ENGINEERING ANALYSIS

D.1 – FACILITY DESIGN

Testimony of Shahab Khoshmashrab

D.1.1 SUMMARY OF CONCLUSIONS

The California Energy Commission staff concludes that the design, construction, and eventual closure of the project and its linear facilities would likely comply with applicable engineering laws, ordinances, regulations and standards. The proposed conditions of certification, below, would ensure compliance with these laws, ordinances, regulations and standards.

Facility Design is not intended to address environmental impacts under either CEQA or NEPA.

D.1.2 INTRODUCTION

Facility design encompasses the civil, structural, mechanical, and electrical engineering design of the Calico Solar Project. The purpose of this analysis is to:

- Verify that the laws, ordinances, regulations and standards (LORS) that apply to the engineering design and construction of the project have been identified;
- Verify that both the project and its ancillary facilities are sufficiently described, including proposed design criteria and analysis methods, in order to provide reasonable assurance that the project will be designed and constructed in accordance with all applicable engineering LORS, in a manner that also ensures the public health and safety;
- Determine whether special design features should be considered during final design to address conditions unique to the site which could influence public health and safety; and
- Describe the design review and construction inspection process and establish the conditions of certification used to monitor and ensure compliance with the engineering LORS, in addition to any special design requirements.

Subjects discussed in this analysis include:

- Identification of the engineering LORS that apply to facility design;
- Evaluation of the applicant's proposed design criteria, including identification of criteria essential to public health and safety;
- Proposed modifications and additions to the application for certification (AFC) necessary for compliance with applicable engineering LORS; and
- Conditions of certification proposed by staff to ensure that the project will be designed and constructed to ensure public health and safety and comply with all applicable engineering LORS.

D.1.3 METHODOLOGY AND THRESHOLDS FOR DETERMINING ENVIRONMENTAL CONSEQUENCES

Lists of LORS applicable to each engineering discipline (civil, structural, mechanical, and electrical) are described in the AFC (SES Solar One 2008a, Appendices F, K, M, O, P, Q, R). Key LORS are listed in **Facility Design Table 1,** below:

Facility Design Table 1
Key Engineering Laws, Ordinances, Regulations and Standards (LORS)

Applicable LORS	Description
Federal	Title 29 Code of Federal Regulations (CFR), Part 1910, Occupational Safety and Health standards
State	2007 California Building Standards Code (CBSC) (also known as Title 24, California Code of Regulations)
Local	San Bernardino County regulations and ordinances
General	American National Standards Institute (ANSI) American Society of Mechanical Engineers (ASME) American Welding Society (AWS) American Society for Testing and Materials (ASTM)

D.1.4 PROPOSED PROJECT

D.1.4.1 SETTING AND EXISTING CONDITIONS

The Calico Solar Project would be built on an approximately 8,230-acre site located in San Bernardino County, California. For more information on the site and its related project description, please see the **PROJECT DESCRIPTION** section of this document. Additional engineering design details are contained in the AFC, Appendices F, K, M, O, P, Q, R (SES Solar One 2008a).

D.1.4.2 ASSESSMENT OF IMPACTS AND DISCUSSION OF MITIGATION

The purpose of this analysis is to ensure that the project would be built to applicable engineering codes and ensure public health and life safety. This analysis further verifies that applicable engineering LORS have been identified and that the project and its ancillary facilities have been described in adequate detail. It also evaluates the applicant's proposed design criteria, describes the design review and construction inspection process, and establishes conditions of certification that would monitor and ensure compliance with engineering LORS and any other special design requirements. These conditions allow both the California Energy Commission (Energy Commission) compliance project manager (CPM) and the applicant to adopt a compliance monitoring scheme that will verify compliance with these LORS.

SITE PREPARATION AND DEVELOPMENT

Staff has evaluated the proposed design criteria for grading, flood protection, erosion control, site drainage, and site access, in addition to the criteria for designing and

constructing linear support facilities such as natural gas and electric transmission interconnections. The applicant proposes the use of accepted industry standards (see SES Solar One 2008a, Appendices F, K, M, O, P, Q, R, for a representative list of applicable industry standards), design practices, and construction methods in preparing and developing the site. Staff concludes that this project, including its linear facilities, would most likely comply with all applicable site preparation LORS, and proposes conditions of certification (see below and the **GEOLOGY AND PALEONTOLOGY** section of this document) to ensure that compliance.

MAJOR STRUCTURES, SYSTEMS, AND EQUIPMENT

Major structures, systems, and equipment are structures and their associated components or equipment that are necessary for power production, costly or time consuming to repair or replace, are used for the storage, containment, or handling of hazardous or toxic materials, or could become potential health and safety hazards if not constructed according to applicable engineering LORS. Major structures and equipment are identified in the proposed Condition of Certification **GEN-2**, below. Typically, **Facility Design Table 2** in Condition of Certification **GEN-2** lists the major structures and equipment identified in the AFC and other project related information available before project licensing; this list is based on the preliminary design of the project. The master drawing and master specifications lists described in Condition of Certification **GEN-2**, however, include the project-related documents based on the project's detailed design and may include additional documents for structures and equipment not identified in **Facility Design Table 2**. (Detailed project design typically occurs after project licensing and is not available at this time.)

The Calico Solar Project shall be designed and constructed to the 2007 California Building Standards Code (CBSC), also known as Title 24, California Code of Regulations, which encompasses the California Building Code (CBC), California Building Standards Administrative Code, California Electrical Code, California Mechanical Code, California Plumbing Code, California Energy Code, California Fire Code, California Code for Building Conservation, California Reference Standards Code, and other applicable codes and standards in effect when the design and construction of the project actually begin. If the initial designs are submitted to the chief building official (CBO) for review and approval after the update to the 2007 CBSC takes effect, the 2007 CBSC provisions shall be replaced with the updated provisions.

Certain structures in a power plant may be required, under the CBC, to undergo dynamic lateral force (structural) analysis; others may be designed using the simpler static analysis procedure. In order to ensure that structures are analyzed according to their appropriate lateral force procedure, staff has included condition of certification **STRUC-1**, below, which, in part, requires the project CBO's review and approval of the owner's proposed lateral force procedures before construction begins.

PROJECT QUALITY PROCEDURES

The project's AFC (SES Solar One 2008a, Appendices F, K, M, O, P, Q, R) describes a quality program intended to inspire confidence that its systems and components will be designed, fabricated, stored, transported, installed, and tested in accordance with all appropriate power plant technical codes and standards. Compliance with design

requirements will be verified through specific inspections and audits. Implementation of this quality assurance/quality control (QA/QC) program will ensure that the Calico Solar Project is actually designed, procured, fabricated, and installed as described in this analysis.

COMPLIANCE MONITORING

Under Section 104.2 of the CBC, the CBO is authorized and directed to enforce all provisions of the CBC. The Energy Commission itself serves as the building official, and has the responsibility to enforce the code, for all of the energy facilities it certifies. In addition, the Energy Commission has the power to interpret the CBC and adopt and enforce both rules and supplemental regulations that clarify application of the CBC's provisions.

The Energy Commission's design review and construction inspection process conforms to CBC requirements and ensures that all facility design conditions of certification are met. As provided by Section 104.2.2 of the CBC, the Energy Commission appoints experts to perform design review and construction inspections and act as delegate CBOs on behalf of the Energy Commission. These delegates typically include the local building official and/or independent consultants hired to provide technical expertise that is not provided by the local official alone. The applicant, through permit fees provided by the CBC, pays the cost of these reviews and inspections. While building permits in addition to Energy Commission certification are not required for this project, the applicant pays in lieu of CBC permit fees to cover the costs of these reviews and inspections.

Engineering and compliance staff will invite San Bernardino County or a third-party engineering consultant to act as CBO for this project. When an entity has been assigned CBO duties, Energy Commission staff will complete a memorandum of understanding (MOU) with that entity to outline both its roles and responsibilities and those of its subcontractors and delegates.

Staff has developed proposed conditions of certification to ensure public health and safety and compliance with engineering design LORS. Some of these conditions address the roles, responsibilities, and qualifications of the engineers who will design and build the proposed project (conditions of certification **GEN-1** through **GEN-8**). These engineers must be registered in California and sign and stamp every submittal of design plans, calculations, and specifications submitted to the CBO. These conditions require that every element of the project's construction (subject to CBO review and approval) be approved by the CBO before it is performed. They also require that qualified special inspectors perform or oversee special inspections required by all applicable LORS.

While the Energy Commission and delegate CBO have the authority to allow some flexibility in scheduling construction activities, these conditions are written so that no element of construction (of permanent facilities subject to CBO review and approval) which could be difficult to reverse or correct can proceed without prior CBO approval. Elements of construction that are not difficult to reverse may proceed without approval of the plans. The applicant bears the responsibility to fully modify construction elements

in order to comply with all design changes resulting from the CBO's subsequent plan review and approval process.

D.1.5 REDUCED ACREAGE ALTERNATIVE

The Facility Design section is not intended to address environmental impacts under either CEQA or NEPA.

D.1.6 AVOIDANCE OF DONATED AND ACQUIRED LANDS ALTERNATIVE

The Facility Design section is not intended to address environmental impacts under either CEQA or NEPA.

D.1.7 NO PROJECT / NO ACTION ALTERATIVE

The Facility Design section is not intended to address environmental impacts under either CEQA or NEPA.

D.1.8 PROJECT-RELATED FUTURE ACTIONS

Proposed upgrades to the Southern California Edison (SCE) transmission system, known as the 275 MW Early Interconnection option and the 850 MW Full Build-Out option are considered to be reasonably foreseeable actions that would be contingent on construction of the proposed Calico Solar Project. The SCE upgrades would not impact the facility design of the proposed Calico Solar Project, and therefore, no additional analysis is required.

D.1.9 CUMULATIVE IMPACT ANALYSIS

The Facility Design section is not intended to address environmental impacts under either CEQA or NEPA.

D.1.10 COMPLIANCE WITH LORS

No federal, state, or local/county laws, ordinances, regulations, and standards (LORS) apply to the design of this project.

D.1.11 NOTEWORTHY PUBLIC BENEFITS

Staff has not identified any noteworthy public benefits associated with this Facility Design section.

D.1.12 PROPOSED CONDITIONS OF CERTIFICATION/MITIGATION MEASURES

GEN-1 The project owner shall design, construct, and inspect the project in accordance with the 2007 California Building Standards Code (CBSC), also known as Title 24, California Code of Regulations, which encompasses the California Building Code (CBC), California Building Standards Administrative Code, California Electrical Code, California Mechanical Code, California Plumbing Code, California Energy Code, California Fire Code, California Code for Building Conservation, California Reference Standards Code, and all other applicable engineering LORS in effect at the time initial design plans are submitted to the CBO for review and approval (the CBSC in effect is the edition that has been adopted by the California Building Standards Commission and published at least 180 days previously). The project owner shall ensure that all the provisions of the above applicable codes are enforced during the construction, addition, alteration, moving, demolition, repair, or maintenance of the completed facility. All transmission facilities (lines, switchyards, switching stations and substations) are covered in the conditions of certification in the **Transmission System Engineering** section of this document.

In the event that the initial engineering designs are submitted to the CBO when the successor to the 2007 CBSC is in effect, the 2007 CBSC provisions shall be replaced with the applicable successor provisions. Where, in any specific case, different sections of the code specify different materials, methods of construction or other requirements, the most restrictive shall govern. Where there is a conflict between a general requirement and a specific requirement, the specific requirement shall govern.

The project owner shall ensure that all contracts with contractors, subcontractors, and suppliers clearly specify that all work performed and materials supplied comply with the codes listed above.

Verification: Within 30 days following receipt of the certificate of occupancy, the project owner shall submit to the CPM a statement of verification, signed by the responsible design engineer, attesting that all designs, construction, installation, and inspection requirements of the applicable LORS and the Energy Commission's decision have been met in the area of facility design. The project owner shall provide the CPM a copy of the certificate of occupancy within 30 days of receipt from the CBO.

Once the certificate of occupancy has been issued, the project owner shall inform the CPM at least 30 days prior to any construction, addition, alteration, moving, demolition, repair, or maintenance to be performed on any portion(s) of the completed facility that requires CBO approval for compliance with the above codes. The CPM will then determine if the CBO needs to approve the work.

GEN-2 Before submitting the initial engineering designs for CBO review, the project owner shall furnish the CPM and the CBO with a schedule of facility design submittals, and master drawing and master specifications lists. The schedule shall contain a list of proposed submittal packages of designs, calculations,

and specifications for major structures and equipment. To facilitate audits by Energy Commission staff, the project owner shall provide specific packages to the CPM upon request.

Verification: At least 60 days (or a project owner- and CBO-approved alternative time frame) prior to the start of rough grading, the project owner shall submit to the CBO and to the CPM the schedule, the master drawing and master specifications lists of documents to be submitted to the CBO for review and approval. These documents shall be the pertinent design documents for the major structures and equipment listed in **Facility Design Table 2**, below. Major structures and equipment shall be added to or deleted from the table only with CPM approval. The project owner shall provide schedule updates in the monthly compliance report.

Facility Design Table 2
Major Structures and Equipment List

Equipment/System	Quantity (Plant)
SunCatcher Power Generating Unit (CT) Foundation and Connections	1 Lot
Administration Building Structure, Foundation and Connections	1
Maintenance Building Structure, Foundation and Connections	1
Assembly Building Structure, Foundation and Connections	3
Satellite Complex Maintenance Building Structure, Foundation and Connections	1
Collector Group Generator Step-up Unit Transformer Foundation and Connections	1 Lot
Generator Collection Power Center	1 Lot
Generator Collection Sub-panel	1 Lot
Power Factor Capacitor	1 Lot
Open Bus Switch Rack	6
Shunt Capacitor Bank	6
Dynamic VAR Compression System	6
Disconnect Switch	15
Power Transformer Foundation and Connections	6
Coupling Capacitor Voltage Transformer Foundation and Connections	6
Diesel Power Generator Set Foundation and Connections	1
Fire Water Pump Foundation and Connections	1
Water Treatment System Foundation and Connections	1
Potable/Fire Water Tank Structure, Foundation and Connections	1
Well Water Storage Tank Structure, Foundation and Connections	1
Demineralized Water Storage Tank Structure, Foundation and Connections	2
Hydrogen Bottles Storage Area	1 Lot
Chemical Storage Area	1 Lot
Drainage Systems (including sanitary drain and waste)	1 Lot
High Pressure and Large Diameter Piping and Pipe Racks	1 Lot
HVAC and Refrigeration Systems	1 Lot
Temperature Control and Ventilation Systems (including water and sewer connections)	1 Lot

Equipment/System	Quantity (Plant)
Building Energy Conservation Systems	1 Lot
Substation, Switchboards, Transformers, Buses and Towers	1 Lot
Electrical Breakers, Cables/Duct Banks	1 Lot
Prefabricated Assemblies	1 Lot

GEN-3 The project owner shall make payments to the CBO for design review, plan checks, and construction inspections, based upon a reasonable fee schedule to be negotiated between the project owner and the CBO. These fees may be consistent with the fees listed in the 2007 CBC, adjusted for inflation and other appropriate adjustments; may be based on the value of the facilities reviewed; may be based on hourly rates; or may be otherwise agreed upon by the project owner and the CBO.

Verification: The project owner shall make the required payments to the CBO in accordance with the agreement between the project owner and the CBO. The project owner shall send a copy of the CBO's receipt of payment to the CPM in the next monthly compliance report indicating that applicable fees have been paid.

GEN-4 Prior to the start of rough grading, the project owner shall assign a California-registered architect, or a structural or civil engineer, as the resident engineer (RE) in charge of the project. All transmission facilities (lines, switchyards, switching stations, and substations) are addressed in the conditions of certification in the **TRANSMISSION SYSTEM ENGINEERING** section of this document.

The RE may delegate responsibility for portions of the project to other registered engineers. Registered mechanical and electrical engineers may be delegated responsibility for mechanical and electrical portions of the project, respectively. A project may be divided into parts, provided that each part is clearly defined as a distinct unit. Separate assignments of general responsibility may be made for each designated part.

The RE shall:

1. Monitor progress of construction work requiring CBO design review and inspection to ensure compliance with LORS;

2. Ensure that construction of all facilities subject to CBO design review and inspection conforms in every material respect to applicable LORS, these conditions of certification, approved plans, and specifications;

3. Prepare documents to initiate changes in approved drawings and specifications when either directed by the project owner or as required by the conditions of the project;

4. Be responsible for providing project inspectors and testing agencies with complete and up-to-date sets of stamped drawings, plans, specifications, and any other required documents;

5. Be responsible for the timely submittal of construction progress reports to the CBO from the project inspectors, the contractor, and other engineers who have been delegated responsibility for portions of the project; and

6. Be responsible for notifying the CBO of corrective action or the disposition of items noted on laboratory reports or other tests when they do not conform to approved plans and specifications.

The resident engineer (or his delegate) must be located at the project site, or be available at the project site within a reasonable period of time, during any hours in which construction takes place.

The RE shall have the authority to halt construction and to require changes or remedial work if the work does not meet requirements.

If the RE or the delegated engineers are reassigned or replaced, the project owner shall submit the name, qualifications and registration number of the newly assigned engineer to the CBO for review and approval. The project owner shall notify the CPM of the CBO's approval of the new engineer.

Verification: At least 30 days (or project owner- and CBO-approved alternative time frame) prior to the start of rough grading, the project owner shall submit to the CBO for review and approval, the resume and registration number of the RE and any other delegated engineers assigned to the project. The project owner shall notify the CPM of the CBO's approvals of the RE and other delegated engineer(s) within 5 days of the approval.

If the RE or the delegated engineer(s) is subsequently reassigned or replaced, the project owner has 5 days to submit the resume and registration number of the newly assigned engineer to the CBO for review and approval. The project owner shall notify the CPM of the CBO's approval of the new engineer within 5 days of the approval.

GEN-5 Prior to the start of rough grading, the project owner shall assign at least one of each of the following California registered engineers to the project: a civil engineer; a soils, geotechnical, or civil engineer experienced and knowledgeable in the practice of soils engineering; and an engineering geologist. Prior to the start of construction, the project owner shall assign at least one of each of the following California registered engineers to the project: a design engineer who is either a structural engineer or a civil engineer fully competent and proficient in the design of power plant structures and equipment supports; a mechanical engineer; and an electrical engineer. (California Business and Professions Code section 6704 et seq., and sections 6730, 6731 and 6736 require state registration to practice as a civil engineer or structural engineer in California). All transmission facilities (lines, switchyards, switching stations, and substations) are handled in the conditions of certification in the **TRANSMISSION SYSTEM ENGINEERING** section of this document.

The tasks performed by the civil, mechanical, electrical, or design engineers may be divided between two or more engineers, as long as each engineer is

responsible for a particular segment of the project (for example, proposed earthwork, civil structures, power plant structures, equipment support). No segment of the project shall have more than one responsible engineer. The transmission line may be the responsibility of a separate California registered electrical engineer.

The project owner shall submit, to the CBO for review and approval, the names, qualifications, and registration numbers of all responsible engineers assigned to the project.

If any one of the designated responsible engineers is subsequently reassigned or replaced, the project owner shall submit the name, qualifications and registration number of the newly assigned responsible engineer to the CBO for review and approval. The project owner shall notify the CPM of the CBO's approval of the new engineer.

A. The civil engineer shall:

1. Review the foundation investigations, geotechnical, or soils reports prepared by the soils engineer, the geotechnical engineer, or by a civil engineer experienced and knowledgeable in the practice of soils engineering;

2. Design (or be responsible for the design of), stamp, and sign all plans, calculations, and specifications for proposed site work, civil works, and related facilities requiring design review and inspection by the CBO. At a minimum, these include: grading, site preparation, excavation, compaction, construction of secondary containment, foundations, erosion and sedimentation control structures, drainage facilities, underground utilities, culverts, site access roads and sanitary sewer systems; and

3. Provide consultation to the RE during the construction phase of the project and recommend changes in the design of the civil works facilities and changes to the construction procedures.

B. The soils engineer, geotechnical engineer, or civil engineer experienced and knowledgeable in the practice of soils engineering, shall:

1. Review all the engineering geology reports;

2. Prepare the foundation investigations, geotechnical, or soils reports containing field exploration reports, laboratory tests, and engineering analysis detailing the nature and extent of the soils that could be susceptible to liquefaction, rapid settlement or collapse when saturated under load;

3. Be present, as required, during site grading and earthwork to provide consultation and monitor compliance with requirements set forth in the 2007 CBC (depending on the site conditions, this may be the

responsibility of either the soils engineer, the engineering geologist, or both); and

4. Recommend field changes to the civil engineer and RE.

This engineer shall be authorized to halt earthwork and to require changes if site conditions are unsafe or do not conform to the predicted conditions used as the basis for design of earthwork or foundations.

C. The engineering geologist shall:

1. Review all the engineering geology reports and prepare a final soils grading report; and

2. Be present, as required, during site grading and earthwork to provide consultation and monitor compliance with the requirements set forth in the 2007 CBC (depending on the site conditions, this may be the responsibility of either the soils engineer, the engineering geologist, or both).

D. The design engineer shall:

1. Be directly responsible for the design of the proposed structures and equipment supports;

2. Provide consultation to the RE during design and construction of the project;

3. Monitor construction progress to ensure compliance with engineering LORS;

4. Evaluate and recommend necessary changes in design; and

5. Prepare and sign all major building plans, specifications, and calculations.

E. The mechanical engineer shall be responsible for, and sign and stamp a statement with, each mechanical submittal to the CBO, stating that the proposed final design plans, specifications, and calculations conform to all of the mechanical engineering design requirements set forth in the Energy Commission's decision.

F. The electrical engineer shall:

1. Be responsible for the electrical design of the project; and

2. Sign and stamp electrical design drawings, plans, specifications, and calculations.

Verification: At least 30 days (or project owner- and CBO-approved alternative time frame) prior to the start of rough grading, the project owner shall submit to the CBO for review and approval, resumes and registration numbers of the responsible civil

engineer, soils (geotechnical) engineer and engineering geologist assigned to the project.

