SECTION 2.0

Project Description

2.1 Introduction

The Hidden Hills Solar Electric Generating System (HHSEGS) is being developed by Hidden Hills Solar I, LLC, and Hidden Hills Solar II, LLC (the Applicant), wholly owned subsidiaries of Hidden Hills Solar Holdings, LLC, (their sole member) which is in turn a wholly owned subsidiary of BrightSource Energy, Inc. (BrightSource) (its sole member), a Delaware corporation.

HHSEGS will be located on approximately 3,277 acres (5.12 square miles) of privately owned land in Inyo County, California, adjacent to the Nevada border. The project site is approximately 18 miles south of Pahrump, Nevada, and approximately 45 miles west of Las Vegas, Nevada (see Figure 2.1-1; figures are provided at the end of this section).

HHSEGS will comprise two solar fields and associated facilities: the northern solar plant (Solar Plant 1) and the southern solar plant (Solar Plant 2). Each solar plant will generate 270 megawatts (MW) gross (250 MW net), for a total net output of 500 MW. Solar Plant 1 will occupy approximately 1,483 acres (or 2.3 square miles), and Solar Plant 2 will occupy approximately 1,510 acres (or 2.4 square miles). A 103-acre common area will be established on the southeastern corner of the site to accommodate an administration, warehouse, and maintenance complex, and an onsite switchyard. A temporary construction laydown and parking area on the west side of the site will occupy approximately 180 acres (see Figure 2.1-2).

Each solar plant will use heliostats—elevated mirrors guided by a tracking system mounted on a pylon—to focus the sun's rays on a solar receiver steam generator (SRSG) atop a solar power tower near the center of each solar field. The solar power tower technology for the HHSEGS project design incorporates an important technology advancement, the 750-foot-tall solar power tower. One principle advantage of the HHSEGS solar power tower design is that it results in more efficient land use and greater power generation. The new, higher, 750-foot solar power tower allows the heliostat rows to be placed closer together, with the mirrors at a steeper angle. This substantially reduces mirror shading and allows more heliostats to be placed per acre. More megawatts can be generated per acre and the design is more efficient overall.

In each solar plant, one Rankine-cycle steam turbine will receive steam from the SRSG (or solar boiler) to generate electricity. The solar field and power generation equipment will start each morning after sunrise and, unless augmented, will shut down when insolation drops below the level required to keep the turbine online. Each solar plant will include a natural-gas-fired auxiliary boiler, used to augment the solar operation when solar energy diminishes or during transient cloudy conditions, a startup boiler, used during the morning startup cycle, and a nighttime preservation boiler, used to maintain system temperatures overnight. On an annual basis heat input from natural gas will be limited by fuel use and other conditions to less than 10 percent of the heat input from the sun. To save water in the

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

Two distinct transmission options are being considered because of a unique situation concerning Valley Electric Association (VEA). Under the first option, the project would interconnect via a 230-kilovolt (kV) transmission line to a new VEA-owned substation (Tap Substation) at the intersection of Tecopa Road[1] and Nevada State Route (SR) 160 (the Tecopa/SR 160 Option). The other option is a 500-kV transmission line that interconnects to the electric grid at the Eldorado Substation (the Eldorado Option), in Boulder City, Nevada.

A 12- to 16-inch-diameter natural gas pipeline will be required for the project. It will exit the HHSEGS site at the California-Nevada border and travel on the Nevada side southeast along the state line, then northeast along Tecopa Road until it crosses under SR 160. From this location a 36-inch line will turn southeast and continue approximately 26 miles, following the proposed Eldorado Option transmission line corridor, to intersect with the Kern River Gas Transmission (KRGT) pipeline. A tap station will be constructed at that point to connect it to the KRGT line. The total length of the natural gas pipeline will be approximately 35.3 miles.

The transmission and natural gas pipeline alignments will be located in Nevada, primarily on federal land managed by the U.S. Bureau of Land Management (BLM), except for small segments of the transmission line (both options) in the vicinity of the Eldorado Substation, which is located within the city limits of Boulder City, Nevada. A detailed environmental impact analysis of the transmission and natural gas pipeline alignments will be prepared by BLM.

The Inyo County General Plan and Solar and Wind Renewable Energy General Plan Amendment (REGPA) are the primary planning documents applicable to the project site. Inyo County's General Plan was recently amended by the REGPA. The REGPA provides the basis for County approvals of solar or wind renewable energy facilities, and establishes policies to encourage development of renewable resources in Inyo County. HHSEGS is located in one of the fifteen Renewable Energy Land Use Designation Overlay zones established by the REGPA.

Following completion of project licensing and close of financing, HHSEGS will be constructed in approximately 29 months (target completion by fourth quarter 2014 / first quarter 2015), with a commercial on-line date of first quarter 2015 for Solar Plant 1 and second quarter 2015 for Solar Plant 2.

2.1.1 Project Location and Jurisdiction

HHSEGS is located in Inyo County, California, west of Las Vegas, Nevada, and approximately 18 miles south of the town of Pahrump, Nevada. It is located along the California-Nevada border (see Figure 2.1-1), in Township 22 North, Range 10 East, Sections

[1] The road is also called Tecopa Highway and Old Spanish Trail Highway. The names are generally used interchangeably.

(or portions thereof) 15, 16, 20, 21, 22, 23, 26, 27, and 28[2] on privately owned land. The assessor parcel numbers (APNs) for the site are: 048-110-002; 048-120-010; Book 048, page 30, parcels 03 to 06 and 12 to 14; Book 048, page 62, parcels 03 to 06 and 11 to 14, and all parcels in Book 048 pages 50, 60, 61, and 64 through 71.

Once offsite, the transmission line and natural gas pipeline are both located wholly within the state of Nevada, primarily on federal land managed by BLM, except for small segments of the transmission line (both options) in the vicinity of the Eldorado Substation, which is located within the city limits of Boulder City, Nevada.

The CEC has exclusive permitting jurisdiction for the siting of thermal power plants of 50 MW or more and related facilities in California. The CEC also has responsibility for ensuring compliance with the California Environmental Quality Act (CEQA) through the administration of the CEC's certified regulatory program. The project site is located within California. As such, the CEC has CEQA jurisdiction over the direct, indirect, and cumulative impacts for activities on the HHSEGS project site.

The CEC has no permitting or CEQA jurisdiction over activities or portions of projects occurring in Nevada. Public Resources Code section 21080 provides that CEQA does not apply to any project or portion thereof located in another state that will be subject to environmental impact review pursuant to NEPA or a comparable state law (see also CEQA Guidelines section 15277).

Once the transmission line and the natural gas pipeline exit the eastern border of the project site, which is also the California-Nevada border, they will be located wholly within Nevada, primarily on BLM-managed lands. The project linears located in Nevada on federal land will be a major federal action under the National Environmental Policy Act (NEPA) for which BLM will be the lead agency. Additionally, a portion of the transmission lines will be on property within the city limits of Boulder City, Nevada. Because these out-of-state facilities will be subject to NEPA, with BLM acting as the lead agency, they are not subject to review under CEQA as part of the CEC's licensing process. Therefore, they are not analyzed further in this Application.

The Applicant has been informed that while that the agencies will not produce a single, joint environmental document, the CEC and BLM will coordinate with each other while fulfilling their individual statutory duties.

2.1.2 Project Elements

The following sections describe the various project elements.

2.1.2.1 Solar Plants

Each solar plant will use heliostats—elevated mirrors guided by a tracking system mounted on a pylon —to focus the sun's rays on an SRSG atop a tower near the center of each solar field. In each plant, one Rankine-cycle steam turbine will receive steam from the SRSG (or solar boiler) to generate electricity. The solar field and power generation equipment will start each morning after sunrise and will shut down (unless augmented by the auxiliary boilers) when insolation drops below the level required to keep the turbine online. To save

[2] San Bernardino Base and Meridian

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

Each of the power blocks (see Figure 2.1-2) will be connected via underground and overhead generation tie (gen-tie) lines to the onsite switchyard in the common area. Each power block will also have a gas metering set. Permanent parking areas will be provided at each power block for operations and maintenance personnel.

2.1.2.2 Common Area

A 103-acre common area will be established on the southeastern corner of the site to accommodate an administration, warehouse, and maintenance complex; an onsite substation; asphalt-paved visitor and employee parking area; and landscape areas (Figure 2.1-3). The administration complex will occupy approximately 4.8 acres and will be served by power from the local 33-kV distribution system and water from water supply wells located in the common area.

The common area will also be used for temporary construction parking areas, construction trailers, a tire cleaning station, and other construction support facilities. The surface areas within the common area that are used for construction will be stabilized and dust suppression maximized with a layer of crushed stone in areas subject to heavy daily traffic.

2.1.2.3 Temporary Construction Laydown Area

The 180-acre temporary construction laydown area on the west side of the site will be used for equipment laydown, construction parking, construction trailers, a tire cleaning station, heliostat assembly buildings, and other construction support facilities. The surface areas within the temporary construction area that are used frequently will be stabilized and dust suppression maximized with a layer of crushed stone in areas subject to heavy daily traffic.

2.1.2.4 Access Roads and Drive Zones

Project access will be from Tecopa Road to the project entrance road on the east side of the project. Tecopa Road is an existing two-lane paved road. Secondary access will be from Tecopa Road along the west side of HHSEGS, then along the paved road between the two solar plants.

The internal roadway and utility corridors for each heliostat field and its power block will contain a 20-foot-wide paved or hardscape access road from the entrance of the solar plant site to the power block, and then around the power block.

In addition to the paved or hardscaped 20-foot-wide access road to the power block of each unit, unpaved roads will radiate out from the power block to provide access through the solar field to the internal perimeter access road. Within the heliostat fields, 20-foot wide "drive zones" will be located concentrically around the power block to provide access to the heliostat mirrors for maintenance and cleaning (Figure 2.1-2). The drive zones will be located approximately 152 feet apart and will be grubbed to remove vegetation and smoothed. A 12-foot-wide unpaved path will be constructed on the inside perimeter of the

project boundary fence for use by HHSEGS personnel to monitor and maintain perimeter security and tortoise exclusion fencing. These paths will be grubbed, bladed, and smoothed to facilitate safe use with minimal grading where necessary to cross washes.

2.1.2.5 Transmission Line

As noted previously, two distinct transmission options are being considered because of a unique situation concerning VEA: the Tecopa Road/SR 160 Option and the Eldorado Option. VEA has announced that it plans to become a participating transmission owner (PTO) and turn operational control of its facilities over to the California Independent System Operator (CAISO). The Tecopa Road/SR 160 Option is only viable if VEA is successful in this endeavor, and VEA determines that there is sufficient capacity on its existing 230-kV system to accommodate HHSEGS.

The Tecopa Road/SR 160 Option would require an approximately 10-mile-long gen-tie line from HHSEGS to the proposed Tap Substation, where the project would interconnect to the electric grid. The transmission line would originate at HHSEGSs onsite switchyard, cross the state line and follow it (on the Nevada side) southeast turning northeast along Tecopa Road to the Tap Substation. The Tecopa Road/ SR 160 Option also includes a 230-kV transmission line from the Tap Substation into the town of Pahrump with approximately 28.1 miles of transmission line and a 2-acre switch on private land with a 1-mile-long connection to the Eldorado Substation. The Tecopa Road/SR 160 Option is viable only if the Tap Substation and the associated transmission lines ultimately become part of the CAISO Balancing Authority Area, pursuant to VEA's current plans, and sufficient excess capacity exists on the 230-kV system to accommodate HHSEGS's transmission needs.

If VEA does not become a PTO, HHSEGS will use the Eldorado Option—a gen-tie line to directly interconnect to the Eldorado Substation in Boulder City, Nevada. Under this scenario, the gen-tie line would follow the same 10-mile-long route to the Tap Substation as the Tecopa Road/SR 160 Option, and would continue for approximately 53.7 miles to the Eldorado Substation in Boulder City, Nevada, for direct interconnection to the CAISO-controlled grid. The proposed gen-tie line would likely be a multi-generator transmission line that could be available to serve other projects in the region.

2.1.2.6 Natural Gas Pipeline

HHSEGS will require a 12- to 16-inch-diameter natural gas pipeline. It will exit the HHSEGS site at the California-Nevada border and travel on the Nevada side southeast along the state line, then northeast along Tecopa Road until it crosses under SR 160. From this location a 36-inch line will turn southeast and continue approximately 26 miles, following the proposed Eldorado Option transmission line corridor, to intersect with the KRGT pipeline. A tap station will be constructed at that point to connect it to the KRGT line. The total length of the natural gas pipeline will be approximately 35.3 miles (see Figure 2.1-4).

2.1.3 Project Ownership

Hidden Hills Solar I, LLC, and Hidden Hills Solar II, LLC, will each own its respective solar plant individually, and together the entities will own the shared facilities located on the common area as tenants in common. Hidden Hills Solar I, LLC, and Hidden Hills Solar II, LLC, will hold leasehold interests in privately held land located in the Mojave

Desert between Death Valley and the California-Nevada border as the site for their respective solar plants and the common area. The land is owned by The Roland John Wiley Trust, The Mary Wiley Trust, and Section 20, LLC, and is currently under options to lease with BrightSource.

Consistent with the California Energy Commission (CEC) past practices,[3] the Applicant requests that the final Orders of Approval for the HHSEGS Application for Certification (AFC) recognize that each plant will be independently operated. During the construction and/or operation phase, the Conditions of Certification shall apply severally and individually such that non-compliance of one plant shall not be deemed non-compliance by the other plant.

2.2 Generating Facility Description, Design, and Operation

This section describes HHSEGS's conceptual design and proposed operation.

