped with drainage systems. Therefore, the wash water would not contribute to runoff or to erosion.

Because most PV panels are black to absorb sun, rather than mirrored to reflect it, glare would be lessened. Additionally, the distributed solar PV alternative would not require the additional operational components, such as dry-cooling towers, substations, transmission interconnection, and maintenance and operation facilities with corresponding visual impacts. Solar PV panels would be visible to passing residents and may be viewed by a larger number of people.

Consideration of CEQA Criteria

Reduction of Impacts. Distributed solar technology is assumed to be located on already existing structures or disturbed areas so little to no new ground disturbance would be required; there would be few associated impacts to biological and cultural resources. Additionally, impacts to soils and waters as well as visual resources would be reduced.

Meet Most Project Objectives. A distributed solar technology alternative, if constructed at 850 MW, would meet the CEC project objectives to operate 850 MW of renewable power in California capable of selling competitively priced renewable energy. The solar

technology would not necessarily meet the objective to locate the facility in areas of high solarity, because the distributed technology could be located throughout the State.

Feasibility. The rate of PV manufacturing and installation is expected to continue to grow very quickly. However, given that there are currently only about 500 MW of distributed solar PV in California, the addition of an additional 850 MW to eliminate the need for the Calico Solar Project cannot be guaranteed. This would require an even more aggressive deployment of PV at more than double the historic rate of solar PV than the California Solar Initiative program currently employs. Challenges to an accelerated implementation of distributed solar PV are discussed below.

- **RETI Consideration of Subsidies, Tariffs, Cost, and Manufacturing.** The RETI Discussion Draft Paper *California's Renewable Energy Goals – Assessing the Need for Additional Transmission Facilities* published with the RETI Final Phase 2A Report (September 2009), addresses the likelihood of a scenario of sufficient distributed solar PV to remove the need for utility scale renewable development. This discussion paper identified the factors likely to influence the pace of large scale deployment of distributed solar PV: subsidies, feed-in tariffs, manufacturing and installation cost, and manufacturing scale-up.
- **Cost.** The 2009 IEPR states that solar PV technology has shown dramatic cost reductions since 2007, and is expected to show the most improvement of all the technologies evaluated in the 2009 IEPR model, bringing its capital cost within range of that of natural gas–fired combined cycle units. However, the CPUC *33% Renewables Portfolio Standard Implementation Analysis Preliminary Results* considered a number of cases to achieve a 33% RPS standard. The results of this study state that the cost of a high distributed generation case is significantly higher than the other 33% RPS alternative cases. The study explains that this is due to the heavy reliance on solar PV resources which are more expensive than wind and central station solar.
- **Tariffs.** Additionally, the IEPR discusses the need to adjust feed-in tariffs to keep downward pressure on costs. Feed-in tariffs should be developed based on the size and type of renewable resources, given that the cost of generating energy from a 100 MW wind farm is less than the cost of generating to ensure a good mix of new renewable energy projects. According to the report, differentiating feed-in tariffs by type and size can ensure a good mix of new renewable energy projects and avoid paying too much for some technologies and too little for others.
- **Limited Installations**. Examples of large scale distributed solar projects are still limited. In the spring of 2008, SCE proposed 250 to 500 MW of rooftop solar PV to be installed in 5 years. As of January 2010, SCE had installed only 3 MW. As the 2009 IEPR points out, the potential for distributed resources remains largely untapped and integrating large amounts of distributed renewable generation on distribution systems throughout the State presents challenges.
- **Electric Distribution System**. The State's electric distribution systems are not designed to easily accommodate large quantities of randomly installed distributed generation resources at customer sites. Accomplishing this objective efficiently and cost-effectively will require the development of a new transparent distribution planning framework.

The 2009 IEPR makes a number of recommendations to support the integration of distributed generation into the California grid, expand feed-in tariffs, and support the efforts to achieve the RPS goals as a whole. It also recommends supporting new renewable facilities and the necessary transmission corridors and lines to access the facilities.

In testimony filed by the Center for Biological Diversity in the Ivanpah Solar Electric Generating System (ISEGS) proceeding [Docket No. 07-AFC-5], Bill Powers stated his disagreement with the conclusions of the ISEGS Alternatives SSA section addressing distributed solar PV. Powers believed that the technology and manufacturing capacity would be adequate to develop 400 MW of distributed PV, and that the distribution system would be able to accommodate the additional distributed generation. He presents numerous examples of California utility programs that have committed to development of hundreds of megawatts of additional distributed solar PV.

The conclusion of this section is that, while it will very likely be possible to achieve 850 MW of distributed solar energy over the coming years, the very limited numbers of existing facilities make it difficult to conclude with confidence that it will happen within the timeframe required for the Calico Solar Project. As a result, this technology is eliminated from detailed analysis in this SSA.

B.2.8.3 ALTERNATIVE RENEWABLE TECHNOLOGIES

Non-solar renewable generation technologies were considered as potential alternatives to the proposed Calico Solar Project. The following renewable generation technologies were considered in this analysis:

- wind energy
- geothermal energy
- biomass energy
- tidal energy
- wave energy

The non-solar renewable technologies alternatives (wind, geothermal, biomass, tidal, wave) would either be infeasible for meeting key project objectives at the scale of the proposed Calico Solar Project, or would not eliminate significant impacts caused by the project without creating significant impacts in other locations. Specifically, wind and geothermal energy that would be viable at some locations in San Bernardino County could create significant impacts to biological, visual, cultural, and water and soils resources.

None of these non-solar renewable technologies would meet the BLM's purpose and need, which is to approve, modify, or deny the applicant's request for a right-of-way. These technologies would be too great a departure from the application to be considered a modification of the applicant's proposal.

Wind Energy

Wind carries kinetic energy that can be used to spin the blades of a wind turbine rotor and an electrical generator, which then feed alternating current (AC) into the utility grid. Most state-of-the-art wind turbines operating today convert 35 to 40% of the wind's kinetic energy into electricity. A single 1.5-MW turbine operating at a 40% capacity factor generates 2,100 MWh annually. Modern wind turbines represent viable renewable alternatives to solar energy projects in the region as exemplified by the number of wind projects applications pending at the BLM in both California and Nevada. The BLM has received over 90 applications for wind projects in California as of September 2009, for use of over 790,000 acres of land (BLM 2009b).

Wind turbines currently being manufactured have power ratings ranging from 250 watts to 5 MW, and units larger than 7 MW in capacity are now under development (AWEA 2008). The average capacity of wind turbines installed in the United States in 2007 was 1.65 MW (EERE 2008). The perception of wind as an emerging energy source reached a peak in the early 1980s, when wind turbine generators to convert wind power into electricity were being installed in California at a rate of nearly 2,000 per year. Progress slowed a few years later, however, as start-up tax subsidies disappeared and experience demonstrated some deficiencies in design. At the present time, technological progress has caught up, contributing lower cost, greater reliability, and reason for genuine optimism for this renewable energy source in the future.

This technology is now well developed and can be used to generate substantial amounts of power. There are now approximately 2,490 MW of wind-generated power being produced in California (AWEA 2008).

Modern wind turbines represent viable renewable alternatives to solar energy projects in the region as exemplified by the number of wind projects applications pending at the BLM in both California and Nevada. The BLM has received approximately 64 applications for wind projects in the California Desert District as of August 2009, for use of over 457,769 acres of land (BLM 2009b). Several of these projects are proposed in locations near to the Calico Solar Project site.

Environmental Assessment. Wind turbines can create adverse environmental impacts, as summarized below (AWEA 2008):

- Wind energy requires between 5 and 17 acres per MW of energy created. As such a nominal 850 MW power plant would require between 4,250 and 14,450 acres. However, wind turbine footprints typically use only 5% of the total area.
- Erosion can be a concern in certain habitats such as the desert or mountain ridgelines. Standard engineering practices can be used to reduce erosion potential.
- Birds collide with wind turbines. Avian deaths, particularly raptors, are a substantial concern depending on raptor use of the area.
- Wind energy can negatively impact birds and other wildlife by fragmenting habitat, both through installation and operation of wind turbines themselves and through the roads and power lines that are required to support the turbines.

- Bats collide with wind turbines. The extent of bat mortality depends on turbine placement and bat flight patterns.
- Visual impacts of wind turbines can be significant, and installation in scenic and high traffic areas can result in strong local opposition. Other impressions of wind turbines are that they are attractive and represent clean energy.

Summary of Impacts. Approximately 4,250 and 14,450 acres of land would be required for a 850 MW wind electricity power plant. While wind plants would not necessarily impact the same types of wildlife and vegetation as the proposed Calico Solar Project plant, the significant acreage necessary for an 850 MW wind plant would still cause significant habitat loss in addition to potentially significant impacts from habitat fragmentation and bird and bat mortality.

Wind turbines are often over 400 feet high for 2-MW turbines. As such, any wind energy project would be highly visible, which is of special concern in scenic areas.

Rationale for Elimination

While wind electricity generation is a viable and important renewable technology in California, it would not reduce the large-scale ground disturbance and visual impacts associated with the Calico Solar Project. Therefore wind generation was eliminated from further consideration in this SSA. Furthermore, wind is part of a renewable energy supply mix along with solar thermal, which staff believes will be needed to meet SCE and statewide RPS requirements.