At least 30 days (or project owner- and CBO-approved alternative time frame) prior to the start of construction, the project owner shall submit to the CBO for review and approval, resumes and registration numbers of the responsible design engineer, mechanical engineer, and electrical engineer assigned to the project.

The project owner shall notify the CPM of the CBO's approvals of the responsible engineers within 5 days of the approval.

If the designated responsible engineer is subsequently reassigned or replaced, the project owner has 5 days in which to submit the resume and registration number of the newly assigned engineer to the CBO for review and approval. The project owner shall notify the CPM of the CBO's approval of the new engineer within 5 days of the approval.

GEN-6 Prior to the start of an activity requiring special inspection, including prefabricated assemblies, the project owner shall assign to the project, qualified and certified special inspector(s) who shall be responsible for the special inspections required by the 2007 CBC. All transmission facilities (lines, switchyards, switching stations, and substations) are handled in conditions of certification in the **TRANSMISSION SYSTEM ENGINEERING** section of this document.

A certified weld inspector, certified by the American Welding Society (AWS), and/or American Society of Mechanical Engineers (ASME) as applicable, shall inspect welding performed on-site requiring special inspection (including structural, piping, tanks and pressure vessels).

The special inspector shall:

1. Be a qualified person who shall demonstrate competence, to the satisfaction of the CBO, for inspection of the particular type of construction requiring special or continuous inspection;

2. Inspect the work assigned for conformance with the approved design drawings and specifications;

3. Furnish inspection reports to the CBO and RE. All discrepancies shall be brought to the immediate attention of the RE for correction, then, if uncorrected, to the CBO and the CPM for corrective action; and

4. Submit a final signed report to the RE, CBO, and CPM, stating whether the work requiring special inspection was, to the best of the inspector's knowledge, in conformance with the approved plans, specifications, and other provisions of the applicable edition of the CBC.

Verification: At least 15 days (or project owner- and CBO-approved alternative time frame) prior to the start of an activity requiring special inspection, the project owner shall submit to the CBO for review and approval, with a copy to the CPM, the name(s) and qualifications of the certified weld inspector(s), or other certified special inspector(s)

assigned to the project to perform one or more of the duties set forth above. The project owner shall also submit to the CPM a copy of the CBO's approval of the qualifications of all special inspectors in the next monthly compliance report.

If the special inspector is subsequently reassigned or replaced, the project owner has 5 days in which to submit the name and qualifications of the newly assigned special inspector to the CBO for approval. The project owner shall notify the CPM of the CBO's approval of the newly assigned inspector within 5 days of the approval.

GEN-7 If any discrepancy in design and/or construction is discovered in any engineering work that has undergone CBO design review and approval, the project owner shall document the discrepancy and recommend required corrective actions. The discrepancy documentation shall be submitted to the CBO for review and approval. The discrepancy documentation shall reference this condition of certification and, if appropriate, applicable sections of the CBC and/or other LORS.

Verification: The project owner shall transmit a copy of the CBO's approval of any corrective action taken to resolve a discrepancy to the CPM in the next monthly compliance report. If any corrective action is disapproved, the project owner shall advise the CPM, within 5 days, of the reason for disapproval and the revised corrective action to obtain CBO's approval.

GEN-8 The project owner shall obtain the CBO's final approval of all completed work that has undergone CBO design review and approval. The project owner shall request the CBO to inspect the completed structure and review the submitted documents. The project owner shall notify the CPM after obtaining the CBO's final approval. The project owner shall retain one set of approved engineering plans, specifications, and calculations (including all approved changes) at the project site or at another accessible location during the operating life of the project. Electronic copies of the approved plans, specifications, calculations, and marked-up as-builts shall be provided to the CBO for retention by the CPM.

Verification: Within 15 days of the completion of any work, the project owner shall submit to the CBO, with a copy to the CPM, in the next monthly compliance report, (a) a written notice that the completed work is ready for final inspection, and (b) a signed statement that the work conforms to the final approved plans. After storing the final approved engineering plans, specifications, and calculations described above, the project owner shall submit to the CPM a letter stating both that the above documents have been stored and the storage location of those documents.

Within 90 days of the completion of construction, the project owner shall provide to the CBO three sets of electronic copies of the above documents at the project owner's expense. These are to be provided in the form of "read only" (Adobe .pdf 6.0) files, with restricted (password-protected) printing privileges, on archive quality compact discs.

CIVIL-1 The project owner shall submit to the CBO for review and approval the following:

1. Design of the proposed drainage structures and the grading plan;

2. An erosion and sedimentation control plan;

3. Related calculations and specifications, signed and stamped by the responsible civil engineer; and

4. Soils, geotechnical, or foundation investigations reports required by the 2007 CBC.

Verification: At least 15 days (or project owner- and CBO-approved alternative time frame) prior to the start of site grading the project owner shall submit the documents described above to the CBO for design review and approval. In the next monthly compliance report following the CBO's approval, the project owner shall submit a written statement certifying that the documents have been approved by the CBO.

CIVIL-2 The resident engineer shall, if appropriate, stop all earthwork and construction in the affected areas when the responsible soils engineer, geotechnical engineer, or the civil engineer experienced and knowledgeable in the practice of soils engineering identifies unforeseen adverse soil or geologic conditions. The project owner shall submit modified plans, specifications, and calculations to the CBO based on these new conditions. The project owner shall obtain approval from the CBO before resuming earthwork and construction in the affected area.

Verification: The project owner shall notify the CPM within 24 hours, when earthwork and construction is stopped as a result of unforeseen adverse geologic/soil conditions. Within 24 hours of the CBO's approval to resume earthwork and construction in the affected areas, the project owner shall provide to the CPM a copy of the CBO's approval.

CIVIL-3 The project owner shall perform inspections in accordance with the 2007 CBC. All plant site-grading operations, for which a grading permit is required, shall be subject to inspection by the CBO.

If, in the course of inspection, it is discovered that the work is not being performed in accordance with the approved plans, the discrepancies shall be reported immediately to the resident engineer, the CBO, and the CPM. The project owner shall prepare a written report, with copies to the CBO and the CPM, detailing all discrepancies, non-compliance items, and the proposed corrective action.

Verification: Within 5 days of the discovery of any discrepancies, the resident engineer shall transmit to the CBO and the CPM a non-conformance report (NCR), and the proposed corrective action for review and approval. Within 5 days of resolution of the NCR, the project owner shall submit the details of the corrective action to the CBO and the CPM. A list of NCRs, for the reporting month, shall also be included in the following monthly compliance report.

CIVIL-4 After completion of finished grading and erosion and sedimentation control and drainage work, the project owner shall obtain the CBO's approval of the final grading plans (including final changes) for the erosion and sedimentation

control work. The civil engineer shall state that the work within his/her area of responsibility was done in accordance with the final approved plans.

Verification: Within 30 days (or project owner- and CBO-approved alternative time frame) of the completion of the erosion and sediment control mitigation and drainage work, the project owner shall submit to the CBO, for review and approval, the final grading plans (including final changes) and the responsible civil engineer's signed statement that the installation of the facilities and all erosion control measures were completed in accordance with the final approved combined grading plans, and that the facilities are adequate for their intended purposes, along with a copy of the transmittal letter to the CPM. The project owner shall submit a copy of the CBO's approval to the CPM in the next monthly compliance report.

STRUC-1 Prior to the start of any increment of construction of any major structure or component listed in **Facility Design Table 2** of condition of certification **GEN-2**, above, the project owner shall submit to the CBO for design review and approval the proposed lateral force procedures for project structures and the applicable designs, plans and drawings for project structures. Proposed lateral force procedures, designs, plans and drawings shall be those for the following items (from **Table 2**, above):

1. Major project structures;

2. Major foundations, equipment supports, and anchorage; and

3. Large field-fabricated tanks.

Construction of any structure or component shall not begin until the CBO has approved the lateral force procedures to be employed in designing that structure or component.

The project owner shall:

1. Obtain approval from the CBO of lateral force procedures proposed for project structures;

2. Obtain approval from the CBO for the final design plans, specifications, calculations, soils reports, and applicable quality control procedures. If there are conflicting requirements, the more stringent shall govern (for example, highest loads, or lowest allowable stresses shall govern). All plans, calculations, and specifications for foundations that support structures shall be filed concurrently with the structure plans, calculations, and specifications;

3. Submit to the CBO the required number of copies of the structural plans, specifications, calculations, and other required documents of the designated major structures prior to the start of on-site fabrication and installation of each structure, equipment support, or foundation;

4. Ensure that the final plans, calculations, and specifications clearly reflect the inclusion of approved criteria, assumptions, and methods used to

develop the design. The final designs, plans, calculations, and specifications shall be signed and stamped by the responsible design engineer; and

5. Submit to the CBO the responsible design engineer's signed statement that the final design plans conform to applicable LORS.

Verification: At least 60 days (or project owner- and CBO-approved alternative time frame) prior to the start of any increment of construction of any structure or component listed in **Facility Design Table 2** of condition of certification **GEN-2**, above, the project owner shall submit to the CBO the above final design plans, specifications and calculations, with a copy of the transmittal letter to the CPM.

The project owner shall submit to the CPM, in the next monthly compliance report, a copy of a statement from the CBO that the proposed structural plans, specifications, and calculations have been approved and comply with the requirements set forth in applicable engineering LORS.

STRUC-2 The project owner shall submit to the CBO the required number of sets of the following documents related to work that has undergone CBO design review and approval:

1. Concrete cylinder strength test reports (including date of testing, date sample taken, design concrete strength, tested cylinder strength, age of test, type and size of sample, location and quantity of concrete placement from which sample was taken, and mix design designation and parameters);

2. Concrete pour sign-off sheets;

3. Bolt torque inspection reports (including location of test, date, bolt size, and recorded torques);

4. Field weld inspection reports (including type of weld, location of weld, inspection of non-destructive testing (NDT) procedure and results, welder qualifications, certifications, qualified procedure description or number (ref: AWS); and

5. Reports covering other structural activities requiring special inspections shall be in accordance with the 2007 CBC.

Verification: If a discrepancy is discovered in any of the above data, the project owner shall, within 5 days, prepare and submit an NCR describing the nature of the discrepancies and the proposed corrective action to the CBO, with a copy of the transmittal letter to the CPM. The NCR shall reference the condition(s) of certification and the applicable CBC chapter and section. Within 5 days of resolution of the NCR, the project owner shall submit a copy of the corrective action to the CBO and the CPM.

The project owner shall transmit a copy of the CBO's approval or disapproval of the corrective action to the CPM within 15 days. If disapproved, the project owner shall

advise the CPM, within 5 days, the reason for disapproval, and the revised corrective action to obtain CBO's approval.

STRUC-3 The project owner shall submit to the CBO design changes to the final plans required by the 2007 CBC, including the revised drawings, specifications, calculations, and a complete description of, and supporting rationale for, the proposed changes, and shall give to the CBO prior notice of the intended filing.

Verification: On a schedule suitable to the CBO, the project owner shall notify the CBO of the intended filing of design changes, and shall submit the required number of sets of revised drawings and the required number of copies of the other above-mentioned documents to the CBO, with a copy of the transmittal letter to the CPM. The project owner shall notify the CPM, via the monthly compliance report, when the CBO has approved the revised plans.

STRUC-4 Tanks and vessels containing quantities of toxic or hazardous materials exceeding amounts specified in the 2007 CBC shall, at a minimum, be designed to comply with the requirements of that chapter.

Verification: At least 30 days (or project owner- and CBO-approved alternate time frame) prior to the start of installation of the tanks or vessels containing the above specified quantities of toxic or hazardous materials, the project owner shall submit to the CBO for design review and approval final design plans, specifications, and calculations, including a copy of the signed and stamped engineer's certification.

The project owner shall send copies of the CBO approvals of plan checks to the CPM in the following monthly compliance report. The project owner shall also transmit a copy of the CBO's inspection approvals to the CPM in the monthly compliance report following completion of any inspection.

MECH-1 The project owner shall submit, for CBO design review and approval, the proposed final design, specifications and calculations for each plant major piping and plumbing system listed in **Facility Design Table 2**, condition of certification **GEN-2**, above. Physical layout drawings and drawings not related to code compliance and life safety need not be submitted. The submittal shall also include the applicable QA/QC procedures. Upon completion of construction of any such major piping or plumbing system, the project owner shall request the CBO's inspection approval of that construction.

The responsible mechanical engineer shall stamp and sign all plans, drawings, and calculations for the major piping and plumbing systems, subject to CBO design review and approval, and submit a signed statement to the CBO when the proposed piping and plumbing systems have been designed, fabricated, and installed in accordance with all of the applicable laws, ordinances, regulations and industry standards, which may include, but are not limited to:

- American National Standards Institute (ANSI) B31.1 (Power Piping Code);
- ANSI B31.2 (Fuel Gas Piping Code);

- ANSI B31.3 (Chemical Plant and Petroleum Refinery Piping Code);
- ANSI B31.8 (Gas Transmission and Distribution Piping Code);
- Title 24, California Code of Regulations, Part 5 (California Plumbing Code);
- Title 24, California Code of Regulations, Part 6 (California Energy Code, for building energy conservation systems and temperature control and ventilation systems);
- Title 24, California Code of Regulations, Part 2 (California Building Code); and
- San Bernardino County codes.

The CBO may deputize inspectors to carry out the functions of the code enforcement agency.

Verification: At least 30 days (or project owner- and CBO-approved alternative time frame) prior to the start of any increment of major piping or plumbing construction listed in **Facility Design Table 2**, condition of certification **GEN-2,** above, the project owner shall submit to the CBO for design review and approval the final plans, specifications, and calculations, including a copy of the signed and stamped statement from the responsible mechanical engineer certifying compliance with applicable LORS, and shall send the CPM a copy of the transmittal letter in the next monthly compliance report.

The project owner shall transmit to the CPM, in the monthly compliance report following completion of any inspection, a copy of the transmittal letter conveying the CBO's inspection approvals.

MECH-2 For all pressure vessels installed in the plant, the project owner shall submit to the CBO and California Occupational Safety and Health Administration (Cal-OSHA), prior to operation, the code certification papers and other documents required by applicable LORS. Upon completion of the installation of any pressure vessel, the project owner shall request the appropriate CBO and/or Cal-OSHA inspection of that installation.

The project owner shall:

1. Ensure that all boilers and fired and unfired pressure vessels are designed, fabricated, and installed in accordance with the appropriate section of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code, or other applicable code. Vendor certification, with identification of applicable code, shall be submitted for prefabricated vessels and tanks; and

2. Have the responsible design engineer submit a statement to the CBO that the proposed final design plans, specifications, and calculations conform to all of the requirements set forth in the appropriate ASME Boiler and Pressure Vessel Code or other applicable codes.

Verification: At least 30 days (or project owner- and CBO-approved alternative time frame) prior to the start of on-site fabrication or installation of any pressure vessel, the project owner shall submit to the CBO for design review and approval, the above listed documents, including a copy of the signed and stamped engineer's certification, with a copy of the transmittal letter to the CPM.

The project owner shall transmit to the CPM, in the monthly compliance report following completion of any inspection, a copy of the transmittal letter conveying the CBO's and/or Cal-OSHA inspection approvals.

MECH-3 The project owner shall submit to the CBO for design review and approval the design plans, specifications, calculations, and quality control procedures for any heating, ventilating, air conditioning (HVAC) or refrigeration system. Packaged HVAC systems, where used, shall be identified with the appropriate manufacturer's data sheets.

The project owner shall design and install all HVAC and refrigeration systems within buildings and related structures in accordance with the CBC and other applicable codes. Upon completion of any increment of construction, the project owner shall request the CBO's inspection and approval of that construction. The final plans, specifications and calculations shall include approved criteria, assumptions, and methods used to develop the design. In addition, the responsible mechanical engineer shall sign and stamp all plans, drawings and calculations and submit a signed statement to the CBO that the proposed final design plans, specifications and calculations conform with the applicable LORS.

Verification: At least 30 days (or project owner- and CBO-approved alternative time frame) prior to the start of construction of any HVAC or refrigeration system, the project owner shall submit to the CBO the required HVAC and refrigeration calculations, plans, and specifications, including a copy of the signed and stamped statement from the responsible mechanical engineer certifying compliance with the CBC and other applicable codes, with a copy of the transmittal letter to the CPM.

ELEC-1 Prior to the start of any increment of electrical construction for all electrical equipment and systems 480 Volts or higher (see a representative list, below), with the exception of underground duct work and any physical layout drawings and drawings not related to code compliance and life safety, the project owner shall submit, for CBO design review and approval, the proposed final design, specifications, and calculations. Upon approval, the above listed plans, together with design changes and design change notices, shall remain on the site or at another accessible location for the operating life of the project. The project owner shall request that the CBO inspect the installation to ensure compliance with the requirements of applicable LORS. All transmission facilities (lines, switchyards, switching stations, and substations) are handled in conditions of certification in the **TRANSMISSION SYSTEM ENGINEERING** section of this document.

A. Final plant design plans shall include:

1. one-line diagrams for the 13.8 kV, 4.16 kV and 480 V systems; and

2. system grounding drawings.

B. Final plant calculations must establish:

1. short-circuit ratings of plant equipment;

2. ampacity of feeder cables;

3. voltage drop in feeder cables;

4. system grounding requirements;

5. coordination study calculations for fuses, circuit breakers and protective relay settings for the 13.8 kV, 4.16 kV and 480 V systems;

6. system grounding requirements; and

7. lighting energy calculations.

C. The following activities shall be reported to the CPM in the monthly compliance report:

1. Receipt or delay of major electrical equipment;

2. Testing or energization of major electrical equipment; and

3. A signed statement by the registered electrical engineer certifying that the proposed final design plans and specifications conform to requirements set forth in the Energy Commission decision.

Verification: At least 30 days (or project owner- and CBO-approved alternative time frame) prior to the start of each increment of electrical construction, the project owner shall submit to the CBO for design review and approval the above listed documents. The project owner shall include in this submittal a copy of the signed and stamped statement from the responsible electrical engineer attesting compliance with the applicable LORS, and shall send the CPM a copy of the transmittal letter in the next monthly compliance report.

D.1.13 CONCLUSIONS

1. The laws, ordinances, regulations and standards (LORS) identified in the AFC and supporting documents directly apply to the project.

2. Staff has evaluated the proposed engineering LORS, design criteria, and design methods in the record, and concludes that the design, construction, and eventual closure of the project will likely comply with applicable engineering LORS.

3. The proposed conditions of certification will ensure that the Calico Solar Project is designed and constructed in accordance with applicable engineering LORS. This will be accomplished through design review, plan checking, and field inspections that will

be performed by the CBO or other Energy Commission delegate. Staff will audit the CBO to ensure satisfactory performance.

4. Though future conditions that could affect decommissioning are largely unknown at this time, it can reasonably be concluded that if, the project owner submits a decommissioning plan as required in the **GENERAL CONDITIONS** portion of this document prior to decommissioning, decommissioning procedures will comply with all applicable engineering LORS.

Energy Commission staff recommends that:

1. The proposed conditions of certification be adopted to ensure that the project is designed and constructed in a manner that protects the public health and safety and complies with all applicable engineering LORS;

2. The project be designed and built to the 2007 CBSC (or successor standards, if in effect when initial project engineering designs are submitted for review); and

3. The CBO reviews the final designs, checks plans, and performs field inspections during construction. Energy Commission staff shall audit and monitor the CBO to ensure satisfactory performance.

D.1.14 REFERENCES

SES Solar One 2008a – Application for Certification for the Stirling Energy Systems (SES) Solar One Project, Volumes 1 and 2 (tn: 49181). Submitted to the California Energy Commission on December 1, 2008.

D.2 – GEOLOGIC STABILITY

Testimony of Dal Hunter, Ph.D., C.E.G.

D.2.1 SUMMARY OF CONCLUSIONS

(NOTE: The GEOLOGIC STABILITY issue area has been addressed as part of Section C.4 GEOLOGY, SOILS, AND PALEONTOLOGICAL RESOURCES. The summary below is from that environmental analysis. Please refer to that section for the full analysis.)

The proposed Calico Solar Project (formerly the Stirling Energy Systems Solar One Project) site is located in an active geologic area of the north-central Mojave Desert Geomorphic Province in central San Bernardino County in south-central California. Because of its geologic setting, the site could be subject to intense levels of earthquake-related ground shaking. The effects of strong ground shaking would need to be mitigated, to the extent practical, through structural designs required by the California Building Code (CBC 2007) and the project geotechnical report. The CBC (2007) requires that structures be designed to resist seismic stresses from ground acceleration and, to a lesser extent, liquefaction. A geotechnical investigation has been performed and presents standard engineering design recommendations for mitigation of seismic shaking and site soil conditions.

There are no known viable geologic or mineralogical resources at the proposed Calico Solar Project site. Locally, paleontological resources have been documented within older Quaternary alluvium which underlies the younger Quaternary alluvium of the site surface. Potential impacts to paleontological resources would be mitigated through worker training and monitoring by qualified paleontologists, as required by Conditions of Certification, **PAL-1** through **PAL-7**.

Based on its independent research and review, California Energy Commission and U.S. Bureau of Land Management staff believes that the potential is low for significant adverse impacts to the proposed project from geologic hazards during its design life and to potential geologic, mineralogic, and paleontological resources from the construction, operation, and closure of the proposed project. It is staff's opinion that the Calico Solar Project could be designed and constructed in accordance with all applicable laws, ordinances, regulations, and standards and in a manner that both protects environmental quality and assures public safety, to the extent practical. Implementation and enforcement of the proposed conditions of certification should result in less than significant impacts to geology and paleontology.

D.3 – POWER PLANT EFFICIENCY

Testimony of Shahab Khoshmashrab

D.3.1 SUMMARY OF CONCLUSIONS

The Calico Solar Project, if constructed and operated as proposed, would generate 850 megawatts (MW) (nominal net output) of electricity. The Calico Solar Project would be a solar thermal power plant to be built on an approximately 8,230-acre site in San Bernardino County, California. The project would use a Stirling engine-based solar thermal technology to produce electrical power using 34,000 Stirling Energy Systems SunCatcher units. The Calico Solar Project would use solar energy to generate all of its capacity; no fossil fuel (natural gas) would be used for power production.