2.2.1 Process Description

In each solar plant, one Rankine-cycle non-reheat steam turbine receives live steam from the SRSG located in the power block at the top of the solar power tower (see Figure 2.2-1 and Figures 2.2-2a and 2.2-2b). The solar field and power generation equipment are started each morning after sunrise and insolation build-up, and shut down when insolation drops below the level required to keep the turbine online. Natural-gas-fired boilers may also be used to extend the daily power generation. However, on an annual basis heat input from natural gas will be limited by fuel use and other conditions to less than 10 percent of the heat input from the sun.

Each solar plant includes three auxiliary (supplemental) boilers that will be used for augmenting the solar operation when solar energy diminishes or during transient cloudy conditions. Each plant also includes a start-up boiler that will be used during the morning start-up cycle to assist the plant in coming up to operating temperature more quickly. Each solar plant includes a night preservation boiler that will be used to provide steam to the gland systems of the steam turbine and boiler feedwater pump turbine to prevent air ingress overnight and during other shutdown periods when steam is not available from the SRSG. This boiler will also provide pegging steam to the deaerator during these shutdowns.

Each solar plant will use an air-cooled condenser or dry cooling, to minimize water usage in the site's desert environment. Water consumption is, therefore, minimal—mainly to provide water for washing heliostats and for boiler make up. Auxiliary equipment at each plant includes feed water heaters, a deaerator, an emergency diesel generator, and a diesel fire pump.

2.2.1.1 Power Cycle

Solar energy is reflected by the heliostats onto the SRSG where the energy heats water into superheated steam. The steam is then routed via the main steam pipe to the steam turbine generator (STG) where the steam's energy is converted to electrical energy.

[3] See the Orders of Approval for the Ivanpah Solar Electric Generating System (07-AFC-05) Document CEC800-2010-004CMF.

The solar plant's power cycle is based on a Rankine-cycle steam turbine with three pressure stage casings. A heat balance diagram for the 270-MW (gross) plant is included in Figure 2.2-3. Primary thermal input is via an SRSG located at the top of the solar power tower. Live superheated steam enters a high pressure (HP) turbine casing at 2,466 pounds per square inch absolute (psia) and 1,085 degrees Fahrenheit (°F) (steam parameters are provided for Normal Continuous Rate).

Following expansion through the HP turbine, the steam is conveyed to the inlet of the intermediate pressure (IP) turbine. Steam enters the IP turbine at 535 psia and 666°F. Upon exiting the IP turbine, the steam travels via the crossover pipe to the inlet of the low pressure (LP) turbine. Steam enters the LP turbine at 78 psia and 310° F and exits at 1.6 psia or 3.25 inches of mercury into the air-cooled condenser.

Condensate is sent from the condenser well through four low-pressure feedwater heaters to the deaerator, which also serves for feedwater reserve storage and is the point of feedwater make-up injection. From the deaerator, high-pressure feedwater pumps send feedwater through three high pressure feedwater heaters and it is returned to the SRSG.

2.2.1.2 Major Facility Components

Electricity is produced by each solar plant's STG. The following sections describe the major components of the generating facility.

Solar Field

Each of the heliostat assemblies is composed of two mirrors, each approximately 12 feet high by 8.5 feet wide with a total reflecting surface of 204.7 square feet. Each heliostat assembly is mounted on a single pylon, along with a computer-programmed aiming control system that directs the motion of the heliostat to track the movement of the sun. Communication between the heliostats and the operations center will be done via surface-mounted anchored cable or wireless remote system. The solar field for each solar plant will consist of approximately 85,000 heliostats.

Solar Plants

The following provides further details regarding the two 270-MW solar plants.

- The solar power tower structure height is approximately 620 feet tall.
- The SRSG located at the top of the solar power tower is approximately 130 feet tall, resulting in an overall height of approximately 750 feet.
- No heliostat will be built closer than 394 feet from the solar power tower location.
- For Solar Plant 1, the distance between the solar power tower and the farthest heliostat in the solar field, approximately 7,660 feet, is in the northwest section of the heliostat array. For Solar Plant 2, the longest distance between the solar power tower and the farthest heliostat in the solar field, approximately 6,523 feet, is in the northeast section of the heliostat array. Generally, this is due to the higher efficiency of heliostats in the northern section in the northern hemisphere. With the sun predominantly in the southern sky, the cosine effect of incidence and reflection angles is less in the northern heliostats than in the southern ones. The converse (lower collection efficiency in the southern section) is also true, and, therefore, the maximum southern arc radius is the shortest.

- The eastern sector heliostat energy collection is more valuable than the western sector collection because afternoon energy collection, during on-peak utility hours, is more valuable than morning energy collection, during part-peak or off-peak hours.

Steam Turbine Generator

The steam turbine system consists of a condensing STG with gland steam system, lubricating oil system, hydraulic control system, and steam admission/induction valving. HP steam from the SRSG superheater enters the HP steam turbine section through the inlet steam system. The steam expands through multiple stages of the turbine, driving the generator. On exiting the LP turbine, the steam is directed into the air-cooled condenser.

Natural Gas Boilers

Each solar plant will include five gas-fired boilers. Three auxiliary boilers will supplement power generation when insolation drops below the level required to keep the turbines online. Each auxiliary boiler will have a capacity of 350,000 pounds per hour (lb/hr) at 950°F and 1,450 psia. A startup boiler will provide steam prior to sunrise to expedite the process of bring the plants online. The startup boiler will have a capacity of 200,000 lb/hr at 770°F and 750 psia. The night preservation boiler will provide superheated steam to the STG and boiler feedwater pump gland systems overnight and during other shutdown periods when steam is not available from the SRSG. The night preservation boiler will produce 8,000 lb/hr at 680°F and 145 psia.

2.2.2 Major Electrical Equipment and Systems

The bulk of the electric power produced by the facility will be transmitted to the grid. A small amount of electric power will be used onsite to power auxiliaries such as pumps and fans, control systems, and general facility loads including lighting, heating, and air conditioning. Some power will also be converted from alternating current (AC) to direct current (DC) and stored in batteries, which will be used as backup power for the plant control systems and essential uses. Transmission and auxiliary uses are discussed in the following subsections.

2.2.2.1 AC Power—Transmission

Each solar plant will include an STG to convert thermal energy into electrical power. Power will be generated by the air-cooled generator at 21-kV and connected through a generator circuit breaker to the generator step-up (GSU) transformer where the voltage will be stepped up and transmitted on the gen-tie lines to the onsite switchyard. Surge arresters will be provided at the high voltage bushings to protect the transformers from surges on the system caused by lightning strikes or other system disturbances. The transformers will be set on concrete pads within containments designed to contain the transformer oil in the event of a leak or spill. Fire protection systems will be provided for the transformers. The high-voltage side of the GSU transformers will be connected to the switchyard located in the common area by means of underground cables (within the solar field) and overhead transmission line. From the switchyard, power will be transmitted via a transmission line to the electrical grid.

A detailed description of the HHSEGS transmission system is provided in Section 3.0.

2.2.2.2 AC Power—Distribution to Auxiliaries

Auxiliary power to each solar plant will be supplied at 4,160 volts AC by a 4,160-volt switchgear lineup. The oil-filled, 21- to 4.16-kV unit auxiliary transformer will supply primary power to the switchgear. The high-voltage side (21 kV) of the unit auxiliary transformers will be connected to the outputs of each of the STGs. The generator circuit breaker is used to isolate and synchronize the generators, and will be located between the generators and both connections to the transformers. The 4,160-volt switchgear lineup supplies power to the various 4,160-volt motors, and to the load center transformers, rated 4,160 to 480 volts, for 480-volt power distribution. The switchgear will have vacuum interrupter circuit breakers for the main incoming feeds and for power distribution. The load center transformers will be oil-filled, each supplying 480-volt, three-phase power to the load centers.

The load center transformers will provide power through feeder breakers to the various 480-volt loads and the 480-volt motor control centers (MCCs). The MCCs will distribute power to 480-volt motors, to 480-volt power distribution panels, and lower voltage lighting and distribution panel transformers. Power for the AC power supply (120-volt/208-volt) system will be provided by the 480-volt MCCs and 480-volt power panels. 480-120/208-volt dry-type transformers will provide transformation of 480-volt power to 120/208-volt power.

2.2.2.3 125-Volt DC Power Supply System

A 125-volt DC power supply system consisting of two 100-percent-capacity battery bank, two 100 percent static battery chargers, a switchboard, and distribution panels will be supplied for essential balance-of-plant and STG equipment.

Under normal operating conditions, the battery chargers supply DC power to the DC loads. The battery chargers receive 480-volt, three-phase AC power from the AC power supply (480-volt) system and continuously charge the battery banks while supplying power to the DC loads.

Under abnormal or emergency conditions, when power from the AC power supply (480-volt) system is interrupted, the batteries supply DC power to the DC system loads. Recharging of a discharged battery occurs whenever 480-volt power becomes available from the AC power supply (480-volt) system. The rate of charge depends on the characteristics of the battery, battery charger, and the connected DC load during charging. The anticipated maximum recharge time will be 12 hours.

The 125-volt DC system will also be used to provide control power to the 220-kV generator breakers, 4,160-volt switchgear, to the 480-volt load center transformers, to critical control circuits, and to the emergency DC motors.

2.2.2.4 Uninterruptible Power Supply System

Each solar plant will also have an essential service 120-volt AC, single-phase, 60-hertz (Hz) uninterruptible power supply (UPS) to supply AC power to essential instrumentation, critical equipment loads, and unit protection and safety systems that require uninterruptible AC power.

Redundant UPS inverters will supply 120-volt AC single-phase power to the UPS panel boards that supply critical AC loads. The UPS inverters will be fed from the station 125-volt DC power supply system. Each UPS system will consist of one full-capacity inverter, a static transfer switch, a manual bypass switch, an alternate source transformer, and panel boards.

The normal source of power to the system will be from the 125-volt DC power supply system through the inverter to the panel board. A solid-state static transfer switch will continuously monitor both the inverter output and the alternate AC source. The transfer switch will automatically transfer essential AC loads without interruption from the inverter output to the alternate source upon loss of the inverter output.

A manual bypass switch will also be included to enable isolation of the inverter for testing and maintenance without interruption to the essential service AC loads.

The distributed control system (DCS) operator stations will be supplied from the UPS. The continuous emission monitoring equipment, DCS controllers, and input/output (I/O) modules will be fed using either UPS or 125-volt DC power directly.

2.2.3 Fuel System

Natural gas supply for HHSEGS will connect to the KRGT pipeline approximately 35.3 miles southeast of the site. A tap station on the main KRGT transmission pipeline will be installed at this point. A gas metering station will be required at the tap point to measure and record gas volumes from the KRGT metering station. The new 36-inch gas pipeline will proceed approximately 26 miles generally westward along the proposed Eldorado Option transmission line corridor to the intersection of Tecopa Road and SR 160. From there, a 12- to 16-inch gas line will follow along the west side of Tecopa Road to the state line and turn northwest to the HHSEGS site, a distance of approximately 9.8 miles. The gas pipeline will enter the site in the common area where it will connect with an onsite gas metering station.

From the onsite metering station in the common area, an underground pipe will be installed along the northeastern border of the Solar Plant 2 solar field. At the road that divides the two solar fields, the pipeline will turn to the southwest and continue to the point where it intersects the road between the two solar plants. At this point, the pipeline will branch with one branch proceeding northwest to Solar Plant 1 and the other southeast to Solar Plant 2. Individual metering sets (including electrical preheaters for the natural gas, pressure-reduction equipment, and filter-separator skids) will be installed at each power block to monitor gas usage.

Construction activities related to the onsite metering station and metering sets will include grading a pad and installing above- and belowground gas piping, metering equipment, gas conditioning and pressure regulation equipment, and possibly pigging facilities. A distribution power line for metering station operation lighting, communication equipment, and perimeter chain link fencing for security will also be installed.

2.2.4 Water Supply and Use

This subsection describes the quantity of water required, the sources of the water supply, and water treatment methods. A water balance diagram for the solar plants is included as Figure 2.2-4.

Six onsite groundwater supply wells will be drilled and developed to provide raw water for the HHSEGS project; two new wells per power block (primary and backup) and two wells at the administration complex. The wells will supply both solar plants and will be used for make-up water, mirror wash water, and domestic uses. The entire 500-MW net project will require up to 84.5 gallons per minute (gpm) (average) raw water make-up, with 30 to 50 gpm required by each plant, and 3.5 gpm (average) required for potable water use.

Each solar plant will have a raw water tank with a capacity of 250,000 gallons. A portion of the raw water (100,000 gallons) is for plant use while the majority will be reserved for fire water.

HHSEGS will generate electricity up to 16 hours a day, with the exception of a scheduled shutdown in late December for maintenance. However, the water treatment plant will operate continuously in order to minimize water treatment system size and capital cost, and to use off-peak energy at night. A more detailed description of the water supply system, treatment, and permits is provided in Section 5.15, Water Resources.

2.2.4.1 Water Requirements

A breakdown of the estimated average daily quantity of water required for HHSEGS operation is presented in Table 2.2-1. The daily water requirements shown are estimated quantities based on HHSEGS operating at full load.

TABLE 2.2-1
Average Daily Water Requirements with Both Solar Plants in Operation

Water Use	Average Daily Use (gpm)	Annual Use (ac-ft/yr)
Process and heliostat wash	84.5	135
Potable water service (including Common Area)	3.5	5

ac-ft/yr = acre-feet per year

2.2.4.2 Water Quality

Section 5.15, Water Resources, includes a projection of the water quality based on data from an existing onsite well.

2.2.4.3 Water Supply and Treatment

The onsite groundwater production wells will supply both solar plants and the administration complex with make-up water, mirror-wash water, and domestic water. Each solar plant will include a water treatment and deionizing facility in the power block area. The combined 500-MW net capacity of the solar plants will require an average of approximately 90 gpm. To provide adequate operating flexibility, 140 afy of water is required for operations and 288 afy will be needed during construction.