Geothermal Energy

Geothermal technologies use steam or high-temperature water obtained from naturally occurring geothermal reservoirs to drive steam turbine/generators. There are vapor dominated resources (dry, super-heated steam) and liquid-dominated resources where various techniques are used to extract energy from the high-temperature water.

Geothermal plants account for approximately 5% of California's power and range in size from under 1 MW to 200 MW. California is the largest geothermal power producer in the United States, with about 1,800 MW installed capacity; in 2007, 13,000 gigawatt hours of electricity were produced in California (CEC 2008). Geothermal plants provide highly reliable baseload power, with capacity factors from 90 to 98%.

Geothermal plants must be built near geothermal reservoir sites because steam and hot water cannot be transported long distances without substantial thermal energy loss. Geothermal power plants are currently operating in the following California counties: Lake, Sonoma, Imperial, Inyo, Mono, and Lassen. The RETI Phase 1A Report (2008) estimated an incremental capacity of approximately 2,400 MW for the entire State by 2018.

Geothermal Alternative Scenario. There is no single 850 MW geothermal project that would be viable as an alternative to the Calico Solar Project. Approximately 10-15 smaller projects would be required to achieve 850 MW of geothermal energy. The amount of land required for a geothermal facility varies greatly. Eight hundred and fifty MW of geothermal energy could require the use of many thousands of acres of land.

However, the amount of ground disturbance on that area would be less than 10%. Additionally, while components of the power plant, cooling towers and brine ponds would likely be fenced, there would not likely be fencing required for the wells and well pads. In that 10-15 geothermal facilities would be required for provision of 850 MW, depending on the locations of the new facilities, more transmission lines and switchyards with corresponding potential impacts (i.e., biological, cultural, soil & water, land use, visual) may be required for grid interconnection, when compared to the proposed Calico Solar Project.

Environmental Assessment. Concerns regarding geothermal power plants include air quality, hazardous materials, and geology. Benefits from geothermal power plants include an increased reliability and less ground disturbance than some renewable resources, including solar.

Air Quality. Toxic air contaminants and odors would be emitted as a result of fuel combustion in construction-related equipment and vehicles and as a result of geothermal steam released during well testing. Hydrogen sulfide (H_2S) in geothermal steam is a toxic air contaminant and a colorless, flammable, poisonous compound with a characteristic rotten-egg odor. Ammonia also occurs in geothermal steam and is a toxic air contaminant with a pungent, penetrating odor. Ammonia is also a precursor pollutant to particulate matter in the ambient air. Releasing geothermal steam during well testing and development would cause substantial emissions of these toxic air contaminants and odors over the construction phase. Aside from closely managing the well testing schedule, few mitigation options are available, and the impact of toxic air contaminants and odors during construction would be significant and unavoidable.

Extracting power from geothermal steam equipment can cause emissions of ammonia and H_2S, which are odors and toxic air contaminants present in the geothermal brine. Ammonia emissions also react with ambient air to form inhalable PM10, and H_2S in the atmosphere will oxidize to SO_2 and sulfuric acid. Without proper control, emissions of these contaminants would cause increased health risks, create objectionable odors, and cause or substantially contribute to violations of H_2S and/or PM10 ambient air quality standards. These contaminants would be emitted during any short-term commissioning activities or uncontrolled releases of geothermal steam, but these impacts would be less than significant because they would be short-term and managed in accordance with permitting requirements.

Ammonia and H_2S emissions could be avoided with sulfur control systems and use of an air-cooling system to reduce cooling tower drift. Commonly, water cooling causes the geothermal fluid entering the cooling tower to be emitted to the atmosphere as water vapor, which results in high levels of ammonia and H_2S in the vapor from the cooling tower. However, a binary cycle plant emits only fresh water vapor from the cooling tower. Cool geothermal brine is injected into the ground after the energy is extracted.

Hazardous Materials. Geothermal plants can also produce waste and byproducts that can have significant impacts. The most potentially harmful gas generally encountered in geothermal systems is H_2S, which at concentrations higher than 30 parts per million (ppm) is toxic (CEC 2003). It can cause a variety of problems including dizziness, vomiting, and eventually death if one is exposed for long periods of time. In

concentrations above 100 ppm, H_2S can be fatal. H_2S is heavier than air and can accumulate in low-lying areas (equipment pits, ravines, and other depressions) and become concentrated over time.

H_2S releases could potentially be of concern during drilling, well testing, and plant start-up and shut-down operations, although recent technology improvements in atmospheric separators can significantly decrease emissions and noise during these operations. H_2S is now often abated at geothermal power plants, resulting in a conversion of close to 100% of the H_2S into elemental sulfur (GEA 2007). Since 1976, H_2S emissions have decreased from 1,900 pounds per hour to 200 pounds per hour despite an increase in geothermal power production from 500 MW to 2,000 MW (GEA 2007).

One additional concern regarding hazardous materials present in geothermal facilities includes the possibility for bacterial growth to occur in the cooling tower, including Legionella. Legionella is a type of bacteria that grows in water and causes Legionellosis, otherwise known as Legionnaires' disease. Untreated or inadequately treated cooling systems in the United States have been correlated with outbreaks of Legionellosis. These outbreaks are usually associated with building heating, ventilating, and air conditioning (HVAC) systems but it is possible for growth to occur in industrial cooling towers. In order to ensure that Legionella growth is kept to a minimum, mitigation would require the project owner to prepare and implement a biocide and anti-biofilm agent monitoring program to ensure that proper levels of biocide and other agents are maintained within the cooling tower water at all times, that periodic measurements of Legionella levels are conducted, and that periodic cleaning is conducted to remove bio-film buildup. With the use of an aggressive antibacterial program coupled with routine monitoring and biofilm removal, the chances of Legionella growing and dispersing would be reduced to insignificance.

Geology, Paleontology, and Minerals. Active seismicity and subsidence generally occur in areas with high levels of tectonic activity (e.g., volcanic regions, fault zones), which are the same areas in which geothermal resources occur; therefore, it is difficult to discern between power plant-induced and naturally occurring seismicity and subsidence. Drilling deep into the earth's crust to access high-temperature geothermal resources and subsequent re-injection of fluid into the geothermal reservoir may result in microearthquakes, which are generally below magnitude 2-3 on the Richter scale. These microearthquakes are typically centered on the injection site and are too low to be noticed by humans (Kagel 2007).

Land Use. Geothermal power projects require less ground disturbance than almost any other energy source, typically from about 0.2 to 0.5 acres per MW; however, geothermal plants must be built where the resource is since the steam cannot be piped long distances without significant heat loss. This results in a highly secure and predictable fuel supply and some inflexibility in siting. It may also result in a long interconnection requirement to reach a transmission system.

Because of the minimal ground disturbance required, impacts to biological resources and cultural resources would likely be minimized compared to the Calico Solar.

Reliability. Geothermal facilities may achieve a 95% or higher availability (CEC 2003). Because the geothermal steam is available throughout the day, geothermal facilities provide an adequate level of reliability throughout the entire day.

Rationale for Elimination

Geothermal generation is a commercially available technology and is important for California's renewable energy future because it provides baseload power that is available 24 hours a day. It also can be developed with substantially less ground disturbance than that needed for the Calico Solar Project, so impacts related to biological and cultural resources, water and soils resources, and traffic/transportation would reduced. However, despite the encouragement provided by Renewable Portfolio Standard targets and ARRA funding, few new projects have been proposed and no geothermal projects are included on the Renewable Energy Action Team list of projects requesting ARRA funds. Therefore, while the technology is clearly feasible and additional development is expected, the technology is not retained for detailed analysis in this SSA

Biomass Energy

Electricity can be generated by burning organic fuels in a boiler to produce steam, which then turns a turbine; this is biomass generation. Biomass can also be converted into a fuel gas such as methane and burned to generate power. Wood is the most commonly used biomass for power generation. Major biomass fuels include forestry and mill wastes, agricultural field crop and food processing wastes, and construction and urban wood wastes. Several techniques are used to convert these fuels to electricity, including direct combustion, gasification, and anaerobic fermentation. Biomass facilities do not require the extensive amount of land required by the other renewable energy sources discussed, but they generate much smaller amounts of electricity.

Currently, nearly 19% of the state's renewable electricity derives from biomass and waste-to-energy sources (CEC 2007). Most biomass plant capacities are in the 3- to 10-MW range and typically operate as baseload capacity. The average size of a sales generation biomass plant is 21 MW (CBEA 2008). Unlike other renewable sources, the locational flexibility of biomass facilities would reduce the need for substantial transmission investments. Solid fuel biomass (555 MW) makes up about 1.75% of the state's electricity, and landfill methane gas generation (260 MW) makes up about 0.75%. Existing landfills not now producing electricity from gas could add a maximum of about 170 MW of new generation capacity (CBEA 2008).

Environmental Assessment. Generally, small amounts of land are required for biomass power facilities; however, a biomass facility should be sited near a relatively large source of biomass to minimize the cost of bringing the biomass waste to the facility.