The project would decrease reliance on fossil fuel, and would increase reliance on renewable energy resources. It would not create significant adverse effects on fossil fuel energy supplies or resources, would not require additional sources of energy supply, and would not consume fossil fuel energy in a wasteful or inefficient manner. No efficiency standards apply to this project. Staff therefore concludes that this project would present no significant adverse impacts on fossil fuel energy resources.

Employing a less land-intensive solar technology, such as the linear parabolic trough technology, would increase the solar land use efficiency of Calico Solar. Staff believes Calico Solar represents one of the least land use-efficient solar technologies proposed by the projects currently in the Energy Commission's licensing process.

D.3.2 INTRODUCTION

Fossil Fuel Use Efficiency

One of the responsibilities of the California Energy Commission (Energy Commission) and the Bureau of Land Management (BLM) is to make findings on whether the energy use by a power plant, including the proposed Calico Solar Project, would result in significant adverse impacts on the environment, as defined in the California Environmental Quality Act (CEQA), and also characterize any adverse impacts under the National Environmental Policy Act (NEPA). If the Energy Commission finds that the Calico Solar Project's energy consumption creates a significant adverse impact under CEQA, it must further determine if feasible mitigation measures could eliminate or minimize that impact. In this analysis, staff addresses the inefficient and unnecessary consumption of energy.

In order to support the SA/DEIS's findings, this analysis will:

- examine whether the facility would likely present any adverse impacts upon energy resources;
- examine whether these adverse impacts are significant; and if so,
- examine whether feasible mitigation measures or alternatives could eliminate those adverse impacts or reduce them to a level of insignificance.

Solar Land Use Efficiency

Solar thermal power plants typically consume much less fossil fuel (usually in the form of natural gas) than other types of thermal power plants. Therefore, common measures of power plant efficiency such as those described above are less meaningful. Solar power plants do occupy vast tracts of land, so, the focus for these types of facilities shifts from fuel efficiency to land use efficiency. To analyze the land use efficiency of a solar facility staff utilizes the following approach.

Solar thermal power plants convert the sun's energy into electricity in three basic steps:

- Mirrors and/or collectors capture the sun's rays.
- This solar energy is converted into heat.
- This heat is converted into electricity, typically in a heat engine such as a steam turbine generator or a Stirling Engine-powered generator.

The effectiveness of each of these steps depends on the specific technology employed; the product of these three steps determines the power plant's overall solar efficiency. The greater the project's solar efficiency, the less land the plant must occupy to produce a given power output.

The most significant environmental impacts caused by solar power plants result from occupying large expanses of land. The extent of these impacts is directly related to the number of acres affected. For this reason, staff will evaluate the land use efficiency of proposed solar power plant projects. This efficiency will be expressed in terms of power produced, or MW per acre, and in terms of energy produced, or MW-hours per acre-year. Specifically:

- Power-based solar land use efficiency is calculated by dividing the maximum net power output in MW by the total number of acres impacted by the power plant, including roads and electrical switchyards and substations.
- Energy-based solar land use efficiency is calculated by dividing the annual net electrical energy production in MW-hours per year by the total number of acres impacted by the power plant. Since different solar technologies consume differing quantities of natural gas for morning warm-up, cloudy weather output leveling and heat transfer fluid freeze protection (and some consume no gas at all), this effect will be accounted for. Specifically, gas consumption will be backed out by reducing the plant's net energy output by the amount of energy that could have been produced by consuming the project's annual gas consumption in a modern combined cycle power plant. This reduced energy output will then be divided by acres impacted. Since Calico Solar would consume no natural gas, this correction is unnecessary for this analysis.

D.3.3 METHODOLOGY AND THRESHOLDS FOR DETERMINING ENVIRONMENTAL CONSEQUENCES

The Calico Solar Project would consume no natural gas or other fossil fuel for power generation. However, some electricity would be consumed in operating the plant. Each of the 34,000 Stirling engines is filled with hydrogen gas, which acts as a working fluid that allows the engine to operate. During operation, hydrogen leaks from the engines and must be continuously replenished from pressure bottles located at each SunCatcher, or by means of a centralized hydrogen system connected to each SunCatcher.

Hydrogen is typically produced either from natural gas, or by electrolysis of water using electricity. The applicant explained that approximately 7.2 million standard cubic feet of hydrogen gas per year would be produced to supply the necessary replenishment hydrogen (SES 2009e, Data Response 58). Hydrogen would be created on-site by electrolysis of water using electricity from the grid, consuming approximately 37 MWh of electrical energy annually (SES 2009e, Data Response 59). In addition, compressing the hydrogen gas to operating pressure would consume approximately 178 MWh of electricity per year (SES 2009e, Data Response 60) for a total of 215 MW-hours per year. Compared to any power plant of equal capacity, this rate is insignificant. Energy Commission staff, however, will include this consumption in calculating the plant's efficiency, below.

There are currently no legal or industry standards for measuring the efficiency of solar thermal power plants (CEC 2008c). Stirling Energy Systems claims that the SunCatcher exhibits a conversion efficiency of 31.25% (SES 2008a, AFC § 1.3).

Since the project will not consume any natural gas, staff considers the impact of the project's fuel consumption on energy supplies and energy efficiency to be less than significant.

Adverse Effects on Energy Supplies and Resources

The applicant would produce hydrogen gas onsite through electrolysis of water (SES 2009e, Data Responses 57-60). Staff deems it unlikely that this could cause any measurable impact on energy supplies.

Additional Energy Supply Requirements

Since supplying the project with hydrogen gas would consume such an insignificant amount of energy, there is no likelihood that additional energy supplies would be required.

Compliance With Energy Standards

No standards apply to the efficiency of Calico Solar or other non-cogeneration projects.

Alternatives To Reduce Wasteful, Inefficient, and Unnecessary Energy Consumption

Staff evaluates the project alternatives to determine if alternatives exist that could reduce the project's fuel use. The evaluation of alternatives to the project (that could reduce wasteful, inefficient, or unnecessary energy consumption) requires the examination of the project's energy consumption. The project's fuel consumption would be negligible, therefore staff need not evaluate alternatives that could reduce or eliminate the use of natural gas.

Efficiency of Alternatives to the Project

The Calico Solar Project's objectives include the generation of electricity using the Stirling Energy Systems SunCatcher solar thermal technology via a 20-year power purchase agreement with SCE for renewable power (SES 2008a, AFC §§ 2.0, 2.1, 2.2).

Alternative Generating Technologies

Alternative generating technologies for the proposed project are considered in the AFC (SES 2008a, AFC §§ 4.4.1, 4.4.2, 4.4.3). For purposes of this analysis, natural gas, oil, coal, nuclear, geothermal, biomass, hydroelectric, wind and solar photovoltaic technologies are all considered. Given the project objectives, location, air pollution control requirements, and the commercial availability of the above technologies, staff agrees with the applicant that the selected solar thermal technology is a reasonable selection.

Staff, therefore, believes that the Calico Solar Project would not constitute a significant adverse impact on fossil fuel energy resources compared to feasible alternatives.

D.3.4 PROPOSED PROJECT

D.3.4.1 SETTING AND EXISTING CONDITIONS

The applicant proposes to build and operate the Calico Solar Project, a solar thermal power plant producing a total of 850 MW (nominal net output) and employing Stirling Energy Systems SunCatcher technology. The project would occupy approximately 8,230 acres of land and would consist of 34,000 SunCatchers (SES 2008a, AFC §§ 1.1, 1.3, 2.2, 3.1, 3.3).

Each SunCatcher is composed of a pedestal, a mirrored dish that tracks the sun, and a power conversion unit (PCU) consisting of a solar receiver, a closed-cycle Stirling engine, and a generator that capture the solar energy and convert it to electricity. Each SunCatcher is capable of generating 25 kW of power. Power would be routed from the SunCatchers to electrical transformers, then to a switchyard located near the center of the project (SES 2008a, AFC §§ 3.1, 3.1.1, 3.4.1, 3.4.3, 3.4.4.1, 3.4.4.2).

The project would not use fossil fuel to generate electricity. However, some electricity consumption would result due to the necessity of replacing hydrogen gas that leaks from the Stirling engines; see below.

D.3.4.2 ASSESSMENT OF IMPACTS AND DISCUSSION OF MITIGATION

Project Energy Requirements and Energy Use Efficiency

The Calico Solar Project would consume no natural gas or other fossil fuel for power generation. However, some electricity would be consumed in operating the plant. Each of the 34,000 Stirling engines is filled with hydrogen gas, which acts as a working fluid that allows the engine to operate. During operation, hydrogen leaks from the engines and must be continuously replenished from pressure bottles located at each SunCatcher, or from a centralized hydrogen distribution system.

The applicant explained that hydrogen would be created on-site by electrolysis of water using electricity from the grid, consuming approximately 37 MWh of electrical energy annually. In addition, compressing the hydrogen gas to operating pressure would consume an additional 178 MWh per year (SES 2009e, Data Responses 58-60), for a total of 215 MW-hours per year. Compared to a typical natural gas-fired power plant of equal capacity, this rate is insignificant. Energy Commission staff, however, will include this consumption in calculating the plant's efficiency, below.

There are currently no legal or industry standards for measuring the efficiency of solar thermal power plants (CEC 2008c). Stirling Energy Systems claims that the SunCatcher exhibits a conversion efficiency of 31.25% (SES 2008a, AFC § 1.3).

Due to the project's negligible consumption of natural gas, staff considers the impact of the project's fuel consumption on energy supplies and energy efficiency to be less than significant.

Adverse Effects on Energy Supplies and Resources

The applicant would produce hydrogen gas onsite through electrolysis of water, consuming 215 MW-hours of electrical energy per year (SES 2009e, Data Responses 57-60). Staff deems it unlikely that this insignificant level of consumption could cause any measurable impact on energy supplies.

Additional Energy Supply Requirements

Since supplying the project with hydrogen gas would consume such an insignificant amount of energy, there is no likelihood that additional energy supplies would be required.

Compliance With Energy Standards

No standards apply to the efficiency of Calico Solar or other non-cogeneration projects.

Alternatives to Reduce Wasteful, Inefficient, And Unnecessary Energy Consumption

Staff evaluates the project alternatives to determine if alternatives exist that could reduce the project's fuel use. The evaluation of alternatives to the project (that could reduce wasteful, inefficient, or unnecessary energy consumption) requires the examination of the project's energy consumption. The project's fuel consumption would

be negligible, therefore staff need not evaluate alternatives that could reduce or eliminate the use of natural gas.

Efficiency of Alternatives to the Project

The Calico Solar Project's objectives include the generation of electricity using the Stirling Energy Systems SunCatcher solar thermal technology via a 20-year power purchase agreement with SCE for renewable power (SES 2008a, AFC §§ 2.0, 2.1, 2.2).

Alternative Generating Technologies

Alternative generating technologies for the Calico Solar Project are considered in the AFC (SES 2008a, AFC §§ 4.4.1, 4.4.2, 4.4.3). For purposes of this analysis, natural gas, oil, coal, nuclear, geothermal, biomass, hydroelectric, wind and solar photovoltaic technologies are all considered. Given the project objectives, location, air pollution control requirements, and the commercial availability of the above technologies, staff agrees with the applicant that the selected solar thermal technology is a reasonable selection.

Staff, therefore, believes that the Calico Solar Project would not constitute a significant adverse impact on fossil fuel energy resources compared to feasible alternatives.

The solar insolation falling on the earth's surface can be regarded as an energy resource. Since this energy is inexhaustible, its consumption does not present the concerns inherent in fossil fuel consumption. What is of concern, however, is the extent of land area required to capture this solar energy and convert it to electricity. Setting aside hundreds or thousands of acres of land for solar power generation removes it from alternative uses.

To assess the proposed project's land use efficiency, staff compares the land use efficiency of the solar projects currently before the Commission to the Calico Solar Project. This comparison helps determine a range of viable efficiencies and where the Calico Solar Project falls.

Method and Threshold for Determining the Significance of Solar Land Use Energy Resources

Energy Commission staff proposes to compare the land use of a solar power plant project to that of other solar projects in the Energy Commission's siting process. Staff proposes to compare several solar projects currently in the process. As this is written, several solar power plant projects have progressed significantly through the Energy Commission siting process. These projects' power and energy output, and the extent of the land occupied by them, are summarized in **Efficiency Table 1**, below. The solar land use efficiency for a typical natural gas-fired combined cycle power plant is shown only for comparison.

Adverse Effects on Project Land Use

The Calico Solar Project would produce power at the rate of 850 MW net, and would generate energy at the rate of 1,840,000 MW-hours net per year, while occupying 8,230 acres (SES 2008a, AFC §§ 1.1, 1.3, 2.2, 3.1, 3.11.1). Staff calculates power-based land use efficiency thus:

Power-based efficiency: 850 MW ÷ 8,230 acres = **0.103 MW/acre** or **9.7 acres/MW**

Staff calculates energy-based land use efficiency thus:

Energy-based efficiency: First, back out the electrical energy consumed in hydrogen replenishment:

1,840,000 MWh/year – 215 MWh/year = 1,839,785 MWh/year

1,839,785 MWh/year ÷ 8,230 acres = **224 MWh/acre-year**

As seen in **Efficiency Table 1**, the Calico Solar Project, employing the Stirling Energy Systems SunCatcher technology, is less efficient in use of land than the Beacon Solar, Ridgecrest Solar, Palen Solar, and Blythe Solar projects, which would employ linear parabolic trough technology. Calico Solar is roughly as efficient in use of land as the Ivanpah Solar Electric Generating System project, which would employ BrightSource power tower technology.

Efficiency Table 1
Solar Land Use Efficiency

Project	Generating Capacity (MW net)	Annual Energy Production (MWh net)	Annual Fuel Consumption (MMBtu LHV)	Foot-print (Acres)	Land Use Efficiency (Power-Based) (MW/acre)	Land Use Efficiency (Energy – Based) (MWh/acre-year)	
						Total	Solar Only[1]
Calico Solar (08-AFC-13)	**850**	**1,840,000**	**0**	**8,230**	**0.103**	**224**	**224**
Beacon Solar (08-AFC-2)	250	600,000	36,000	1,240	0.20	484	480
Ivanpah SEGS (07-AFC-5)	400	960,000	432,432	3,744	0.11	256	238
Abengoa Solar (09-AFC-5)	250	630,000	94,280	1420	0.18	444	434
Blythe Solar (09-AFC-6)	1,000	2,100,000	207,839	5,950	0.17	353	348
Palen Solar (09-AFC-7)	500	1,000,000	103,919	2,970	0.17	337	332
Genesis Solar (09-AFC-8)	250	600,000	60,000	1,800	0.14	333	329
Ridgecrest Solar (09-AFC-9)	250	500,000	51,960	1,440	0.17	347	342
San Joaquin Solar Hybrid (08-AFC-12)	106	774,000	5,899,500	640	0.17	1,209	415
Avenal Energy (08-AFC-1)[2]	600	3,023,388	24,792,786	25	24.0	120,936	N/A

[1] Net energy output is reduced by natural gas-fired combined cycle proxy energy output; see **Efficiency Appendix A**.
[2] Example is a natural gas-fired combined cycle plant.

Alternatives to Reduce Solar Land Use Impacts

Building and operating a natural gas-fired combined cycle power plant would yield much greater land use efficiency than any solar power plant; see **Efficiency Table 1**. However, this would not achieve the basic project objective, to generate electricity from the renewable energy of the sun.

Building a solar power plant employing a different technology, such as the linear parabolic trough technology of the Ridgecrest Solar, Blythe Solar, or Palen Solar projects, would increase the solar land use efficiency of the Calico Solar Project. Staff believes the Calico Solar Project represents one of the least land use-efficient solar technologies proposed among the projects currently in the Energy Commission's licensing process.

Alternative Heat Rejection System

The Stirling engine that is the heart of the SunCatcher technology is cooled by an automotive-style cooling system. Waste engine heat is conducted via an enclosed cooling loop to a radiator that dumps the waste heat to the atmosphere. This is a dry cooling system; its only water consumption is that required to make up any unintended leakage from the system. Thus, staff believes the cooling technology selected for this project is the optimum possible.

Project Closure

According to Section 3.12 of the applicant's project description, the solar generating facility is expected to have a lifespan of up to 40 years. At any point during this time, temporary or permanent closure of the solar facility could occur. Temporary closure would be a result of necessary maintenance, hazardous weather conditions, or damage due to a natural disaster. Permanent closure would be result of damage that is beyond repair, adverse economic conditions, or other significant reasons.

Both temporary and permanent closures would require the applicant to submit to the CEC a contingency plan or a decommissioning plan, respectively. A contingency plan would be implemented to ensure compliance with applicable LORS, and appropriate shutdown procedures depending on the length of the cessation. A decommissioning plan would be implemented to ensure compliance with applicable LORS, removal of equipment and shutdown procedures, site restoration, potential decommissioning alternatives, and the costs and source of funds associated with decommissioning activities.

D.3.4.3 CEQA LEVEL OF SIGNIFICANCE

CEQA guidelines state that the environmental analysis "…shall describe feasible measures which could minimize significant adverse impacts, including where relevant, inefficient and unnecessary consumption of energy" (Title 14 CCR §15126.4[a][1]). Appendix F of the guidelines further suggests consideration of such factors as the project's energy requirements and energy use efficiency; its effects on local and regional energy supplies and energy resources; its requirements for additional energy supply capacity; its compliance with existing energy standards; and any alternatives that

could reduce the wasteful, inefficient, and unnecessary consumption of energy (Title 14, CCR §15000 et seq., Appendix F).

The inefficient and unnecessary consumption of energy, in the form of non-renewable fuels such as natural gas and oil, constitutes an adverse environmental impact. An adverse impact can be considered significant if it results in:

- adverse effects on local and regional energy supplies and energy resources;
- a requirement for additional energy supply capacity;
- noncompliance with existing energy standards; or
- the wasteful, inefficient, and unnecessary consumption of fuel or energy.

D.3.5 REDUCED ACREAGE ALTERNATIVE

The Reduced Acreage alternative would essentially be a 275 MW solar facility located within the boundaries of Phase 2 of the proposed 850 MW project. This alternative and alternative locations of the transmission line, substation, laydown, and control facilities are shown in **Alternatives Figure 1**.

D.3.5.1 SETTING AND EXISTING CONDITIONS

The Reduced Acreage alternative would be a 275 MW solar facility within the Phase 2 boundaries of the proposed project.

D.3.5.2 ASSESSMENT OF IMPACTS AND DISCUSSION OF MITIGATION

Since the Reduced Acreage plant output would produce only 275 MW (32% of the proposed project's 850 MW), its impacts on the SCE grid would be proportionately less. Since the Reduced Acreage plant would produce 275 MW while occupying 2,300 acres (28% of the proposed project's 8,230 acres), its power-based land use efficiency would be 0.12 MW/acre, slightly higher than the proposed project, but still only about half as efficient as other solar thermal technologies.

D.3.5.3 CEQA LEVEL OF SIGNIFICANCE

If the Reduced Acreage alternative were constructed, the CEQA Level of Significance, as measured by land use (occupied acreage), would amount to approximately 28% of the levels described for the proposed project. No conditions of certification would apply.

D.3.6 AVOIDANCE OF DONATED AND ACQUIRED LANDS ALTERNATIVE

The Avoidance of Donated and Acquired Lands Alternative would be an approximately 720 MW solar facility located within the boundaries of the proposed 850 MW project. This alternative, the transmission line, substation, laydown, and control facilities are shown in **Alternatives Figure 2**.

D.3.6.1 SETTING AND EXISTING CONDITIONS

The Avoidance of Donated and Acquired Lands Alternative would be an approximately 720 MW solar facility located within the boundaries of the proposed 850 MW project.

D.3.6.2 ASSESSMENT OF IMPACTS AND DISCUSSION OF MITIGATION

Since the Avoidance of Donated and Acquired Lands Alternative plant output would produce 720 MW (85% of the proposed project's 850 MW) its impacts on the SCE grid would be only slightly less. Since the Avoidance of Donated and Acquired Lands Alternative plant would produce 720 MW while occupying 7,050 acres (86% of the proposed project's 8,230 acres), its power-based land use efficiency would be 0.102 MW/acre, about the same as the proposed project, but still only about half as efficient as other solar thermal technologies.

D.3.6.3 CEQA LEVEL OF SIGNIFICANCE

The CEQA Level of Significance would not change from the levels described for the proposed project if this alternative were constructed. No condition of certification would apply.

D.3.7 NO PROJECT / NO ACTION ALTERNATIVE

D.3.7.1 NO PROJECT/NO ACTION ALTERNATIVE #1:

No Action on the Calico Solar Project application and on CDCA land use plan amendment

Under this alternative, the proposed Calico Solar Project would not be approved by the Energy Commission and BLM would not amend the CDCA Plan. As a result, no solar energy project would be constructed on the project site and BLM would continue to manage the site consistent with the existing land use designation in the CDCA Land Use Plan of 1980, as amended.

Because there would be no amendment to the CDCA Plan and no solar project approved for the site under this alternative, it is expected that the site would continue to remain in its existing condition, with no new structures or facilities constructed or operated on the site and no ground disturbance. The decreased reliance on fossil fuel and increased reliance on renewable energy resources that would occur with the proposed project would not occur. However, the land on which the project is proposed would become available to other uses that are consistent with BLM's land use plan, including another solar project requiring a land use plan amendment. In addition, in the absence of this project, other renewable energy projects may be constructed to meet State and Federal mandates, and those projects would have similar impacts in other locations

D.3.7.2 NO PROJECT/NO ACTION ALTERNATIVE #2:

No Action on the Calico Solar Project and amend the CDCA land use plan to make the area available for future solar development

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

Because the CDCA Plan would be amended, it is possible that the site will be developed with another solar technology. Construction and operation requirements for solar technologies vary; however, they would all decrease reliance on fossil fuel, and would increase reliance on renewable energy resources as with the proposed project.

