PROPOSED ACTION ALTERNATIVE/PROJECT DESCRIPTION

Robert Dover and John Kessler

INTRODUCTION

The applicant for this project consists of Solar Partners I, LLC; Solar Partners II, LLC; Solar Partners IV, LLC; and Solar Partners VIII, LLC (applicant), which are subsidiaries of BrightSource Energy, Inc. On August 31, 2007, the applicant filed an Application for Certification (AFC) with the California Energy Commission (Energy Commission) seeking permission to develop the Ivanpah Solar Electric Generating System (ISEGS) project. The applicant filed four right-of-way (ROW) applications with the U.S. Bureau of Land Management (BLM) for the ISEGS project on August 29, 2007. BrightSource Energy, Inc.(BrightSource), is a technology and development company and the parent company of the four limited liability companies. The Applicant will use BrightSource's solar thermal technology to develop ISEGS. The four ROW applications filed by BrightSource are for projects that are designed and intended to operate while sharing certain common areas and facilities. The analysis contained in the FSA/DEIS applies to the proposed project as a whole. The AFC filed with the Energy Commission and the four applications to BLM include an application for shared facilities including a substation, administration and maintenance buildings within a construction logistics area, and separate applications for the three power plants. On October 31, 2007, the Energy Commission accepted the AFC as data adequate. The applicant's development plans have been updated several times since filing its original AFC and ROW applications with the most substantial revisions summarized as follows in **Project Description Table 1**.

Project Description Table 1
Summary of Applicant's Updates to its ISEGS Development Plans

Date	Reference Document	Project Area	Number of Heliostats	Other Revisions to Proposed Project
AFC and ROW Application				
8-31-07	AFC Section 2.1, page 2-2 (BSE2007a)	3,400	272,000	The original heliostat proposal consisted of a single 7 square meter (m^2) mirror hung in a landscape orientation;
Revision 1 – Optimized Project Design				
5-9-08	Data Response 1D, page 4 (CH2ML2008g)	3,700	214,000	1. Reduced the total number of heliostats from 272, 000 in the single-hung to 214,000 in the double-hung mirror configuration (reducing from 68,000 to 55,000 heliostats each for Ivanpah 1 and 2, and reducing from 136,000 to 104,000 heliostats for Ivanpah 3); 2. Doubled the heliostat mirror surface area from 7 to 14 m^2; 3. Reduced the number of power towers associated with Ivanpah 1 and 2 from three to one, and increased the height of the power tower from 262 to 459 feet; 4. Moved the project boundaries out an additional 250 feet on the perimeters within the surveyed areas to increase the spacing between the larger heliostats;
Revision 2 – Revision to Site Plans & Stormwater Drainage Design				
6-10-08	Data Response 2A (CH2MHL2008i)	4,065	214,000	1. Revised stormwater drainage plans from pass-through to active management including large detention ponds and conveyance features; 2. The addition of stormwater detention ponds resulted in an increased project area from 3,700 to 4,065 acres; 3. Proposed a high level of grading and ground disturbance;
Note: Because the revised plans were not supported with underlying site characterization assumptions and stormwater calculations, BLM and staff requested supporting information from the applicant. This led the applicant to reconsider its site plans and to develop Revision 3.				
Revision 3 – Revision to Site Plans & Stormwater Drainage Design				
5-18-09	Data Response 2I (CH2ML2009f)	4,073	214,000	1. Revised stormwater drainage plans again, eliminating large detention basins and conveyance features, and relying on existing ephemeral drainages; 2. Proposed Low Impact Development (LID) approach to minimize ground disturbance and to retain as much vegetation as possible; Vegetation would be cut and maintained to a height of 12 – 18" ;
Note: The Power Purchase Agreement would allow utilization of up to 270,000 heliostats.				

PROJECT LOCATION

The applicant has proposed to locate the ISEGS project in the Mojave Desert, near the Nevada border in San Bernardino County, California, on land administered by the BLM. The proposed project site is located 4.5 miles southwest of Primm, Nevada, and 0.5 mile west of the Primm Valley Golf Club, which is located just west of the Ivanpah Dry Lake. Access to site is from the Yates Well Road Interchange on Interstate 15 (I-15) via Colosseum Road. Please see **Project Description Figure 1 – Regional Setting** and **Project Description Figure 2 – Local Setting**.

PROJECT DESCRIPTION

The proposed ISEGS project would be a development of three solar concentrating thermal power plants, which are comprised of fields of heliostats (elevated mirrors guided by a tracking system) focusing solar energy on boilers located on centralized power towers. Each heliostat tracks the sun throughout the day and reflects the solar energy to the receiver boiler. In each plant, one Rankine-cycle reheat steam turbine receives live steam from the solar boilers and reheat steam from the solar reheater. The applicant proposes to develop the ISEGS project as three power plants in separate and sequential phases that are designed to generate a total of 400 megawatts (MW) of electricity. Ivanpah 1 and 2 would each have an electrical generation capacity of 100 MW, and Ivanpah 3 a capacity of 200 MW. Shared facilities consisting of the substation, administration and maintenance buildings would be developed during construction of the first power plant in the Construction Logistics area between Ivanpah 1 and 2.