The water treatment systems will be supplied by a water treatment specialty company and will include the following components:

- **Granular Activated Carbon Filters.** The granular activated carbon (GAC) filters will be periodically replaced by the treatment company and backwashed offsite. Alum injection will be included before the GAC inlet.
- **Deionization Trailer.** The water treatment vendor will supply a trailer containing deionization media (cation/anion/mixed bed ion-exchange) and columns to make deionized water. When the media have been exhausted, the water treatment company will replace the trailer and re-charge the deionization media offsite. High quality deionized water will be obtained from the flow of water through the system and will be used for steam cycle makeup and auxiliary boiler makeup. Intermediate quality deionized water will be obtained from a take-off prior to the mixed bed treatment and will be used for mirror washing and the wet surface air cooler used in the auxiliary cooling system. Each quality of deionized water will have its own storage tank.
- **Evaporator System.** No reject streams from water treatment are planned to be generated onsite under the planned treatment scheme. A thermal evaporator system will be used to reduce the volume of the process wastewater stream or stormwater streams that cannot be recycled back to the service water tank. The reject from the thermal evaporator will be trucked offsite for disposal at an approved facility.

2.2.5 Plant Cooling Systems

The cycle heat rejection system will consist of an air-cooled steam condenser system. The heat rejection system will receive exhaust steam from the low-pressure section of the steam turbine and feedwater heaters and condense it back to water for reuse. The condenser will be designed to normally operate at a pressure of about 3.2 inches of mercury absolute (0.11 millibar absolute). The condenser will remove heat from the condensing steam up to a maximum of 1,140 million British thermal units per hour (MMBtu/hr), depending on ambient temperature and plant load.

An auxiliary cooling system will cool the generator, steam turbine generator lubrication oil, boiler feed pump lubricating oil, SRSG circulating water pumps, and other equipment requiring cooling. A maximum of 34 MMBtu/hr will be rejected to the atmosphere via a fin-fan heat exchanger. Above 85°F, the fin-fan heat exchanger will be assisted by a wet surface air cooler using intermediate quality deionized water.

2.2.6 Waste Management

Waste management is the process whereby all wastes produced at the project site are properly collected, treated (if necessary), and disposed of. Wastes include process and sanitary wastewater, nonhazardous waste, and hazardous waste, both liquid and solid. Waste management is discussed in more detail in Section 5.14.

2.2.6.1 Wastewater Collection, Treatment, and Disposal

The primary wastewater collection system will collect process wastewater from all of the solar plant equipment, including the boilers and water treatment equipment. To the extent practical, process wastewater will be recycled and reused. Each solar plant and the

administration complex will include a septic tank and leach field system for sanitary water streams, including showers and toilet. When needed, septic tank contents will be removed from site by a sanitary service.

Plant Drains and Oil/Water Separator

General plant drains will collect containment area washdown, sample drains, and drainage from facility equipment drains. Water from these areas will be collected in a system of floor drains, hub drains, sumps, and piping and routed to the wastewater collection system. Drains that potentially could contain oil or grease will first be routed through an oil/water separator. Water from the process wastewater collection system will be returned back into the raw water storage tank. Water passing through the oil/water separator will be reduced in volume by the thermal evaporator, the reject from which will be trucked offsite for disposal.

Power Cycle Makeup Water Treatment Wastes

High quality deionized water from the high quality deionized water tank will be used as the feed water for the power-cycle makeup treatment system.

SRSG and Boiler Blowdown

SRSG and natural-gas-fired boiler blowdown will consist of boiler water discharged from the SRSG and five boilers to control the concentration of dissolved solids and silica within acceptable ranges. The blowdown will be discharged to flash tanks.

Steam from the flash tanks will be recovered back into the steam cycle via the deaerator. Condensate from the flash tanks will be further flashed to atmosphere then cooled and recycled to the raw water storage tank. As an alternative, blowdown may be discharged to the wastewater collection tank for treatment.

2.2.6.2 Solid Wastes

HHSEGS will produce maintenance and plant wastes typical of power generation operations. Generation plant wastes may include oily rags, broken and rusted metal and machine parts, defective or broken electrical materials, empty containers, and other solid wastes, including the typical refuse generated by workers. Solid wastes will be trucked offsite for recycling or disposal (see Section 5.14, Waste Management).

2.2.6.3 Liquid Waste

Waste lubricating oil will be recovered and recycled by a waste oil recycling contractor. Spent lubrication oil filters will be disposed of at an appropriate disposal facility. Workers will be trained to handle hazardous wastes generated at the site.

2.2.6.4 Hazardous Wastes

Several methods will be used to properly manage and dispose of hazardous wastes generated by the project. Chemical cleaning wastes will consist of alkaline and acid cleaning solutions used during pre-operational chemical cleaning of the boilers, and acid cleaning solutions used for chemical cleaning of the boilers after the units are put into service. These wastes, which are subject to high metal concentrations, will be temporarily stored onsite in portable tanks or sumps, and disposed of offsite by the chemical cleaning contractor in

accordance with applicable regulatory requirements. Other hazardous wastes generated onsite are described in Section 5.14.

2.2.7 Management of Hazardous Materials

A variety of chemicals will be stored and used onsite during HHSEGS construction and operation. The storage, handling, and use of all chemicals will be conducted in accordance with applicable laws, ordinances, regulations, and standards (LORS). Section 5.5, Hazardous Materials Handling, provides a description of the types, locations and quantities of hazardous material storage onsite. Chemicals will be stored in appropriate chemical storage facilities. Bulk chemicals will be stored in storage tanks, and most other chemicals will be stored in returnable delivery containers. Chemical storage and chemical feed areas will be designed to contain leaks, spills, and stormwater. Concrete containment pits and drain piping design will allow a full-tank capacity spill without overflowing the containment. For multiple tanks located within the same containment area, the capacity of the largest single tank will determine the volume of the containment area and drain piping. Drain piping for reactive chemicals will be trapped and isolated from other drains to eliminate noxious or toxic vapors.

Safety showers and eyewashes will be provided adjacent to, or in the vicinity of, chemical storage and use areas. Plant personnel will use approved personal protective equipment during chemical spill containment and cleanup activities. Personnel will be properly trained in the handling of these chemicals and instructed in the procedures to follow in case of a chemical spill or accidental release. Adequate supplies of absorbent material will be stored onsite for spill cleanup.

A list of the chemicals anticipated to be used at the project site and their storage locations is provided in Section 5.5, Hazardous Materials Handling. This list identifies each chemical by type, intended use, and estimated quantity to be stored onsite.

2.2.8 Emission Control and Monitoring

Air emissions from the combustion of natural gas in the auxiliary-boilers at each plant will be controlled using appropriate air emission control devices. To ensure that the systems perform correctly, continuous emissions monitoring for oxides of nitrogen (NO_x) and carbon monoxide will be performed. Section 5.1, Air Quality, includes additional information on emission control and monitoring.

2.2.8.1 NO_x Emission Control

The boilers will be provided with ultra-low-NO_x burners and flue gas recirculation to minimize NO_x emissions.

2.2.8.2 Particulate Emission Control

Particulate emissions will be controlled by the use of best combustion practices, the use of natural gas, which is low in sulfur, as the sole fuel for the boilers, and high-efficiency air inlet filtration.

2.2.8.3 Continuous Emission Monitoring

The auxiliary boilers will be equipped with a continuous emission monitoring system (CEMS); the exhaust gas primary elements will be connected to a common CEMS. The CEMS will sample, analyze, and record fuel gas flow rate, NO_x concentration levels, and percentage of oxygen in the exhaust gas from the boiler stacks. The CEMS will transmit data to a data acquisition system that will store the data and generate emission reports in accordance with permit requirements. The data acquisition system will also include alarm features to alert when the emissions approach or exceed pre-selected limits.

For each of the start-up boilers and night preservation boilers, a predictive emissions monitoring system (PEMS) will be used. PEMS are permitted on boilers that are rated at less than 250 MMBTU/hr.

2.2.9 Fire Protection

The fire protection system will be designed to protect personnel and limit property loss and plant downtime in the event of a fire. The system will be designed to limit the spread of any fire generated at the plant site to adjacent land to avoid igniting a wildland fire. The primary source of fire protection water will be the raw water storage tank.

An electric jockey pump and electric-motor-driven main fire pump will be provided to increase the water pressure in the plant fire main to the level required to serve all fire fighting systems. In addition, a back-up, diesel-engine-driven fire pump will be provided to pressurize the fire loop if the power supply to the electric-motor-driven main fire pump fails. A fire pump controller will be provided for each fire pump.

The fire pump will discharge to a dedicated underground firewater loop piping system. Normally, the jockey pump will maintain pressure in the firewater loop. Both the fire hydrants and the fixed suppression systems will be supplied from the firewater loop. Fixed fire suppression systems will be installed at determined fire risk areas such as the transformers and turbine lube oil equipment. Sprinkler systems will also be installed in the administration complex buildings and fire pump enclosure as required by National Fire Protection Association (NFPA) and local code requirements. Handheld fire extinguishers of the appropriate size and rating will be located in accordance with NFPA 10 throughout the facility. Onsite personnel will be trained in the use of fire protection equipment and will be the first responders to an incident.

Section 5.5, Hazardous Materials Handling, includes additional information for fire and explosion risk, and Section 5.10, Socioeconomics, provides information on local fire protection capability.

2.2.10 Plant Auxiliaries

The following systems will support, protect, and control the generating facility.

2.2.10.1 Lighting

The lighting system will provide personnel with illumination for operation under normal conditions and for egress under emergency conditions, and will include emergency lighting to perform manual operations during an outage of the normal power source. The system

also will provide 120-volt AC convenience outlets for portable lamps and tools. Exterior light fixtures will utilize technologies to reduce light pollution.

2.2.10.2 Grounding

The electrical system is susceptible to ground faults, lightning, and switching surges that result in high voltage that constitute a hazard to site personnel and electrical equipment. The station grounding system will provide an adequate path to permit the dissipation of current created by these events.

The station grounding grid will be designed for adequate capacity to dissipate the ground fault current from the ground grid under the most severe conditions in areas of high ground fault current concentration. The grid spacing will maintain safe voltage gradients.

Bare conductors and ground rods will be installed below-grade in a grid pattern. Each junction of the grid will be bonded together by an exothermic weld.

Ground resistivity readings will be used to determine the necessary numbers of ground rods and grid spacing to ensure safe step and touch potentials under severe fault conditions.

Grounding conductors will be brought from the ground grid to connect to building steel and non-energized metallic parts of electrical equipment.

2.2.10.3 Distributed Control System

The DCS provides modulating control, digital control, monitoring, and indicating functions for the plant power block systems. The DCS will provide the following functions:

- Controlling the STG, SRSG, heliostat mirrors, and other systems in a coordinated manner
- Controlling the balance-of-plant systems in response to plant demands and operator
- Monitoring controlled plant equipment and process parameters and delivery of this information to plant operators
- Providing control displays (printed logs, video monitors) for signals generated within the system or received from I/O
- Providing consolidated plant process status information through displays presented in a timely and meaningful manner
- Providing alarms for out-of-limit parameters or parameter trends, displaying on alarm video monitors(s), and recording on an alarm log printer
- Providing storage and retrieval of historical data

The DCS will be a redundant microprocessor-based system and will consist of the following major components:

- Personal computer-based operator consoles with liquid-crystal diode video monitors
- Engineer workstation

- Distributed processing units
- I/O cabinets and cards
- Historical data unit or historian
- Printers
- Data links to the steam turbine control systems

The DCS will have a functionally distributed architecture comprising a group of similar redundant processing units linked to a group of operator consoles and the engineer workstation by redundant data highways. Each processor will be programmed to perform specific dedicated tasks for control information, data acquisition, annunciation, and historical purposes. By being redundant, no single processor failure can cause or prevent a unit trip.

The DCS will interface with the control systems furnished by heliostat mirror and STG suppliers to provide remote control capabilities, as well as data acquisition, annunciation, and historical storage of turbine and generator operating information.

The system will be designed with sufficient redundancy to preclude a single device failure from significantly affecting overall plant control and operation. This also will allow critical control and safety systems to have redundancy of controls, as well as an uninterruptible power source.

As part of the quality control program, daily operator logs will be available for review to determine the status of the operating equipment.

2.2.10.4 Cathodic Protection

The cathodic protection system will be designed to control the electrochemical corrosion of designated metal piping buried in the soil. Depending on the corrosion potential and the site soils, either passive or impressed current cathodic protection will be provided.

2.2.10.5 Service Air

The service air system will supply compressed air to hose connections for general plant use. Service air headers will be routed to hose connections located at various points throughout the facility.

2.2.10.6 Instrument Air

The instrument air system will provide dry air to pneumatic operators and devices. An instrument air header will be routed to locations within the facility equipment areas and within the water treatment facility where pneumatic operators and devices will be located.

2.2.11 Project Schedule

Construction of HHSEGS, from perimeter fencing to site preparation and grading to commercial operation, is expected to take place from the third quarter of 2012 to the second quarter of 2015 (29 months total). Major milestones are listed in Table 2.2-2; however, the construction order may change. Construction of the common area facilities would occur concurrently with the construction of the first plant.

TABLE 2.2-2
Project Schedule Major Milestones

Activity	Date
Solar Plant 1	
Fencing and tortoise clearance	Third Quarter 2012
Begin construction	Fourth Quarter 2012
Startup and commissioning	Fourth Quarter 2014
Commercial operation	First Quarter 2015
Solar Plant 2	
Fencing and tortoise clearance	Third Quarter 2012
Begin construction	First Quarter 2013
Startup and commissioning	First Quarter 2015
Commercial operation	Second Quarter 2015

There will be an average and peak workforce of approximately 634 and 1,033 respectively, of construction craft people, supervisory, support, and construction management personnel onsite during construction. The peak construction site workforce level is expected to occur in month 14.