D.3.7.3 NO PROJECT/NO ACTION ALTERNATIVE #3:

No Action on the Calico Solar Project application and amend the CDCA land use plan to make the area unavailable for future solar development

Under this alternative, the proposed Calico Solar Project would not be approved by the Energy Commission and BLM and the BLM would amend the CDCA Plan to make the proposed site unavailable for future solar development. As a result, no solar energy project would be constructed on the project site and BLM would continue to manage the site consistent with the existing land use designation in the CDCA Land Use Plan of 1980, as amended.

Because the CDCA Plan would be amended so no solar projects can be approved for the site under this alternative, it is expected that the site would continue to remain in its existing condition, with no construction of a solar facility. Therefore, there would be no decreased reliance on fossil fuel and increased reliance on renewable energy resources as with the proposed project. However, in the absence of this project, other renewable energy projects may be constructed to meet State and Federal mandates, and those projects would have similar impacts in other locations.

D.3.8 PROJECT-RELATED FUTURE ACTIONS

Proposed upgrades to the SCE transmission system, known as the 275 MW Early Interconnection option and the 850 MW Full Build-Out option are considered to be reasonably foreseeable actions that would be contingent on construction of the proposed Calico Solar Project. The SCE upgrades would not impact the power plant efficiency of the proposed Calico Solar Project.

D.3.9 CUMULATIVE IMPACT ANALYSIS

There are no nearby power plant projects or other projects consuming large amounts of fossil fuel that hold the potential for cumulative energy consumption impacts when aggregated with the project.

Staff believes that the construction and operation of the project would not create indirect impacts (in the form of additional fuel consumption) that would not have otherwise occurred without this project. Because Calico Solar would consume no fossil fuel, it should compete favorably in the California power market and replace fossil fuel burning power plants. The project would therefore cause a positive impact on the cumulative amount of fossil fuel consumed for power generation.

D.3.10 COMPLIANCE WITH LORS

No federal, state, or local/county laws, ordinances, regulations, and standards (LORS) apply to the efficiency of this project.

D.3.11 NOTEWORTHY PUBLIC BENEFITS

The Calico Solar Project would employ an advanced solar thermal technology. Solar energy is renewable and unlimited. The project would have a less than significant adverse impact on nonrenewable energy resources (natural gas). Consequently, the project would help in reducing California's dependence on fossil fuel-fired power plants.

D.3.12 PROPOSED CONDITIONS OF CERTIFICATION/MITIGATION MEASURES

No conditions of certification are proposed.

D.3.13 CONCLUSIONS

Fossil Fuel Energy Use

The Calico Solar Project, if constructed and operated as proposed, would use solar energy to generate all of its capacity, consuming no natural gas for power production. The project would decrease reliance on fossil fuel, and would increase reliance on renewable energy resources. It would not create significant adverse effects on energy supplies or resources, would not require additional sources of energy supply, and would not consume energy in a wasteful or inefficient manner. No energy standards apply to this project. Staff therefore concludes that this project would present no significant adverse impacts on energy resources.

No cumulative impacts on energy resources are likely. Facility closure would not likely present significant impacts on electric system efficiency.

Land Use

The Calico Solar Project, if constructed and operated as proposed, would occupy nearly 10 acres per MW of power output, a figure higher than that of some other solar power technologies. Employing a less land-intensive solar technology, such as the linear parabolic trough technology of the Ridgecrest Solar, Blythe Solar, or Palen Solar projects, would increase the solar land use efficiency of the proposed project. The Calico Solar Project is roughly as efficient in use of land as the Ivanpah Solar Electric Generating System project, which would employ BrightSource power tower technology.

Staff believes the Calico Solar Project represents one of the least land use-efficient solar technologies proposed among the projects currently in the Energy Commission's licensing process.

D.3.14 REFERENCES

CEC 2008c – Report of Conversation between Steve Baker and Golam Kibrya – CEC staff. February 22, 2008.

SES 2008a – Stirling Energy Systems/R. Liden (tn 49181). Application for Certification, dated December 1, 2008. Submitted to CEC/Docket Unit on December 1, 2008.

SES 2009e – Tessera Solar/ C. Champion (tn: 52466). Applicant's Responses to CEC and BLM Data Requests Set 1 Part 1. Dated 7/17/09. Submitted to CEC/Docket Unit on 7/20/09.

EFFICIENCY APPENDIX A

Solar Power Plant Efficiency Calculation
Gas-Fired Proxy

In calculating the efficiency of a solar power plant, it is desired to subtract the effect of natural gas burned for morning startup, cloudy weather augmentation and Therminol freeze protection. As a proxy, we will use an average efficiency based on several recent baseload combined cycle power plant projects in the Energy Commission siting process. Baseload combined cycles were chosen because their intended dispatch most nearly mirrors the intended dispatch of solar plants, that is, operate at full load in a position high on the dispatch authority's loading order.

The most recent such projects are:

Colusa Generating Station (06-AFC-9)
- Nominal 660 MW 2-on-1 Combined Cycle with GE Frame 7FA CGTs
- Air cooled condenser, evaporative inlet air cooling
- Efficiency with duct burners on: 666.3 MW @ 52.5% LHV
- Efficiency with duct burners off: 519.4 MW @ 55.3% LHV
- Efficiency (average of these two): **53.9% LHV**

San Gabriel Generating Station (07-AFC-2)
- Nominal 696 MW 2-on-1 Combined Cycle with Siemens 5000F CGTs
- Air cooled condenser, evaporative inlet air cooling
- Efficiency with duct burners on: 695.8 MW @ 52.1% LHV
- Efficiency with duct burners off: 556.9 MW @ 55.1% LHV
- Efficiency (average of these two): **53.6% LHV**

KRCD Community Power Plant (07-AFC-7)
- Nominal 565 MW 2-on-1 Combined Cycle with GE or Siemens F-class CGTs
- Evaporative cooling, evaporative or fogging inlet air cooling
- Efficiency with GE CGTs: 497 MW @ 54.6% LHV
- Efficiency with Siemens CGTs: 565 MW @ 56.1% LHV
- Efficiency (average of these two): **55.4% LHV**

Avenal Energy (08-AFC-1)
- Nominal 600 MW 2-on-1 Combined Cycle with GE Frame 7FA CGTs
- Air cooled condenser, inlet air chillers
- Efficiency with duct burners on: 600.0 MW @ 50.5% LHV
- Efficiency with duct burners off: 506.5 MW @ 53.4% LHV
- Efficiency (average of these two): **52.0% LHV**

Average of these four power plants: **53.7% LHV**

D.4 – POWER PLANT RELIABILITY

Testimony of Shahab Khoshmashrab

D.4.1 SUMMARY OF CONCLUSIONS

The applicant predicts an availability factor of 99%. Staff cannot determine whether this is achievable and cannot predict what the actual availability might be, given the demonstration status of this Stirling engine and limited data on large-scaled deployments of Stirling engines. (The availability factor of a power plant is the percentage of time it is available to generate power; both planned and unplanned outages subtract from this availability.) Staff believes it possible that the project may face challenges from considerable maintenance demands, reducing its availability.

Power Plant Reliability is not intended to address environmental impacts under either CEQA or NEPA.

D.4.2 INTRODUCTION

In this analysis, California Energy Commission (Energy Commission) staff addresses the reliability issues of the Calico Solar Project to determine if the power plant is likely to be built in accordance with typical industry norms for reliable power generation. Staff uses this norm as a benchmark because it ensures that the resulting project would not be likely to degrade the overall reliability of the electric system it serves (see the "Setting" subsection, below).

The scope of this power plant reliability analysis covers:

- equipment availability;
- plant maintainability;
- fuel and water availability; and
- power plant reliability in relation to natural hazards.

Staff examined the project design criteria to determine if the project is likely to be built in accordance with typical industry norms for reliable power generation. While the applicant has predicted an availability factor of 99% for the Calico Solar Project (see below), staff commonly uses typical industry norms as the benchmark, rather than the applicant's projection, to evaluate the project's reliability.

D.4.3 METHODOLOGY AND THRESHOLDS FOR DETERMINING ENVIRONMENTAL CONSEQUENCES

METHOD FOR DETERMINING RELIABILITY

The Energy Commission must make findings as to how a project is designed, sited, and operated in order to ensure its safe and reliable operation (Title 20, CCR §1752[c]). Staff takes the approach that a project is acceptable if it does not degrade the reliability

of the utility system to which it is connected. This is likely the case if a project is at least as reliable as other power plants on that system.

The availability factor of a power plant is the percentage of time it is available to generate power; both planned and unplanned outages subtract from this availability. Measures of power plant reliability are based upon both the plant's actual ability to generate power when it is considered to be available and upon starting failures and unplanned (or forced) outages. For practical purposes, reliability can be considered a combination of these two industry measures, making a reliable power plant one that is available when called upon to operate. Power plant systems must be able to operate for extended periods without shutting down for maintenance or repairs. Achieving this reliability requires adequate levels of equipment availability, plant maintainability with scheduled maintenance outages, fuel and water availability, and resistance to natural hazards. Staff examines these factors for the project and compares them to industry norms. If the factors compare favorably for the project, staff may then conclude that the project would be as reliable as other power plants on the electric system and would not degrade system reliability.

D.4.4 PROPOSED PROJECT

D.4.4.1 SETTING AND EXISTING CONDITIONS

In the restructured competitive electric power industry, the responsibility for maintaining system reliability falls largely to the state's control area operators, such as the California Independent System Operator (California ISO), that purchase, dispatch, and sell electric power throughout the state. Determining how the California ISO and other control area operators would ensure system reliability has been an ongoing effort. Protocols have been developed and put in place that allow sufficient reliability to be maintained under the competitive market system. "Must-run" power purchase agreements and "participating generator" agreements are two mechanisms that have been employed to ensure an adequate supply of reliable power.

The California ISO's mechanisms to ensure adequate power plant reliability apparently were devised under the assumption that the individual power plants that compete to sell power into the system will each exhibit a level of reliability similar to that of power plants of past decades. Accordingly, staff has recommended that power plant owners continue to build and operate their projects to the level of reliability to which all in the industry are accustomed.

As part of its plan to provide needed reliability, the applicant proposes to operate the 850-megawatt (MW) (net power output) Calico Solar Project, a solar thermal power plant facility employing advanced solar power technology. This project, using renewable solar energy, is intended to provide dependable power to the grid, generally during the hours of peak power consumption by Southern California Edison (SCE), the interconnecting utility. This project would help serve the need for renewable energy in California, as all its generated electricity would be produced by a reliable source of energy that is available during hot summer afternoons, when power is needed most.

The project applicant has indicated it expects the proposed project to achieve an availability factor of 99%. The project is anticipated to operate at an annual capacity factor of approximately 25% (SES 2008a, AFC §§ 1.3, 3.1, 3.9.14, 3.11.1).

D.4.4.2 ASSESSMENT OF IMPACTS AND DISCUSSION OF MITIGATION

Equipment Availability

Equipment availability would be ensured by adoption of appropriate quality assurance/quality control (QA/QC) programs during the design, procurement, construction, and operation of the plant and by providing for adequate maintenance and repair of the equipment and systems discussed below.

Quality Control Program

The applicant describes a QA/QC program (SES 2008a, AFC § 3.11.4) that is typical of the power industry. Equipment would be purchased from qualified suppliers based on technical and commercial evaluations. Suppliers' personnel, production capability, past performance, QA programs, and quality history would be evaluated. The project owner would perform receipt inspections, test components, and administer independent testing contracts. Staff expects that implementation of this program would result in typical reliability of design and construction. To ensure this implementation, staff has proposed appropriate conditions of certification in the section of this document entitled **FACILITY DESIGN**.

Plant Maintainability

Equipment Redundancy

The project, as proposed in the AFC, would be able to operate only when the sun is shining. Maintenance or repairs could be done when the plant is shut down at night. This would help to enhance the project's reliability. Also, the project would incorporate redundant pieces of those components that are most likely to require service or repair. In this case, this redundancy is inherent in the incorporation of 34,000 individual SunCatcher units. This would allow service or repair to be done either at night when the plant is shut down, or during the day, when the plant is in operation, since only those SunCatchers actually being serviced or repaired would be unavailable to generate power.

In addition to the inherent redundancy of many independent units, the applicant plans to provide an appropriate redundancy of function for the remainder of project, including electrical transformers (SES 2008a). Major plant systems are designed with adequate redundancy to ensure their continued operation if equipment fails. Staff believes that this project's proposed equipment redundancy could be sufficient for its reliable operation.

Maintenance Program

Equipment manufacturers provide maintenance recommendations for their products, and the applicant would base the project's maintenance program on those

recommendations (SES 2008a, AFC § 3.11.1). Because the plant would operate only during the sunlight hours, planned maintenance outages could be performed during other hours, when the plant would not need to be in operation.

The applicant predicts that each machine will leak its entire inventory of hydrogen once a year, thus requiring constant replenishment of hydrogen. For this reason, the applicant proposes a hydrogen electrolyzer and piping system that uses electricity from the grid to convert water into hydrogen and oxygen, then compresses the hydrogen and pipes it to each of the 34,000 SunCatchers (SES 2009h from SES Solar Two Project proceedings).

An expert familiar with the machines claims that the SunCatcher exhibits a Mean Time Between Failures (MTBF) of only 40 hours (Butler 2007). This means each machine, if operating continuously on long summer days, would need to be shut down and repaired approximately every 3 to 5 days, depending on expected average 8 to 12 hours operation in winter and summer, respectively. Shutting down and repairing several thousand SunCatchers each day would likely result in enormous maintenance demands and the project would likely face challenges in achieving the predicted 99% availability factor. It is believed by one expert that a MTBF of 2,000 to 10,000 hours must be proven before a technology is ready for incorporation into a utility grid (Butler 2007, Public 2009a; Conklin 2009 from SES Solar Two Project proceedings).

Staff conducted an online research to gather more information on the demonstration status of this Stirling engine on a large-scaled format, but no useful information was found. Due to the lack of sufficient information supporting the applicant's claim of an availability factor of 99% for the project, staff cannot determine whether the project would yield this availability factor.

Fuel and Water Availability

The long-term availability of fuel and water for cooling or process use may be necessary to ensure the reliability of any power plant, depending on the technology deployed.

Fuel Availability

The Calico Solar Project would consume no natural gas or other fossil fuel. Therefore, there is no likelihood that availability of natural gas would cause concern.

Water Supply Reliability

The Calico Solar Project would use water from a Cadiz groundwater well for mirror washing, for potable and fire protection water, and in an electrolysis process to produce hydrogen gas to replenish the hydrogen that leaks from the Stirling engines (SES 2008a, AFC §§ 1.3, 1.4, 3.1.2, 3.5.6, 3.5.10, 3.7). Since the Stirling engines are air-cooled, no water would be required for power plant cooling. At the project site, the water will be conveyed to a groundwater storage tank located at the Water Treatment Facility within the Main Services Complex.

Soil and Water Resources staff is currently evaluating the feasibility of this source. Thus, at this time, staff cannot conclude that the proposed source of water would

represent a reliable supply of water for the project. For further discussion of water supply, see the **Soil and Water Resources** section of this document.

Power Plant Reliability in Relation to Natural Hazards

Natural forces can threaten the reliable operation of a power plant. Tsunamis (tidal waves) and seiches (waves in inland bodies of water) are not likely to present hazards for this project, but seismic shaking (earthquakes), flooding and high winds could present credible threats to the project's reliable operation (SES 2008a, AFC § 3.10.1).

Seismic Shaking

The site lies within a seismically active region; see the "Faulting and Seismicity" portion of the **GEOLOGY AND PALEONTOLOGY** section of this document. The project will be designed and constructed to the latest applicable LORS (SES 2008a, AFC § 3.10.1.1). Compliance with current seismic design LORS represents an upgrading of performance during seismic shaking compared to older facilities since these LORS have been continually upgraded. Because it would be built to the latest seismic design LORS, this project would likely perform at least as well as, and perhaps better than, existing plants in the electric power system. Staff has proposed conditions of certification to ensure this; see the section of this document entitled **FACILITY DESIGN**. In light of the general historical performance of California power plants and the electrical system in seismic events, staff has no special concerns with the power plant's functional reliability during earthquakes.

Flooding

Portions of the site lie within the 100-year flood plain (SES 2008a, AFC §§ 3.10.1.4). Project features would be designed and built to provide adequate levels of flood resistance. Staff believes there are no special concerns with power plant functional reliability due to flooding. For further discussion, see **SOIL AND WATER RESOURCES** and **GEOLOGY AND PALEONTOLOGY**.

High Winds

High winds are common in the region of the site; project features would be built to withstand winds over 90 miles per hour. Design would be in accordance with applicable LORS, including the 2007 California Building Code (SES 2008a, AFC § 3.10.1.2). Staff believes there are no special concerns with power plant functional reliability due to wind.

Comparison with Existing Facilities

The North American Electric Reliability Corporation (NERC) maintains industry statistics for availability factors (as well as other related reliability data). The NERC regularly polls North American utility companies on their project reliability through its Generating Availability Data System and periodically summarizes and publishes those statistics on the Internet at <http://www.nerc.com>. Energy Commission staff typically compares the applicant's claims for reliability to the statistical reliability of similar power plants. Because solar technology is relatively new and the technologies employed so varied, no NERC statistics are available for solar power plants. Staff's typical comparison with other existing facilities thus cannot be accomplished.

D.4.4.3 CEQA LEVEL OF SIGNIFICANCE

This does not apply to power plant reliability.

D.4.5 REDUCED ACREAGE ALTERNATIVE

The Reduced Acreage alternative would essentially be a 275 MW solar facility located within the central portion of the proposed 850 MW project. It was developed because it can be constructed. This alternative's boundaries and the revised locations of the transmission line, substation, laydown, and control facilities are shown in **Alternatives Figure 1**.

D.4.5.1 SETTING AND EXISTING CONDITIONS

The Reduced Acreage alternative would be a 275 MW solar facility within the Phase 2 boundaries of the proposed project.

D.4.5.2 ASSESSMENT OF IMPACTS AND DISCUSSION OF MITIGATION

Since the Reduced Acreage plant output would produce only 275 MW (32% of the proposed project's 850 MW), its impacts on the SCE grid would be proportionately less.

D.4.5.3 CEQA LEVEL OF SIGNIFICANCE

This does not apply to power plant reliability.

D.4.6 Avoidance of Donated and Acquired Lands Alternative

The Avoidance of Donated and Acquired Lands Alternative would be an approximately 720 MW solar facility located within the boundaries of the proposed 850 MW project. This alternative, the transmission line, substation, laydown, and control facilities are shown in **Alternatives Figure 2**.

D.4.6.1 SETTING AND EXISTING CONDITIONS

The Avoidance of Donated and Acquired Lands Alternative would be an approximately 720 MW solar facility located within the boundaries of the proposed 850 MW project.

D.4.6.2 ASSESSMENT OF IMPACTS AND DISCUSSION OF MITIGATION

Since the Avoidance of Donated and Acquired Lands Alternative plant output would produce 720 MW (85% of the proposed project's 850 MW), its impacts on the SCE grid would be only slightly less.

D.4.6.3 CEQA LEVEL OF SIGNIFICANCE

This does not apply to power plant reliability.

D.4.7 NO PROJECT / NO ACTION ALTERNATIVE

D.4.7.1 NO PROJECT/NO ACTION ALTERNATIVE #1

No Action on the Calico Solar Project application and on CDCA land use plan amendment

Under this alternative, the proposed Calico Solar Project would not be approved by the Energy Commission and BLM would not amend the CDCA Plan. As a result, no solar energy project would be constructed on the project site and BLM would continue to manage the site consistent with the existing land use designation in the CDCA Land Use Plan of 1980, as amended.

Because there would be no amendment to the CDCA Plan and no solar project approved for the site under this alternative, it is expected that the site would continue to remain in its existing condition, with no new structures or facilities constructed or operated on the site and no ground disturbance. As a result, the power generation benefits of the proposed project would not occur. However, the land on which the project is proposed would become available to other uses that are consistent with BLM's land use plan, including another solar project requiring a land use plan amendment. In addition, in the absence of this project, other renewable energy projects may be constructed to meet State and Federal mandates. However, if the current Stirling engine technology as proposed for the Calico Solar Project is proposed, reliability uncertainties similar to those described above, due to the lack of sufficient information supporting a high availability factor may result.

D.4.7.2 NO PROJECT/NO ACTION ALTERNATIVE #2

No Action on the Calico Solar Project and amend the CDCA land use plan to make the area available for future solar development

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

Because the CDCA Plan would be amended, it is possible that the site will be developed with another solar technology. It is expected that the solar technology would be built in accordance with typical industry norms for reliable power generation. However, if the current Stirling engine technology as proposed for the Calico Solar Project is proposed, reliability uncertainties similar to those described above, due to the lack of sufficient information supporting a high availability factor may result.

D.4.7.3 NO PROJECT/NO ACTION ALTERNATIVE #3

No Action on the Calico Solar Project application and amend the CDCA land use plan to make the area unavailable for future solar development

Under this alternative, the proposed Calico Solar Project would not be approved by the Energy Commission and BLM and the BLM would amend the CDCA Plan to make the

proposed site unavailable for future solar development. As a result, no solar energy project would be constructed on the project site and BLM would continue to manage the site consistent with the existing land use designation in the CDCA Land Use Plan of 1980, as amended.

Because the CDCA Plan would be amended so no solar projects can be approved for the site under this alternative, it is expected that the site would continue to remain in its existing condition, with no construction of a solar facility. Therefore, no benefits resulting from additional power generation would occur with this alternative. However, in the absence of this project, other renewable energy projects may be constructed to meet State and Federal mandates. But, if the current Stirling engine technology as proposed for the Calico Solar Project is proposed, reliability uncertainties similar to those described above, due to the lack of sufficient information supporting a high availability factor may result.