As noted above in **Project Description Table 1**, since filing the AFC and ROW Application, the applicant's proposed project plans have been updated for design optimization and for two revisions associated with stormwater management approaches. Associated with the Optimized Project Design adjustment of power plant boundaries, the applicant proposed that the western Ivanpah 3 boundary line be moved to exclude the existing mining claim at the limestone outcrop to the west of the project site (CH2ML2008g). The acreages of long term (life of the facility) and temporary disturbances associated with the applicant's final conceptual plans are summarized as follows in **Project Description Table 2**:

Project Description Table 2
Long Term and Temporary Disturbance of BLM Land (acres)

Facility	Acres
Long Term Disturbance	
Ivanpah 1	913.5
Ivanpah 2	920.7
Ivanpah 3	1,836.3
Substation	16.1
Administration/warehouse & parking	8.9
Southwest Gas Company's Kern River Gas Line Tap Station (100' X 150')	0.3
Southwest Gas Company's Metering Set for Ivanpah 1 & 2 (20' X 40')	0.02
Groundwater Wells [10' x 10' area for 2 supply wells and 1 monitoring well)	0.01
Transmission Towers (8' x 8' area every 750 feet)	0.01
Linear Facilities (Colosseum Road, Gas, Water & Transmission Lines)	16.9
Subtotal – Long Term Disturbance	**3,712.7**
Temporary Disturbance	
Main Construction Laydown Area	260.0
Equipment Laydown and Wash Area	21.5
Contractor Trailers	20.1
Colosseum Road Improvement (100-ft wide construction corridor from Golf Club to Ivanpah 2, less asphalt road)	12.4
Southwest Gas Company's construction laydown	5.0
Gas line (75' wide construction disturbance from tap to Ivanpah 3 for 2,011 feet)	2.9
Southwest Gas Company's Kern River Gas Line tap construction area (200' x 200')	0.9
Adjustment for Roads	(1.8)
Subtotal – Temporary Disturbance	**321.0**
Existing Transmission Line Corridor (within Construction Logistics Area)	38.9
Total ISEGS Project Land Use	**4,073**
Overview of ISEGS Project Land Use	
Ivanpah 1	**913.5**
Ivanpah 2	**920.7**
Ivanpah 3	**1,836.3**
Construction Logistics Area	**377.5**
External Features to ISEGS Project Boundaries (Roads & Natural Gas Line)	**24.5**
Total ISEGS Project Land Use	**4,073**

Source: CH2ML2009f

The proposed project would cause long term disturbance of about 3,713 acres, temporary disturbance of 321 acres, and including the existing transmission line corridor of about 39 acres within the Construction Logistics area, ISEGS would utilize about

4,073 acres (6.4 square miles) of federal land managed by BLM. Please see **Project Description Figure 3 – Visual Simulation from Benson Mine/Mojave Preserve**.

SOLAR POWER PLANT EQUIPMENT AND FACILITIES

HELIOSTATS

Each heliostat would be configured with two mirrors hung in the portrait position. Each mirror would be 7.2 feet high by 10.5 feet wide, providing a reflective surface of 75.6 square feet (7.04 m²) per mirror or 14.08 m² per heliostat (See **Project Description Figure 4 – Double Mirror Heliostat**). The overall height of the heliostats would be about 12 feet. The heliostats would be connected with communication cables strung aboveground between each heliostat. The communications cables would transmit signals from a computer-programmed aiming control system that would direct the movement of each heliostat to track the movement of the sun (CH2ML2009f). Heliostats in the northern section of the heliostat array have the highest solar collection efficiency because the sun is predominantly in the southern horizon, and they have the most direct reflection angle to the power towers (most perpendicular to the face of the mirror as it reflects to the power tower). Conversely, heliostats in the southern section of the heliostat array have the lowest solar collection efficiency. The eastern sector of heliostats is more valuable than the western sector because afternoon energy collection during on-peak utility hours, is more valuable than morning energy collection during partial-peak or off-peak hours. In consideration of the relative efficiency of heliostats depending on their orientation to the power tower, the applicant indicated that the number of heliostat rows increased from least to greatest according to this efficiency in order of southern, western, eastern and northern sectors respectively (BSE2007a, page 2-5).

The heliostats would normally travel by day within the range of the stowed position with the mirrors facing vertically upwards to the track position at some angle higher than facing horizontally. At night, the heliostats would normally be maintained in the stowed position. Approximately every 2 weeks, the mirror would travel from the stowed to the wash position for night-time mirror washing with the mirrors facing horizontally. Daily positioning of the heliostats would occur as follows:

1. At dawn, when likely all heliostats would be moved from stowed to track position to begin reflecting solar energy to the receiver/boiler;

2. During mid-day, when some heliostats would be returned to the stowed position to not exceed solar energy capacity limits of the receiver/boiler;

3. During late-afternoon or evening, when the stowed heliostats would be returned to track position to increase solar energy directed to the receiver/boiler as the sun's position begins to lower in the western horizon and be less optimal for energy production;

4. At nightfall, when all heliostats would be returned to the stowed position or to the wash position for mirror washing at a frequency of about once every two weeks (CH2ML 2009f).

The number of heliostats described under the Optimized Project Design (55,000 each for Ivanpah 1 and 2, and 104,000 for Ivanpah 3) represents the maximum number of heliostats that would be constructed; however, all of them may not be constructed. Although the number of heliostats within Ivanpah 1 and 2 have been reduced about 19.1 percent, the permitted surface area of the heliostats would increase about 61.8 percent from about 5,283,600 square feet (~490,960 square meters) to about 8,547,000 square feet (~794,200 square meters). In Ivanpah 3, with a 23.5 percent reduction in the number of heliostats, the reflective surface area permitted would increase about 52.9 percent from about 10,567,200 square feet (~981,920 square meters) to about 16,161,600 square feet (~1,501,760 square meters). This surface area increase would result in additional electricity production (MW-hours) on an annual basis with no change in installed capacity (MW) and with only a small amount of additional land. Under the Optimized Project Design, the applicant has not proposed any changes in the steam turbine-generators and interconnection capacity (CH2ML2008g).

The applicant's proposed increase in heliostat mirror surface area associated with the Optimized Project Design led the applicant to also propose an increase in total ISEGS area of about 300 acres and extension of the project boundaries of the three power plants by 250 feet along each perimeter. The proposed increase in the heliostat mirror area is a result of the following considerations:

1. The double-hung mirror configuration is taller than the single-hung orientation, and the resulting increase in shadowing requires greater distance between the arrays, with the result that the last rows are farther from the towers. Energy collection is less efficient the farther the mirrors are from the tower receivers, so additional heliostat surface area (approximately 5 to 10 percent) is needed to achieve the same annual energy output.