Noisy construction activities occurring within 500 feet of existing noise sensitive uses will be limited to the hours of 7:00 a.m. to 7:00 p.m. Monday through Saturday. Generally, construction activities will occur from 5:00 a.m. to 3:30 p.m. with a swing shift during heliostat assembly from 6:00 p.m. to 4:00 a.m. Additional hours may be necessary to make up schedule deficiencies, or to complete critical construction activities (e.g., tower construction, foundation pouring, or working around time-critical shutdowns and constraints). During some construction periods and during the startup phase of the project, some activities will continue 24 hours per day, 7 days per week.

2.2.12 Generating Facility Operation

Management, engineering, administrative staff, skilled workers, and operators will serve both plants. HHSEGS is expected to employ up to 120 full-time employees: 36 at Solar Plant 1 (including mirror washing machine operators), 36 at Solar Plant 2 (including mirror washing machine operators), and 48 at the administration complex. The facility will operate 7 days a week.

Detailed long-term maintenance schedules are currently unavailable, but will include periodic maintenance and overhauls in accordance with manufacturer recommendations. To maintain heliostat performance, nighttime labor demand includes an average 10 hours of mirror washing per day, covering the entire solar field every 2 weeks.

HHSEGS is expected to have an annual plant availability of 92 to 98 percent. It will be possible for plant availability to exceed 98 percent for a given 12-month period.

The facility may be operated in one of the following modes:

- The facility would be operated at its maximum continuous output for as many hours per year as solar input allows.
- A full shutdown will occur if forced by equipment malfunction, transmission or gas line disconnect, or scheduled maintenance.

2.3 Engineering

In accordance with CEC regulations, this section, together with the engineering appendixes and Section 4.0, Natural Gas Supply, presents information concerning the design and engineering of HHSEGS. The LORS applicable to the engineering of the project are provided along with a list of agencies that have jurisdiction, the contact persons within those agencies, and a list of the permits that will be required.

2.3.1 Facility Design

A description of the project is provided in Section 2.2, Generating Facility Description, Design, and Operation. Design for safety is provided in Section 2.3.1.1, Facility Safety Design. Appendix 5.4A contains a preliminary geotechnical report for the project site based on borings taken at the site.

Descriptions of the design criteria are included in the following appendixes:

- Appendix 2A, Civil Engineering Design Criteria
- Appendix 2B, Structural Engineering Design Criteria
- Appendix 2C, Mechanical Engineering Design Criteria
- Appendix 2D, Electrical Engineering Design Criteria
- Appendix 2E, Control Engineering Design Criteria
- Appendix 2F, Chemical Engineering Design Criteria
- Appendix 2G, Geologic and Foundation Design Criteria

Design and engineering information and data for the following systems are found in the following sections of this AFC:

- **Power Generation**—See Section 2.2.1, Process Description. Also see Appendix 2C and Sections 2.2.2 through 2.2.11, which describe the various plant auxiliaries.
- **Heat Dissipation**—See Section 2.2.5, Plant Cooling Systems, and Appendix 2C.
- **Air Emission Control System**—See Section 2.2.8, Emission Control and Monitoring, and Section 5.1, Air Quality.
- **Waste Disposal System**—See Section 2.2.6 and Section 5.14, Waste Management.
- **Noise Abatement System**—See Section 5.7, Noise.
- **Switchyards/Transformer Systems**—See Section 2.2.2, Major Electrical Equipment and Systems; Section 2.2.10.2, Grounding; Section 2.2.2.1, AC Power-Transmission; Section 3.0, Transmission System Engineering; and Appendix 2D.

2.3.1.1 Facility Safety Design

HHSEGS will be designed to maximize safe operation. Potential hazards that could affect the facility include earthquake, flood, and fire. The project will be designed in accordance with all applicable codes regarding these hazards. Facility operators will be trained in safe operation, maintenance, and emergency response procedures to minimize the risk of personal injury and damage to the facility.

Natural Hazards

The principal natural hazard associated with the project site is earthquakes. Structures will be designed to meet the seismic requirements of California Code of Regulations Title 24 and the 2010 California Building Standards Code (CBC). Section 5.4, Geologic Hazards and Resources, includes a review of potential geologic hazards, seismic ground motion, and potential for soil liquefaction due to ground-shaking. Potential seismic hazards will be mitigated by implementing the 2010 CBC construction guidelines. Appendix 2B, Structural Engineering, includes the structural seismic design criteria for the buildings and equipment.

The project site is affected by two Federal Emergency Management Agency (FEMA) Special Flood Hazard Zones. According to FEMA, these flood hazard zones are classified as Zone A, which is defined as an area subject to flooding by the 1 percent annual chance flood with no base flood elevation determined. More information on flooding is provided in Section 5.15, Water Resources.

Emergency Systems and Safety Precautions

This subsection discusses the fire protection systems, emergency medical services, and safety precautions to be used by project personnel. Section 5.10, Socioeconomics, includes additional information on area medical services and emergency systems; and Section 5.16, Worker Health and Safety, includes additional information on safety for workers. Appendixes 2A through 2G contain the design practices and codes applicable to safety design for the project. Compliance with these requirements will minimize project effects on public and employee safety.

Fire Protection Systems

The project will rely on both onsite fire protection systems and local fire protection services.

Onsite Fire Protection Systems

The fire protection systems are designed to protect personnel and limit property loss and plant downtime from fire or explosion. The project will have the following fire protection systems:

- **Steam Turbine Lube Oil Areas Water Spray System.** This system provides suppression for the steam turbine area lube oil piping and lube oil storage.
- **Fire Hydrants/Hose Stations.** This system will supplement the facility's fixed fire suppression systems. Water will be supplied from the fire water system.
- **Fire Extinguisher.** The administrative complex buildings, plant facilities, and other structures will be equipped with fixed fire suppression systems and portable fire extinguishers as required by the local fire department.

Local Fire Protection Services

The project site is within the Southern Inyo Fire Protection Department jurisdiction. Tecopa station has nine personnel (one full-time and eight volunteers) and Mt. Charleston View location has five volunteer fire fighters. The response time for Mt. Charleston and Tecopa locations are 10 minutes and 30 minutes, respectively. Additional information on fire services is provided in Section 5.10, Socioeconomics.

Personnel Safety Program

HHSEGS will operate in compliance with federal and state occupational safety and health program requirements. Compliance with these programs will minimize project effects on employee safety. These programs are described in Section 5.16, Worker Health and Safety.

2.3.2 Facility Reliability

This subsection discusses the expected facility availability, equipment redundancy, fuel availability, water availability, and project quality control measures.

2.3.2.1 Facility Availability

It is anticipated that the facility will normally operate at high average annual capacity factors during periods of sunlight. HHSEGS will be designed for an operating life of 25 to 30 years. Reliability and availability projections are based on this operating life. Operation and maintenance procedures will be consistent with industry standard practices to maintain the useful life status of plant components.

The percent of time that the solar plants are projected to be operated is defined as the service factor. The service factor considers the amount of time that a unit is operating and generating power, whether at full or partial load. The projected service factor for the power block, which considers projected percent of time of operation, differs from the equivalent availability factor (EAF), which considers the projected percent of energy production capacity achievable.

The EAF, which is a weighted average of the percent of energy production capacity achievable, differs from the availability of a unit, which is the percent of time that a unit is available for operation, whether at full load, partial load, or standby. The projected equivalent availability factor for the project is estimated to be approximately 92 to 98 percent.

2.3.2.2 Redundancy of Critical Components

The following subsection identifies equipment redundancy as it applies to project availability. A summary of equipment redundancy is shown in Table 2.3-1. Final design could differ.

TABLE 2.3-1
Major Equipment Redundancy

Description	Number	Note
Solar Receiver Steam Generators	One per plant	
SRSG Superheater	One per plant	
SRSG Circulating Pumps	Four – 25 percent capacity per plant	Two spares per plant in warehouse
STG	One per plant	
Boiler feedwater pump – Turbine Driven	One – 100 percent capacity per plant	One spare per plant in warehouse (consisting of a spare pump cartridge and key spare parts for turbine drive)
Boiler feedwater pump – Motor Driven	One – 100 percent capacity per plant	One spare in warehouse
Condensate pumps	Two – 50 percent capacity per plant	One spare in warehouse
Condenser	One per plant	
Demineralization trailer	Two – 100 percent capacity per plant	

Power Block

Each solar plant will have one SRSG. Thermal energy from the steam generation system will be converted to mechanical energy, and then electrical energy in the STG. The expanded steam from the STG will be condensed and recycled to the feedwater system.

The major components of each solar plant's power block are described below. The power block is served by the balance-of-plant systems described in Sections 2.2.3 through 2.2.11.

TABLE 2.3-2
Power Block Major Equipment and Facility List

Steam Turbine	SRSG, including a Superheater
Generator	Solar Power Tower
Auxiliary Boilers	Switchyard
Air-cooled Condenser	Generator Step-up Transformer
Feed Water Heaters	Unit Auxiliary Transformer
Boiler Feed Pumps	Station Services Transformer
Plant Services Building	Raw Water/Fire Water Tank
Water Treatment Equipment Area	HQ & IQ Demineralized Water Tanks
Underground Gas Pipeline	Raw Water Forwarding Pumps
Condensate Tank/Pump	Demineralized Water Forwarding Pumps
Emergency Generator	Access Roadway
Local Control Building	230-kV Generation Tie Line

Steam Generation Subsystems

The steam generation subsystems consist of the SRSG including superheater, circulation pumps and blowdown systems. The SRSG collects solar energy from the heliostat mirrors and transfers it to feedwater for steam production. This heat transfer produces steam at the pressures and temperatures required by the steam turbine. The blowdown system maintains feedwater quality. The system includes safety and auto relief valves and processing of continuous and intermittent blowdown streams.

Steam Turbine Generator Subsystems

The steam turbine converts the thermal energy in the steam to mechanical energy to drive the generator. The basic subsystems include the steam turbine and auxiliary systems, turbine lube oil system, and generator/exciter system. The generator will be air-cooled.

Distributed Control System

The DCS will be a redundant microprocessor-based system that will provide the following functions:

- Control the heliostat mirrors, STG, and other systems in response to unit load demands (coordinated control)
- Provide control room operator interface
- Monitor plant equipment and process parameters and provide this information to the plant operators in a meaningful format
- Provide visual and audible alarms for abnormal events based on field signals or software-generated signals from plant systems, processes, or equipment

The DCS will have functionally distributed architecture comprising a group of similar redundant processing units linked to a group of operator consoles and an engineer workstation by redundant data highways. Each redundant processor pair will be programmed to perform specific dedicated tasks for control information, data acquisition, annunciation, and historical purposes.

Plant operation will be controlled from the operator panel located in the control room. The operator panel will consist of two individual video/keyboard consoles and one engineering workstation. Each video/keyboard console will be an independent electronic package so that failure of a single package does not disable more than one video/keyboard. The engineering workstation will allow the control system operator interface to be revised by authorized personnel.

Boiler Feedwater System

The boiler feedwater system transfers feedwater from the deaerator to the SRSG. The system will consist of one turbine-driven pump and one motor-driven pump, each pump sized for 100 percent capacity for supplying the SRSG. The pumps will be multistage, horizontal, with intermediate bleed-off, and will include regulating control valves, minimum flow recirculation control, and other associated piping and valves. One spare turbine-driven pump (spare pump cartridge and key spare parts for turbine drive) and one spare motor-driven pump will be available for the project.

Condensate System

The condensate system will provide a flow path from the air-cooled condenser hotwell to the deaerator. The condensate system will include two 50-percent-capacity multistage, vertical, motor-driven condensate pumps. One spare condensate pump will be available for the project.

Demineralized Water System

The demineralized water system will consist of a filter and demineralizer train from an onsite water treatment system consisting of GAC filters, deionization columns, and a mixed bed polisher. Both high quality and intermediate quality demineralized water will be produced by each unit. The unit will be a self-contained trailer-mounted unit. High quality demineralized water will be stored in the high quality demineralized water storage tank. Intermediate quality demineralized water will be stored in an intermediate quality demineralized water storage tank. Boiler feedwater make-up water will be from the high quality demineralized water storage tank.

Power Cycle Makeup and Storage

The power cycle makeup and storage subsystem provides high quality demineralized water storage and pumping capabilities to supply high-purity water for system cycle makeup and chemical cleaning operations. Major components of the system are the demineralized water trailers; high quality demineralized water storage tank; and two 100-percent-capacity, horizontal, centrifugal, cycle makeup water pumps.

Compressed Air

The compressed air system provides instrument air and service air to points of use throughout the facility. The compressed air system will include two 100-percent-capacity motor-driven air compressors, two air dryers with pre-filters and after-filters, an air receiver, instrument air header, and service air header. All instrument air will be dried. A control valve will be provided in the service air header to prevent high consumption of service air from reducing the instrument air header pressure below critical levels.

2.3.2.3 Fuel Availability

Natural gas will be delivered via pipeline as described previously and in Section 4.0, Natural Gas Supply.

2.3.2.4 Water Availability

The project will use up to 140 afy of well water for general process use. The boiler blowdown will be flashed into steam and condensate and the remaining water will be used to wash mirrors.

Potable water for drinking, safety showers, fire protection water, service water, and sanitary uses will be served from the onsite wells and treated appropriately.

The availability of water to meet the needs the project is discussed in more detail in Section 5.15, Water Resources.

2.3.2.5 Project Quality Control

The objective of the HHSEGS quality control program is to ensure that all systems and components have the appropriate quality measures applied; whether it is during design, procurement, fabrication, construction, or operation. The goal of the quality control program is to achieve the desired levels of safety, reliability, availability, operability, constructability, and maintainability for the generation of electricity.

The required quality assurance for a system is obtained by applying controls to various activities, according to the activity being performed. For example, the appropriate controls for design work are checking and review, and the appropriate controls for manufacturing and construction are inspection and testing. Appropriate controls will be applied to each of the various activities for the project.