D.4.8 PROJECT-RELATED FUTURE ACTIONS

Proposed upgrades to the SCE transmission system, known as the 275 MW Early Interconnection option and the 850 MW Full Build-Out option are considered to be reasonably foreseeable actions that would be contingent on construction of the proposed Calico Solar Project. The SCE upgrades would not impact the reliability of the proposed Calico Solar Project, and therefore, no additional analysis of reliability is required.

D.4.9 COMPLIANCE WITH LORS

No federal, state, or local/county laws, ordinances, regulations, or standards (LORS) apply to the reliability of this project.

D.4.10 NOTEWORTHY PUBLIC BENEFITS

This project, if successful, would help serve the need for renewable energy in California, as all of the electricity generated would be produced by a reliable source of energy that is available during the hot summer afternoons, when power is needed most.

D.4.11 PROPOSED CONDITIONS OF CERTIFICATION/MITIGATION MEASURES

No conditions of certification are proposed.

D.4.12 CONCLUSIONS

The applicant predicts an availability factor of 99%. Staff cannot determine whether this is achievable and cannot predict what the actual availability might be, given the demonstration status of this Stirling engine and limited data on large-scaled deployments of Stirling engines. Staff believes it possible that the project may face challenges from considerable maintenance demands, reducing its availability.

D.4.13 REFERENCES

Ayers, C. 2009 – Letter to Christopher Meyer, CEC staff, from Charlene Ayers, January 2, 2009.

CEC 2007 – California Energy Demand 2008-2018 Staff Revised Forecast, CEC-200-2007-015-SF2, November 2007; p. 122, Table 22.

CEM 2008 – California Energy Markets, No. 963, February 15, 2008, pp. 1, 11-12.

Conklin 2009 – Letter to Christopher Meyer, CEC staff, from Diane Conklin, Mussey Grade Road Alliance, January 2, 2009.

McGraw-Hill 1994 – McGraw-Hill Energy Information Services Group. 1994. Operational Experience in Competitive Electric Generation. Executive Report.

SES 2008a – Stirling Energy Systems/R. Liden (tn 49181). Application for Certification, dated December 1, 2008. Submitted to CEC/Docket Unit on December 1, 2008.

D.5 – TRANSMISSION SYSTEM ENGINEERING

Testimony of Sudath Edirisuriya and Mark Hesters

D.5.1 SUMMARY OF CONCLUSIONS

The proposed Calico Solar Project (formerly the Stirling Energy Systems Solar One Project) outlet lines and termination are acceptable and would comply with all applicable laws, ordinances, regulations, and standards. The analysis of project transmission lines and equipment, both from the power plant up to the point of interconnection with the existing transmission network as well as upgrades beyond the interconnection that are attributable to the project have been evaluated by California Energy Commission and U.S. Bureau of Land Management staff and are included in the environmental sections of this Staff Assessment/Draft Environmental Impact Statement.

Staff concludes that mitigation of thermal overloads caused by the Calico Solar Project under the Base case and N-1 conditions would require the following facilities:

- Expand Southern California Edison's existing Pisgah 230kV interconnection facility and install a new 2,240 MVA, 500/230 kV substation with two 1,120 MVA transformer banks. The expansion of the existing Pisgah 230kV substation requires California CEQA/NEPA analysis.
- Loop the existing Eldorado-Lugo 500kV transmission line into the expanded Pisgah substation forming the Eldorado-Pisgah and Lugo-Pisgah number 1 500kV transmission lines.
- Install a new Lugo-Pisgah Number 2 500kV transmission line by removing the existing Lugo-Pisgah number 2 230kV transmission line, widening the existing Right-of-Way (ROW) where needed and constructing the new 500kV structures within the vacated ROW. The widening the existing ROW would require CEQA/NEPA analysis.
- Additionally, a Special Protection System (SPS) will be required to trip the proposed project to mitigate the thermal overloads caused by the N-1 emergency condition.
- The proposed Calico Solar Project should be designed and constructed with adequate reactive power resources to compensate the consumption of Var by the generator step-up transformers, distribution feeders and generator tie-lines.

D.5.2 INTRODUCTION

D.5.2.1 STAFF ANALYSIS

This transmission system engineering (TSE) analysis examines whether this project's proposed interconnection conforms to all laws, ordinances, regulations, and standards (LORS) required for safe and reliable electric power transmission. Additionally, under CEQA, the Energy Commission must conduct an environmental review of the "whole of the action," which may include facilities not licensed by the Energy Commission (Title 14, California Code of Regulations Section 15378). The Energy Commission must, therefore, identify the system impacts and necessary new or modified transmission

facilities downstream of the proposed interconnection that are required for interconnection and that, when included with the other project features, represent the whole of the action.

Commission staff relies on the responsible interconnecting authority for analysis of impacts on the transmission grid, as well as for the identification and approval of new or modified facilities required downstream from a proposed interconnection for mitigation purposes. The proposed Calico Solar Project would connect to Southern California Edison's (SCE's) existing 230-kV transmission network and would require both analysis by SCE and the approval of the California Independent System Operator (California ISO).

D.5.2.2 SCE'S ROLE

SCE is responsible for ensuring electric system reliability in its service territory for proposed transmission modifications. For the proposed Calico Solar Project, SCE performed a System Impact Study (SIS) used to determine whether or not the proposed transmission modifications needed for the proposed Calico Solar Project conform to reliability standards. Because the project would be connected to the California ISO controlled transmission grid, the California ISO's role is to review and approve the SIS and its conclusions.

D.5.2.3 CALIFORNIA ISO'S ROLE

The California ISO is responsible for ensuring electric system reliability for all participating transmission owners and for developing the standards to achieve system reliability. The power generated by the proposed Calico Solar Project will be dispatched to the California ISO grid via SCE's existing Pisgah 230-kV Substation. Therefore, the California ISO will review the studies of the SCE system to ensure adequacy of the proposed transmission interconnection. The California ISO determines the reliability impacts of proposed transmission modifications on the SCE transmission system in accordance with all applicable reliability criteria. According to the California ISO tariffs, the California ISO will determine the need for transmission additions or upgrades downstream from the interconnection point to insure reliability of the transmission grid.

The California ISO reviewed the SIS prepared by SCE for the proposed Calico Solar Project and issued a preliminary approval to SCE. On completion of the SCE Facility Study, the California ISO will review the study results and provide its conclusions and recommendations. The California ISO may provide written and verbal testimony on its findings at the Energy Commission hearings.

D.5.2.4 LAWS, ORDINANCES, REGULATIONS, AND STANDARDS

The LORS that apply to the transmission facilities associated with the proposed Calico Solar Project are:

- California Public Utilities Commission (CPUC) General Order 95 (GO-95), *Rules for Overhead Electric Line Construction*, sets forth uniform requirements for the construction of overhead lines. Compliance with this Order ensures adequate service and the safety of the public and the people who build, maintain, and operate overhead electric lines.

- CPUC General Order 128 (GO-128), *Rules for Construction of Underground Electric Supply and Communications Systems*, sets forth uniform requirements and minimum standards for underground supply systems to ensure adequate service and the safety of the public and the people who build, maintain, and operate underground electric lines.
- The National Electric Safety Code, 1999, provides electrical, mechanical, civil, and structural requirements for overhead electric line construction and operation.
- The combined North American Electric Reliability Corporation/Western Electricity Coordinating Council (NERC/WECC) planning standards provide system performance standards for assessing the reliability of the interconnected transmission system. These standards require continuity of service and the preservation of interconnected operation as the first and second priorities, respectively. Some aspects of NERC/WECC standards are either more stringent or more specific than the either agency's standards alone. These standards are designed to ensure that transmission systems can withstand both forced and maintenance outage system contingencies while operating reliably within equipment and electric system thermal, voltage, and stability limits. These standards include reliability criteria for system adequacy and security, system modeling data requirements, system protection and control, and system restoration. Analysis of the WECC system is based to a large degree on Section I.A of WECC standards, *NERC and WECC Planning Standards with Table I and WECC Disturbance-Performance Table,* and on Section I.D, *NERC and WECC Standards for Voltage Support and Reactive Power.* These standards require that power flows and stability simulations verify defined performance levels. Performance levels are defined by specifying allowable variations in thermal loading, voltage and frequency, and loss of load that may occur during various disturbances. Performance levels range from no substantial adverse effects inside and outside a system area during a minor disturbance (such as the loss of load from a single transmission element) to a catastrophic loss level designed to prevent system cascading and the subsequent blackout of islanded areas and millions of consumers during a major transmission disturbance (such as the loss of multiple 500-kV lines along a common right-of- way, and/or of multiple large generators). While the controlled loss of generation or system separation is permitted under certain specific circumstances, a major uncontrolled loss is not permitted (WECC, 2002).
- NERC's reliability standards for North America's electric transmission system spell out the national policies, standards, principles, and guidelines that ensure the adequacy and security of the nation's transmission system. These reliability standards provide for system performance levels under both normal and contingency conditions. While these standards are similar to the combined NERC/WECC standards, certain aspects of the combined standards are either more stringent or more specific than the NERC performance standards alone. NERC's reliability standards apply to both interconnected system operations and to individual service areas (NERC, 2006).
- California ISO planning standards provide the standards and guidelines that ensure the adequacy, security, and reliability of the state's member grid facilities. These standards incorporate the combined NERC/WECC and NERC standards. These standards are also similar to the NERC/WECC or NERC standards for transmission

system contingency performance. However, the California ISO standards provide additional requirements not included in the WECC/NERC or NERC standards. The California ISO standards apply to all participating transmission owners interconnecting to the California ISO-controlled grid. They also apply to non-member facilities that impact the California ISO grid through their interconnections with adjacent control grids (California ISO, 2002a).

- California ISO/Federal Energy Regulatory Commission (FERC) electricity tariffs contain guidelines for building all transmission additions/upgrades within the California ISO-controlled grid. (California ISO, 2003a).

D.5.3 PROPOSED PROJECT

D.5.3.1 SETTING AND EXISTING CONDITIONS

The applicant proposes to interconnect the proposed 850 megawatt (MW) Calico Solar Project to SCE's existing Pisgah 230 kV Substation which is located in San Bernardino County approximately 35 miles east of Barstow, California. The proposed project would be developed in two phases, one 275 MW phase (Calico Solar Project Phase 1), and one 575 MW phase (Calico Solar Project Phase 2), with a net output of 850MW.

The Calico Solar Project is a solar concentrating thermal power plant, based on the proprietary SunCatcher technology of Sterling Energy System, Inc. Each SunCatcher consists of a 25-kilowatt (kW) solar power generating system. The system is designed to track the sun automatically and to focus solar energy onto a power conversion unit (PCU), which generates electricity. Each SunCatcher consists of a 38-foot high by 40-foot wide solar concentrator in a dish structure that supports an array of curved glass mirror facets. These mirrors collect and concentrate solar energy onto the solar receiver of the PCU. Both phases of the project will consist of a total of approximately 34,000 SunCatchers. Each SunCatcher will produce 575 volts alternating current. The project will be electrically designed to 575V, 1.5 MW, three phase, 60Hz solar groups. Each complete solar group will consist of 60 SunCatchers, which correlates to a 1.5 MW power block with a corresponding GSU transformer. The 1750 KVA GSU transformer will step up the 575 volt (V) collector feeder voltage to 34.5 kV. The 1.5 MW solar groups will be connected by underground electrical cables to create the 3, 6 and 9 MW solar groups. Five 9 MW groups and one 3 MW group will be coupled through underground 4/0 aluminum electrical cables and ascend through a pole riser to create an overhead 48MW distribution collector line. Five 9 MW groups and one 6 MW group will be coupled through underground 4/0 aluminum electrical cables and ascend through a pole riser to create an overhead 51MW distribution collector line. The overhead collector groups will deliver the solar electric generated power to a new 850MW substation constructed on the site as part of the project. (SES Solar One, 2007c, Section 3.4, pages 3-27 to 3-32 and Figure 3-1 to 3-45

Switchyard and Interconnection Facilities

The applicant will build a 34.5 kV to 230 kV 850 MW substation on the project site. The substation will consist of six segments of 34.5 kV open air bus with each bus segment consist of five 1200A **,** 35 kV collection feeder circuit breakers. One 48 MW and two 51

MW overhead collection lines will be connected to the each six 34.5 kV bus segments via circuit breakers. Additionally, two 35 kV circuit breakers in each segment will connect to power factor correction 45 MVar capacitor banks in the substation yard. For Phase 1 of the project, the first interconnection substation will initially consist of four power transformers rated at 100/133/167 MVA each to convert the generation collection voltage from 34.5 kV to the transmission tie voltage of 230kV. The substation will ultimately contain six 100/133/167 MVA, 34.5 kV to 230kV step up transformers. Each power transformer will serve 3 of the 15 overhead collection lines. The high side of each step up transformer will be connected to the 230kV bus segments via 2000A, 230kV circuit breakers. One common bus for each phase will be formed by connecting the 230 kV bus segments through 2000A disconnect switches.

An approximately, 2 mile long 230kV single circuit will be used to interconnect the 850 MW Calico Solar Project substation to the Pisgah Substation. The single circuit of the overhead 230kV transmission line will be constructed with one 1590 kcmil per phase, aluminum conductor steel-reinforced (ACSR) conductor per line; each thermally rated to carry full project output in emergency conditions. Each circuit of the overhead line begins at a dead-end structure in the Calico Solar Project substation, continues east and parallel to the BNSF railroad ROW, and south crossing the BNSF railroad to a point where the line turns east leaving the site and undercrossing three SCE transmission lines before it finally enters the SCE Pisgah substation from the south. The transmission lines will start within the project site boundary but a 0.14 mile long segment from the project site to the Pisgah Substation will be outside the project site boundary. The off-site portion of the 230kV interconnect transmission line will be routed under existing SCE transmission lines. Construction of that line will include dead-end structures in the substation and 12 to 15 230 kV lattice steel towers and/ or tubular steel poles and new 1590 kcmil ACSR conductors for each phase of the circuit.

Furthermore, SCE has proposed expanding and upgrading the existing 230kV SCE Pisgah substation to a 230/500kV substation, increasing the voltage to 500kV, looping the Eldorado-Lugo 500kV line into the SCE Pisgah substation and upgrading 65 miles of the existing Lugo-Pisgah number two 230kV transmission line to 500kV. The SCE Pisgah substation work includes installation of a new double Breaker 230kV line position to terminate the new Calico Solar Project 230kV Gen Tie Line, install Motorized disconnect switches at each one of the existing Lugo No.1 and No.2 230kV line positions, and install SPS relays. (SES Solar One, LGIP Optional Interconnection Study, Section 3.6 pages 3.27 to 3.30, and Figures 3-5, 3-6, and 3-7)

D.5.3.2 ASSESSMENT OF IMPACTS AND DISCUSSION OF MITIGATION

For the interconnection of this proposed project to the grid, the interconnecting utility (SCE) and the control area operator (California ISO) are responsible for ensuring grid reliability. These two entities will assess the potential impacts of the proposed Calico Solar Project on the transmission system and any mitigation measures needed to ensure system conformance with the applicable utility reliability criteria, NERC planning standards, WECC reliability criteria, and California ISO reliability criteria. System impact and facilities studies are used to determine the impacts of the proposed Calico Solar Project on the transmission grid. Staff relies on these studies and any review conducted

by the California ISO to determine the potential effects of the proposed Calico Solar Project on the transmission grid and to identify any necessary downstream facilities or indirect project impacts required to bring the transmission network into compliance with applicable reliability standards. System impact and facilities studies analyze the grid with and without the proposed Calico Solar Project, under conditions specified in the planning standards and reliability criteria. The standards and criteria define the assumptions used in the study and establish the thresholds through which grid reliability is determined. The studies analyze the potential impact of the proposed Calico Solar Project for the anticipated first year of operation, and are based on a forecast of loads, generation, and transmission. Load forecasts are developed by the interconnected utility. Generation and transmission forecasts are established by an interconnection queue. The studies focus on thermal overloads, voltage deviations, system stability (excessive oscillations in generators and transmission system, voltage collapse, loss of loads, or cascading outages), and short circuit current. If the studies show that the interconnection of the project causes the grid to be out of compliance with the reliability standards, then the study will identify mitigation measures or ways in which the grid could be brought into compliance with the reliability standards.

When a project connects to the California ISO-controlled grid, both the studies and mitigation measures must be reviewed and approved by the California ISO. If either the California ISO or interconnecting utility determines that the only feasible mitigation includes transmission modifications or additions requiring CEQA review, the Energy Commission must analyze those modifications or additions according to CEQA requirements.

D.5.3.3 SCOPE OF SYSTEM IMPACT STUDIES

The System Impact Studies (SIS) were performed by SCE at the request of the applicant to identify the potential impacts of the proposed Calico Solar Project on SCE's 69/115/230kV transmission system. The SIS included power flow, sensitivity, and short circuit studies and transient and post-transient analyses (SES Solar One, Phase 1 and Phase 2-2006a SIS). The SIS modeled the proposed project for a net output of 850 MW. The base cases included all California ISO approved major SCE transmission projects, and major path flow limits of Southern California Import Transmission (SCIT), East-Of-River, West-of-River and upgraded 115kV phase shifting transformer at Inyo substation. The SIS considered light load conditions with generation patterns and SCIT imports maximized to identify the extent of potential congestion and to fully stress the SCE system in the area where the project phases of the proposed Calico Solar Project would be interconnected. The study assumptions are described in further detail in the SIS. The power flow studies were conducted with and without Calico Solar connected to SCE's grid at the existing Pisgah Substation, using 2009 heavy summer and 2009 light spring base cases. The power flow study assessed the potential impacts of the proposed Calico Solar Project on thermal loading of the transmission lines and equipment. Transient and post-transient studies were conducted for Phases 1 and 2 of the proposed Calico Solar Project using the 2009 heavy summer base case to determine whether the project would create instability in the system following certain selected outages. Short circuit studies were conducted to determine if Phases 1 and 2 of the proposed Calico Solar Project would overstress existing substation facilities.

Pre-Project Upgrade Requirements

The upgrades included below are those facilities that are required to mitigate reliability violations caused by higher-queued projects, placed ahead of the project in the generator interconnection queue, and are expected to be implemented by those higher-queued projects. However, in the event that any of these higher-queued projects withdraw their application, the Calico Solar Project may become responsible for any or all of these additional facilities.

- Upgrade of the Inyo 115kV Phase-Shift transformer: The upgrade involves replacement of the phase-shift transformer at Inyo with a new one that has greater phase-shift capability.
- Inyokern substation conversion to 230kV: The facility upgrades involve a new Inyokern 230kV substation and utilization of existing 230kV transmission facilities.
- New Lugo-Kramer Transmission Line project: The facility involves the construction of a new Kramer-Lugo 230kV transmission line.
- Construction of a third Lugo 500/230kV Transformer Bank.
- Mountain Pass-El Dorado 115kV line reconductor.
- El Dorado 230/115kV transformer Bank – The facility involves replacing existing 230/115kV transformer bank with a larger size.

Power Flow Study Results with Pre-Project Upgrades

Normal (N-0) Overloads

With the addition of the Calico Solar Project, the study identified two 230kV transmission lines and two 500/230kV transformer banks with base case overloads during heavy summer and Light spring load conditions. Sensitivity studies were conducted to identify the Calico Solar Project level that would mitigate thermal overloads on the Lugo-Pisgah 230kV transmission lines. The study found that if Calico Solar Project output was reduced to 687MW and 750MW for heavy summer and light spring load conditions there would be no thermal overloads on the Lugo-Pisgah 230kV lines. However, the reduction in generation does not mitigate the thermal overloads identified on the Lugo number 1 and Lugo number 2 500/230kV transformer banks. To mitigate the thermal overloads on the transformer banks the Calico Solar Project generation output should be reduced to 300MW and 150MW for heavy summer and light spring load conditions.

Overloads:

- Lugo-Pisgah No.2 230kV transmission line was 112% overloaded under the heavy summer and light spring Base case conditions.
- Lugo-Pisgah No.1 230kV transmission line was 111% overloaded under the heavy summer and light spring Base case conditions.
- Lugo Number 1 500/230 kV transformer bank was 103% overloaded under the heavy summer and light spring Base case conditions.

- Lugo Number 2 500/230 kV transformer bank was 104% overloaded under the heavy summer and light spring Base case conditions.

  Mitigation:

  - The recommended mitigation strategy is to expand the existing Pisgah 230kV interconnection facility and install a new 2240MVA 500/230kV substation with two 1120MVA transformer banks.
  - Loop the existing Eldorado-Lugo 500kV transmission line into the expanded Pisgah substation and form the two new Eldorado-Pisgah and Lugo-Pisgah number 1 500kV transmission lines.
  - Install a new Lugo-Pisgah Number 2 500kV transmission line by removing the existing Lugo-Pisgah number 2 230kV transmission line, widening the existing Right-of-Way where needed and constructing the new 500kV structures within the vacated ROW

Single Outage Contingency (N-1 or T-1)

With the addition of the Calico Solar Project, the study identified one 230kV transmission line and one 500/230kV transformer bank overload under the N-1 or T-1 contingency analysis during the heavy summer and light spring load conditions.

Overload:

- One Lugo-Pisgah 230kV transmission line was overloaded approximately 147% above the pre-project ratings, during the outage of the other Lugo-Pisgah 230kV transmission line under the heavy summer and light spring N-1 conditions.
- One Lugo 500/230kV transformer was overloaded approximately 56% above the pre-project ratings, during the outage of the other Lugo 500/230kV transformer bank, under the heavy summer and light spring N-1 conditions.

  Mitigation:

  - With the output of the Calico Solar Project reduced to 300MW and 150MW for heavy summer and light spring load conditions, there are no thermal overloads of the Lugo 500/230kV transformer banks. Additionally, a Special Protection System (SPS) will be required to trip off the Calico Solar Project to mitigate the thermal overloads caused by the N-1 condition.
  - To support the required SPS the replacement of a portion of existing Eldorado-Lugo 500kV Over Head Ground Wire (OHGW) with new Optical Ground Wire) OPGW between the Lugo and Pisgah substations.
  - Replacement of a portion of existing OHGW with OPGW on the existing Eldorado-Lugo 500kV transmission line between the Lugo and Pisgah substations.
  - Installment of new Fiber Cable coupled with use of existing Microwave.