2. The Applicant has also sought to increase the annual electricity production from the same facility by adding heliostat surface area, an efficiency gain made possible by the double mirror configuration. Daily solar output is less in the early morning hours and later afternoon hours. Adding heliostat surface area results in increased heat to the receivers and increased steam to the steam turbine during these otherwise lower production hours. During the peak hours of the day, these additional mirrors will be placed on standby since the steam turbine remains the same size and cannot accept additional steam. The double-hung heliostats are more compact and use less land than the single-hung heliostats, which creates the opportunity for additional heliostat surface area within the same land area. This means that the land is more productive, and that the impacts per kilowatt hour (kWh) of production are less.

3. Finally, a portion of the increased heliostat surface area to be licensed ensures that the project will be able to meet its contractual output requirements even if the solar resource is less than forecasted. The final rows of heliostats may not be necessary. Pending the results of actual performance during plant operation, a decision will be made on whether or not to install the additional heliostats. Thus, the project optimization represents the maximum number of heliostat structures and heliostat surface area (CH2ML2008g).

SOLAR POWER TOWERS

Another result of the applicant's Optimized Project Design was to revise the number and height of the solar power towers for Ivanpah 1 and 2. In the original application, Ivanpah 1 and 2 would have required three power tower receivers and one solar reheater; each would have stood 262 feet high. The revised site design incorporated only one power tower for each Ivanpah 1 and 2, with an increased height to 459 feet, consistent with the height of the five power towers for Ivanpah 3. The decrease from three power towers to one each for Ivanpah 1 and 2 also resulted in a change in the orientation of the heliostats as they are generally arranged concentrically around the power tower. Ivanpah 3 would have five power tower receivers situated with one in each quadrant, and one central to the Ivanpah 3 site, each with a height of 459 feet. The central power tower of Ivanpah 3 would include the power block with one steam turbine-generator supplied superheated steam by the five power tower boilers. Steam from the four quadrant solar power tower boilers would be conveyed by above-ground pipeline.

The solar power tower is a metal structure designed specifically to support the boiler and efficiently move high-quality steam through a STG at its base. The power tower support structure would be about 120 meters high (approximately 393 feet). The receiving boiler (which sits on top of the support structure) would be 20 meters tall (approximately 66 feet) including the added height for upper steam drum and protective ceramic insulation panels (See **Project Description Figure 5 – Power Block and Power Tower Elevations**). Overall, each of the seven power towers would have a height of 140 meters (approximately 459 feet). Additionally, a Federal Aviation Administration (FAA)-required lighting and a lightning pole would extend above the top of the towers approximately 10 feet. The height of the power towers allows heliostats from significant distances to accurately reflect sunlight to the receiving boiler. The receiving boiler is a traditional high-efficiency boiler positioned on top of the power tower. The boiler converts the concentrated energy of the sun reflected from the heliostats into superheated steam. The boiler's tubes are coated with a material that maximizes energy absorbance. The boiler has steam generation, superheating, and reheating sections and is designed to generate superheated steam at a pressure of 160 bars and a temperature of 550 degrees Celsius (°C).

POWER BLOCK

Each solar power plant (Ivanpah 1, 2 and 3) would have a power block located in the approximate center of the power plant area. The power block would include a solar power tower, a receiver boiler, a steam turbine-generator (STG) set, air-cooled condensers, and other auxiliary systems. Each of the three solar-thermal plants would include the following equipment and facilities in their power block:

- natural gas-fired start-up boiler;
- the air emission control system for the combustion of natural gas in the start-up boiler;
- steam turbine generator;
- air-cooled condenser;

- auxiliary equipment (feed water heaters, a de-aerator, an emergency diesel generator, diesel fire pump, etc.);
- a raw water tank with a 250,000 gallon capacity, to supply water for plant use and fire fighting; and a
- water treatment system.

Each of the three power plants includes a partial-load, natural gas-fired steam boiler, which would be used for thermal input to the turbine during the morning start-up cycle to assist the plant in coming up to operating temperature more quickly. The boiler would also be operated during transient cloudy conditions, in order to maintain the turbine on-line and ready to resume production from solar thermal input, after the clouds pass. After the clouds pass and solar thermal input resumes, the turbine would be returned to full solar production and the boilers would be shut down. The solar field and power generation equipment are started up each morning after sunrise and insolation build-up, and shut down in the evening when insolation drops below the level required to keep the turbine on line. The natural gas-fired boilers would not be big enough to allow operation for sustained periods of reduced sunlight (i.e., on cloudy days or at night). Heat input from natural gas would not exceed 5% of the heat input from the sun, on an annual basis. The natural gas-fired boiler use would not exceed four hours on any given day, and average use would be less than one hour per operating day. Solar heat would be used to keep each boiler in hot standby mode, capable of responding to demand on short notice. No fuel would be fired while a boiler is on hot standby. Please see **Project Description Figure 6 – Ivanpah 1 Solar Field and Project Description Figure 7 – Ivanpah 1 Power Block**.

RELATED EQUIPMENT AND FACILITIES

The following related equipment and facilities described in this section are included as part of the proposed action. All would be constructed, operated and maintained by the one or more of the individual applicants except for the Ivanpah Substation. The Ivanpah Substation would eventually be constructed, operated and maintained by the transmission line owner, Southern California Edison but is included in this analysis because it is directly connected to this proposed action.