Project Stages

For quality assurance planning purposes, the project activities have been divided into the following nine stages that apply to specific periods of time during the project:

1. **Conceptual Design Criteria.** Activities such as definition of requirements and engineering analyses.
2. **Detail Design.** Activities such as the preparation of calculations, drawings, and lists needed to describe, illustrate, or define systems, structures, or components.
3. **Procurement Specification Preparation.** Activities necessary to compile and document the contractual, technical, and quality provisions for procurement specifications for plant systems, components, or services.
4. **Manufacturer's Control and Surveillance.** Activities necessary to ensure that the manufacturers conform to the provisions of the procurement specifications.
5. **Manufacturer Data Review.** Activities required to review manufacturers' drawings, data, instructions, procedures, plans, and other documents to ensure coordination of plant systems and components, and conformance to procurement specifications.
6. **Receipt Inspection.** Inspection and review of product at the time of delivery to the construction site.
7. **Construction/Installation.** Inspection and review of storage, installation, cleaning, and initial testing of systems or components at the facility.
8. **System/Component Testing.** Actual operation of generating facility components in a system in a controlled manner to ensure that the performance of systems and components conform to specified requirements.
9. **Plant Operation.** Operation of the facility's systems and equipment by operations personnel according to manufacturer's recommendations and instructions.

As the project progresses, the design, procurement, fabrication, erection, and checkout of the facility system will progress through the nine stages defined above.

Quality Control Records

The following quality control records will be maintained for review and reference:

- Project instructions manuals
- Design calculations
- Project design manual
- Quality assurance audit reports
- Conformance to construction records drawings
- Procurement specifications (contract issue and change orders)
- Purchase orders and change orders
- Project correspondence

For procured component purchase orders, a list of qualified suppliers and subcontractors will be developed. Before contracts are awarded, the subcontractors' capabilities will be evaluated. The evaluation will consider suppliers and subcontractors' personnel, production capability, past performance, and quality assurance program.

During construction, field activities are accomplished during the last four stages of the project: receipt inspection, construction/installation, system/component testing, and plant operations. The construction contractor will be contractually responsible for performing the work in accordance with the quality requirements specified by contract.

The subcontractors' quality compliance will be surveyed through inspections, audits, and administration of independent testing contracts.

A plant operation and maintenance program, typical of a project this size, will be implemented by the applicant to control operation and maintenance quality. A specific program for this project will be defined and implemented during initial plant startup.

2.4 Project Construction

2.4.1 General Design Considerations and Construction

The technology proposed for this project allows for several strategies to reduce environmental impacts and take advantage of the site's natural attributes. These include the following.

- Cutting vegetation to a height that will not interfere with construction and operation of the heliostat fields but not clearing or grading the entire field
- Restricting clearing and grading activities to areas where foundations, drainage facilities, and all-weather roads must be placed
- Taking advantage of the natural permeability of the alluvium at the site by minimizing compaction and decompacting soils where necessary
- Implementing a stormwater control design that promotes sheet flow and greater infiltration

2.4.1.1 General Grading and Leveling

The surface soil grade of each area will be designed to provide the minimum requirements for access of installation equipment and materials during site construction and operations. Most of the natural drainage features will be maintained and any grading required will be designed to promote sheet flow where possible. Areas disturbed by grading and other ground disturbance will be protected from erosion by implementation of appropriate best management practices (BMPs) that will be identified in the project's Construction Stormwater Pollution Prevention Plan (SWPPP) a draft of which is provided in Appendix 5.15B.

Heavy to medium grading will be performed within each plant's solar power tower and power block areas, for the switchyard, within the administration complex area, and for the heliostat assembly buildings. The deepest excavations will be restricted to foundations and sumps. Within each of these individual areas, earthwork cuts and fills will be balanced to the degree possible. The earthwork within the power blocks and common area will be excavated and compacted to the recommendations of the associated geotechnical report.

At some washes, limited grading may be required. Surface rocks and boulders will need to be relocated to allow proper installation of heliostats and facilities when they cannot be avoided.

2.4.1.2 Storm Drainage System

The majority of the project site will maintain the original grades and natural drainage features and, therefore, will require no added storm drainage control. In limited areas, such as the power blocks, switchyard, heliostat assembly buildings and administrative areas, the stormwater management system will include diversion channels, bypass channels, or swales to direct run-on flow from up-slope areas and run-off flow through and around each facility. Diversion channels will be designed so that a minimum ground surface slope of 0.5 percent will be provided to allow positive, puddle-free drainage. To reduce erosion, storm drainage channels may be lined with a nonerodible material such as compacted rip-rap, geo-synthetic matting, or engineered vegetation. The design will be developed for sheet flow for all storm events less than or equal to a 100-year, 24-hour storm event.

All surface runoff during and after construction will be controlled in accordance with the requirements of the Drainage, Erosion, and Sedimentation Control Plan, and all other applicable LORS.

2.4.1.3 Erosion and Sediment Control Measures

Protection of soil resources will be an important factor in the design of the erosion and sedimentation controls. To minimize wind and water erosion, open spaces will be preserved and left undisturbed maintaining existing vegetation to the extent possible with respect to site topography and access requirements. Areas compacted during construction activities will be restored, as appropriate, to approximate preconstruction compaction levels to minimize the opportunity for any increase in surface runoff.

If needed, stone filters and check dams will be strategically placed throughout the project site to provide areas for sediment deposition and to promote the sheet flow of stormwater prior to leaving the project site boundary. Where available, native materials (rock and

gravel) will be used for the construction of the stone filter and check dams. Diversion berms will be used to redirect stormwater around critical facilities, as required.

Periodic maintenance will be conducted as required after major storm events and when the volume of material behind the check dams exceeds 50 percent of the original volume. Stone filters and check dams are not intended to alter drainage patterns but to minimize soil erosion and promote sheet flow

2.4.2 Heliostat Field Preparation

Vegetation clearing, grubbing, and contour smoothing in the heliostat fields will occur where necessary to allow for equipment access and stormwater management. In areas where these activities are not required for access or construction, the vegetation will not be removed but will be mowed (if needed) to a height of approximately 12 to 18 inches.

A linear swath of vegetation along the outer edge of each heliostat field will be cleared, grubbed and smoothed to create an external perimeter path for installation and maintenance of the tortoise and security fence and associated external perimeter inspection roads. Grading of the roads will be performed in limited areas to afford safe passage of vehicles. To allow for external roads, the setback area from the property line will be a minimum of 8 to 12 feet between the tortoise fence and the property line. Additional setbacks may be required due to installation of gas and electric utilities. Elsewhere, vegetation will remain but will be cut (when necessary) to a height that will allow clearance for heliostat function while leaving the root structures intact. Occasional cutting of the vegetation will be performed as needed to permit unobstructed heliostat mirror movement.

Drive zones will be used for installation of the heliostats and then subsequent washing of the mirrors. The drive zones will be located approximately every 152 feet in a circumferential fashion surrounding the power blocks (see Figure 2.1-2). The drive zones will be approximately 20 feet wide and will be cleared, grubbed, smoothed, and rolled to permit safe and efficient installation of the heliostats and washing of the mirrors. The shoulders of washes crossed by the drive zones will be graded as necessary to permit safe passage of vehicles for installation and maintenance activities.

2.4.2.1 Installation of Heliostats

The heliostats will be installed in two steps. Initially, the support pylons will be installed using vibratory technology to insert the pylons into the ground (pre-augering prior to the installation of the pylon may be required). Then, the heliostat assembly (mirrors, support structure and aiming system) will be mounted on the pylon. The majority of the project site will maintain the original grades and natural drainage features, and therefore, construction will require machines that are maneuverable and can negotiate the terrain. The siting of pylons will be guided by global positioning system (GPS) technology. Pylons will be delivered to their locations by an all-terrain vehicle. Installation of the heliostat assemblies will be accomplished with a rough terrain crane. The crane will be able to mount heliostat assemblies on several pylons before moving to the next location.

2.4.3 Construction of Power Blocks

Project construction will commence with the building of site roads and the installation of temporary construction facilities including office trailers, parking areas, material laydown areas, a concrete batch plant, and a heliostat assembly facility. The construction of each plant will begin with the excavation and placement of foundations and other underground facilities. Superstructures and equipment will then be placed on the foundations. Major items include the 750-foot-tall solar power tower and SRSG construction, the STG pedestal and STG, and construction of the air-cooled condenser. Once the mechanical equipment is in place, construction will continue with the installation of the piping, electrical equipment, and cables necessary to connect and power the equipment. Upon completion of construction, the checkout, testing, startup and commissioning of the various plant systems will begin resulting in a fully operational solar plant.

2.5 Facility Closure

Facility closure can be temporary or permanent. Temporary closure is defined as a shutdown for a period exceeding the time required for normal maintenance, including closure for overhaul or replacement of the steam turbine. Causes for temporary closure include a disruption in the supply of natural gas or damage to the plant 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 plant age, damage to the plant beyond repair, economic conditions, or other reasons. Section 2.5.1 discusses temporary facility closure; Section 2.5.2 discusses permanent facility closure.

2.5.1 Temporary Closure

For a temporary facility closure, where there is no release of hazardous materials, security of the facilities will be maintained on a 24-hour basis. The CEC would be notified. Other responsible agencies would also be notified as necessary and appropriate. Depending on the length of shutdown necessary, a contingency plan for the temporary cessation of operations will be implemented. The contingency plan will be conducted to ensure conformance with all applicable LORS and the protection of public health, safety, and the environment. The plan, depending on the expected duration of the shutdown, may include the draining of all chemicals from storage tanks and other equipment and the safe shutdown of all equipment. All wastes will be disposed of according to applicable LORS, as discussed in Section 5.14, Waste Management.

Where the temporary closure includes damage to the facility, and there is a release or threatened release of regulated substances or other hazardous materials into the environment, procedures will be followed as set forth in a Risk Management Plan and a Hazardous Materials Business Plan to be developed as described in Section 5.5, Hazardous Materials Handling. Procedures will include methods to control releases, notification of applicable authorities and the public, emergency response, and training for plant personnel in responding to and controlling releases of hazardous materials. Once the immediate problem is solved, and the regulated substance/hazardous material release is contained and cleaned up, temporary closure will proceed as described above for a closure where there is no release of hazardous materials.

2.5.2 Permanent Closure

When the facility is permanently closed, the closure procedure will follow a plan that will be developed. The removal of the facility from service, or decommissioning, may range from mothballing to the removal of all 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 CEC when more information is available and the timing for decommissioning is more imminent.

To ensure that public health and safety and the environment are protected during decommissioning, a decommissioning plan will be submitted to the CEC for approval prior to decommissioning. The plan will address the following:

- Proposed decommissioning activities for the facility and all appurtenant facilities constructed as part of the facility
- Conformance of the proposed decommissioning activities to all applicable LORS and local/regional plans
- Activities necessary to restore the site if the plan requires removal of all equipment and appurtenant facilities
- Decommissioning alternatives other than complete restoration
- Associated costs of the proposed decommissioning and the source of funds to pay for the decommissioning

In general, the decommissioning plan for the facility will attempt to maximize the recycling of all facility components. The Applicant will attempt to sell unused chemicals back to the suppliers or other purchasers or users. All equipment containing chemicals will be drained and shut down to ensure public health and safety and to protect the environment. All nonhazardous wastes will be collected and disposed of in appropriate landfills or waste collection facilities. All hazardous wastes will be disposed of according to all applicable LORS. The site will be secured 24 hours per day during the decommissioning activities.

2.6 Laws, Ordinances, Regulations, and Standards

The LORS listed in Section 2.6.1 are generally applicable to the engineering aspects of the project. The applicable local LORS for administration and enforcement are described in Section 2.6.2. LORS for the environmental aspects are provided in each of their subsections in Section 5.0 of the AFC.

2.6.1 General Laws, Ordinances, Regulations, and Standards

- California Building Standards Code—2010
- Uniform Fire Code, Article 80
- Occupational Safety and Health Act—29 Code of Federal Regulations (CFR) §1910 and 29 CFR §1926

- Environmental Protection Agency—40 CFR §60, 40 CFR §75, 40 CFR §112, 40 CFR §302, 40 CFR §423, 40 CFR §50, 40 CFR §100, 40 CFR §260, 40 CFR §300, and 40 CFR §400
- California Code of Regulations—Title 8, Sections 450 and 750 and Title 24, 2001, Titles 14, 17, 19, 20, 22, 23, 26, and 27
- California Department of Transportation—Standard Specifications
- California Occupational Safety and Health Administration—Regulations and Standards
- California Business and Professions Code—Sections 6704, 6730, and 6736
- California Vehicle Code—Section 35780
- California Labor Code—Section 6500
- Federal Aviation Agency—Obstruction Marking and Lighting AC No. 70/7460-1H

Codes and standards pertinent to the generating facility are presented in Engineering Appendixes 2A through 2G.

2.6.2 Local LORS

HHSEGS is consistent with the Inyo County General Plan and zoning requirements for the development of a solar energy facility (see Section 5.6, Land Use).