Double Outage Contingency (N-2 or N-1 and T-1)

The study identified that power flows do not converge under loss of both Lugo-Pisgah 230kV or loss of both Pisgah-El Dorado 230kV lines. These study results are indicative of a potential voltage collapse. Since the existing system cannot support the entire project output with all facilities in service, the results under loss of two transmission lines were not closely evaluated for the existing system arrangement.

Power Flow Study Results with 230kV to 500kV Lugo to Pisgah Conversion

The study results obtained from the power flow study with pre-project upgrades modeled to mitigate base case overload problems triggered by queued ahead projects are insufficient to accommodate the Calico Solar Project. As a result, facility upgrades will be needed to interconnect and deliver the full output of the Calico Solar Project. The following presents the power flow study results with the upgrades:

Normal Condition (N-0):

With all pre-project upgrades and the first set of Calico Solar Project upgrades included into the study cases, the base case overloads identified on both Lugo-Pisgah 230kV transmission lines and both Lugo 500/230kV transformer banks were eliminated.

Single Outage Contingency (N-1 and T-1):

With the first set of facility upgrades modeled, the study identified two single outage contingencies that resulted in a case non-convergence due to insufficient Var support of the system. Loss of the new Lugo Pisgah 500kV transmission line or loss of the single Pisgah 500/230kV transformer bank results in a possible voltage collapse problem. Under the two outage conditions, there is insufficient capacity to transfer the entire Calico Solar Project output, even if the voltage problem were resolved as the two remaining 230kV lines in service from Pisgah can only carry approximately 575MVA. With the final set of facility upgrades modeled, no single outage contingency problems were identified.

Transient Study Results

The Transient Study was conducted for the critical single and double contingencies affecting the area on the page 18, table 1-8 and 1-9 in the Calico Solar Project (Phases 1 and 2) SIS. The three-phase faults with normal clearing are studied for single contingencies; single-line-to-ground faults with delayed clearing are studied for double contingencies. All outage cases were evaluated with the assumption that existing SPS or Remedial Action Schemes (RAS) would operate as designed where required. The Transient Studies concluded that the existing Kramer RAS and High Desert Power Project (HDPP) RAS operating as designed where required and the new SPS proposed for this project there are no additional upgrades to the SCE system required. However, the project will need to provide 300MVAR of dynamic reactive support. (Final Interconnection Facilities Study Report, Page 5, June 13, 2008)

Post-Transient Study Results

The NERC/WECC planning standards require that the system maintain post-transient voltage stability when either critical path transfers or area loads increase by 5 percent for Category B contingencies, and 2.5 percent for Category C contingencies. Post-transient studies conducted for similar or larger generators in the area concluded that voltage remains stable under both N-1 and N-2 contingencies. All outage cases were evaluated with the assumption that existing SPS or RAS would operate as designed where required. The studies determined that the system remained stable with the proposed upgrades in place under both single and double contingency outage conditions and the addition of Phases 1 and 2 of the proposed Calico Solar Project would not trigger any new post-transient criteria violations. (Final Interconnection Facilities Study Report, Page 5, June 13, 2008)

Short-Circuit Duty Study Results

Short circuit studies were performed to determine the degree to which the addition of the power generated by the Calico Solar Project increases fault duties at SCE substations, and other 69kV, 115 kV, 230 kV, and 500 kV busses in the study area. The busses at which faults were simulated, the maximum three-phase and single-line-to-ground fault currents at these busses both with and without the project, and information on the breaker duties at each location are summarized in the Short Circuit Study results tables in the SIS (SES Solar One, Table 2-6,Page 30 –SIS and Final Interconnection Facilities Study Report -Page 5).

The results of the three-phase-to-ground and single-phase-to-ground short-circuit duty studies identified six 500kV, nineteen 230kV, and three 66kV substation locations where the project causes the Three Phase and or the Single Phase to Ground short circuit duties to increase by 0.1kA or more and required further evaluation. The Circuit Breaker evaluations concluded that the project does not trigger any Circuit Breaker replacements or upgrades but aggravates pre-project conditions that require fifteen replacements and seventeen upgrades of 230kV Circuit breakers at the Etiwanda generation station 230kV switchyard and Mira Loma substation. The increased Short Circuit Duty at Mira Loma substation also requires that the 230kV switchyard be upgraded to 80kA ratings. (Final interconnection Facilities Study Report, Page 5, November 6, 2008)

Reactive Power Deficiency Analysis Results

The addition of the Calico Solar Project adversely impacts SCE’s ability to maintain schedule voltages if power factor correction is not placed at strategic locations. For generation levels ranging up to 400MW, the amount of Calico Solar Project uncompensated reactive demands vary between 0 and 350MVar. Of the 350MVar reactive demands, approximately 260 MVar are associated with the reactive loads at 0.84 Power Factor and the remaining 90 MVar are associated with transformation and local distribution collector losses. Without Power Factor correction, the reactive requirements are transmitted from other generation resources. Such transmission of reactive power can potentially result in voltage collapse conditions. This condition was identified for the Calico Solar Project when generation levels exceed 400MW under

normal operating conditions, 325 MW under loss of one transmission line, and 200 MW under loss of two transmission lines. Power Factor correction devices such as shunt capacitor banks, substation capacitor banks or other reactive resource devices should be located where they are needed, within the Calico Solar Project.

Optional Interconnection Study (275MW)

On January, 2008 the applicant requested that SCE determine the impacts of a 275 MW on the SCE system. The study revealed that a maximum of 275MW generation could be interconnected to the existing Pisgah 230kV Bus and related 230kV system contingent on the installation of a new Special Protection Scheme (SPS) that would trip-off the generation under certain contingencies. The 275MW interconnection would be a temporary Interconnection until the 500kV System Upgrades are on line and the full 850MW generation is connected to the upgraded system.

Power Flow Study Results:

Although the project does not trigger any Base case overloads it requires a new SPS to eliminate single contingency (N-1) overloads as follows:

Overload:

- Lugo-Pisgah No.1 230kV transmission line was 115% overloaded under the outage of the Lugo-Pisgah No. 2 230kV transmission line.
- Lugo-Pisgah No.2 230kV transmission line was 115% overloaded under the outage of the Lugo-Pisgah No.1 230kV transmission line.

  Mitigation:

  - The recommended mitigation strategy is to install a new SPS to trip the project under either one of the outages described above.

Additionally, the Calico Solar Project has aggravated two pre-project transformer overloads under the N-1 contingency analysis.

Overload:

- Lugo No. 1 AA 500/230kV transformer bank pre-project overload has been aggravated by the project under the outage of the Lugo No. 2AA 500/220kV transformer bank.
- Lugo No. 2 AA 500/220kV transformer bank pre-project overload has been aggravated by the project under the outage of the Lugo No. 1AA 500/220kV transformer bank.

  Mitigation:

  - The recommended mitigation strategy is to install a new SPS to trip the project under either one of the N-1 outages described above.

Short Circuit Study Results:

The study identified two 500kV, five 230kV, and one 115kV substation locations where the Calico Solar Project causes the Three Phase and /or the Single Phase to Ground Short Circuit Duties to increase by 0.1kA or more. The Circuit Breaker evaluation concluded that the project does not trigger any CB replacements or upgrades but aggravated pre-project conditions that require the replacement of twelve 230kV CB's at Mira Loma Substation. (Table 2.1 and 2.2, Page 11, LGIP Optional Interconnection Study).

D.5.3.4 COMPLIANCE WITH LORS

The findings of the studies conducted for the proposed Calico Solar Project and summarized above indicate that Phases 1 and 2 of the project would comply with the NERC/WECC planning standards and California ISO reliability criteria. The project will be designed and constructed to include the 230 kV substation on the project site and a new 2 mile long, 230kV single circuit transmission facility from the project site to the Pisgah Substation. Staff concludes that, assuming the proposed conditions of certification are met, the project would meet the requirements and standards of all applicable LORS for TSE.

D.5.4 REDUCED ACREAGE ALTERNATIVE

The Reduced Acreage alternative would essentially be a 275 MW solar facility located within the central portion of the proposed 850 MW project. It was developed because it can be constructed without upgrading the SCE Lugo-Pisgah transmission line. This alternative's boundaries and the revised locations of the transmission line, substation, laydown, and control facilities are shown in **Alternatives Figure 1**.

D.5.4.1 SETTING AND EXISTING CONDITIONS

Like the proposed project, this alternative would include numerous groups of 60 SunCatchers, connected by underground electrical cables. When aggregated at the project substation, the power generated would interconnect to SCE's existing Pisgah 230 kV substation which is located in San Bernardino County approximately 35 miles east of Barstow, California. There would be fewer SunCatcher groups in this alternative, but the system of aggregation and method of power transmission would be the same as for the proposed project.

D.5.4.2 ASSESSMENT OF IMPACTS AND DISCUSSION OF MITIGATION

This alternative would require fewer SunCatcher groups to generate 275 MW. Therefore, it would require fewer distribution facilities and a smaller substation to be built within the project site.

D.5.4.3 CEQA LEVEL OF SIGNIFICANCE

This alternative would require fewer distribution and transmission facilities to be built in the project site. Therefore, installation of fewer transformers, fewer collector distribution

feeders and other electrical components would contribute lesser environmental impacts and trigger lesser CEQA analysis.

D.5.5 AVOIDANCE OF DONATED AND ACQUIRED LANDS ALTERNATIVE

The Avoidance of Donated and Acquired Lands Alternative would be an approximately 720 MW solar facility located within the boundaries of the proposed 850 MW project. This alternative, the transmission line, substation, laydown, and control facilities are shown in **Alternatives Figure 2**.

D.5.5.1 SETTING AND EXISTING CONDITIONS

Like the proposed project, this alternative would include numerous groups of 60 SunCatchers, connected by underground electrical cables. When aggregated at the project substation, the power generated would interconnect to SCE's existing Pisgah 230 kV substation which is located in San Bernardino County approximately 35 miles east of Barstow, California. There would be fewer SunCatcher groups in this alternative, but the system of aggregation and method of power transmission would be the same as for the proposed project.

D.5.5.2 ASSESSMENT OF IMPACTS AND DISCUSSION OF MITIGATION

The Avoidance of Donated and Acquired Lands Alternative would consist of 28,800 SunCatchers with a net generating capacity of approximately 720 MW occupying the entire proposed project footprint but avoiding use of any lands that were donated to BLM or acquired by BLM through the Land and Water Conservation Fund program. Like the proposed project, this alternative would transmit power to the grid through the SCE Pisgah Substation and would require infrastructure similar to the entire proposed 850 MW project, including water storage tanks, transmission line, road access, main services complex, and substation. Additionally, like the proposed project, the Avoidance of Donated and Acquired Lands Alternative would require the 65-mile upgrade to the SCE Lugo-Pisgah transmission line.

The Avoidance of Donated and Acquired Lands Alternative would use approximately 85 percent of the SunCatchers, provide 85 percent of the power generating potential, and would affect approximately 86 percent of the land (7,050 acres) of the proposed 850MW project. This alternative would require fewer SunCatcher groups to generate 275 MW. Therefore, it would require fewer distribution facilities and a smaller substation to be built within the project site.

If the Avoidance of Donated and Acquired Lands Alternative were approved, other renewable projects may be developed on other sites in the in San Bernardino County, the Mojave Desert, or in adjacent states to fill the 130 MW gap not supplied by the proposed project as developers strive to provide renewable power that complies with utility requirements and State/Federal mandates.

D.5.5.3 CEQA LEVEL OF SIGNIFICANCE

The level of significance under CEQA for the Avoidance of Donated and Acquired Lands Alternative would be the same as for the proposed project. This alternative would require fewer distribution and transmission facilities to be built in the project site. Therefore, installation of fewer transformers, fewer collector distribution feeders and other electrical components would contribute lesser environmental impacts and trigger lesser CEQA analysis.

D.5.6 NO PROJECT / NO ACTION ALTERNATIVE

There are three No Project / No Action Alternatives evaluated as follows:

No Project / No Action Alternative #1: No Action on the Calico Solar Project application and on CDCA land use plan amendment

Under this alternative, the proposed Calico Solar Project would not be approved by the CEC and BLM and BLM would not amend the CDCA Plan. As a result, no solar energy project would be constructed on the project site and BLM would continue to manage the site consistent with the existing land use designation in the CDCA Land Use Plan of 1980, as amended.

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

- The impacts of the proposed project would not occur. However, the land on which the project is proposed would become available to other uses that are consistent with BLM's land use plan, including another renewable energy project.
- The benefits of the proposed project in displacing fossil fuel fired generation and reducing associated greenhouse gas emissions from gas-fired generation would not occur. Both State and Federal law support the increased use of renewable power generation.

If the proposed project is not approved, renewable projects would likely be developed on other sites in San Bernardino County, the Mojave Desert, or in adjacent states as developers strive to provide renewable power that complies with utility requirements and State/Federal mandates. For example, there are dozens of other wind and solar projects that have applications pending with BLM in the California Desert District.

No Project / No Action Alternative #2: No Action on the Calico Solar Project and amend the CDCA land use plan to make the area available for future solar development

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

Because the CDCA Plan would be amended, it is possible that the site would be developed with the same or a different solar technology. As a result, GHG emissions would result from the construction and operation of the solar technology and would likely be similar to the GHG emissions from the proposed project. Different solar

technologies require different amounts of construction and operations maintenance; however, it is expected that all the technologies would provide the more significant benefit, like the proposed project, of displacing fossil fuel fired generation and reducing associated GHG emissions. As such, this No Project/No Action Alternative could result in GHG benefits similar to those of the proposed project.

No Project / No Action Alternative #3: No Action on the Calico Solar Project application and amend the CDCA land use plan to make the area unavailable for future solar development

Under this alternative, the proposed Calico Solar Project would not be approved by the CEC and BLM and the BLM would amend the CDCA Plan to make the proposed site unavailable for future solar development. As a result, no solar energy project would be constructed on the project site and BLM would continue to manage the site consistent with the existing land use designation in the CDCA Land Use Plan of 1980, as amended.

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

D.5.7 PROJECT-RELATED FUTURE ACTIONS

Proposed upgrades to the Southern California Edison (SCE) transmission system, known as the 275 MW Early Interconnection option and the 850 MW Full Build-Out option are considered to be reasonably foreseeable actions that would be contingent on construction of the proposed Calico Solar Project. The SCE upgrades are required for the reliable interconnection and transmission of power generated by the proposed Calico Solar Project. The SCE project will be fully evaluated in a future EIR/EIS prepared by the BLM and the California Public Utilities Commission.

The project components and construction activities associated with these future actions are described in detail in Section B.3 of this Staff Assessment/EIS.

- The **275 MW Early Interconnection Option** would include upgrades to the existing SCE system that would result in 275 MW of additional latent system capacity. Under the 275 MW Early Interconnection option, Pisgah Substation would be expanded adjacent to the existing substation, one to two new 220 kV structures would be constructed to support the transmissions interconnection (gen-tie) from the Calico Solar Project into Pisgah Substation, and new telecommunication facilities would be installed within existing SCE Right of Ways (ROWs).
- The **850 MW Full Build-Out Option** would include replacement of a 67-mile 220 kV SCE transmission line with a new 500 kV line, expansion of the Pisgah Substation at

a new location and other telecommunication upgrades to allow for additional transmission system capacity to support the operation of the full Calico Solar Project.

D.5.7.1 MITIGATION

The proposed upgrades to the SCE system required for the reliable interconnection of the Early Interconnection Option and the Full Build-Out Option are the mitigation for impacts of the proposed project on the SCE transmission system.

D.5.7.2 CONCLUSION

The transmission upgrades identified in this TSE analysis are required for the reliable interconnection of the Calico Solar project. Without these transmission facilities the SCE transmission system would not comply with reliability LORS with the Calico Solar Project operating.

D.5.8 CUMULATIVE IMPACT ANALYSIS

Staff has reviewed the lists of existing and foreseeable projects as presented in the **CUMULATIVE SCENARIO** section of this document. Staff's review considers whether the interconnection of the Calico Solar Project to SCE's transmission system along with other existing and foreseeable generation projects would conform to all LORS required for safe and reliable electric power transmission. The analysis described above under the heading Proposed Project – Scope of System Impact Studies is conducted in coordination with, and the approval of, California ISO to consider existing and proposed generator interconnections to the transmission grid and their potential safety and reliability impacts under a number of conservative contingency conditions.

The impacts to the safe and reliable operation of the transmission system due to the Calico Solar Project, as identified in the SIS, would be mitigated with the Energy Commission's and BLM's incorporation of the mitigation measures and COCs set forth in this section to minimize the project's contribution to the cumulative impacts. Staff also believes that there would be some positive impacts because the Calico Solar Project would supplement local solar generation and import of power to the SCE system, meet the increasing load demand in the San Bernardino County, Riverside County.

Geographic Extent

The geographic scope for considering cumulative impacts on the electric system from this project is the Southern California Edison (SCE) grid.

Existing Cumulative Conditions

The SCE grid includes many natural gas-fired power plants, several hydroelectric power plants, and a growing number of solar and wind power plants are being proposed. The existing transmission system in the project area lacks additional capacity and would require upgrades for any projects not currently interconnected to the grid.

Future Foreseeable Projects

Future projects on the SCE grid will likely include numerous solar and wind power plants, as well as more natural gas-fired peaking plants. The ratio of gas-fired to renewable energy power plants is likely to drop as SCE acquires more solar and wind power energy in response to government mandates to increase the portion of energy produced from renewable sources.

Foreseeable Projects in the Barstow Area

The BLM field office in Barstow has received several applications for solar and wind energy projects. Although some of the smaller projects may be closer to the Barstow load center and would not require upgrades to the same transmission lines as the proposed project, the requirements of other larger proposed projects could lead to cumulative impacts to transmission system engineering. However, due to the lack of additional capacity on the SCE transmission system in the project area, any one of these projects could require upgrades to the SCE system with or without the proposed project.

Foreseeable Renewable Projects in the California and Arizona Desert

Numerous solar, wind power and geothermal projects are foreseeable in the deserts of California and Arizona. The BLM Desert District has received many applications for solar and wind energy projects. Although some of the smaller projects may be closer to the load centers and would not require upgrades to the same SCE transmission lines as the proposed project, the requirements of other larger proposed projects could lead to cumulative impacts to transmission system engineering. However, due to the lack of additional capacity on some of the transmission lines in the area, any one of these projects could require upgrades to the system with or without the proposed project.

D.5.9 COMPLIANCE WITH LORS

The findings of the studies conducted for the proposed Calico Solar Project and summarized in D.5.4.3 above indicate that Phases 1 and 2 of the project would comply with the NERC/WECC planning standards and California ISO reliability criteria. The project will be designed and constructed to include the 230 kV substation on the project site and a new 2 mile long, 230kV single circuit transmission facility from the project site to the Pisgah Substation. Staff concludes that, assuming the proposed conditions of certification are met, the project would meet the requirements and standards of all applicable LORS for TSE.

D.5.10 NOTEWORTHY PUBLIC BENEFITS

Staff has not identified and noteworthy public benefits to TSE from the proposed Calico Solar Project.

D.5.11 FACILITY CLOSURE

In the future, upon closure of Calico Solar Project, the reduction of electrical generation from the Calico Solar Project would not have an adverse impact on the capacity of the electrical transmission grid, and could potentially open up capacity for newer and more efficient renewable energy projects. The upgrades necessary to the SCE system to transmit the power from the Calico Solar Project to the load centers will remain after the decommissioning of the proposed project.

D.5.12 PROPOSED CONDITIONS OF CERTIFICATION

The following conditions of certification/mitigation measures are incorporated in the proposed Calico Solar Project to address potential project impacts related to the transmission system.

TSE-1 The project owner shall furnish to the Compliance Project Manager (CPM) and to the Chief Building Official (CBO) a schedule of transmission facility design submittals, a Master Drawing List, a Master Specifications List, and a Major Equipment and Structure List. The schedule shall contain a description and list of proposed submittal packages for design, calculations, and specifications for major structures and equipment. To facilitate audits by Energy Commission staff, the project owner shall provide designated packages to the CPM when requested

Verification: At least 60 days prior to the start of construction (or a lesser number of days mutually agreed to by the project owner and the CBO), the project owner shall submit the schedule, a Master Drawing List, and a Master Specifications List to the CBO and to the CPM. The schedule shall contain a description and list of proposed submittal packages for design, calculations, and specifications for major structures and equipment (see a list of major equipment in **Transmission System Engineering Table 1**, Major Equipment List below). Additions and deletions shall be made to the table only with CPM and CBO approval. The project owner shall provide schedule updates in the Monthly Compliance Report.

Transmission System Engineering Table 1
Major Equipment List

Breakers	Take Off Facilities
Step-Up Transformer	Electrical Control Building
Switchyard	Switchyard Control Building
Busses	Transmission Pole/Tower
Surge Arrestors	Grounding System
Disconnects	

TSE-2 Prior to the start of construction, the project owner shall assign an electrical engineer and at least one of each of the following to the project: A) a civil engineer; B) a geotechnical engineer or a civil engineer experienced and knowledgeable in the practice of soils engineering; C) a design engineer who is either a structural engineer or a civil engineer fully competent and proficient in the design of power plant structures and equipment supports; or D) a

mechanical engineer. (Business and Professions Code Sections 6704 et seq. require state registration to practice as a civil engineer or structural engineer in California).

The tasks performed by the civil, mechanical, electrical, or design engineers may be divided between two or more engineers, as long as each engineer is responsible for a particular segment of the project (e.g., proposed earthwork, civil structures, power plant structures, equipment support). No segment of the project shall have more than one responsible engineer. The transmission line may be the responsibility of a separate California-registered electrical engineer. The civil, geotechnical or civil, and design engineer assigned in conformance with Facility Design condition GEN-5, may be responsible for design and review of the TSE facilities.