Operational noise impacts may be a concern, originating from truck engines as a result hauling operations coming from and going to the facility repeatedly on a daily basis. Other operations of the biomass facilities, while internal to the main structure, can result in increased noise due to the material grinding equipment.

The emissions due to biomass fuel-fired power plant operation are generally unavoidable. Direct impacts of criteria pollutants could cause or contribute to a violation of the ambient air quality standards. Significant impacts can potentially occur for PM10 and ozone because emissions of particulate matter and precursors and ozone precursors could contribute to existing violations of the standards for those criteria pollutants. Biomass/biogas facility emissions could also adversely affect visibility and vegetation in federal Class I areas or state wilderness areas as a result of significantly deteriorating air quality related values in the wilderness areas. Toxic air contaminants from routine operation would also cause health risks that could locally adversely affect sensitive receptors.

Rationale for Elimination

Most biomass facilities produce only small amounts of electricity (in the range of 3 to 10 MW) and so could not meet the project objectives. Biomass facilities also generate significant air emissions and require numerous truck deliveries to supply the plants with the biomass waste materials. Also, in waste-to-energy facilities, there is some concern regarding the emission of toxic chemicals, such as dioxin, and the disposal of the toxic ash that results from biomass burning. Therefore, this technology is not analyzed in detail in this SSA as an alternative to the Calico Solar Project.

Tidal Energy

The oldest technology to harness tidal power for the generation of electricity involves building a dam, known as a *barrage*, across a bay or estuary that has large differences in elevation between high and low tides. Water retained behind a dam at high tide generates a power head sufficient to generate electricity as the tide ebbs and water released from within the dam turns conventional turbines.

Certain coastal regions experience higher tides than others. This is a result of the amplification of tides caused by local geographical features such as bays and inlets. In order to produce practical amounts of power for tidal barrages, a difference between high and low tides of at least 5 meters is required. There are about 40 sites around the world with this magnitude of tidal range. The higher the tides, the more electricity can be generated from a given site and the lower the cost of electricity produced. Worldwide, existing power plants include a 240-MW plant in France, a 20-MW plant in Nova Scotia, and a 0.5-MW plant in Russia (EPRI 2006).

Tidal Fences

Tidal fences are effectively barrages that completely block a channel. If deployed across the mouth of an estuary, they can be very environmentally destructive. However, in the 1990s, their deployment in channels between small islands or in straights between the mainland and islands has increasingly been considered a viable option for generation of large amounts of electricity.

The advantage of a tidal fence is that all the electrical equipment (generators and transformers) can be kept high above the water. Also, by decreasing the cross-section of the channel, current velocity through the turbines is significantly increased.

The United Kingdom is currently considering the feasibility of tidal energy across the Bristol Channel. The feasibility study began with the consideration of the Severn tidal barrage. The barrage would work similarly to a dam which generates hydro electric power by holding water back before it is allowed to flow at speed through a pipe at the base of the dam to drive the turbines (BBC 2007). Since then, alternative tidal projects have been proposed, including a tidal fence that would allow shipping to move freely and keep ports at Cardiff and Bristol open (BBC 2008). The results of the feasibility study are expected to be published in 2010; however, preliminary results from the Sustainable Development Commission confirmed the potential of the huge Severn tidal range to generate approximately 5% of United Kingdom's electricity (BIS 2009).

Tidal Turbines

Tidal turbines are the chief competition to the tidal fence. Looking like an underwater wind turbine, they offer a number of advantages over the tidal fence. They are less disruptive to wildlife, allow small boats to continue to use the area, and have much lower material requirements than the fence.

Tidal turbines function well where coastal currents run at 2 to 2.5 meters per second (slower currents tend to be uneconomic while larger ones stress the equipment). Such currents provide an energy density four times greater than air, meaning that a 15-meter-diameter turbine will generate as much energy as a 60-meter-diameter windmill. In addition, tidal currents are both predictable and reliable, a feature which gives them an advantage over both wind and solar systems. The tidal turbine also offers significant environmental advantages over wind and solar systems; the majority of the assembly is hidden below the waterline, and all cabling is along the sea bed.

There are many sites around the world where tidal turbines could be effectively installed. The ideal site is close to shore (within 1 kilometer) in water depths of about 20 to 30 meters. In April 2007, the first major tidal-power project was installed in the United States off New York City's Roosevelt Island (Fairley 2007). The Roosevelt Island Tidal Energy (RITE) project completed the Phase 2 Demonstration at the end of 2008. This phase included operating six full-scale turbines and resulted in 70 MW hours of energy delivered to two end users (Verdant 2009). Phase 3 of the RITE project is currently underway, and Verdant Power applied to the Federal Energy Regulatory Commission for a pilot license in November 2008. If granted, this license would allow Verdant Power to build out the RITE Project in the east channel of the East River to a 30-turbine 1 MW pilot project and to commercially deliver the energy generated by the field (Verdant 2009).

Turbines such as those used in New York City use in-flow turbines, thereby lessening the environmental impacts. A study conducted in 2006, *System Level Design, Performance, Cost and Economic Assessment – San Francisco Tidal In-Stream Power Plant*, concluded that a tidal plant located under the Golden Gate Bridge could create approximately 35 MW of power with no significant impacts to the environment and recommended further research and development into both ocean energy technology and a pilot project in San Francisco (EPRI 2006a).

Environmental Assessment. Tidal technologies, especially tidal fences, have the potential to cause significant biological impacts, especially to marine species and habitats. Fish could be caught in the unit's fins by the sudden drop in pressure near the unit. The passageways, more than 15 feet high and probably sitting on a bay floor, could squeeze out marine life that lives there or alter the tidal flow, sediment build-up, and the ecosystem in general. Even the in-flow turbines can have adverse impacts on marine systems. The in-flow turbines off New York City must undergo environmental monitoring for 18 months to ensure the turbines will not create adverse impacts to the river's marine wildlife. Also, depending on the location of the tidal technology, commercial shipping could be disrupted during construction.

The reduced tidal range (difference between high and low water levels) resulting from tidal energy generation can destroy inter-tidal habitat used by wading birds. Sediment trapped behind the barrage could also reduce the volume of the estuary over time.

Rationale for Elimination

Tidal fence technology is a commercially available technology in Europe, although limited to areas that are adjacent to a body of water with a large difference between high and low tides, and it creates significant environmental impacts to ocean ecosystems. In-flow tidal turbines are a relatively new technology and are not considered an alternative to the Calico Solar Project because they are an unproven technology at the scale that would be required to replace the proposed project. Additionally, the environmental impacts of tidal turbines are still under review, as demonstrated by the pilot project under continued environmental monitoring in New York. Therefore, this technology is not analyzed in detail in this SSA as an alternative to the Calico Solar Project.

Wave Energy

Wave power technologies have used for nearly 30 years. Setbacks and a general lack of confidence have contributed to slow progress towards proven devices that would have a good probability of becoming commercial sources of electrical power.

The highest energy waves are concentrated off the western coasts in the 40^{o} to 60^{o} latitude range north and south. The power in the wave fronts varies in these areas between 30 and 70 kilowatts per meter (kW/m) with peaks to 100 kW/m in the Atlantic southwest of Ireland, the Southern Ocean and off Cape Horn. Many wave energy devices are still in the research and development stage and would require large amounts of capital to get started. Additional costs from permitting and environmental assessments also make wave energy problematic (WEC 2007). Nonetheless, wave energy is likely to increase in use within the next 5 to 10 years.

The total power of waves breaking on the world's coastlines is estimated at 2 to 3 million MW. In favorable locations, wave energy density can average 65 MW per mile of coastline. Three approaches to capturing wave energy are:

- **Floats or Pitching Devices.** These devices generate electricity from the bobbing or pitching action of a floating object. The object can be mounted to a floating raft or to a device fixed on the ocean floor.

- **Oscillating Water Columns.** These devices generate electricity from the wave-driven rise and fall of water in a cylindrical shaft. The rising and falling water column drives air into and out of the top of the shaft, powering an air-driven turbine.
- **Wave Surge or Focusing Devices.** These shoreline devices, also called tapered channel or tapchan systems, rely on a shore-mounted structure to channel and concentrate the waves, driving them into an elevated reservoir. Water flow out of this reservoir is used to generate electricity, using standard hydropower technologies.

In December 2007, PG&E signed a power purchase agreement with Finavera Renewables, which had planned to operate a wave farm approximately 2.5 miles off the coast of Eureka, California. The agreement was for 2 MW of power beginning in 2012. On October 16, 2008, the California Public Utilities Commission rejected PG&E's request for approval of a renewable resource procurement contract with Finavera Renewables because, among other reasons, the CPUC concluded the project had not been shown to be viable. As stated in that decision, there is significant uncertainty surrounding wave technology and the wave energy industry is at a beginning stage (CPUC 2008). The CPUC did authorize up to $4.8 million for PG&E to undertake its WaveConnect project in Decision D.09-01-036. WaveConnect is designed to document the feasibility of a facility that converts wave energy into electricity by using wave energy conversion (WEC) devices in the open ocean adjacent to PG&E's service territory.