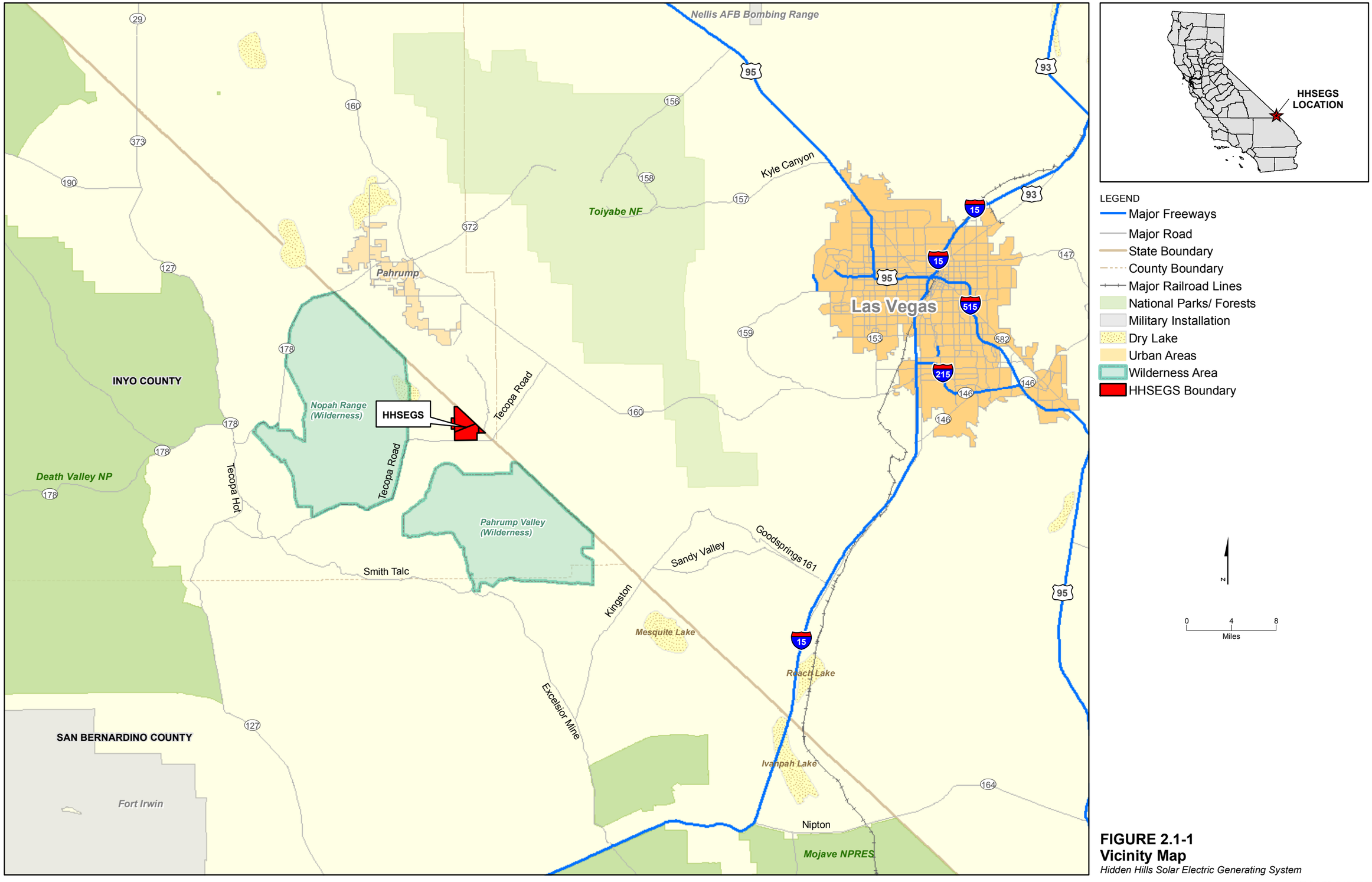

FIGURE 2.1-1
Vicinity Map
Hidden Hills Solar Electric Generating System

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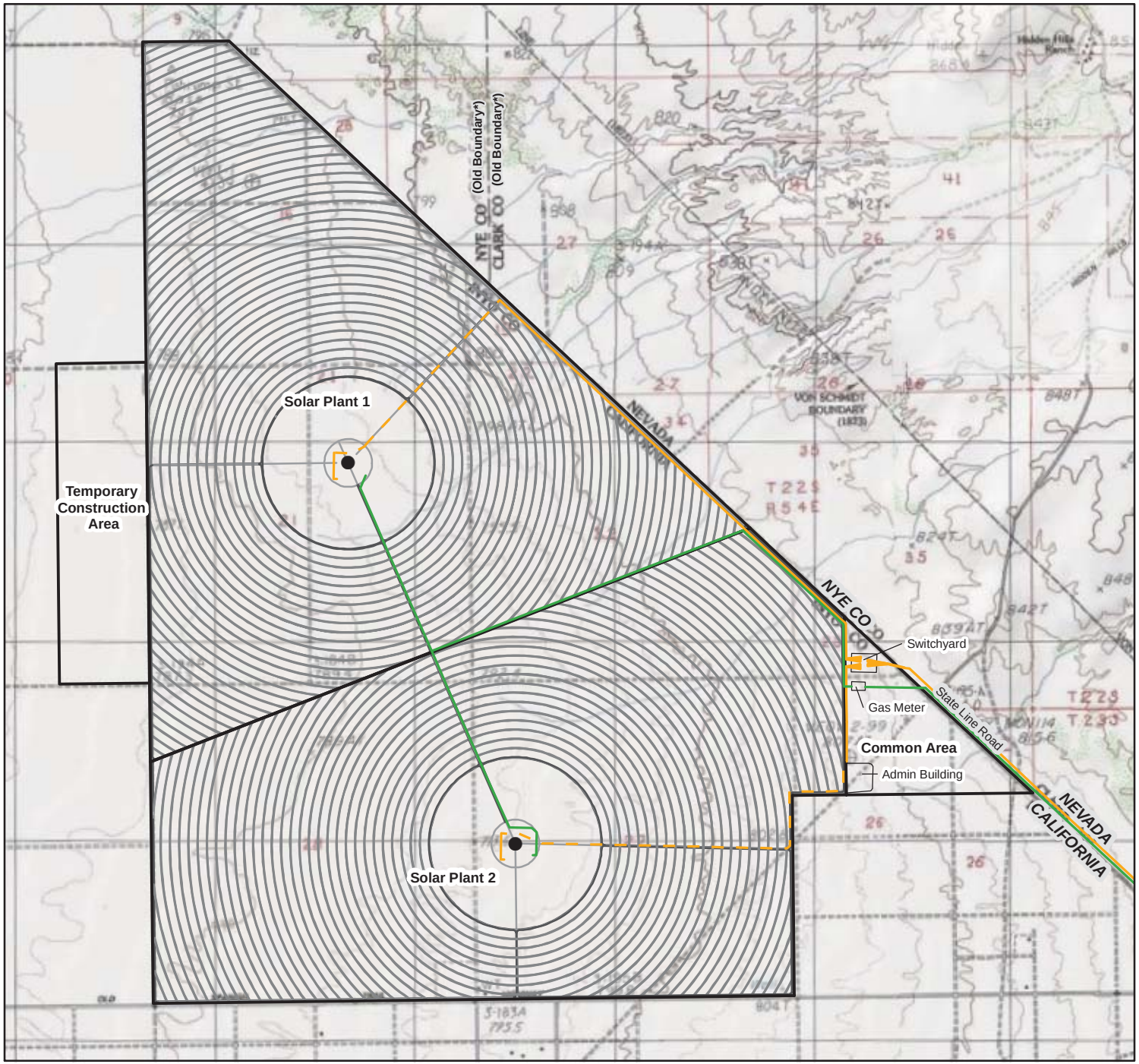

LEGEND

- Solar Power Towers
- Proposed Gasline
- Transmission Line
- Underground Transmission Line
- Solar Field Heliostat Arrays
- Access Roads
- HHSEGS Boundary

*County boundary moved due to annexation, 2001

N

0 1,200 2,400
Feet

Figure 2.1-2
Site Plan and Linear Facilities
Hidden Hills Solar Electric Generating System

SAC \\ZION\SACGIS\PROJ\SOLARPROJECTS\HIDDENHILLS\MAPFILES\2011_HIDDENHILLS\AFC_MAPS\PROJECT_DESCRIPTION\SITE_PLAN_8X11.MXD SSCOPES 7/27/2011 9:01:04 AM

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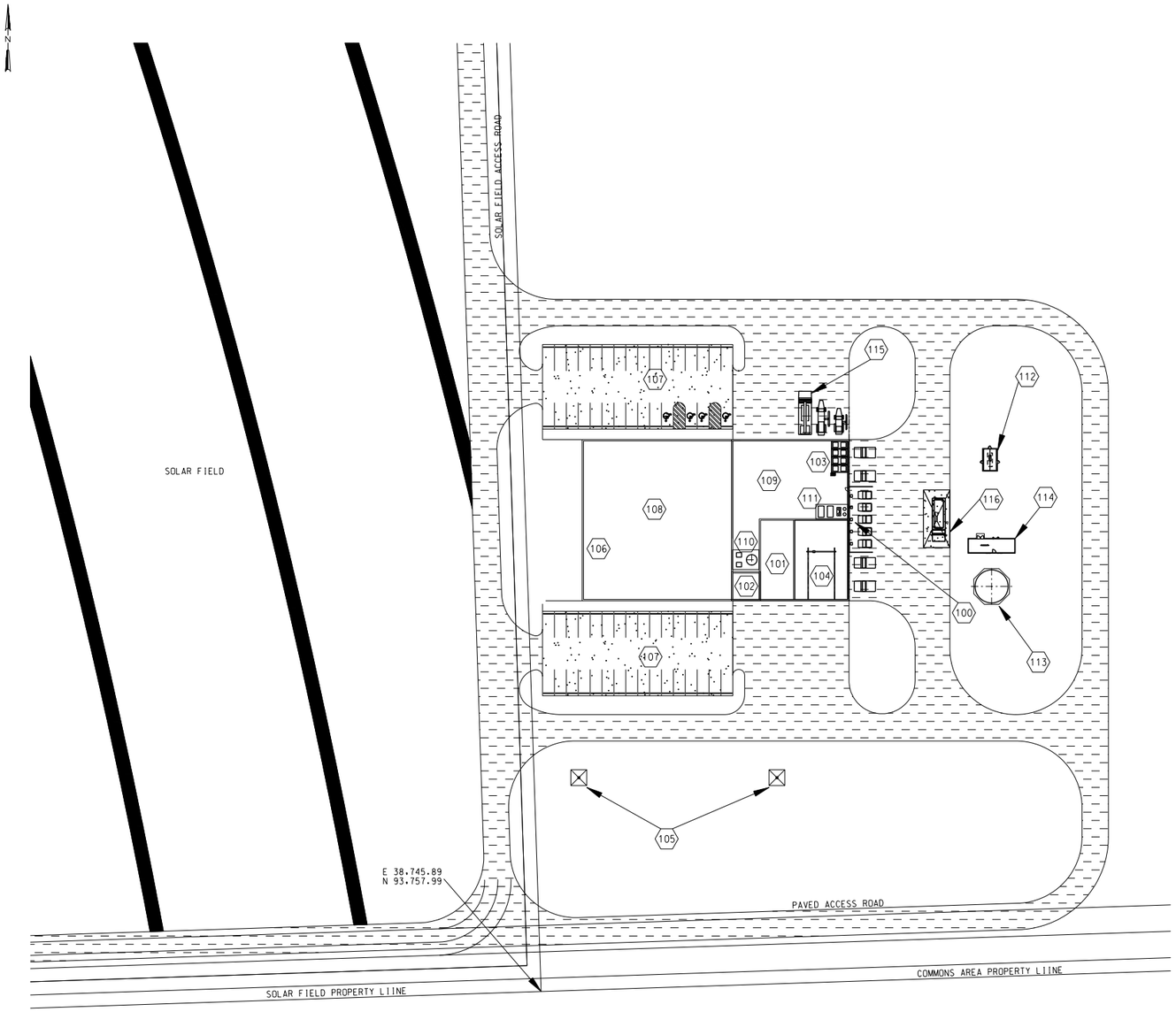

EQUIPMENT LEGEND CONTINUED FROM DWG. P-1000

- 100 BATTERY CHARGING STATION
- 101 MECHANICAL MAINTENANCE SHOP
- 102 ELECTRICAL / INSTRUMENT MAINTENANCE SHOP
- 103 BULK CHEMICAL STORAGE
- 104 VEHICLE MAINTENANCE SHOP
- 105 GROUND WATER WELLS
- 106 CONTROL ROOM
- 107 PARKING
- 108 ADMINISTRATION
- 109 WAREHOUSE
- 110 POTABLE WATER GENERATION
- 111 AIR COMPRESSOR SKID
- 112 EMERGENCY DIESEL GENERATOR
- 113 FIRE / SERVICE WATER STORAGE TANK
- 114 FIRE WATER PUMP HOUSE
- 115 SPARE WASH TRUCKS
- 116 DIESEL FUEL TRUCK PARKING

NORMAL GRADE ELEV. 2,648'-0"

50 0 50 100

Scale: 1 INCH = 50 FEET

FIGURE 2.1-3
Site Plan of Common Area
Hidden Hills Solar Electric Generating System

Source: BrightSource Industries, Drawing P-1001.