NATURAL GAS PIPELINE

The solar heat used in the boiler (steam) process would be supplemented by burning natural gas to heat a partial load steam boiler when solar conditions are insufficient. Each power plant within the project would include a small package, natural gas-fired start-up boiler to provide additional heat for plant start-up and during temporary cloud cover. Natural gas would be supplied to the site through a new, proposed six-mile long distribution pipeline ranging from 4 to 6 inches in diameter. From the Kern River Gas Transmission pipeline, the pipeline would extend 0.5 miles south to the northern edge of Ivanpah 3. The ROW area required for this section of the pipeline would be 75 feet wide and 0.5 miles long. The line would then run east along the northern edge, and then south along the eastern edge, of Ivanpah 3 to a metering station near the southeast corner of Ivanpah 3. From there, a supply line would extend northwest into the Ivanpah 3 power block. The main pipeline would continue along the eastern edge of Ivanpah 2 to another metering station at its southeastern corner. Again, a branch supply line will

extend northwestwards into the center of the Ivanpah 2 power block. From that station, the pipeline would follow the paved access road from Colosseum Road past the administration/warehouse building to the Ivanpah 1 power block. The extensions of the pipeline into the power blocks would be located within the project fenceline. However, the sections of pipeline along the northern boundary of Ivanpah 3, and then the eastern boundaries of Ivanpah 3 and 2, would be located outside of the fenced heliostat area, in order to allow access to the pipeline for maintenance.

A new tap metering station of approximately 100 feet by 150 feet in area would be located at the Kern River Gas Transmission Line. The tap station would measure and record gas volumes. Facilities would be installed at the tap station to regulate the gas pressure, to remove any liquids or solid particles, and facilitate the use of pigs for pipeline inspection and cleaning. Once measured this tap would be a custody transfer point in the sale of natural gas to the applicant. In addition to the tap station, separate metering sets would be installed for each of the power plant sites. The three metering sets would measure and record gas volumes utilized at each individual power plant. As part of the Optimized Project Design, the location of the proposed gas line was re-routed along the west side of Ivanpah 2 and 3 to provide the applicant access to the line for service/repair work (CH2ML2008g). Please see **Project Description Figure 8 – Site Plan and Linear Facilities**.

AIR POLLUTION CONTROL

Air pollution emissions from the combustion of natural gas in the start-up boiler would be controlled using best available control technology. Each boiler would be equipped with low-Nitrogen Oxide (NOx) burners for NOx control. Carbon Monoxide (CO) would be controlled using good combustion practices such as burner and control adjustment based on oxygen continuous monitoring, operator training and proper maintenance. Particulate and Volatile Organic Compounds (VOC) emissions will be minimized through the use of natural gas as the fuel. To ensure that the systems perform correctly, continuous emission monitoring for NO_x and CO would be performed. Boiler use would not exceed four hours on any given day, and average boiler use would be less than one hour per operating day.

WATER SUPPLY AND DISCHARGE

The facilities would require a water source to support operations, including process water consisting of make-up water for the steam system and wash water for the heliostats, and potable water for domestic water needs. Groundwater would be supplied from one of two wells that would be constructed at the northwest corner of Ivanpah 1, just outside the perimeter fence but within the construction logistics area. Each of the three power blocks would be connected to the groundwater wells by underground water pipelines. The applicant estimates project water consumption would not exceed a maximum of 100 acre-feet per year (afy) for all three solar plants combined, which would primarily be used to provide water for washing heliostats (mirrors) and to replace boiler feed water blow-down. The applicant has estimated that average annual water demands for all project operating needs would be on the order of 77 afy allocated as shown in **Project Description Table 3.**

Project Description Table 3
Annual Average ISEGS Water Demands (acre-feet/year)

Facility	Mirror Wash	Boiler Makeup	Total
Ivanpah 1	11	7	18
Ivanpah 2	11	7	18
Ivanpah 3	21	16.5	37.5
Potable Water			2.9
Total	**43**	**30.5**	**76.4**

The quality of groundwater would be improved using a treatment system for meeting the requirements of the boiler make-up and mirror wash water. Water treatment equipment would consist of activated carbon filters, de-ionization media, and a mixed-bed polisher. Each power plant would have a 250,000 gallon raw water storage tank. Approximately 100,000 gallons would be usable for plant process needs and 150,000 gallons would be reserved for fire protection. Demineralized water would be stored in a 25,000-gallon demineralized water storage tank. Boiler feedwater make-up water will be stored in another 25,000-gallon tank.

Because the BLM expressed concern that the two original proposed well locations would interfere with monitoring and regulation of the Primm Valley Golf Club Colosseum wells, the applicant relocated the proposed wells 4,250 feet south of their original location to the northwest corner of Ivanpah 1. This would eliminate the need for a separate access road and minimize land disturbance. In addition to supply wells, a monitoring well would be installed between the Ivanpah supply wells and the Primm Valley Golf Club wells (CH2ML 2008g).

FIRE PROTECTION

The fire protection system would be designed to protect personnel and limit property loss and plant downtime in the event of a fire. The primary source of fire protection water would be the 250,000 gallon raw water storage tank to be located in each power block. Approximately 100,000 gallons would be usable for plant process needs and 150,000 gallons would be reserved for fire protection. An electric jockey pump and electric motor-driven main fire pump would be provided to increase the water pressure to the level required to serve all fire fighting systems. In addition, a backup diesel engine-driven fire pump would be provided to pressurize the fire loop if the power supply to the electric motor-driven main fire pump fails. All fire protection systems would be focused on the power blocks, administration/warehouse building, and other areas of active operations. The project would not include any specific facilities to address potential wild fires.

ACCESS ROADS AND MAINTENANCE PATHS

Access to the project site would occur from the Yates Well Road exit from I-15 to Colosseum Road. Colosseum Road, currently a dirt road, would be paved to a 30-foot wide, two lane road for a distance of 1.9 miles from the Primm Valley Golf Club to the facility entrance. A portion of the current route of Colosseum Road would be

incorporated into the Ivanpah 2 plant site, so the road would be diverted for a distance of 1.66 miles. A segment of 1.2 miles would be re-routed around the southern end of Ivanpah 2 and paved, and then an additional 0.46 mile, 12-foot wide dirt segment would link the paved road to the existing dirt road to the west of Ivanpah 2. Please see **Project Description Figure 9 – Access Roads**.

Within the heliostat fields, maintenance paths would be established concentrically around the power blocks to provide access for heliostat washing and maintenance. The paths would be established between every other row of heliostats. An additional maintenance path would be established on the inside perimeter of the boundary fence. Within each unit, a diagonal dirt road would be established to provide access to the concentric maintenance paths and the power blocks.