In January 2010, the California State Lands Commission and the Federal Energy Regulatory Commission issued a Request for Statements of Interest to prepare an environmental document for the PG&E WaveConnect project discussed above. PG&E has selected a wave energy project siting area that is between 2.5 and 3.0 nautical miles (nm) from the shore in Humboldt County. WaveConnect consists of: (1) wave energy converters (WECs) including multi-point catenary moorings and anchors; (2) marker buoys, navigation lights, and environmental monitoring instruments; (3) subsea electrical cables extending on-shore to (4) land-based power conditioning equipment; (5) an above-ground transmission line and interconnection to the electrical grid; (6) data acquisition and telemetry equipment; and (7) security and safety equipment.

Environmental Assessment. The environmental impacts of wave power have yet to be fully analyzed. A recent study published by the U.S. Department of Commerce and National Oceanic and Atmospheric Administration listed a number of potentially significant environmental impacts created by wave power (Boehlert 2008). These include (Boehlert 2008):

- Significant reduction to waves with possible effects to beaches (e.g. changes to sediment transport processes).
- The use of buoys may have positive effects on forage fish species, which in turn could attract larger predators. Structures need to be designed to reduce the potential entanglement of larger predators, especially marine turtle species.
- Modifications to water circulation and currents may result in changes to larval distribution and sediment transport.
- Wave energy development may affect community structures for fish and fisheries.

- Lighting and above-water structures may result in marine bird attraction and collisions and may alter food webs and beach processes.
- A diversity of concerns would arise regarding marine mammals including entanglement issues.
- Energy-absorbing structures may affect numerous receptors and should avoid sensitive habitats.
- Chemicals used in the process must be addressed both for spills and for a continuous release such as in fouling paints.
- New hard structures and lighting may break loose and increase debris accumulation.
- Impacts on fish and marine mammals caused by noise coming from the buoys should be understood and mitigated.
- Electromagnetic effects may affect feeding or orientation and should be better understood.
- Impact thresholds need to be established. As projects scale up in location or implementation, new risks may become evident.

Rationale for Elimination

Wave energy is new and may not be technologically feasible; as stated above, PG&E is proposing to sponsor a project to test the feasibility of harnessing wave energy. Additionally, wave power must be located where waves are consistently strong; even then, the production of power depends on the size of waves, which result in large differences in the amount of energy produced. Wave technology is not considered an alternative to the Calico Solar Project because is an unproven technology at the scale that would be required to replace the proposed project and because it may also result in substantial adverse environmental impacts. Therefore, this technology is not analyzed in detail in this SSA as an alternative to the Calico Solar Project.

B.2.8.4 ALTERNATIVE METHODS OF GENERATING OR CONSERVING ELECTRICITY

Nonrenewable generation technologies that require use of natural gas, coal, or nuclear energy would not achieve the key project objective for the proposed Calico Solar Project to provide clean, renewable, solar-powered electricity and to assist Southern California Edison in meeting its obligations under California's Renewable Portfolio Standard Program.

While these generation technologies would not achieve this key objective, they are described briefly in this section to present this information to the public and decision makers. Conservation and demand-side management are also briefly addressed in this section.

The following topics were considered in this analysis:

- natural gas
- coal

- nuclear energy
- conservation and demand-side management

Of the three nonrenewable generation alternatives (natural gas, coal, and nuclear), only natural gas-fired power plants would be viable alternatives within California. However, gas-fired plants would fail to meet a major project objective to construct and operate a renewable power generating facility in California capable of selling competitively priced renewable energy consistent with the needs of California utilities and would therefore not achieve the purpose and need of the project. Because these alternatives would not support renewable power generation within California, and could have significant environmental impacts of their own, they were eliminated from further consideration.

None of these non-renewable energy technologies would meet the BLM's purpose and need, which is to approve, modify, or deny the applicant's request for a right-of-way. These technologies would be too great a departure from the application to be considered a modification of the applicant's proposal

Natural Gas Generation

Natural gas power generation accounts for approximately 22% of all the energy used in the United States and comprises 40% of the power generated in California (CEC 2007). Natural gas power plants typically consist of combustion turbine generators, heat recovery steam generators, a steam turbine generator, wet or dry cooling towers, and associated support equipment. An interconnection with a natural gas pipeline, a water supply, and electric transmission are also required.

A gas-fired power plant generating 850 MW would generally require less than 90 acres of land.

Environmental Assessment. Natural gas power plants may result in numerous adverse environmental impacts such as the following.

- Overall air quality impacts would increase because natural gas-fired power plants can contribute to local violations of the PM10 and ozone air quality standards, and operational emissions could result in toxic air contaminants that could adversely affect sensitive receptors. Net increases in greenhouse gas emissions due to natural gas-firing in the conventional power plants would also be substantial.
- Environmental justice may be a concern. Gas-fired power plants tend to be located in developed urban areas that are zoned for heavy industry. In some instances, low-income and minority populations are also located in such areas.
- To avoid adverse land use impacts, natural gas-fired power plants must be consistent with local jurisdictions' zoning.
- Several hazardous materials, including regulated substances (aqueous ammonia, hydrogen, and sulfuric acid), would be stored at a natural gas power plant during operation. Aqueous ammonia would be stored in amounts above the threshold quantity during the final stages of construction, initial start-up, and operations phases. Transport of hazardous materials during power plant operation includes delivery of aqueous ammonia and removal of wastes. During operation, the aqueous

ammonia transporter would be required to obtain a Hazardous Material Transportation License in accordance with California Vehicle Code Section 32105 and would be required to follow appropriate safety procedures and routes.

- Cultural impacts can be severe depending on the power plant siting; however, because natural gas power plants require substantially fewer acres per MW of power generated, impacts to cultural resources would be expected to be fewer than with solar facilities.
- Power plant siting may result in the permanent conversion of designated farmland to non-agricultural uses. However, because natural gas power plants require substantially fewer acres per MW of power generated, impacts to designated farmlands would be expected to be less than with solar facilities.
- Visual impacts may occur with natural gas power plants because they introduce large structures with industrial character. The most prominent structures are frequently the cooling towers, which may reach 100 feet tall, and the power plant stacks, which may reach over 100 feet tall. Visible plumes from the cooling tower would also potentially occur.

Rationale for Elimination

Although natural gas generation is clearly a viable technology, it is not a renewable technology, so it would not attain the objective of generating renewable power meeting California's renewable energy needs. The air quality impacts of gas-fired plants include greenhouse gases and are one major reason that California's Renewable Portfolio Standard was developed. Therefore, this alternative is not considered in detail as an alternative to the Calico Solar Project and is not analyzed further in this SSA.

Coal Generation

Coal-fired electric generating plants are the cornerstone of America's electric power generation system. Traditional coal-fired plants generate large amounts of greenhouse gases. New clean coal technology includes a variety of energy processes that reduce air emissions and other pollutants from coal-burning power plants. The Clean Coal Power Initiative is providing government co-financing for new coal technologies that help utilities meet the Clear Skies Initiative to cut sulfur, nitrogen, and mercury pollutants by nearly 70% by 2018. The Clean Coal Power Initiative is now focusing on developing projects that use carbon sequestration technologies and/or beneficial reuse of carbon dioxide (DOE 2008). In 2009, Hydrogen Energy California received a DOE grant to advance a full-scale demonstration project. However, these technologies are not yet in use.

In 2006, approximately 15.7% of the energy used in California came from coal fired sources; 38% of this was generated in state, and 62% was imported (CEC 2007). The in-state coal-fired generation includes electricity generated from out-of-state, coal-fired power plants owned by and reported by California utilities (CEC 2007). In 2006, California enacted Senate Bill 1368 (Perata, Chapter 598, Statutes of 2006), which prohibits utilities from making long-term commitments for electricity generated from plants that create more carbon dioxide (CO_2) than clean-burning natural gas plants (CEC 2007).

Environmental Assessment. Coal-fired power plants may also result in numerous adverse environmental impacts such as the following.

- Overall, air quality impacts would increase because coal-fired power plants contribute carbon dioxide, sulfur dioxide, nitrogen oxides, mercury, and fly ash (USEPA 2008a). Mining, cleaning, and transporting coal to the power plants generates additional emissions. Average per megawatt hour emissions of a coal-fired power plant are 2,249 pounds of carbon dioxide, 13 pounds of sulfur dioxide and 6 pounds of nitrogen oxides (EPA 2008a). Net increases in greenhouse gas emissions due to coal-firing in conventional power plants would be significant.
- Health risks associated with power plants have also been documented, including problems associated with exposure to fine particle pollution or soot, an increase in asthma, and an increase in non-fatal heart attacks.
- Large quantities of water are generally required to produce steam and for cooling. When coal-fired power plants use water from a lake or river, fish or other aquatic life can be adversely impacted (EPA 2008).

Rationale for Elimination

Although coal generation is a viable technology, it is not a renewable technology, so it would not attain the objective of generating renewable power meeting California's renewable energy needs. Existing technology for coal-fired plants results in high greenhouse gas emissions. Therefore, coal generation was eliminated from detailed analysis.