The project owner shall submit to the CBO for review and approval, the names, qualifications, and registration numbers of all engineers assigned to the project. If any one of the designated engineers is subsequently reassigned or replaced, the project owner shall submit the name, qualifications, and registration number of the newly assigned engineer to the CBO for review and approval.

The project owner shall notify the CPM of the CBO's approval of the new engineer. This engineer shall be authorized to halt earthwork and to require changes if site conditions are unsafe or do not conform to predicted conditions used as a basis for design of earthwork or foundations.

The electrical engineer shall:

1. Be responsible for the electrical design of the power plant switchyard, outlet and termination facilities; and
2. Sign and stamp electrical design drawings, plans, specifications, and calculations.

Verification: At least 30 days prior to the start of rough grading (or a lesser number of days mutually agreed to by the project owner and the CBO), the project owner shall submit to the CBO for review and approval, the names, qualifications, and registration numbers of all the responsible engineers assigned to the project. The project owner shall notify the CPM of the CBO's approvals of the engineers within 5 days of the approval.

If the designated responsible engineer is subsequently reassigned or replaced, the project owner shall have 5 days in which to submit the name, qualifications, and registration number of the newly assigned engineer to the CBO for review and approval. The project owner shall notify the CPM of the CBO's approval of the new engineer within 5 days of that approval.

TSE-3 If any discrepancy in design and/or construction is discovered in any engineering work that has previously undergone CBO design review and approval, the project owner shall document the discrepancy and recommend corrective action (California Building Code, 1998, Chapter 1, Section 108.4,

Approval Required; Chapter 17, Section 1701.3, Duties and Responsibilities of the Special Inspector; Appendix Chapter 33, Section 3317.7, Notification of Noncompliance). The discrepancy documentation shall become a controlled document and shall be submitted to the CBO for review and approval and shall reference this condition of certification.

Verification: The project owner shall submit a copy of the CBO's approval or disapproval of any corrective action taken to resolve a discrepancy to the CPM within 15 days of receipt. If disapproved, the project owner shall advise the CPM, within 5 days, the reason for disapproval, and the revised corrective action required obtaining the CBO's approval**.**

TSE-4 For the power plant switchyard, outlet line, and termination, the project owner shall not begin any increment of construction until plans for that increment have been approved by the CBO. These plans, together with design changes and design change notices, shall remain on the site for one year after completion of construction. The project owner shall request that the CBO inspect the installation to ensure compliance with the requirements of applicable LORS. The following activities shall be reported in the Monthly Compliance Report:

1. Receipt or delay of major electrical equipment;
2. Testing or energization of major electrical equipment; and
3. The number of electrical drawings approved, submitted for approval, and still to be submitted**.**

Verification: At least 30 days prior to the start of each increment of construction (or a lesser number of days mutually agreed to by the project owner and the CBO), the project owner shall submit to the CBO for review and approval the final design plans, specifications, and calculations for equipment and systems of the power plant switchyard, outlet line, and termination, including a copy of the signed and stamped statement from the responsible electrical engineer attesting to compliance with the applicable LORS, and shall include a copy of the transmittal letter in the next Monthly Compliance Report**.**

TSE-5 The project owner shall ensure that the design, construction, and operation of the proposed transmission facilities conform to all applicable LORS, including the requirements listed below. The project owner shall submit the required number of copies of the design drawings and calculations as determined by the CBO.

1. The Calico Solar Project shall be interconnected to the SCE grid via a segment of 230kV, 1590 kcmil-ACSR, approximately 2 mile long single circuit extending from the new substation on the project site to the Pisgah SCE Substation.

2. The Calico Solar Project substation on the project site shall use 34.5kV, 1200A, 25 breakers and six, three phase, 100/133/167.7 MVA, 34.5kV/230 kV transformers.

3. The power plant outlet line shall meet or exceed the electrical, mechanical, civil, and structural requirements of CPUC General Order 95 and General Order 98 or National Electric Safety Code (NESC), Title 8 of the California Code and Regulations (Title 8), Articles 35, 36, and 37 of the "High Voltage Electric Safety Orders", California ISO standards, National Electric Code (NEC), and related industry standards.

4. Breakers and busses in the power plant switchyard and other switchyards, where applicable, shall be sized to comply with a short-circuit analysis.

5. Outlet line crossings and line parallels with transmission and distribution facilities shall be coordinated with the transmission line owner and comply with that owner's standards.

6. The project conductors shall be sized to accommodate the full output from the project.

7. Termination facilities shall comply with applicable SCE interconnection standards.

8. The project owner shall provide to the CPM:

    a. The final Detailed Facility Study (DFS) including a description of facility upgrades, operational mitigation measures, and/or Special Protection System (SPS) sequencing and timing if applicable,

    b. Executed project owner and California ISO Large Generator Interconnection Agreement.

Verification: At least 60 days prior to the start of construction of transmission facilities (or a lesser number of days mutually agreed to by the project owner and CBO), the project owner shall submit to the CBO for approval:

1. Design drawings, specifications, and calculations conforming with CPUC General Order 95 and General Order 98 or NESC; Title 8, California Code of Regulations, Articles 35, 36, and 37 of the "High Voltage Electric Safety Orders"; NEC; applicable interconnection standards, and related industry standards for the poles/towers, foundations, anchor bolts, conductors, grounding systems, and major switchyard equipment.
2. For each element of the transmission facilities identified above, the submittal package to the CBO shall contain the design criteria, a discussion of the calculation method(s), a sample calculation based on worst-case conditions,[1] and a statement signed and sealed by the registered engineer in responsible charge**,** or other acceptable alternative verification, that the transmission element(s) will conform with CPUC General Order 95 or NESC; Title 8, California Code of Regulations, Articles 35, 36 and 37 of the "High Voltage Electric Safety Orders"; NEC; applicable interconnection standards, and related industry standards.

[1] Worst-case conditions for the foundations would include for instance, a dead-end or angle pole.

3. Electrical one-line diagrams signed and sealed by the registered professional electrical engineer in responsible charge, a route map, and an engineering description of equipment and the configurations covered by requirements **TSE-1 through 5** above.
4. The final Detailed Facility Study and the Large Generator Interconnection Agreement, including a description of facility upgrades, operational mitigation measures, and/or SPS sequencing and timing if applicable, shall be provided concurrently to the CPM.

TSE-6 The project owner shall provide the following Notice to the California Independent System Operator (California ISO) prior to synchronizing the facility with the California transmission system:

1. At least one week prior to synchronizing the facility with the grid for testing, provide the California ISO a letter stating the proposed date of synchronization; and

2. At least one business day prior to synchronizing the facility with the grid for testing, provide telephone notification to the California ISO Outage Coordination Department.

Verification: The project owner shall provide copies of the California ISO letter to the CPM when it is sent to the California ISO one week prior to initial synchronization with the grid. A report of the conversation with the California ISO shall be provided electronically to the CPM one day before synchronizing the facility with the California transmission system for the first time.

TSE-7 The project owner shall be responsible for the inspection of the transmission facilities during and after project construction, and any subsequent CPM and CBO approved changes thereto, to ensure conformance with CPUC GO-95 or NESC; Title 8, CCR, Articles 35, 36 and 37 of the "High Voltage Electric Safety Orders"; applicable interconnection standards; NEC; and related industry standards. In case of non-conformance, the project owner shall inform the CPM and CBO in writing, within 10 days of discovering such non-conformance and describe the corrective actions to be taken.

Verification: Within 60 days after first synchronization of the project, the project owner shall transmit to the CPM and CBO:

1. As-built engineering description(s) and one-line drawings of the electrical portion of the facilities signed and sealed by the registered electrical engineer in responsible charge. A statement attesting to conformance with CPUC GO-95 or NESC; Title 8, California Code of Regulations, Articles 35, 36 and 37 of the "High Voltage Electric Safety Orders"; applicable interconnection standards; NEC; and related industry standards, and these conditions shall be provided concurrently with the submittal of the as-built plans.
2. An as-built engineering description of the mechanical, structural, and civil portions of the transmission facilities signed and sealed by the registered engineer in responsible charge or acceptable alternative verification. As-built drawings of the

electrical, mechanical, structural, and civil portions of the transmission facilities shall be maintained at the power plant and made available, if requested, for CPM audit as set forth in the "Compliance Monitoring Plan."

3. A summary of inspections of the completed transmission facilities, and identification of any nonconforming work and corrective actions taken, signed and sealed by the registered engineer in charge.

D.5.13 CONCLUSIONS

The outlet lines and termination of Phases 1 and 2 of the proposed Calico Solar Project are acceptable and would comply with all applicable LORS. The analysis of project transmission lines and equipment, both from the power plant up to the point of interconnection with the existing transmission network as well as upgrades beyond that interconnection that are attributable to the project, have been evaluated by staff and are included in the environmental sections of this SA/DEIS.

Staff's analysis with respect to Transmission System Engineering concludes that the Calico Solar Project (850MW) needs to meet the following mitigation measures:

- Expand the existing Pisgah 230kV interconnection facility and install a new 2,240 MVA, 500/230 kV substation with two 1,120 MVA transformer banks. The expansion of the existing Pisgah 230kV substation requires California CEQA/NEPA analysis.
- Loop the existing Eldorado-Lugo 500kV transmission line into the expanded Pisgah substation forming the Eldorado-Pisgah and Lugo-Pisgah number 1 500kV transmission lines.
- Install a new Lugo-Pisgah Number 2 500kV transmission line by removing the existing Lugo-Pisgah number 2 230kV transmission line, widening the existing Right-of-Way (ROW) where needed and constructing the new 500kV structures within the vacated ROW. The widening the existing ROW would require CEQA/NEPA analysis.
- Additionally, a Special Protection System (SPS) will be required to trip the Calico Solar Project to mitigate the thermal overloads caused by the N-1 emergency condition.
- The proposed Calico Solar Project should be designed and constructed with adequate reactive power resources to compensate the consumption of Var by the generator step-up transformers, distribution feeders and generator tie-lines.

RECOMMENDATIONS

If the BLM and Energy Commission approve the proposed Calico Solar Project, staff recommends that the applicant be required to satisfy the conditions of certification/ mitigation measures set forth in this section to ensure both system reliability and conformance with LORS.

D.5.14 REFERENCES

California ISO (California Independent System Operator). 1998a. Cal-ISO Tariff Scheduling Protocol. Posted April 1998, Amendments 1,4,5,6, and 7 incorporated.

California ISO (California Independent System Operator). 1998b. Cal-ISO Dispatch Protocol. Posted April 1998.

California ISO (California Independent System Operator). 2002a. Cal-ISO Grid Planning Standards. February 2002.

SES Solar One phase 1 and 2 (SES Solar One). 2006a. Stirling Energy System, Inc, (System Impact Study) submitted to the California Energy Commission.

SES Solar One LGIP Optional Interconnection Study Report (SES Solar One project). 2008b. California ISO, LGIP Study submitted to the California Energy Commission.

SES Solar One phase 1 and 2 (SES Solar 1). 2008c, SES Solar One, LLC, Application for Certification. Submitted to the California Energy Commission.

NERC/WECC (North American Reliability Council/Western Electricity Coordinating Council). 2002. NERC/WECC Planning Standards. August 2002.

DEFINITION OF TERMS

AAC – All aluminum conductor

ACSR – Aluminum conductor steel-reinforced

ACSS – Aluminum conductor steel-supported

Ampacity – Current-carrying capacity, expressed in amperes, of a conductor at specified ambient conditions, at which damage to the conductor is nonexistent or deemed acceptable based on economic, safety, and reliability considerations.

Ampere – The unit of current flowing in a conductor.

Bundled – Two wires, 18 inches apart.

Bus – Conductors that serve as a common connection for two or more circuits.

Conductor – The part of the transmission line (the wire) that carries the current.

Congestion management – A scheduling protocol, which provides that dispatched generation and transmission loading (imports) will not violate criteria.

Emergency overload – See “Single Contingency.” This is also called an N-1.

Kcmil– Thousand circular mil. A unit of the conductor’s cross sectional area When divided by 1,273, the area in square inches is obtained

Kilovolt (kV) – A unit of potential difference, or voltage, between two conductors of a circuit, or between a conductor and the ground.

Megavars – Mega-volt-Ampere-Reactive. One million Volt-Ampere-Reactive. Reactive power is generally associated with the reactive nature of motor loads that must be fed by generation units in the system.

Megavolt ampere (MVA) – A unit of apparent power. It equals the product of the line voltage in kilovolts, current in amperes, and the square root of 3, divided by 1,000.

Megawatt (MW) – A unit of power equivalent to 1,341 horsepower.

Normal operation/normal overload – The condition arrived at when all customers receive the power they are entitled to, without interruption and at steady voltage, and with no element of the transmission system loaded beyond its continuous rating.

Outlet – Transmission facilities (circuit, transformer, circuit breaker, etc.) linking generation facilities to the main grid.

Power flow analysis – A forward-looking computer simulation of essentially all generation and transmission system facilities that identifies overloaded circuits, transformers, and other equipment and system voltage levels.

Reactive power – Generally associated with the reactive nature of motor loads that must be fed by generation units in the system. An adequate supply of reactive power is required to maintain voltage levels in the system.

Remedial action scheme (RAS) – An automatic control provision, which, for instance, will trip a selected generating unit upon a circuit overload.

Single contingency – Also known as “emergency” or “N-1 condition,” the occurrence when one major transmission element (circuit, transformer, circuit breaker, etc.) or one generator is out of service.

Solid dielectric cable – Copper or aluminum conductors that are insulated by solid polyethylene type insulation and covered by a metallic shield and outer polyethylene jacket.

Switchyard – An integral part of a power plant and used as an outlet for one or more electric generators.

TSE – Transmission system engineering.

Undercrossing – A transmission configuration where a transmission line crosses below the conductors of another transmission line, generally at 90 degrees.

Underbuild – A transmission or distribution configuration where a transmission or distribution circuit is attached to a transmission tower or pole below (under) the principle transmission line conductors.

GENERAL CONDITIONS

E – JOINT AGENCY GENERAL CONDITIONS INCLUDING COMPLIANCE MONITORING AND CLOSURE PLAN

Prepared by Mary Dyas

E.1 INTRODUCTION

The project's General Compliance Conditions of Certification, including Compliance Monitoring and Closure Plan (Compliance Plan) have been established as required by Public Resources Code section 25532. The plan provides a means for assuring that the facility is constructed, operated and closed in compliance with public health and safety, environmental and other applicable regulations, guidelines, and conditions adopted or established by the California Energy Commission and specified in the written decision on the Application for Certification or otherwise required by law. The Compliance Plan will be integrated with a U.S. Bureau of Land Management (BLM) Compliance Monitoring Plan (hereafter referred to as the Compliance Plan) to assure compliance with the terms and conditions of any approved Right-of-Way (ROW) grant including the approved Plan of Development (POD)

The Compliance Plan is composed of elements that:

- set forth the duties and responsibilities of BLM's Authorized Officer, the Compliance Project Manager (CPM), the project owner, delegate agencies, and others;
- set forth the requirements for handling confidential records and maintaining the compliance record;
- state procedures for settling disputes and making post-certification changes;
- state procedures for requesting and approving ROW Grant or POD changes;
- state the requirements for periodic compliance reports and other administrative procedures that are necessary to verify the compliance status for all BLM and Energy Commission approved conditions of certification/mitigation measures;
- establish requirements for modifications or amendments to facility Closure, Revegetation, and Restoration Plans; and
- specify conditions of certification for each technical area containing the measures required to mitigate any and all potential adverse project impacts associated with construction, operation and closure below a level of significance. Each specific condition of certification also includes a verification provision that describes the method of assuring that the condition has been satisfied.

Conditions of Certification referred to herein serve the purpose of both the Energy Commission's Conditions of Certification for purposes of the California Environmental Quality Act (CEQA) and BLM's Mitigation Measures for purposes of the National Environmental Policy Act (NEPA).

E.2 DEFINITIONS

The following terms and definitions are used to establish when Conditions of Certification are implemented.

BLM AUTHORIZED OFFICER:

The BLM Authorized Officer for the Project is the BLM Needles Field Manager or his designated Compliance Inspector that is responsible for oversight and inspection of all construction and operational related activities on public land.

PRE-CONSTRUCTION SITE MOBILIZATION

Site mobilization is limited preconstruction activities at the site to allow for the installation of fencing, construction trailers, construction trailer utilities, and construction trailer parking at the site. Limited ground disturbance, grading, and trenching associated with the above mentioned pre-construction activities is considered part of site mobilization. Walking, driving or parking a passenger vehicle, pickup truck and light vehicles is allowable during site mobilization.

CONSTRUCTION

Onsite work to install permanent equipment or structures for any facility.

Ground Disturbance

Construction-related ground disturbance refers to activities that result in the removal of top soil or vegetation at the site beyond site mobilization needs, and for access roads and linear facilities.

Grading, Boring, and Trenching

Construction-related grading, boring, and trenching refers to activities that result in subsurface soil work at the site and for access roads and linear facilities, e.g., alteration of the topographical features such as leveling, removal of hills or high spots, moving of soil from one area to another, and removal of soil.

Notwithstanding the definitions of ground disturbance, grading, boring and trenching above, construction does not include the following:

1. the installation of environmental monitoring equipment;
2. a soil or geological investigation;
3. a topographical survey;
4. any other study or investigation to determine the environmental acceptability or feasibility of the use of the site for any particular facility; and
5. any work to provide access to the site for any of the purposes specified in “Construction” 1, 2, 3, or 4 above.

START OF COMMERCIAL OPERATION

For compliance monitoring purposes, “commercial operation” begins after the completion of start-up and commissioning, when each of the power plants has reached reliable steady-state production of electricity at the rated capacity. At the start of commercial operation, plant control is usually transferred from the construction manager to the plant operations manager.

E.3 BLM’S AUTHORIZED OFFICER AND COMPLIANCE PROJECT MANAGER RESPONSIBILITIES

BLM’s Authorized Officer (AO) and the Compliance Project Manager (CPM) shall oversee the compliance monitoring and is responsible for:

1. Ensuring that the design, construction, operation, and closure of the project facilities are in compliance with the terms and conditions of BLM’s ROW Grant and the Energy Commission Decision
2. Resolving complaints
3. Processing post-certification changes to the conditions of certification, project description (petition to amend), and ownership or operational control (petition for change of ownership) (See instructions for filing petitions)
4. Documenting and tracking compliance filings
5. Ensuring that compliance files are maintained and accessible

BLM’s AO is the contact person for BLM and will consult with appropriate responsible agencies, Energy Commission, and Energy Commission staff when handling disputes, complaints, and amendments. The CPM is the contact person for the Energy Commission and will consult with appropriate responsible agencies, BLM, Energy Commission, and Energy Commission staff when handling disputes, complaints, and amendments.

All project compliance submittals are submitted to BLM’s AO and the CPM for processing. Where a submittal required by a condition of certification requires BLM’s AO and/or CPM approval, the approval will involve all appropriate BLM personnel, Energy Commission staff and management. All submittals must include searchable electronic versions (pdf or word files).

E.4 CHIEF BUILDING OFFICIAL RESPONSIBILITIES

The Chief Building Official (CBO) shall serve as BLM's and the Energy Commission's delegate to assure the project is designed and constructed in accordance with BLM's Right-of-Way Grant, the Energy Commission's Decision including Conditions of Certification, California Building Standards Code, local building codes and applicable laws, ordinances, regulations and standards to ensure health and safety. The CBO is typically made-up of a team of specialists covering civil, structural, mechanical and electrical disciplines whose duties include the following:

1. Performing design review and plan checks of all drawings, specifications and procedures;
2. Conducting construction inspection;
3. Functioning as BLM's and the Energy Commission's delegate including reporting noncompliance issues or violations to the BLM Authorized Officer for action and taking any action allowed under the California Code of Regulations, including issuing a Stop Work Order, to ensure compliance;
4. Exercising access as needed to all project owner construction records, construction and inspection procedures, test equipment and test results; and
5. Providing weekly reports on the status of construction to BLM's Authorized Officer and the CPM.

PRE-CONSTRUCTION AND PRE-OPERATION COMPLIANCE MEETING

BLM's AO and the CPM shall schedule pre-construction and pre-operation compliance meetings prior to the projected start-dates of construction, plant operation, or both. The purpose of these meetings is to assemble BLM's, the Energy Commission's and project owner's technical staff and construction contractor to review the status of all pre-construction or pre-operation requirements, contained in BLM's and the Energy Commission's conditions of certification. This is to confirm that all applicable conditions of certification have been met, or if they have not been met, to ensure that the proper action is taken. In addition, these meetings ensure, to the extent possible, that BLM and Energy Commission conditions will not delay the construction and operation of the plant due to oversight and to preclude any last minute, unforeseen issues from arising. Pre-construction meetings held during the certification process must be publicly noticed unless they are confined to administrative issues and processes.

BLM AND ENERGY COMMISSION RECORD

BLM and the Energy Commission shall maintain the following documents and information as a public record, in either the Energy Commission's Compliance file or Dockets file, for the life of the project (or other period as required):

- All documents demonstrating compliance with any legal requirements relating to the construction and operation of the facility;
- All monthly and annual compliance reports filed by the project owner;
- All complaints of noncompliance filed with BLM and the Energy Commission; and
- All petitions/requests for project or condition of certification changes and the resulting BLM, Energy Commission staff or Energy Commission action.

E.5 PROJECT OWNER RESPONSIBILITIES

The project owner is responsible for ensuring that the compliance conditions of certification and all other conditions of certification that appear in BLM's ROW Grant and the Energy Commission Decision are satisfied. The compliance conditions regarding post-certification changes specify measures that the project owner must take when requesting changes in the project design, conditions of certification, or ownership.