Off-road, recreational vehicle trails currently authorized by BLM which run through the proposed project site would be re-located outside of the project boundary fence. The trails that would be rerouted are:

1. Trail 699226, which passes through the northern third of Ivanpah 3, would be rerouted along the northern border of Ivanpah 3;

2. Trail 699198 would be rerouted between Ivanpah 2 and 3; and

3. An unnumbered trail on the east side of Ivanpah 3 would be relocated outside the project site so that it would provide continued access to the limestone outcrop.

CONSTRUCTION LOGISTICS AREA, SUBSTATION, AND ADMINISTRATIVE COMPLEX

The applicant proposes using a temporary construction logistics area for staging contractor equipment and trailers, assembly yards, storage of materials, equipment laydown and wash area, construction personnel parking, and assembly areas for heliostats. The construction logistics area would be located between Ivanpah 1 and 2 and would comprise approximately 377.5 acres. Following project construction, the majority of the area would undergo site closure, rehabilitation, and revegetation as described in the Draft Closure, Revegetation, and Rehabilitation Plan (CH2ML2009q). A 40-acre portion of this area would be used as a botanical succulent storage and stockpiling area.

The administrative complex and substation area would be located within the perimeter of this 377.5 acre logistics area. The administrative complex, comprising 8.9 acres, would be used as a common area to support all three solar facilities. These facilities would include an administration/warehouse building and asphalt-paved parking lot. Please see **Project Description Figure 10 – Construction Logistics Area**.

FENCING

The project area would be surrounded by security fence, which would be constructed of 8-foot tall galvanized steel chain-link, with barbed wire at the top as required. The security fence would surround the outer perimeter of each power plant, the substation, and the administrative complex. Tortoise barrier fence would also be installed in accordance with the Recommended Specifications for Desert Tortoise Exclusion

Fencing (USFWS 2005). The tortoise fence would consist of 1-inch horizontal by 2-inch vertical galvanized welded wire. The fence would be installed to a depth of 12 inches, and would extend 22 to 24 inches above the ground surface and integrated with the security fence.

In addition to use of the proposed right-of-way area, the applicant proposes some project-related maintenance and monitoring activities to occur outside of the project perimeter fence. As presented in the applicant's Revised Project Description, a variety of project-related activities must be conducted outside of the project security fence, including:

- Inspection and maintenance of security fence and tortoise exclusion fence;
- Underground utility repairs;
- Installation of new underground pipeline;
- Maintenance of drainage systems, including removal of debris and sediment; and
- Installation of new stormwater drainage systems (CH2MHL 2009f).

In addition to these activities, a roadway would need to be maintained outside of the project fence to allow vehicle and equipment access for these activities. The Revised Project Description does not define specific locations or acreages for these activities. Instead, it states that some activities, such as installation of new stormwater drainage systems, could disturb greater than one acre, with no upward bound placed on the projected disturbance.

Throughout most of the proposed right-of-way area, the applicant proposes that the security and tortoise exclusion fence be inset from the right-of-way boundary to allow access for these activities. These inset distances range from 65 feet where natural gas pipeline is buried to 12 feet in areas without pipeline. In some preliminary drawings submitted by applicant, it is unclear if the fence is inset sufficiently to allow access for proposed maintenance and monitoring activities. Applicant has also stated the potential area of disturbance associated with new stormwater drainage systems is defined as "one acre or more". Since the buffer distance between the security fence and the right-of-way boundary in other areas is as narrow as 12 feet, the development of stormwater drainage systems that exceed one acre in size would likely extend outside of the right-of-way boundary and would require supplemental environmental review and analysis and appropriate land use authorizations and permits (CH2ML2009e, Drainage, Erosion and Sediment Control Plan Figure 15 – Access Roadway Plan). Please see **Project Description Figure 9 – Access Roads**.

TRANSMISSION SYSTEM INTERCONNECTION AND UPGRADES

The ISEGS project would deliver power from Ivanpah 1, 2 and 3 via three separate 115-kilovolt (kV) transmission generation tie lines to a new Ivanpah substation that would be owned and operated by Southern California Edison and located in the common construction logistics area between Ivanpah 1 and 2. The new Ivanpah substation would be about 850 feet by 850 feet and located on a little over 16 acres. Each of the power plants would have a switchyard with a step-up transformer to increase the 13.8 kV generator output voltage to 115 kV. The ISEGS #1 115 kV generator tie line would be

approximately 5,800 feet long and supported by single-pole structures. The ISEGS #2 and #3 generator tie lines would share the same poles for the last 1,400 feet of their routes before they interconnect to SCE's Ivanpah Substation. The ISEGS #2 generator would connect to the Ivanpah Substation through a 115kV, 3,900 feet-long single circuit generator tie line built with the last 1,400 feet merged with the ISEGS #3 generator tie line to create a 1,400 feet long, overhead double circuit line prior to entering the Ivanpah Substation. The ISEGS #3 generator tie line would be an approximately 14,100 feet long, single circuit, 115 kV line and would merge into a 115kV double circuit with the ISEGS #2 generator tie line.

In accordance with the Interconnection Agreement between the applicant and SCE, the existing Eldorado-Baker-Cool Water-Dunn Siding-Mountain Pass 115-kV line would loop in and out through the newly built Ivanpah Substation to interconnect the project to the SCE transmission grid. This 115-kV line is currently aligned between the Ivanpah 1 and 2 sites along a northeast-southwest right-of-way. In order to accommodate the total anticipated 1,400 MW load generation by ISEGS and five other planned renewable energy generation projects in the region, the California Independent System Operator (California ISO) has identified approximately 36 miles of transmission line within California and Nevada that would need to be upgraded from 115 kV to 220 kV. SCE is in the process of developing a project to upgrade the transmission system, which includes removing the existing 115-kV transmission lines and constructing a new double-circuit 220-kV transmission line between the existing Eldorado Substation in Nevada and the proposed new Ivanpah Substation in California. The upgraded to 220-kV transmission line by SCE and the 1,400 MW of planned renewable energy projects are discussed in the Cumulative Scenario and analyzed as cumulative impacts throughout this document. Additional upgrades required as mitigation in order for ISEGS to receive final approval of interconnection to California ISO and Non-California ISO controlled facilities include replacing an existing 115/230 kV, 102 megavolt-ampere (MVA) transformer bank at the Eldorado Substation with 115/230 KV, 280 MVA bank and modifying a Special Protection System affecting the Eldorado-Baker-Cool Water-Dunn Siding-Mountain Pass 115-kV line. These additional upgrades would be accomplished within the property boundaries of existing developed facilities and are being addressed in a separate CEQA/NEPA analysis by the Californina Public Utilities Commission and the BLM.