Nuclear Energy

Due to environmental and safety concerns, California law currently prohibits the construction of new nuclear power plants in the state until the California Energy Commission finds that the federal government has approved and there exists a demonstrated technology for the permanent disposal of spent fuel from these facilities (CEC 2006). In June 1976, California enacted legislation directing the Energy Commission to perform an independent investigation of the nuclear fuel cycle. This investigation was to assess whether the technology to reprocess nuclear fuel rods or to permanently dispose of high-level nuclear waste had been demonstrated and approved and was operational (Public Resources Code 25524.1 (a) (1), 25524.1 (b), and 25524.2 (a)). After extensive public hearings, the Energy Commission determined that it could not make the requisite affirmative findings concerning either reprocessing of nuclear fuel or disposal of high-level waste as documented in the *Status of Nuclear Fuel Reprocessing, Spent Fuel Storage and High-level Waste Disposal*, Energy Commission publication P102-78-001 (January 1978.) As a result, the development of new nuclear energy facilities in California was prohibited by law.

It has been more than 25 years since the last comprehensive Energy Commission assessment of nuclear power issues. The *Nuclear Power in California: 2007 Status Report* (October 2007) provides a detailed description of the current nuclear waste issues and their implications for California. This was prepared as part of the development of the Energy Commission's *2007 Integrated Energy Policy Report* (CEC 2007a).

Rationale for Elimination

The permitting of new nuclear facilities in California is currently illegal, so this technology is infeasible and is not considered further in this SSA.

Conservation and Demand-Side Management

Conservation and demand-side management consist of a variety of approaches to reduction of electricity use, including energy efficiency and conservation, building and appliance standards, and load management and fuel substitution. In 2005 the Energy Commission and CPUC's Energy Action Plan II declared cost effective energy efficiency as the resource of first choice for meeting California's energy needs. The Energy Commission noted that energy efficiency has helped flatten the state's per capita electricity use and saved consumers more than $56 billion since 1978 (CPUC 2008). The investor-owned utilities' 2006-2008 efficiency portfolio marks the single-largest energy efficiency campaign in U.S. history, with a $2 billion investment by California's energy ratepayers (CPUC 2008). However, with population growth, increasing demand for energy, and the need to reduce greenhouse gases, there is a greater need for energy efficiency.

The CPUC, with support from the Governor's Office, the Energy Commission, and the California Air Resources Board, among others, adopted the *California Long-Term Energy Efficiency Strategy Plan for 2009 to 2020* (CPUC September 2008). The plan is a framework for all sectors in California including industry, agriculture, large and small businesses, and households. Major goals of the plan include:

- All new residential construction will be zero net energy by 2020;
- All new commercial construction will be zero net energy by 2030;
- Heating, ventilation, and air conditioning industries will be re-shaped to deliver maximum performance systems;
- Eligible low-income customers will be able to participate in the Low Income Energy Efficiency program and will be provided with cost-effective energy efficiency measures in their residences by 2020.

In addition to the concept of zero net energy, California is discussing the importance of net zero peak energy use, meaning buildings do not use more energy during peak energy use times and net zero carbon meaning the building generates more zero-carbon energy onsite than it uses in an average year.

Rationale for Elimination

Conservation and demand-side management are important for California's energy future and cost effective energy efficiency is considered as the resource of first choice for meeting California's energy needs. However, with population growth and increasing demand for energy, conservation and demand-management alone are not sufficient to address all of California's energy needs. Additionally, it will not provide the renewable energy required to meet the California Renewable Portfolio Standard requirements, so technologies, like solar thermal generation, would be required. Therefore, they are not analyzed in detail in this SSA as an alternative to the Calico Solar Project.

B.2.9 RESPONSES TO AGENCY AND PUBLIC COMMENTS

Staff received comments on the Alternatives for the proposed Calico Solar Project from two commenters: the Defenders of Wildlife (DW 2010c) and from the Applicant (TS 2010s). Following is a summary of comments and staff's response to each.

Defenders of Wildlife

Comment 1: The Defenders of Wildlife submitted a reconfigured alternative that would incorporate use of land west of the proposed Calico Solar Project site, and would eliminate impacts to portions of the proposed site with the greatest number of desert tortoise and the highest desert tortoise habitat. In the Intervenor Status Report No. 2 (dated March 23, 2010), Defenders of Wildlife stated that the Applicant withdrew its right-of-way application for the Solar Three site but that this was irrelevant for purposes of a CEQA analysis, and that maintaining a place in the queue with a right-of-way application does not constitute a development right. It also stated that while the applicant withdrew its right-of-way application, it could reapply and be eligible for site control.

Response: The Defenders of Wildlife reconfigured alternative was analyzed in Section B.2.8.1, and is called the SES Solar Three Alternative. As Defenders of Wildlife acknowledges, SES withdrew its Solar Three application in December of 2009 and the case file for SES Solar Three was closed by the BLM. Prior to the withdrawal of the SES Solar Three application, a second-in-line application was filed for the site. Under its existing regulations, BLM gives priority consideration to applications that are "first in time." BLM does not allow applications filed later in time to enter the NEPA process as long as the first project is still viable. Therefore, an alternative on BLM land where there is a pending application for another project is not considered a feasible alternative to the proposed project, unless that other application is timely rejected or withdrawn.

Applicant

The applicant submitted a number of comments regarding the Alternatives analysis. These comments have been grouped into themes and addressed below.

Comment 1: The applicant does not consider either the Reduced Acreage Alternative or the Avoidance of Donated or Acquired Lands Alternative to be economically feasible because both the alternatives would increase overhead costs on a per MWh basis, increase the costs of the SunCatchers installed, and would not reduce operations and maintenance costs. In addition, these smaller alternatives could put the ARRA funding at risk and potentially increase costs by as much as 30%.

Response: The applicant did not provided details regarding the feasibility and cost analysis for the Reduced Acreage Alternative, including the internal rate of return, and any changes to the internal rate of return based on a reduced project. CEQA defines "feasible" as "capable of being accomplished in a successful manner within a reasonable period of time, taking into account economic, environmental, legal, social, and technological factors." (Cal. Code Regs., tit. 14, § 15364.) "The fact that an alternative may be more expensive or less profitable is not sufficient to show that the alternative is financially infeasible. What is required is evidence that the additional costs or lost profitability are sufficiently severe as to render it impractical to proceed with the

project." (*Citizens of Goleta Valley v. Board of Supervisors*, 197 Cal.App.3d at p. 1181, 243 Cal.Rptr. 339.) While the applicant provided examples of how a 275 MW project might be more expensive on a per-MW basis than the proposed 850 MW project, it did not provide *concrete* evidence that the alternative is financially infeasible. A detailed financial analysis for a reduced-size project would be required in order to determine the economic feasibility of this alternative.

Comment 2: The applicant states that the Reduced Acreage Alternative would reduce the project output substantially, and interfere with California's ability to comply with the Renewable Portfolio Standards.

Response: The Energy Commission Staff has already incorporated the California RPS goals and Global Warming Solutions Act into the Energy Commission project objectives, see Section B.2.4.2. The Energy Commission Staff has acknowledged that the Reduced Acreage Alternative would reduce the contribution of the project to the RPS goals. However, the Energy Commission Staff also understands the need to "balance clean energy development and conservation" as stated in the 2009 Integrated Energy Policy Report.

Comment 3: The applicant has provided a number of engineering constraints for the Avoidance of Donated and Acquired Lands Alternative.

Response: The Avoidance of Donated and Acquired Lands Alternative is no longer retained for further consideration because it would not substantially reduce impacts of the proposed project. See Section B.2.8.1.

Comment 4: The applicant revised its purpose for the project and suggested revisions to the Energy Commission's project objectives due to the change in the PPA and the need for a considerable amount of renewable energy generation in California to meet legislatively-mandated goals.

Response: The applicant's purpose for the project has been revised as requested. The Energy Commission's project objectives have not incorporated the applicant's revision. After considering the objectives set forth by the Applicant in the Calico Solar Project AFC, the Energy Commission identified two objectives related to siting of the proposed project as well as three objectives regarding California's RPS and Global Warming Solutions Act. These five basic project objectives identified by the Energy Commission were then used to shape the alternatives analysis in accordance with CEQA requirements (see Section B.2.4.2).

The Energy Commission's project objectives already address the importance California's RPS and Global Warming Solutions Act and of the need for a considerable amount of renewable energy generation in California to meet legislatively-mandated goals. However, as stated above, the Energy Commission Staff also acknowledge the need to "balance clean energy development and conservation". The Energy Commission planning documents, specifically the 2009 Integrated Energy Policy Report acknowledge the complexities in siting renewable energy development and the need for careful placement of renewable projects to avoid sensitive environmental resources. Additionally, the RETI Draft Phase 2B report highlights the refinements RETI made to the Competitive Renewable Energy Zones (CREZ) previously published to avoid sensitive resources within CREZs. Likewise, the DRECP Starting Point Maps (March, 2010) acknowledge that sensitive resources occur within renewable clusters and locate conservation opportunities immediately adjacent to Renewable Energy Study Areas.