VICINITY MAP

LEGEND

- Substation
- Proposed Gasline
- Tecopa Road/ SR-160 Corridor
- Eldorado Corridor
- Double-circuit 230kv
- Kern River Gasline

Existing Transmission Lines (Platts)

- Below 230kV
- 230kV - 344kV
- 500kV - 734kV
- 735kV - 999kV
- DC
- HHSEGS Boundary
- Wilderness Areas
- City Boundary

N

0 13,000 26,000
Feet

FIGURE 2.1-4
Linear Corridors
Hidden Hills Solar Electric Generating System

SAC \\ZION\SACGIS\PROJ\SOLARPROJECTS\HIDDENHILLS\MAPFILES\2011_HIDDENHILLS\AFC_MAPS\PROJECT_DESCRIPTION\LINEAR_CORRIDOR.MXD SSCOPES 7/27/2011 9:11:45 AM

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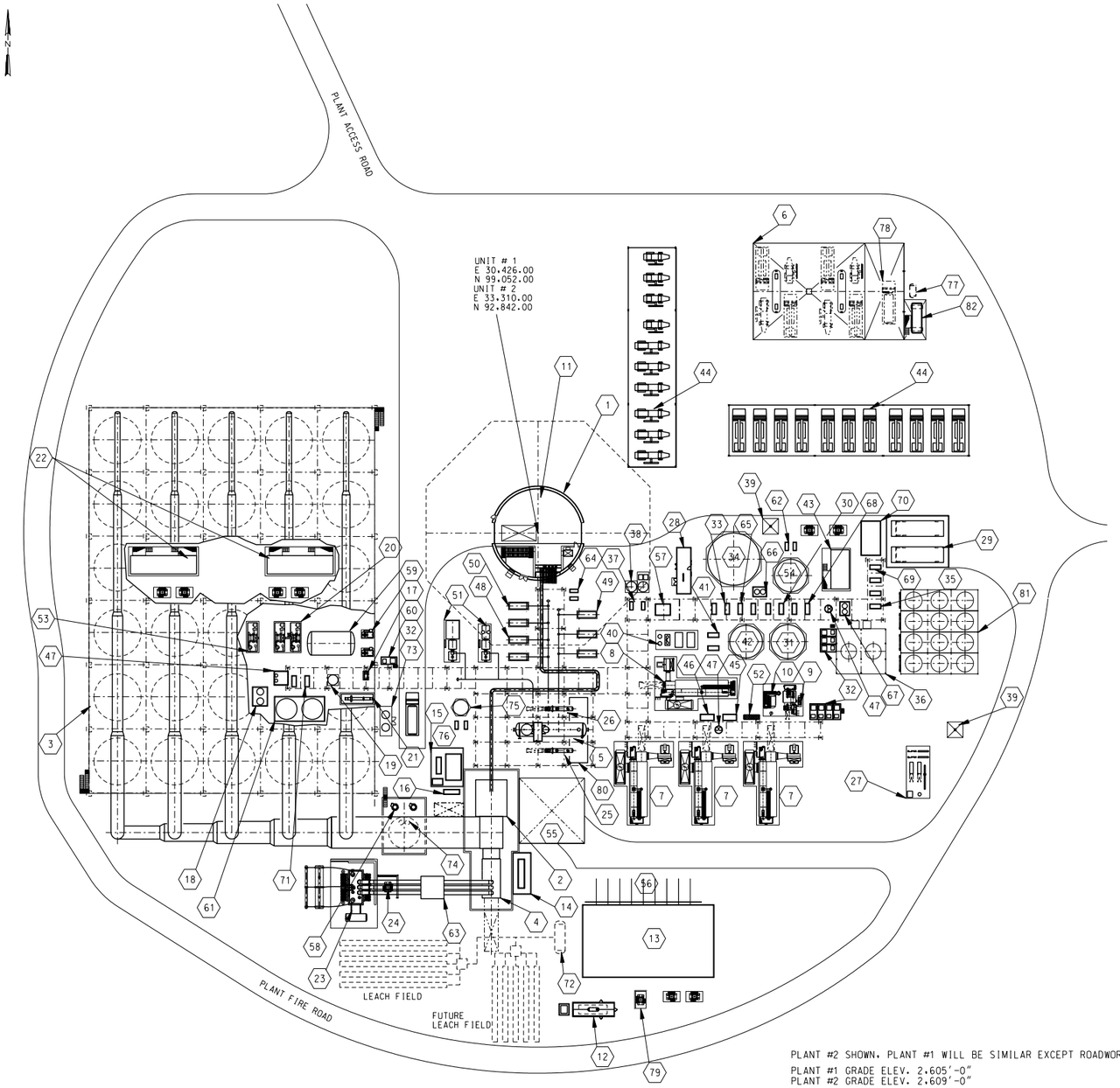


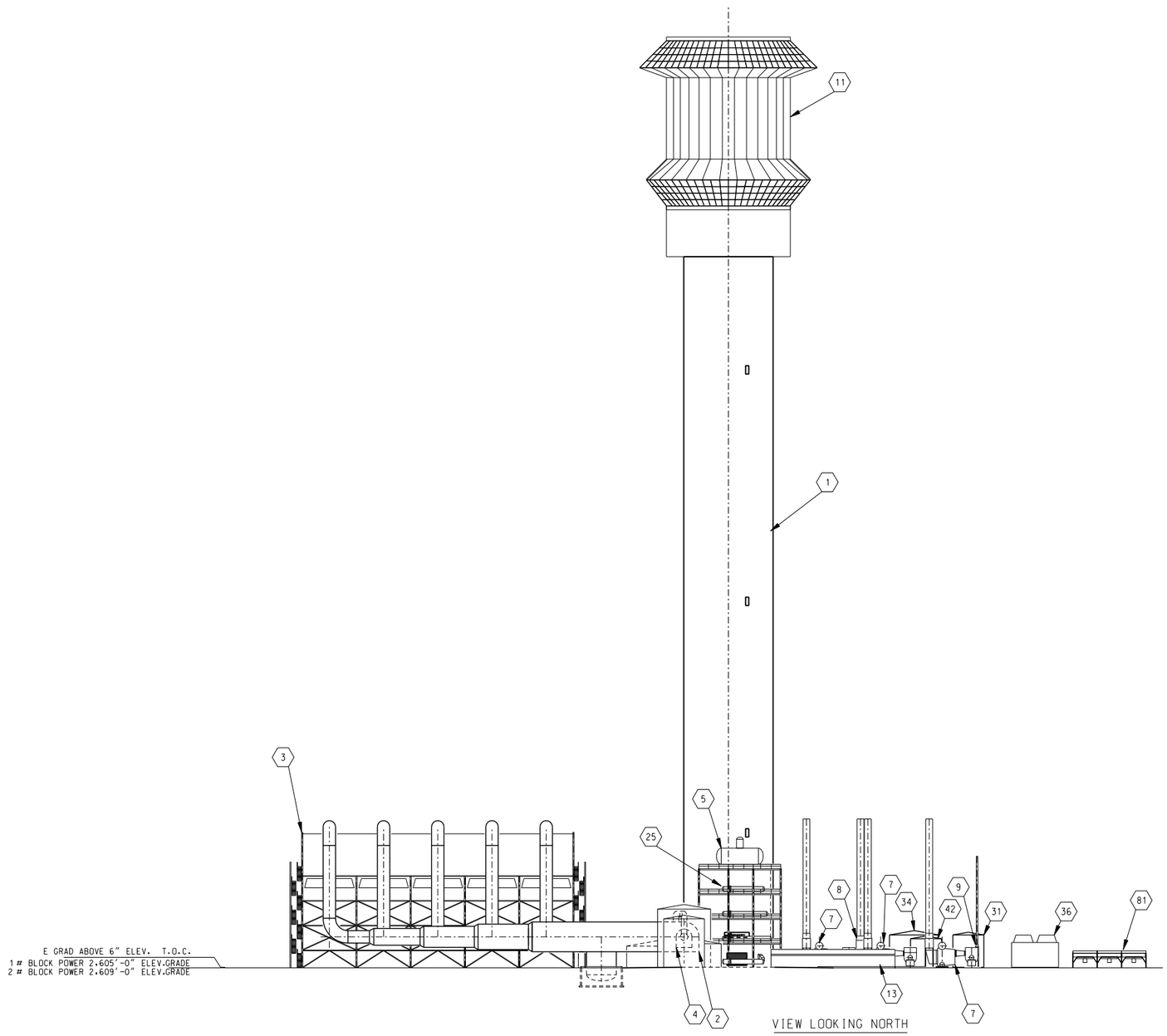
EQUIPMENT LEGEND

1. SOLAR POWER TOWER
2. STEAM TURBINE
3. AIR COOLED CONDENSER (ACC)
4. STEAM TURBINE GENERATOR
5. DEAERATOR
6. WASH VEHICLE FILLING AND FUELING STATION
7. HIGH PRESSURE AUXILARY BOILERS (3 REQ'D)
8. START-UP AUXILARY BOILER
9. NIGHT PRESERVATION AUXILARY BOILER (NPAB)
10. NPAB DEAERATOR
11. SOLAR RECEIVER STEAM GENERATOR (SRSG) ABOVE
12. EMERGENCY DIESEL GENERATOR
13. PLANT SERVICES BUILDING
14. STEAM TURBINE EXCITATION CONTAINER
15. STEAM TURBINE OIL SYSTEMS
16. STEAM TURBINE GLAND STEAM CONDENSER
17. CONDENSATE PUMPS (2 REQ'D)
18. CONDENSATE POLISHER PREFILTER SKID
19. CONDENSATE FILTER AIR RECEIVER
20. ACC VACUUM SKID (NORMAL OPERATION)
21. ACC AIR EJECTOR SKID
22. ACC POWER DISTRIBUTION CENTER
23. GSU STEP-UP TRANSFORMER
24. UNIT AUXILRY TRANSFORMER
25. LP FEED WATER HEATERS (4 REQ'D)
26. HP BOILER FEED WATER HEATERS (3 REQ'D)
27. FUEL GAS FILTER/METERING STATION
28. FIRE WATER PUMP HOUSE W/1 DIESEL, 1 ELEC. & 1 JOCKEY PUMP
29. DEMINERALIZED WATER TRAILERS (2 REQ'D)
30. DEMIN. WATER TRANSFER PUMPS (2 REQ'D)
31. DEMIN. WATER STORAGE TANK
32. CHEMICAL FEED STATION
33. SERVICE WATER DISTRIBUTION PUMPS (2 REQ'D)
34. FIRE / SERVICE WATER STORAGE TANK
35. CLOSED COOLING WATER (CCW) PUMPS (2 REQ'D)
36. CCW WET SURFACE AIR COOLER (WSAC)
37. POTABLE WATER PUMP
38. POTABLE WATER GENERATION SKID
39. GROUND WATER WELLS W/PUMPS (2 REQ'D)
40. DUEL AIR COMPRESSOR SKID
41. WASTE WATER PUMPS (2 REQ'D)
42. WASTE WATER STORAGE TANK
43. WATER SYSTEMS POWER DISTRIBUTION CENTER
44. MIRROR WASH TRUCKS
45. SAMPLE PANEL
46. CONTINUOUS EMISSION MONITORING SYSTEM
47. LOCALIZED SUMP W/ 2 PUMPS
48. NP AUXILARY BOILER FEED PUMPS (2 REQ'D)
49. HP AUXILARY BOILER FEED PUMPS (3 REQ'D)
50. START-UP AUXILARY BOILER FEED PUMPS (2 REQ'D)
51. SRSG FEED PUMPS (2 REQ'D) 1 STEAM DRIVE 1 ELEC.
52. BULK STORAGE NOTROGEN BOTTLES
53. ACC VACUUM SKID (NIGHT OPERATION)
54. WASH WATER STORAGE TANK
55. CONSTRUCTION AND MAINTENANCE CRANE PAD
56. PLANT PARKING
57. THERMAL EVAPORATION UNIT
58. ACC DRAIN PUMPS (2 REQ'D)
59. CONDENSATE TANK
60. ACC WASHING SKID
61. POLISHING SKID
62. WASH WATER PUMPS
63. GENERATOR CIRCUIT BREAKER
64. CLOSED COOLING WATER BOOSTER PUMPS
65. RAW WATER FORWARDING PUMPS (2 REQ'D)
66. SERVICE WATER BAG FILTERS
67. DEMINERALIZED WATER CARTRIDGE FILTERS
68. POLISHER SLUICE PUMPS
69. WSAC MAKE-UP WATER PUMPS
70. DEMINERALIZED WATER METERING SHED
71. CONDENSATE RECYCLE PUMPS
72. SEPTIC TANK
73. SPENT AND CLEAN RESIN STORAGE TANKS
74. CONDENSATE FILTERS
75. DRAINS TANK
76. DRAINS TANK PUMPS
77. OIL WATER SEPARATOR
78. DIESEL FUEL TRUCK REFUELING
79. STATION SERVICE TRANSFORMER
80. BOILER PUMP POWER DISTRIBUTION CENTER
81. FIN FAN COOLER
82. 8000 GAL. DIESEL FUEL STORAGE TANK

50 0 50 100
Scale: 1 INCH = 50 FEET

FIGURE 2.2-1
Solar Plant 2, Power Block
Hidden Hills Solar Electric Generating System

Source: Drawing p1000 V8 rev4, 7/20/2011.