SCE has filed an application for a Certificate of Public Convenience and Necessity from the California Public Utilities Commission (CPUC) for the transmission line upgrade. They have also filed an application for a ROW from the BLM. The CPUC will serve as the lead agency for CEQA compliance for the approximately five-mile portion of the transmission line work within California. BLM will serve as the lead agency for National Environmental Policy Act compliance. BLM published a Notice of Intent to prepare an Environmental Impact Statement/Environmental Impact Report (EIS/EIR) with the CPUC on July 27, 2009. SCE is completing required inventories and preparing reports for the joint environmental analysis of the transmission line upgrade.

TELECOMMUNICATIONS FACILITIES

The proposed Ivanpah Substation would also require that new telecommunication infrastructure be installed to provide protective relay circuit and a supervisory control

and data acquisition (SCADA) circuit, together with data and telephone services. The telecommunication path from Ivanpah Substation to the local carrier facility interface at Mountain Pass area consists of approximately eight miles of fiber optic cable to be installed overhead on existing poles and through new underground conduits to be constructed in the substation and telecom carrier interface point. This fiber optic route consists of two segments. The first segment is from Ivanpah Substation to Mountain Pass Substation using the existing Nipton 33-kV distribution line poles built along the transmission line corridor that crosses between Ivanpah 1 and 2. The second segment is from Mountain Pass Substation to the telecommunications facility approximately 1.5 miles away at an interface point to be designated by the local telecommunication carrier. The fiber cable would be installed on the existing 12-kV distribution line poles.

PROJECT DESIGN AND MANAGEMENT APPROACH

STORMWATER MANAGEMENT APPROACH

The proposed project site is located on an alluvial fan that acts as an active stormwater conveyance between the Clark Mountain Range to the west and the Ivanpah Dry Lake to the east. In addition to receiving direct precipitation that results in stormwater runoff, rainfall within the mountains to the west passes through the proposed project site along a complex series of braided channels that are normally dry throughout the year. In response to the original AFC, CEC and BLM provided a series of Data Requests (Numbers 53 through 60, and Number 139) which requested a variety of information and calculations describing the proposed site grading and stormwater management systems, with the intention of understanding both the potential impact of the proposed development on downstream stormwater flow and sedimentation rates, and the potential impact of stormwater on the facilities (heliostats, fences, roads, buildings, and power blocks) installed as part of the proposed project.

In response to the referenced Data Requests, the Applicant developed an iterative series of conceptual design plans, calculations, and other supporting materials which have resulted in the currently proposed stormwater design and management system. This proposed system, defined in Data Response Set 2I (CH2ML2009f), generally relies on a Low-Impact Development (LID) design concept which attempts to minimize disruption to natural stormwater flow pathways. The elements of the applicant's design approach include:

- Minimizing the areas of direct vegetation removal. Where possible, natural vegetation would be left in place and undisturbed during construction activities. This is to be accomplished through the use of equipment selected to maximize slope-climbing capability, minimize width of footprint, minimize weight of equipment and ground pressure, and allow extended reach across multiple heliostat rows. Vegetation would be actively removed only in the power block areas, long term access roads, and areas where topography modification is required for access or construction. In other areas, vegetation may be cut to facilitate access for construction, but existing root systems would remain in place. Additional cutting of vegetation during active operations would be conducted to avoid interference with mirror movement.

- Minimizing the areas of grading and leveling. Grading would be conducted in areas where existing topography must be modified for installation and operations. This primarily includes the northern portion of Ivanpah 3, and may also include limited areas within Ivanpah 1 and 2.
- Providing for active stormwater management in limited areas. Active stormwater management generally includes construction of erosion protection features, diversion channels, detention ponds, and culverts for road crossings. For the proposed project, these systems would be limited to diversion channels around the power block areas, and installation of erosion protection and/or culverts at channel crossings along the long term access roads (CH2ML2009f). Please see **Project Description Figure 11 – Existing Watershed and Primary Washes** and **Project Description Figure 12 – Overall Grading Plan**.

PROJECT CONSTRUCTION

The applicant anticipates ISEGS construction would be performed in the following order: 1) the Construction Logistics Area; 2) Ivanpah 1 (the southernmost site) and other shared facilities; 3) Ivanpah 2 (the middle site); and 4) Ivanpah 3 (the 200-MW plant on the north). However, it is possible that the order of construction may change. The shared facilities will be constructed in connection with the first plant construction, whether it is Ivanpah 1, 2, or 3. Prior to construction, geotechnical testing, heliostat installation tests, and heliostat load tests would be performed in each of the three units. This testing was performed in Ivanpah 1 in the summer of 2009, under a Temporary Use Permit granted by BLM. Should the right-of-way be approved, the additional testing in Ivanpah 2 and 3 would occur within the approved right-of-way area under the conditions associated with the right-of-way grant.