Comment 5: The applicant has provided further information regarding the Maricopa Solar 1.5 MW power plant located in Arizona. The applicant requests that the Alternatives Section include language that states that the Maricopa Solar project has demonstrated the success of the Stirling engine technology.

Response: The Energy Commission Staff appreciates the information provided by the applicant regarding the Maricopa Solar project. However, the alternatives section is not the appropriate forum for this analysis. The efficiency and the reliability of the Calico Solar Project and the Stirling engine technology in particular are addressed in Section D.3 (Power Plant Efficiency) and in Section D.4 (Power Plant Reliability).

Comment 6: The applicant has provided additional information regarding the BLM and DOE Programmatic Environmental Impact Statement (PEIS) and specifically have stated that the Calico Solar Project is within a solar energy study area identified by the BLM and DOE.

Response: The Energy Commission Staff appreciates the clarification that the Calico Solar Project is located within one of the BLM and DOE solar energy study areas and that the solar energy study areas were designed in part to exclude some sensitive resource areas. However, the NOA for the PEIS also clarifies that the solar energy study areas are preliminary and that the PEIS itself will determine whether the study areas should be designated as Solar Energy Zones. At this time, any determination regarding the viability of the solar energy zones is preliminary. As stated above, the DRECP Starting Point Maps (March, 2010) acknowledge that sensitive resources occur within renewable clusters and locate conservation opportunities immediately adjacent to Renewable Energy Study Areas.

B.2.10 CONCLUSIONS OF ALTERNATIVES ANALYSIS

In this analysis of the Calico Solar Project (formerly the Stirling Energy Systems Solar One Project), 24 alternatives to the project were identified and evaluated. These include three alternative site locations or configurations, a range of different solar and renewable technologies, generation technologies using different fuels, and conservation/demand-side management. Of the 24 alternatives, two alternatives were determined potentially feasible by the Energy Commission and analyzed in detail because they appeared to have the potential to substantially reduce one or more of the project's significant impacts: the Reduced Acreage Alternative and Private Lands Alternative. In addition to the proposed action and the potentially feasible alternatives, the Energy Commission considered the No Project Alternative.

The Reduced Acreage Alternative would be a 275 MW solar facility located within the central portion of the proposed 850 MW project. The impacts of this alternative are analyzed in each discipline’s analysis in Sections C and D. Because it would occupy about one-third of the land area required for the proposed project, it would affect substantially less native vegetation, and habitat for the Mojave fringe toed-lizard, bighorn sheep, and desert tortoise. It would also have fewer effects on the east-west movement of desert tortoise. Additionally, the Reduced Acreage Alternative would avoid impacts to lands acquired by Land and Water Conservation Funds and would comply with all laws, ordinances, regulations, and standards. The alternative would also reduce impacts to visual resources to less than significant. However, as highlighted in the

Section C.1 (Air Quality), the Reduced Acreage Alternative would reduce the benefits of the proposed Calico Solar Project in displacing fossil fuel fired generation and reducing associated criteria pollutant emissions. The Reduced Acreage Alternative is considered to be potentially feasible, as solar thermal facilities of 275 MW and smaller are currently proposed in California. However, no studies have been done to evaluate its economic feasibility.

CEC staff has determined that the No Project Alternative is not superior to the proposed project because it would likely delay development of renewable resources or shift renewable development to other similar areas, and could lead to increased operation of existing power plants that use non-renewable technologies. However, the No Project/No Action Alternative is evaluated in detail in this SSA, as required by NEPA and CEQA.

The Private Lands Alternative would have impacts similar to those of the proposed site in many disciplines. However, because this alternative would be on disturbed agricultural lands, the alternative site is likely to have less severe cultural, visual, and biological resources impacts than the proposed site. The Private Land Alternative presents an additional challenge: its northern section is made up of approximately 64 parcels with 27 separate landowners and the southern portion is made up of 45 parcels with 22 separate landowners. Due to the number of parcels that would have to be acquired, obtaining site control would be more challenging than at the proposed site where BLM is the only land management entity. In addition, detailed site engineering and transmission interconnection would require additional time for this site to be developed; as a result this alternative would not meet the project objective requiring that a decision to be made in 2010.

The Avoidance of Donated and Acquired Lands Alternative was developed to avoid direct impacts to all lands within the Calico Solar Project boundary that were donated to or acquired by the Bureau of Land Management and was fully analyzed in the Staff Assessment. It would generate 720 MW and would have impacts similar to the proposed project for most resource elements, though reduced by about 15%. Because the Avoidance of Donated and Acquired Lands Alternative does not appear to have the potential to substantially reduce one or more of the project’s significant impacts, it was eliminated from further consideration in this SSA.

Six alternative sites on federal lands were identified but were not evaluated in detail due to conflicting land use classifications and/or because they do not appear to have the potential to substantially reduce one or more of the project's significant impacts. Alternative solar thermal technologies (solar trough, solar power tower, utility scale solar photovoltaics, and linear Fresnel) are also evaluated. As compared with the proposed solar trough technology, most of these technologies would not substantially reduce one or more of the project’s significant impacts including to visual impacts, biological resources impacts and cultural impacts as all require extensive acreage. Distributed solar photovoltaic facilities would likewise require extensive acreage if deployed in the same location as the project, although it can also be installed on existing buildings, minimizing the loss of undisturbed open space. However, increased deployment of distributed solar photovoltaics faces challenges in manufacturing capacity, cost, and policy implementation. Water use varies among the technologies.

Other generation technologies (wind, geothermal, biomass, tidal, wave, natural gas, and nuclear) are also examined as possible alternatives to the project. These technologies would either be potentially infeasible at the scale of the Calico Solar Project, or would not substantially reduce one or more of the project's significant impacts without creating their own significant impacts in other locations. A natural gas plant would contribute to greenhouse gas emissions and would not meet the project's renewable generation objective. Construction of new nuclear power plants is currently prohibited under California law.

Conservation and demand side management programs would likely not meet the state's growing electricity needs that would be served by the Calico Solar Project. In addition, these programs would not provide the renewable energy required to meet the California Renewable Portfolio Standard requirements. Wave and tidal technologies are not yet commercially available in the United States.

Staff's analysis of renewable energy technology options indicates that contributions from each commercially available renewable technology will be needed to meet California's Renewable Portfolio Standard requirements and to achieve the statewide RPS target for 2020 (between 45,000 gigawatt hours (GWhs) to almost 75,000 GWhs according to the 2009 IEPR). Wave and tidal technologies are not yet commercially available in the United States. Therefore, the combined contribution of the alternatives of wind, distributed solar photovoltaic, geothermal, and biomass is needed to complement rather than substitute for the Calico Solar Project solar thermal contribution to meeting SCE and statewide RPS requirements.

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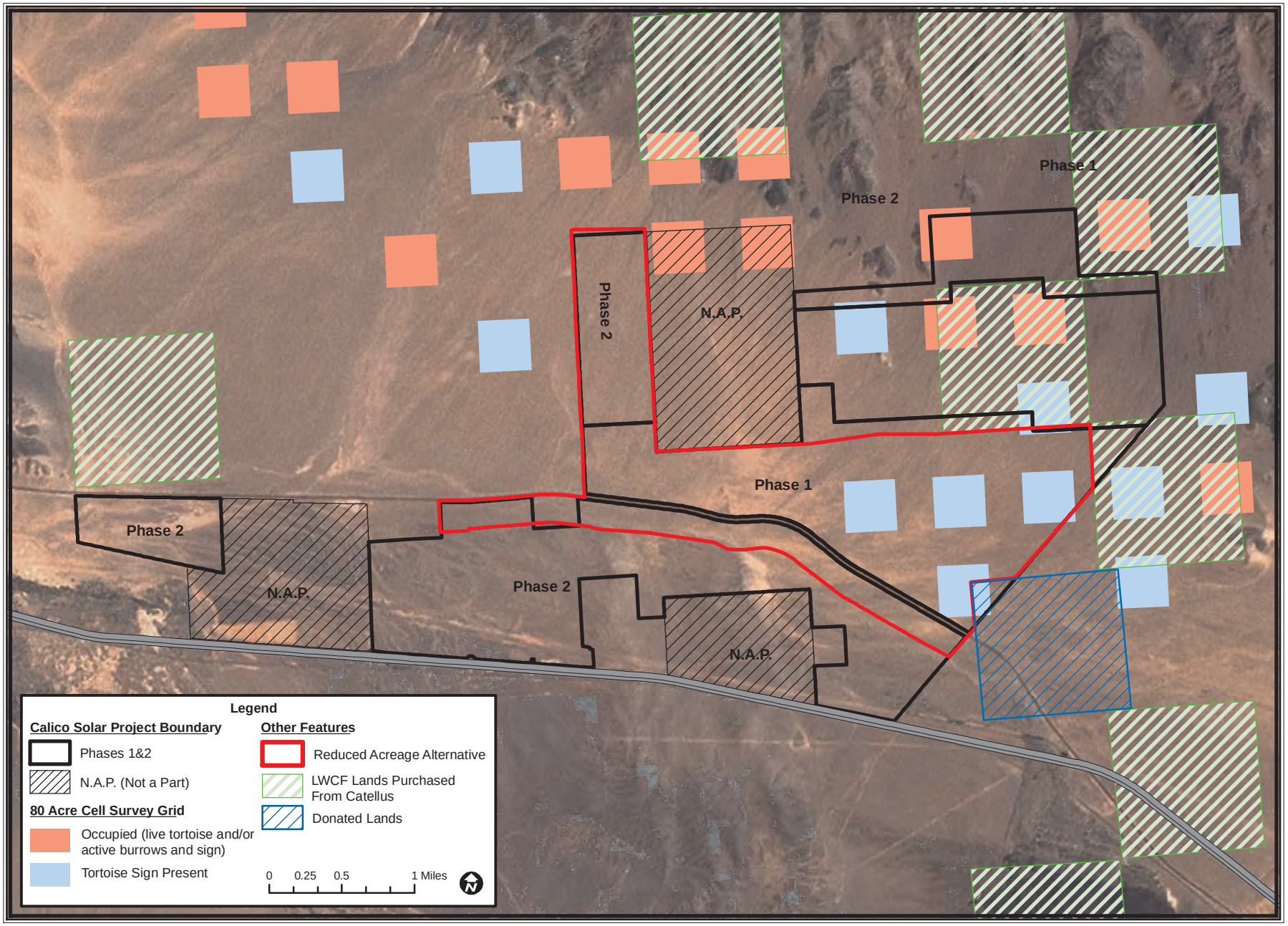
ALTERNATIVES - FIGURE 1