EQUIPMENT LEGEND

1	SOLAR POWER TOWER
2	STEAM TURBINE
3	AIR COOLED CONDENSER (ACC)
4	STEAM TURBINE GENERATOR
5	DEAERATOR
6	WASH VEHICLE FILLING AND FUELING STATION
7	HIGH PRESSURE AUXILARY BOILERS (3 REQ'D)
8	START-UP AUXILARY BOILER
9	NIGHT PRESERVATION AUXILARY BOILER (NPAB)
11	SOLAR RECEIVER STEAM GENERATOR (SRSG) ABOVE
13	PLANT SERVICES BUILDING
25	LP FEED WATER HEATERS (4 REQ'D)
31	DEMINERALIZED WATER STORAGE TANK
34	SERVICE / FIRE WATER STORAGE TANK
36	CCW WET SURFACE AIR COOLER (WSAC)
42	WASTE WATER STORAGE TANK
54	WASH WATER STORAGE TANK
81	FIN FAN COOLER

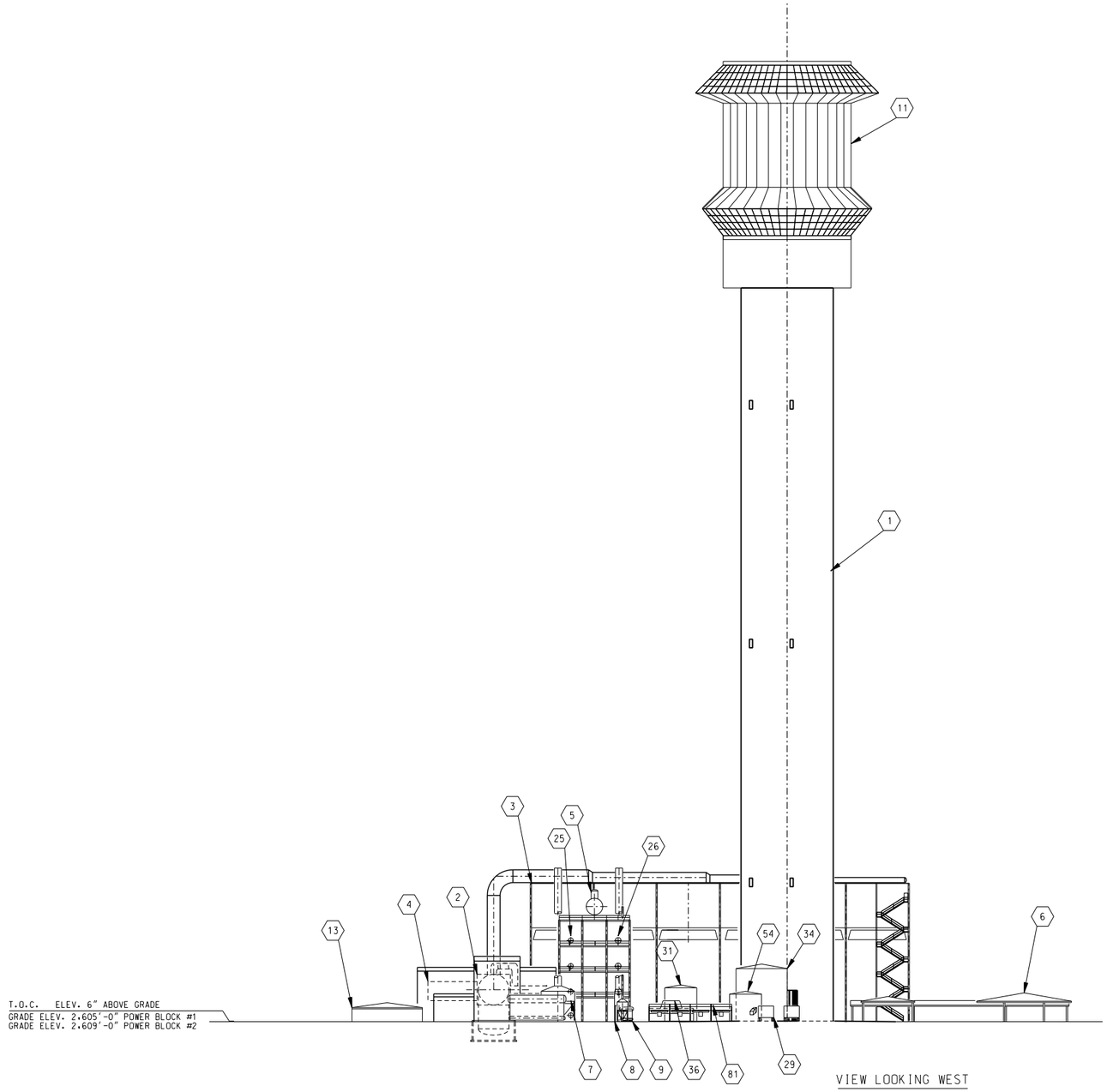
PLANT #2 SHOWN, PLANT #1 WILL BE SIMILAR EXCEPT ROADWORK

50 0 50 100

Scale: 1 INCH = 50 FEET

FIGURE 2.2-2a
Solar Plant 2, Elevation
Hidden Hills Solar Electric Generating System

Source: Drawing p1005 V8 rev2, 7/20/2011.



EQUIPMENT LEGEND

1	SOLAR POWER TOWER
2	STEAM TURBINE
3	AIR COOLED CONDENSER (ACC)
4	STEAM TURBINE GENERATOR
5	DEAERATOR
6	WASH VEHICLE FILLING AND FUELING STATION
7	HIGH PRESSURE AUXILARY BOILERS (3 REQ'D)
8	START-UP AUXILARY BOILER
9	NIGHT PRESERVATION AUXILARY BOILER (NPAB)
11	SOLAR RECEIVER STEAM GENERATOR (SRSG) ABOVE
13	PLANT SERVICES BUILDING
25	LP FEED WATER HEATERS (4 REQ'D)
26	HP BOILER FEED WATER HEATERS (3 REQ'D)
29	DEMINERALIZED WATER TRAILERS (2 REQ'D)
31	DEMIN. WATER STORAGE TANK
34	SERVICE / FIRE WATER STORAGE TANK
36	CCW WET SURFACE AIR COOLER (WSAC)
42	WASTE WATER STORAGE TANK
54	WASH WATER STORAGE TANK
81	FIN FAN COOLER

PLANT #2 SHOWN, PLANT #1 WILL BE SIMILAR EXCEPT ROADWORK

50 0 50 100

Scale: 1 INCH = 50 FEET

FIGURE 2.2-2b
Solar Plant 2, Elevation
Hidden Hills Solar Electric Generating System

Source: Drawing p1006 V8 rev2, 7/20/2011.

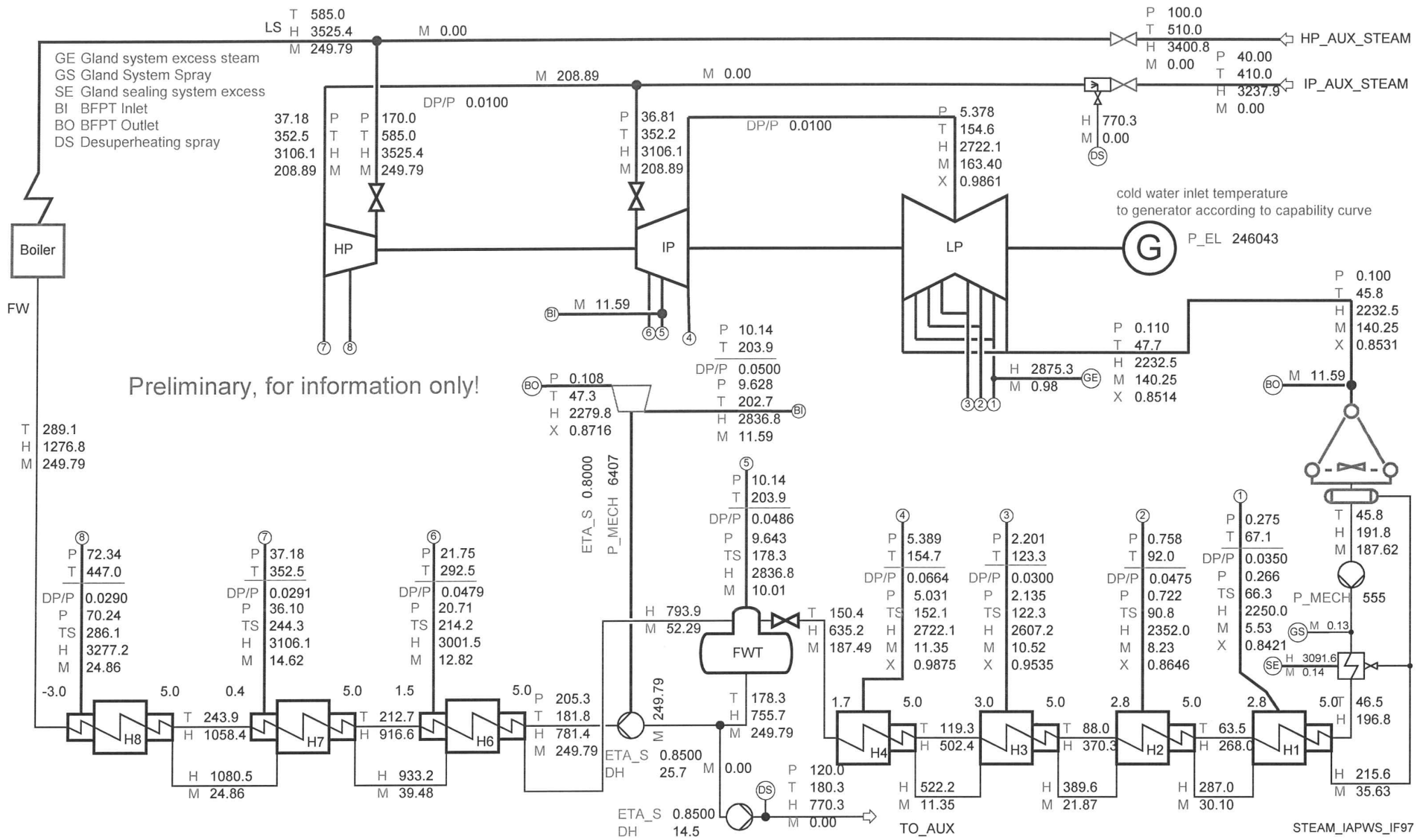
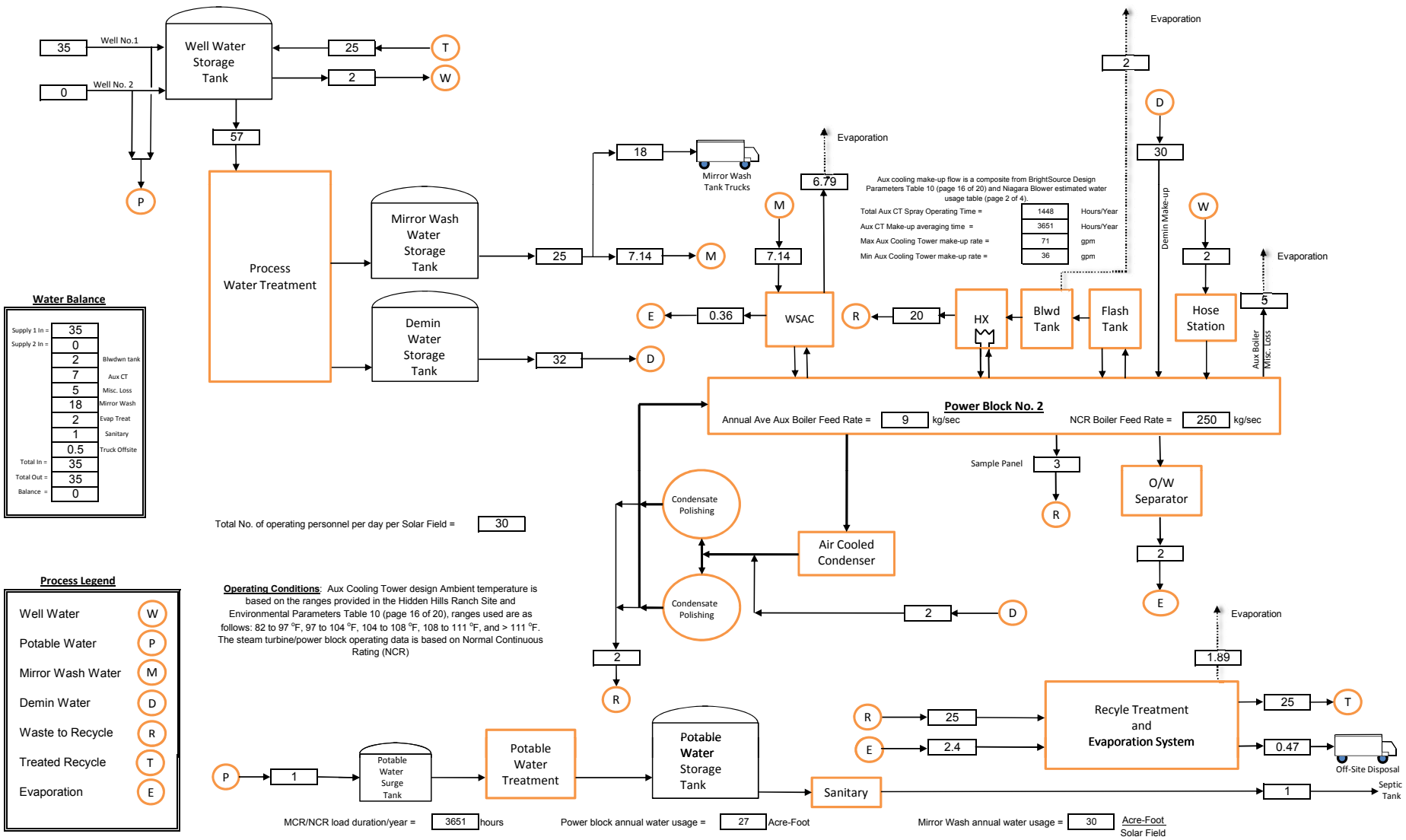


FIGURE 2.2-3
Heat Balance Diagram
Hidden Hills Solar Electric Generating System

Source: ALSTOM Power, 2011.

250 Mega Watt Power Block No. 2

Normal Continuous Rating (NCR)



Water Balance

Supply 1 In =	35	
Supply 2 In =	0	
	2	Blwdwn tank
	7	Aux CT
	5	Misc. Loss
	18	Mirror Wash
	2	Evap Treat
	1	Sanitary
	0.5	Truck Offsite
Total In =	35	
Total Out =	35	
Balance =	0	

Total No. of operating personnel per day per Solar Field = 30

Operating Conditions: Aux Cooling Tower design Ambient temperature is based on the ranges provided in the Hidden Hills Ranch Site and Environmental Parameters Table 10 (page 16 of 20), ranges used are as follows: 82 to 97 °F, 97 to 104 °F, 104 to 108 °F, 108 to 111 °F, and > 111 °F. The steam turbine/power block operating data is based on Normal Continuous Rating (NCR)

Process Legend

Well Water	W
Potable Water	P
Mirror Wash Water	M
Demin Water	D
Waste to Recycle	R
Treated Recycle	T
Evaporation	E

FIGURE 2.2-4
Water Balance Diagram

Hidden Hills Solar Electric Generating System