Construction is planned to take place over approximately 48 months, with the applicant's desire that it could begin during the first quarter of 2010 and be completed during the fourth quarter 2013. The applicant has estimated the overall durations and aerial extent of grading at the 3 sites and common construction logistics area as follows:

1. Ivanpah 1 and Common Construction Logistics Area - Total of 4 - 5 months for everything comprising the common construction logistics area (laydown, administration and other buildings, main access roads, road to access gas line, and the substation) and Ivanpah 1 comprising the diagonal access roads, perimeter road for fence, channel crossings as needed, and the power block;

2. Ivanpah 2 - Total of 3 - 4 months comprising the diagonal access roads, perimeter road for fence, channel crossings as needed, power block, and grading of approximately 170 acres in the southwest region of the power plant area;.and

3. Ivanpah 3 - Total of 5 months comprising the diagonal access roads, perimeter road for fence, channel crossings as needed, five solar power tower area and one power block, and grading of approximately 360 acres in the northern and western regions of the power plant area.

Project construction would be performed in accordance with plans and mitigation measures that would assure the project conforms with applicable LORS and would

avoid significant adverse impacts. These plans that are to be developed by the applicant, for which some have already been prepared in draft and reviewed by staff to support this environmental analysis, and the necessary mitigation measures, are specified in the Conditions of Certification as appropriate of each technical area of this FSA/DEIS. Of the plans already prepared in draft by the applicant, those that have contributed most significantly to define the proposed plan of development including construction procedures are as follows:

- Draft Contractor Health and Safety Standards (CH2ML 2009g)
- Administrative Draft ISEGS Construction Stormwater Pollution Prevention Plan (CH2ML 2009d)
- Preliminary Draft Plan, Revision 2, Drainage, Erosion, and Sediment Control Plan (CH2ML 2009e)
- Draft Raven Management Plan, ISEGS (CH2ML 2008v)
- Draft Desert Tortoise Translocation/Relocation Plan for ISEGS (CH2ML 2009c)
- Application for Incidental Take Permit Under Section 2081 of the Fish and Game Code (CH2ML2009i)
- Draft Biological Assessment for the ISEGS Project (CH2ML 2008u)
- Streambed Alteration Agreement Application (CH2ML 2009j)
- Weed Management Plan for ISEGS, Eastern Mojave Desert (CH2ML 2008o)

FACILITY OPERATION AND MAINTENANCE

Assuming the construction of Ivanpah 1, 2 and 3 were to begin in a sequential fashion during the first quarter of 2010 and be completed during the fourth quarter of 2013, the applicant would expect to commence commercial operation in the fourth quarter for each of the power plants beginning in 2011 at Ivanpah 1, in 2012 at Ivanpah 2, and in 2013 at Ivanpah 3. The proposed project would be designed for an operational life of 50 years. During this period, project operations would be supported by a variety of operational, maintenance, and monitoring activities. Within the power blocks, operations would include transmission of water and natural gas into the power block, and operation of the natural gas-fired start-up boiler, the air emission control system for the combustion of natural gas in the start-up boiler, a steam turbine generator, an air-cooled condenser, and auxiliary equipment (feed water heaters, a de-aerator, and an emergency diesel generator, diesel fire pump).

Within the heliostat fields, operations would include routine washing of mirrors on a rotating basis, every two weeks. Washing would utilize water accessed from the groundwater supply wells, following treatment in the water treatment system. Water requirements would include approximately 2.5 gallons every 2 weeks, for a total consumption of 42.7 acre-feet per year. Washing would be done using a truck-mounted pressure washer. Maintenance would also include clipping of vegetation that could interfere with mirror movement to a height of 12 – 18 inches, management of weeds as specified in the Applicant's Weed Management Plan (CH2ML2008o), and use of soil binder and weighting agents to minimize dust accumulation on the mirrors and fugitive dust as could occur by wind or vehicle traffic.

In addition to those activities, discussed above, that would occur within the fenced area, certain routine inspection and maintenance activities would be conducted outside the project security fence. Activities to be conducted outside of the security fence may include inspection and maintenance of the buried natural gas pipeline, the buried water pipelines, and the fence itself, including its desert tortoise exclusion features.

Similar to project construction, facility operations would be performed in accordance with plans and mitigation measures that would assure the project conforms with applicable LORS and would avoid significant adverse impacts. These plans that are to be developed by the applicant, for which some have already been prepared in draft and reviewed by staff to support this environmental analysis, and the necessary mitigation measures, are specified in the Conditions of Certification as appropriate of each technical area of this FSA/DEIS. Of the plans already prepared in draft by the applicant, those that have contributed most significantly to define the proposed plan of development including operating procedures are as follows:

- Draft Contractor Health and Safety Standards (CH2ML 2009g)
- Preliminary Draft Plan, Revision 2, Drainage, Erosion, and Sediment Control Plan (CH2ML 2009e)
- Draft Raven Management Plan, ISEGS (CH2ML 2008v)
- Application for Incidental Take Permit Under Section 2081 of the Fish and Game Code (CH2ML2009i)
- Draft Biological Assessment for ISEGS (Ivanpah SEGS) Project (CH2ML 2008u)
- Weed Management Plan for ISEGS, Eastern Mojave Desert (CH2ML 2008o)

WASTE MANAGEMENT

Non-hazardous solid wastes generated during construction would include approximately 280 tons of scrap wood, concrete, steel/metal, paper, glass, scrap metals and plastic waste (BSE2007a, § 5.14.4.1.1). All non-hazardous wastes would be recycled to the extent possible and non-recyclable wastes would be collected by a licensed hauler and disposed in a Class III solid waste disposal facility. Generation of hazardous wastes anticipated during construction includes over 100 5-gallon empty hazardous material containers which would include 4,300 pounds of solvents, waste paint, and adhesives; 3,000 pounds of oil absorbents, used oil, oily rags; and varying amounts of batteries, and waste oil filters. Hazardous wastes would be recycled to the extent possible and disposed in either a Class I or II waste facility as appropriate.