Calico Solar Project- Reduced Acreage Alternative



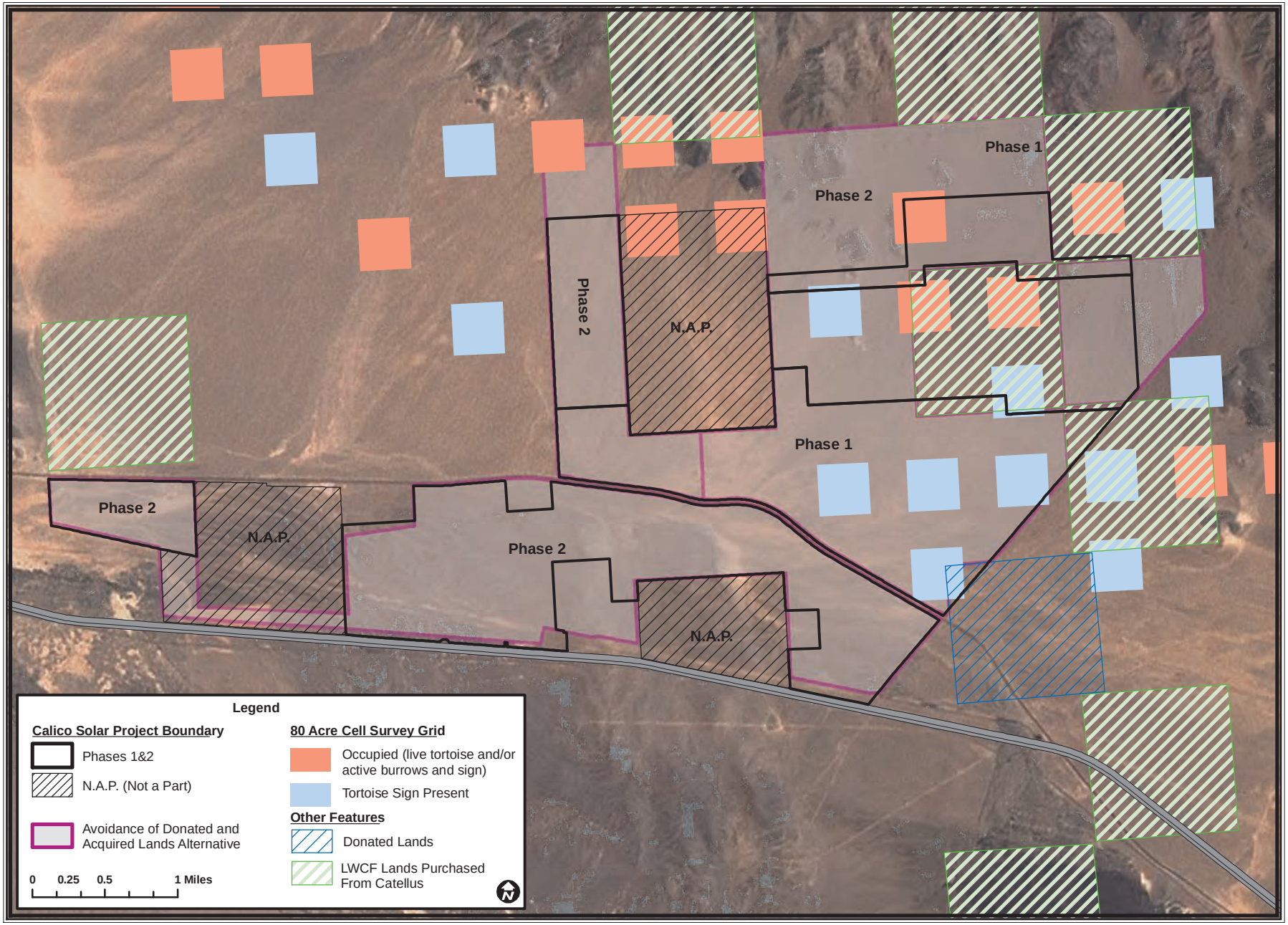
ALTERNATIVES

U.S. BUREAU OF LAND MANAGEMENT and CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION

SOURCE: California Energy Commission - Tele Atlas Data - San Bernardino County

ALTERNATIVES - FIGURE 2

Calico Solar Project - Avoidance of Donated and Acquired Lands Alternative



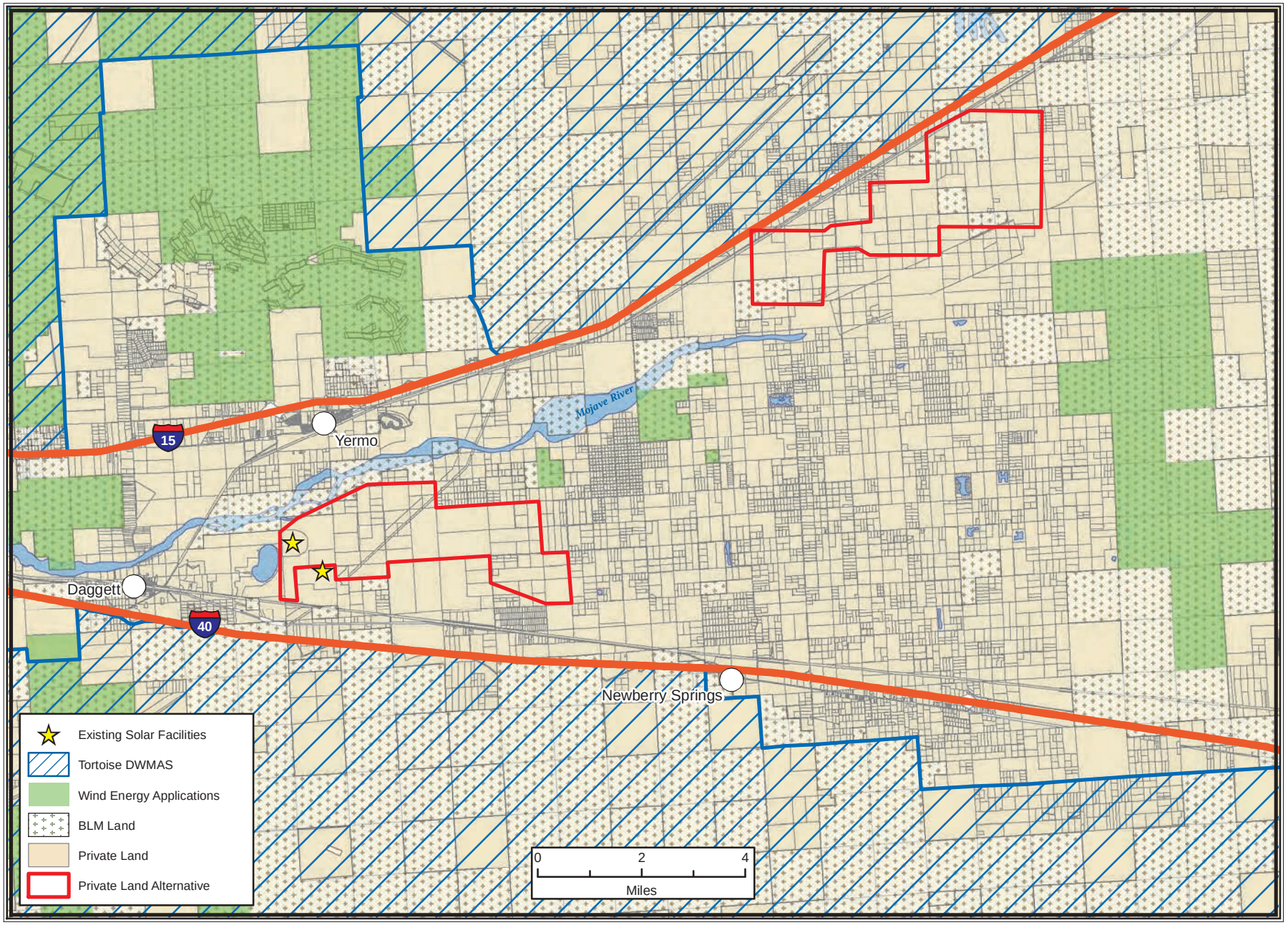
ALTERNATIVES

U.S. BUREAU OF LAND MANAGEMENT & CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION

SOURCE: California Energy Commission - Tele Atlas Data - San Bernardino County

ALTERNATIVES - FIGURE 3

Calico Solar Project - Private Land Alternative



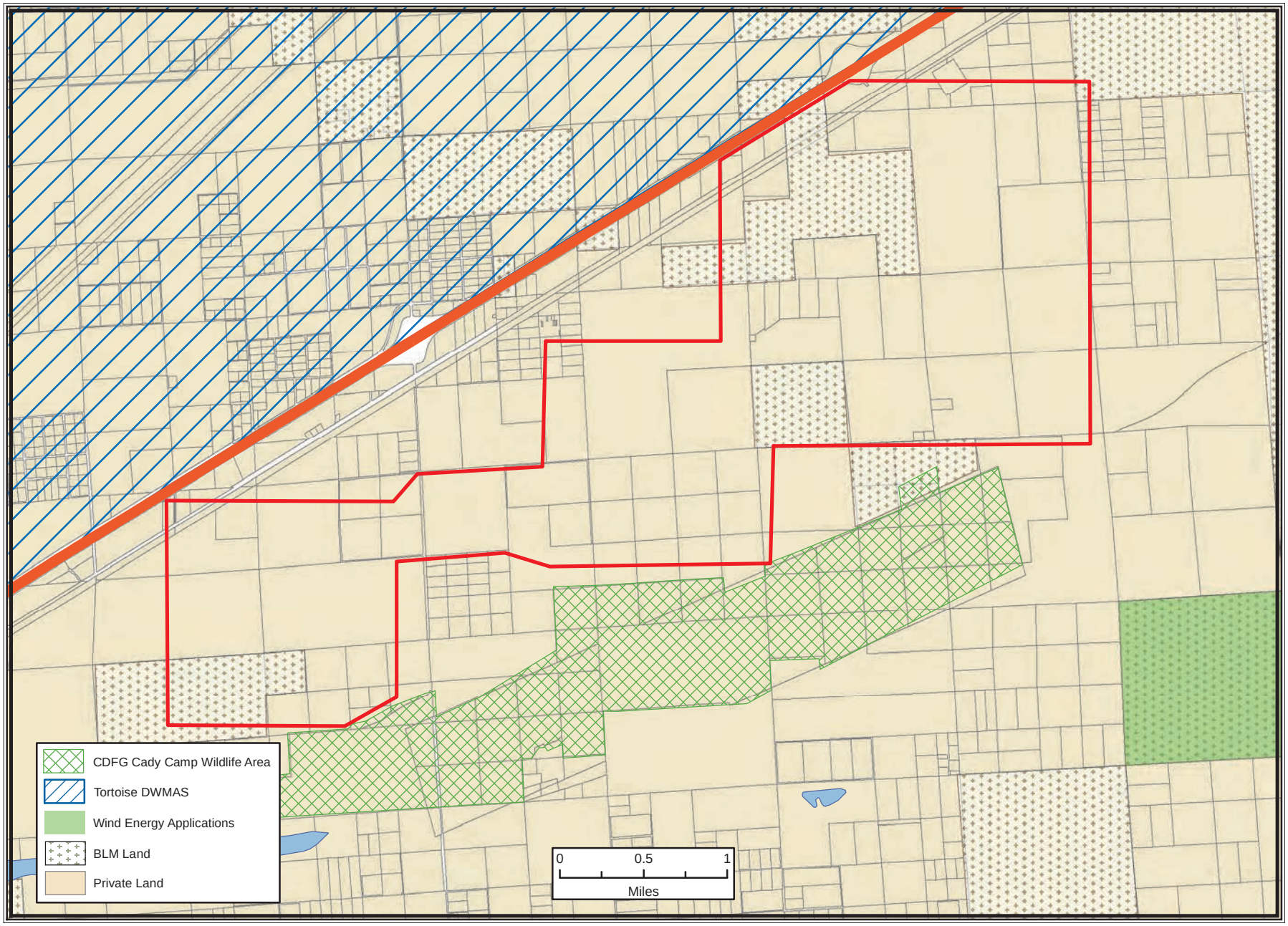
ALTERNATIVES

U.S. BUREAU OF LAND MANAGEMENT and CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION

SOURCE: California Energy Commission - Tele Atlas Data - San Bernardino County

ALTERNATIVES - FIGURE 3A

Calico Solar Project - Private Land Alternative Northern Section



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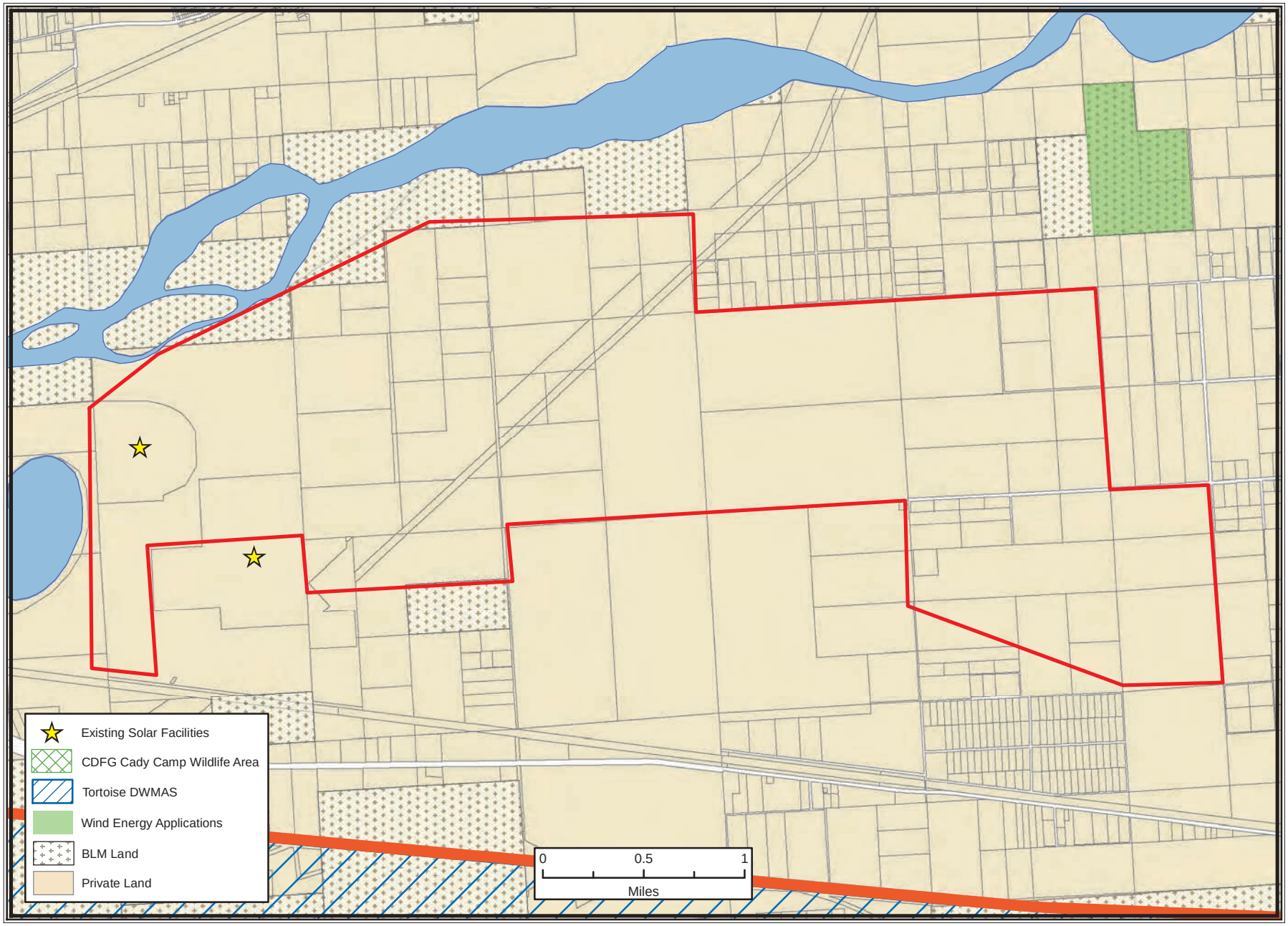
SOURCE: California Energy Commission - Tele Atlas Data - San Bernardino County

ALTERNATIVES - FIGURE 3B

Calico Solar Project - Private Land Alternative Southern Section



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SOURCE: California Energy Commission - Tele Atlas Data - San Bernardino County