All operational wastes produced at ISEGS would be properly collected, treated (if necessary), and disposed of at either a Class I or II waste facility as appropriate. Wastes include process and sanitary wastewater, nonhazardous waste and hazardous waste, both liquid and solid. A septic system for sanitary wastewater would be located at the administration building/operations and maintenance area, located between Ivanpah 1 and 2. Portable toilets would be placed in the power block areas of each the three solar facilities and pumped by a sanitary service provider. Process wastewater from all equipment, including the boilers and water treatment equipment would be recycled. If necessary, a small filter/purification system would be used to treat project groundwater and provide potable water at the administration building. Any reject

streams from water treatment would be trucked off site for treatment or disposal at either a Class I or II waste facility as appropriate. Additionally, two concrete-lined holding basins, approximately 40 feet by 60 feet by 6 feet deep in size, would be part of each power block facility, and would serve for boiler commissioning and emergency outfalls from any of the processes.

HAZARDOUS WASTE MANAGEMENT

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

PROJECT DECOMMISSIONING

Following the operational life of 50 years, the project owner would perform site closure activities to meet federal and state requirements for the rehabilitation and revegetation of the project site after decommissioning. The procedures to be used for project decommissioning and restoration are defined in the Applicant's Draft Closure, Revegetation, and Rehabilitation Plan (CH2ML2009q). Under this plan, all aboveground structures and facilities would be removed to a depth of three feet below grade, and removed offsite for recycling or disposal. Concrete, piping, and other materials existing below three feet in depth would be left in place. Areas that had been graded would be restored to original contours. Succulent plant species would be salvaged prior to construction, transplanted into windrows, and maintained for later transplanting following decommissioning. Shrubs and other plant species would be revegetated by the collection of seeds, and re-seeding following decommissioning.

Similar to project construction and facility operations, decommissioning would be performed in accordance with plans and mitigation measures that would assure the project conforms with applicable LORS and would avoid significant adverse impacts. These plans that are to be developed by the applicant, for which some have already been prepared in draft and reviewed by staff to support this environmental analysis, and the necessary mitigation measures, are specified in the Conditions of Certification as appropriate for each technical area of this FSA/DEIS. Of the plans already prepared in draft by the applicant, those that have contributed most significantly to define the proposed plan of development including decommissioning procedures are as follows:

- Draft Closure, Revegetation, and Rehabilitation Plan (CH2ML2009q)
- Draft Contractor Health and Safety Standards (CH2ML 2009g)
- Preliminary Draft Plan, Revision 2, Drainage, Erosion, and Sediment Control Plan (CH2ML 2009e)
- Draft Raven Management Plan, ISEGS (CH2ML 2008v)
- Application for Incidental Take Permit Under Section 2081 of the Fish and Game Code (CH2ML2009i)

- Draft Biological Assessment for the ISEGS (Ivanpah SEGS) Project (CH2ML 2008u)
- Weed Management Plan for ISEGS, Eastern Mojave Desert (CH2ML 2008o)

REFERENCES

BSE2007a – Bright Source Energy / J. Woolard (tn: 42174). Application for Certification, Volumes I and II, for the Ivanpah Solar Electric Generating System. Dated 8/28/2007.

CEC2008o – California Energy Commission / M. Jones (tn: 48836). System Impact Study Application for Confidentiality. Dated 10/30/2008.

CH2ML2008b – CH2M Hill/ J. Carrier (tn: 45305). Data Response Set 1B. Dated 2/11/2008.

CH2ML2008e – CH2M Hill/ J. Carrier (tn: 45322). Attachment DR 93-1B, Interconnection System Impact Study. Dated 2/11/2008.

CH2ML2008g – CH2M Hill/ / J. Carrier (tn: 46239). Data Responses Set 1D. Dated 5/09/2008.

CH2ML2008i – CH2M Hill/ J. Carrier (tn: 46666). Data Response Set 2A –. Dated 6/10/2008.

CH2ML2008m – CH2M Hill / J. Carrier (tn: 47190). Data Response, Set 2B. Dated 7/22/2008.

CH2ML 2008o - CH2M Hill/ J. Carrier (tn: 47476). Data Response 1F - Weed Management Plan for ISEGS, Eastern Mojave Desert. Dated 8/6/2008.

CH2ML2008u – CH2M Hill/ J. Carrier (tn: 48033). Data Responses Set 2D – Draft Biological Assessment. Dated 9/12/2008.

CH2ML 2008v - CH2M Hill/ J. Carrier (tn: 48034). Data Response Set 1H - Draft Raven Management Plan, Ivanpah Solar Electric Generating System. Dated 9/12/2008.

CH2ML 2009c - CH2M Hill/ J. Carrier (tn: 50610). Data Response Set 2A - Draft Desert Tortoise Translocation/Relocation Plan for ISEGS. Dated 3/19/09

CH2ML2009d - CH2M Hill/ J. Carrier (tn: 51575). Data Response Set 2B - Draft ISEGS Construction Stormwater Pollution Prevention Plan. Dated 5/13/2009.

CH2ML2009e - CH2M Hill/ J. Carrier (tn: 51576). Data Response Set 2H - Drainage, Erosion and Sediment Control Plan. Dated 5/13/2009.

CH2ML2009f – CH2M HILL / J. Carrier (tn 51597). Data Response Set 2I – Project Description and Stormwater Plans. Dated on 05/18/2009. Submitted to CEC / J. Kessler on 05/18/2009.

CH2ML2009g - CH2M Hill/ J. Carrier (tn: 51612). Data Response Set 2C - Draft Contractor Health and Safety Standards. Dated 5/19/2009.

CH2ML2009i - CH2M Hill/ J. Carrier (tn: 51720). Data Response Set 2D - Application for Incidental Take Permit Under Section 2081 of the Fish and Game Code. Dated 5/27/2009.

CH2ML 2009j - CH2M Hill/ J. Carrier (tn: 51790). Data Response 1L - Streambed Alteration Agreement Application. Dated 6/2/2009.

CH2ML 2009q – CH2M HILL / J. Carrier (tn 52208). Data Response Set 2K – Draft Closure, Revegetation, and Rehabilitation Plan. Dated on 06/30/2009. Submitted to CEC / J. Kessler on 06/30/2009.