Failure to comply with any of the conditions of certification or the compliance conditions may result in reopening of the case and revocation of the Energy Commission certification; an administrative fine; or other action as appropriate. A summary of the Compliance Conditions of Certification is included as Compliance Table 1 at the conclusion of this section. The BLM ROW grant holder will comply with the terms, conditions, and special stipulations of the ROW grant. Failure to comply with applicable laws or regulations or any of the terms and conditions of a BLM ROW grant may result in the suspension or termination of the ROW grant (43 CFR 2807.17). Prior to suspending or terminating a ROW grant, BLM will provide written notice to the holder stating it intends to suspend or terminate and will provide reasonable opportunity to correct any noncompliance.

E.6 COMPLIANCE MITIGATION MEASURES/CONDITIONS OF CERTIFICATION

UNRESTRICTED ACCESS (COMPLIANCE-1)

BLM's AO, responsible BLM staff, the CPM, responsible Energy Commission staff, and delegated agencies or consultants shall be guaranteed and granted unrestricted access to the power plant site, related facilities, project-related staff, and the records maintained on-site, for the purpose of conducting audits, surveys, inspections, or general site visits. Although BLM's AO and the CPM will normally schedule site visits on dates and times agreeable to the project owner, BLM's AO and the CPM reserve the right to make unannounced visits at any time.

COMPLIANCE RECORD (COMPLIANCE-2)

The project owner shall maintain project files on-site or at an alternative site approved by BLM's AO and the CPM for the life of the project, unless a lesser period of time is specified by the conditions of certification. The files shall contain copies of all "as-built" drawings, documents submitted as verification for conditions, and other project-related documents. As-built drawings of all facilities including linear facilities shall be provided to the BLM AO for inclusion in the BLM administrative record within 90-days of completion of that portion of the facility or project.

BLM and Energy Commission staff and delegate agencies shall, upon request to the project owner, be given unrestricted access to the files maintained pursuant to this condition.

COMPLIANCE VERIFICATION SUBMITTALS (COMPLIANCE-3)

Each condition of certification is followed by a means of verification. The verification describes the Energy Commission's procedure(s) to ensure post-certification compliance with adopted conditions. The verification procedures, unlike the conditions, may be modified as necessary by BLM's AO and the CPM.

Verification of compliance with the conditions of certification can be accomplished by the following:

1. Monthly and/or annual compliance reports, filed by the project owner or authorized agent, reporting on work done and providing pertinent documentation, as required by the specific conditions of certification;
2. Appropriate letters from delegate agencies verifying compliance;
3. BLM and Energy Commission staff audits of project records; and/or
4. BLM and Energy Commission staff inspections of work, or other evidence that the requirements are satisfied.

Verification lead times associated with start of construction may require the project owner to file submittals during the certification process, particularly if construction is planned to commence shortly after certification.

A cover letter from the project owner or authorized agent is required for all compliance submittals and correspondence pertaining to compliance matters. The cover letter subject line shall identify the project by AFC number, the appropriate condition(s) of certification by condition number(s), and a brief description of the subject of the submittal. The project owner shall also identify those submittals not required by a condition of certification with a statement such as: "This submittal is for information only and is not required by a specific condition of certification." When submitting supplementary or corrected information, the project owner shall reference the date of the previous submittal and BLM/CEC submittal number.

The project owner is responsible for the delivery and content of all verification submittals to the BLM's AO and CPM, whether such condition was satisfied by work performed by the project owner or an agent of the project owner.

All hardcopy submittals shall be addressed to each of the following:

BLM's Authorized Officer	**Mary Dyas**
(CACA-049537 and CACA-049539)	**(08-AFC-13C)**
U.S. Bureau of Land Management	**California Energy Commission**
2601 Barstow Road	**1516 Ninth Street, MS-2000**
Barstow, CA 92311	**Sacramento, CA 95814**

Those submittals shall be accompanied by a searchable electronic copy, on a CD or by e-mail, as agreed upon by BLM's AO and the CPM.

If the project owner desires BLM and/or Energy Commission staff action by a specific date, that request shall be made in the submittal cover letter and shall include a detailed explanation of the effects on the project if that date is not met.

PRE-CONSTRUCTION MATRIX AND TASKS PRIOR TO START OF CONSTRUCTION (COMPLIANCE-4)

Prior to commencing construction, a compliance matrix addressing only those conditions that must be fulfilled before the start of construction shall be submitted by the project owner to BLM's AO and the CPM. This matrix will be included with the project

owner's first compliance submittal or prior to the first pre-construction meeting, whichever comes first. It will be submitted in the same format as the compliance matrix described below. In order to begin any on-site mobilization or surface disturbing activities on public land, the BLM AO must approve a written Notice to Proceed (NTP). NTPs will be phased as appropriate to facilitate timely implementation of construction.

Construction shall not commence until the pre-construction matrix is submitted, all pre-construction conditions have been complied with, and BLM's AO and the CPM has issued a letter and BLM has issues a NTP to the project owner authorizing construction. Various lead times for submittal of compliance verification documents to BLM's AO and the CPM for conditions of certification are established to allow sufficient BLM and Energy Commission staff time to review and comment and, if necessary, allow the project owner to revise the submittal in a timely manner. This will ensure that project construction may proceed according to schedule.

Failure to submit compliance documents within the specified lead-time may result in delays in authorization to commence various stages of project development.

If the project owner anticipates commencing project construction as soon as the project is certified, it may be necessary for the project owner to file compliance submittals prior to project certification. Compliance submittals should be completed in advance where the necessary lead time for a required compliance event extends beyond the date anticipated for start of construction. The project owner must understand that the submittal of compliance documents prior to project certification is at the owner's own risk. Any approval by Energy Commission staff is subject to change, based upon BLM's ROW Grant and the Energy Commission Decision.

Compliance Reporting

There are two different compliance reports that the project owner must submit to assist BLM's AO and the CPM in tracking activities and monitoring compliance with the terms and conditions of BLM's ROW Grant and the Energy Commission Decision. During construction, the project owner or authorized agent will submit Monthly Compliance Reports. During operation, an Annual Compliance Report must be submitted. These reports, and the requirement for an accompanying compliance matrix, are described below. The majority of the conditions of certification require that compliance submittals be submitted to BLM's AO and the CPM in the monthly or annual compliance reports.

POSTING OF A SURETY BOND (COMPLIANCE-5)

Prior to site disturbance and each increment of construction, the project owner shall post a surety bond adequate to cover the cost of decommissioning and restoration, including the removal of the project features that have been constructed for that that portion of the site and restoring the native topography and vegetation. An "increment of construction" shall mean a significant feature of construction, such as site grading, a building, a fluid storage tank, a water treatment facility, a hydrogen production facility, a switchyard, or a group of solar collectors connected to an electrical transformer (including that transformer). This Surety bond will apply to all site disturbance features.

The project owner shall provide the surety bond to the BLM AO for approval and to the CPM for review with written evidence indicating that the surety bond is adequate to cover the cost of decommissioning and removing the project features constructed, allowing for site restoration. The written evidence shall include a valid estimate showing that the amount of the bond is adequate to accomplish such work. The timing for the submittal of the surety bond and approval of this document shall be coordinated with the BLM AO and CPM. Over the life of the project, the surety bond will be updated as necessary to account for any changes to the project description and/or decommissioning costs.

COMPLIANCE MATRIX (COMPLIANCE-6)

A compliance matrix shall be submitted by the project owner to BLM's AO and the CPM along with each monthly and annual compliance report. The compliance matrix is intended to provide BLM's AO and the CPM with the current status of all conditions of certification in a spreadsheet format. The compliance matrix must identify:

1. the technical area;
2. the condition number;
3. a brief description of the verification action or submittal required by the condition;
4. the date the submittal is required (e.g., 60 days prior to construction, after final inspection, etc.);
5. the expected or actual submittal date;
6. the date a submittal or action was approved by the Chief Building Official (CBO), BLM's AO, CPM, or delegate agency, if applicable; and
7. the compliance status of each condition, e.g., "not started," "in progress" or "completed" (include the date).
8. if the condition was amended, the date of the amendment.

Satisfied conditions shall be placed at the end of the matrix.

MONTHLY COMPLIANCE REPORT (COMPLIANCE-7)

The first Monthly Compliance Report is due one month following the Energy Commission business meeting date upon which the project was approved, unless otherwise agreed to by BLM's AO and the CPM. The first Monthly Compliance Report shall include the AFC number and an initial list of dates for each of the events identified on the Key Events List. The Key Events List Form is found at the end of this section.

During pre-construction and construction of each power plant, the project owner or authorized agent shall submit an original and an electronic searchable version of the Monthly Compliance Report within 10 working days after the end of each reporting month. Monthly Compliance Reports shall be clearly identified for the month being reported. The reports shall contain, at a minimum:

1. A summary of the current project construction status, a revised/updated schedule if there are significant delays, and an explanation of any significant changes to the schedule;

2. Documents required by specific conditions to be submitted along with the Monthly Compliance Report. Each of these items must be identified in the transmittal letter, as well as the conditions they satisfy and submitted as attachments to the Monthly Compliance Report;
3. An initial, and thereafter updated, compliance matrix showing the status of all conditions of certification (fully satisfied conditions do not need to be included in the matrix after they have been reported as completed);
4. A list of conditions that have been satisfied during the reporting period, and a description or reference to the actions that satisfied the condition;
5. A list of any submittal deadlines that were missed, accompanied by an explanation and an estimate of when the information will be provided;
6. A cumulative listing of any approved changes to conditions of certification;
7. A listing of any filings submitted to, or permits issued by, other governmental agencies during the month;
8. A projection of project compliance activities scheduled during the next two months. The project owner shall notify BLM's AO and the CPM as soon as any changes are made to the project construction schedule that would affect compliance with conditions of certification;
9. A listing of the month's additions to the on-site compliance file; and
10. A listing of complaints, notices of violation, official warnings, and citations received during the month, a description of the resolution of the resolved actions, and the status of any unresolved actions.

All sections, exhibits, or addendums shall be separated by tabbed dividers or as acceptable by BLM's AO and the CPM.

ANNUAL COMPLIANCE REPORT (COMPLIANCE-8)

After construction of each power plant is complete or when a power plant goes into commercial operations, the project owner shall submit Annual Compliance Reports instead of Monthly Compliance Reports. The reports are for each year of commercial operation and are due to BLM's AO and the CPM each year at a date agreed to by BLM's AO and the CPM. Annual Compliance Reports shall be submitted over the life of the project unless otherwise specified by BLM's AO and the CPM. Each Annual Compliance Report shall include the AFC number, identify the reporting period and shall contain the following:

1. An updated compliance matrix showing the status of all conditions of certification (fully satisfied conditions do not need to be included in the matrix after they have been reported as completed);
2. A summary of the current project operating status and an explanation of any significant changes to facility operations during the year;
3. Documents required by specific conditions to be submitted along with the Annual Compliance Report. Each of these items must be identified in the transmittal letter,

with the condition it satisfies, and submitted as attachments to the Annual Compliance Report;

4. A cumulative listing of all post-certification changes by the Energy Commission or changes to the BLM ROW grant or approved POD by BLM , or cleared by BLM's AO and the CPM;
5. An explanation for any submittal deadlines that were missed, accompanied by an estimate of when the information will be provided;
6. A listing of filings submitted to, or permits issued by, other governmental agencies during the year;
7. A projection of project compliance activities scheduled during the next year;
8. A listing of the year's additions to the on-site compliance file;
9. An evaluation of the on-site contingency plan for unplanned facility closure, including any suggestions necessary for bringing the plan up to date [see Compliance Conditions for Facility Closure addressed later in this section]; and
10. A listing of complaints, notices of violation, official warnings, and citations received during the year, a description of the resolution of any resolved matters, and the status of any unresolved matters.

CONFIDENTIAL INFORMATION (COMPLIANCE-9)

Any information that the project owner deems confidential shall be submitted to the Energy Commission's Executive Director with an application for confidentiality pursuant to Title 20, California Code of Regulations, section 2505(a). Any information that is determined to be confidential shall be kept confidential as provided for in Title 20, California Code of Regulations, section 2501 et. seq.

Any information the ROW holder deems confidential shall be submitted to the BLM AO with a written request for said confidentiality along with a justification for the request. All confidential submissions to BLM should be clearly stamped "proprietary information" by the holder when submitted.

ANNUAL ENERGY FACILITY COMPLIANCE FEE (COMPLIANCE-10)

Pursuant to the provisions of Section 25806(b) of the Public Resources Code, the project owner is required to pay an annual compliance fee, which is adjusted annually. Current Compliance fee information is available on the Energy Commission's website http://www.energy.ca.gov/siting/filing_fees.html. You may also contact the CPM for the current fee information. The initial payment is due on the date the Energy Commission adopts the final decision. All subsequent payments are due by July 1 of each year in which the facility retains its certification. The payment instrument shall be made payable to the California Energy Commission and mailed to: Accounting Office MS-02, California Energy Commission, 1516 9th St., Sacramento, CA 95814.

REPORTING OF COMPLAINTS, NOTICES, AND CITATIONS (COMPLIANCE-11)

Prior to the start of construction, the project owner must send a letter to property owners living within one mile of the project notifying them of a telephone number to contact project representatives with questions, complaints or concerns. If the telephone is not staffed 24 hours per day, it shall include automatic answering with date and time stamp recording. All recorded complaints shall be responded to within 24 hours. The telephone number shall be posted at the project site and made easily visible to passersby during construction and operation. The telephone number shall be provided to BLM's AO and the CPM who will post it on the Energy Commission's web page at:

http://www.energy.ca.gov/sitingcases/power_plants_contacts.html.

Any changes to the telephone number shall be submitted immediately to BLM's AO and the CPM, who will update the web page.

In addition to the monthly and annual compliance reporting requirements described above, the project owner shall report and provide copies to BLM's AO and the CPM of all complaint forms, including noise and lighting complaints, notices of violation, notices of fines, official warnings, and citations, within 10 days of receipt. Complaints shall be logged and numbered. Noise complaints shall be recorded on the form provided in the **NOISE** conditions of certification. All other complaints shall be recorded on the complaint form (Attachment A).

E.7 FACILITY CLOSURE

At some point in the future, the project will cease operation and close down. At that time, it will be necessary to implement the Closure, Revegetation and Restoration Plan to ensure that the closure occurs in such a way that public health and safety and the environment are protected from adverse impacts. Although the project setting for this project does not appear, at this time, to present any special or unusual closure problems, it is impossible to foresee what the situation will be in 30 years or more when the project ceases operation. Therefore, provisions must be made that provide the flexibility to deal with the specific situation and project setting that exist at the time of closure. Laws, Ordinances, Regulations and Standards (LORS) pertaining to facility closure are identified in the sections dealing with each technical area. Facility closure will be consistent with LORS in effect at the time of closure. Closure would be conducted in accordance with Condition of Certification **BIO-14** that requires the project owner to develop and implement a Closure, Revegetation and Rehabilitation Plan.

There are at least three circumstances in which a facility closure can take place: planned closure, unplanned temporary closure and unplanned permanent closure.

CLOSURE DEFINITIONS

Planned Closure

A planned closure occurs when the facility is closed in an anticipated, orderly manner, at the end of its useful economic or mechanical life, or due to gradual obsolescence.

Unplanned Temporary Closure

An unplanned temporary closure occurs when the facility is closed suddenly and/or unexpectedly, on a short-term basis, due to unforeseen circumstances such as a natural disaster or an emergency. Short-term is defined as cessation of construction activities or operations of a power plant for a period less than 6-months long. Cessation of construction of operations for a period longer than 6 months in considered a permanent closure.

Unplanned Permanent Closure

An unplanned permanent closure occurs if the project owner closes the facility suddenly and/or unexpectedly, on a permanent basis. This includes unplanned closure where the owner implements the on-site contingency plan. It can also include unplanned closure where the project owner fails to implement the contingency plan, and the project is essentially abandoned.

E.8 COMPLIANCE CONDITIONS FOR FACILITY CLOSURE

PLANNED CLOSURE (COMPLIANCE-11)

In order to ensure that a planned facility closure does not create adverse impacts, a closure process that provides for careful consideration of available options and applicable laws, ordinances, regulations, standards, and local/regional plans in existence at the time of closure, will be undertaken. To ensure adequate review of a planned project closure, the project owner shall submit a revision or update to the approved Closure, Revegetation and Rehabilitation Plan to BLM and the Energy Commission for review and approval at least 12 months (or other period of time agreed to by BLM's AO and the CPM) prior to commencement of closure activities. The project owner shall file 50 copies and 50 CDs with the Energy Commission and 10 copies and 10 CDs with BLM (or other number of copies agreed upon by BLM's AO and the CPM) of a proposed facility closure plan/Closure, Revegetation and Rehabilitation Plan.

The plan shall:

1. identify and discuss any impacts and mitigation to address significant adverse impacts associated with proposed closure activities and to address facilities, equipment, or other project related materials that must be removed from the site;
2. identify a schedule of activities for closure of the power plant site, transmission line corridor, and all other appurtenant facilities constructed as part of the project;
3. address conformance of the plan with all applicable laws, ordinances, regulations, standards, and local/regional plans in existence at the time of facility closure, and applicable conditions of certification; and.
4. Address any changes to the site revegetation, rehabilitation, monitoring and long-term maintenance specified in the existing plan that are needed for site revegetation and rehabilitation to be successful.

Prior to submittal of an amended or revised Closure, Revegetation and Restoration Plan, a meeting shall be held between the project owner, BLM's AO and the Energy Commission CPM for the purpose of discussing the specific contents of the plan.

In the event that there are significant issues associated with the proposed facility Closure, Revegetation and Restoration plan's approval, or the desires of local officials or interested parties are inconsistent with the plan, BLM's AO the CPM shall hold one or more workshops and/or BLM and the Energy Commission may hold public hearings as part of its approval procedure.

As necessary, prior to or during the closure plan process, the project owner shall take appropriate steps to eliminate any immediate threats to public health and safety and the environment, but shall not commence any other closure activities until BLM and the Energy Commission approves the facility Closure, Revegetation and Restoration plan.

UNPLANNED TEMPORARY CLOSURE/ON-SITE CONTINGENCY PLAN (COMPLIANCE-12)

In order to ensure that public health and safety and the environment are protected in the event of an unplanned temporary facility closure, it is essential to have an On-Site Contingency Plan in place. The On-Site Contingency Plan will help to ensure that all necessary steps to mitigate public health and safety impacts and environmental impacts are taken in a timely manner.

The project owner shall submit an On-Site Contingency Plan for BLM's AO and CPM review and approval. The plan shall be submitted no less than 60 days (or other time agreed to by BLM's AO and the CPM) after approval of any NTP or letter granting approval to commence construction for each phase of construction. A copy of the approved plan must be in place during commercial operation of the facility and shall be kept at the site at all times.

The project owner, in consultation with BLM's AO and the CPM, will update the On-Site Contingency Plan as necessary. BLM's AO and the CPM may require revisions to the On-Site Contingency Plan over the life of the project. In the annual compliance reports submitted to the Energy Commission, the project owner will review the On-Site Contingency Plan, and recommend changes to bring the plan up to date. Any changes to the plan must be approved by BLM's AO and the CPM.

The On-Site Contingency Plan shall provide for taking immediate steps to secure the facility from trespassing or encroachment. In addition, for closures of more than 90 days, unless other arrangements are agreed to by BLM's AO and the CPM, the plan shall provide for removal of hazardous materials and hazardous wastes, draining of all chemicals from storage tanks and other equipment, and the safe shutdown of all equipment. (Also see specific conditions of certification for the technical areas of Hazardous Materials Management and Waste Management.)

In addition, consistent with requirements under unplanned permanent closure addressed below, the nature and extent of insurance coverage, and major equipment warranties must also be included in the On-Site Contingency Plan. In addition, the

status of the insurance coverage and major equipment warranties must be updated in the annual compliance reports.

In the event of an unplanned temporary closure, the project owner shall notify BLM's AO and the CPM, as well as other responsible agencies, by telephone, fax, or e-mail, within 24 hours and shall take all necessary steps to implement the On-Site Contingency Plan. The project owner shall keep BLM's AO and the CPM informed of the circumstances and expected duration of the closure.

If BLM's AO and the CPM determine that an unplanned temporary closure is likely to be permanent, or for a duration of more than 6 months, a Closure Plan consistent with the requirements for a planned closure shall be developed and submitted to BLM's AO and the CPM within 90 days of BLM's AO and the CPM's determination (or other period of time agreed to by BLM's AO and the CPM).

UNPLANNED PERMANENT CLOSURE/ON-SITE CONTINGENCY PLAN (COMPLIANCE-13)

The On-Site Contingency Plan required for unplanned temporary closure shall also cover unplanned permanent facility closure. All of the requirements specified for unplanned temporary closure shall also apply to unplanned permanent closure.

In addition, the On-Site Contingency Plan shall address how the project owner will ensure that all required closure steps will be successfully undertaken in the event of abandonment.

In the event of an unplanned permanent closure, the project owner shall notify BLM's AO and the CPM, as well as other responsible agencies, by telephone, fax, or e-mail, within 24 hours and shall take all necessary steps to implement the On-Site Contingency Plan. The project owner shall keep BLM's AO and the CPM informed of the status of all closure activities.

To ensure that public health and safety and the environment are protected in the event of an unplanned permanent closure, the project owner shall submit an On-Site Contingency Plan no less than 60 days after a NTP is issued for each phase of development.

POST CERTIFICATION CHANGES TO BLM'S ROW GRANT AND/OR THE ENERGY COMMISSION DECISION: AMENDMENTS, OWNERSHIP CHANGES, STAFF APPROVED PROJECT MODIFICATIONS AND VERIFICATION CHANGES (COMPLIANCE-14)

The project owner must petition the Energy Commission pursuant to Title 20, California Code of Regulations, section 1769, in order to modify the project (including linear facilities) design, operation or performance requirements, and to transfer ownership or operational control of the facility. The BLM ROW holder must file a written request in the form of an application to the BLM AO in order to change the terms and conditions of their ROW grant or POD. Written requests will be in a manner prescribed by the BLM AO.

It is the responsibility of the project owner to contact BLM's AO and the CPM to determine if a proposed project change should be considered a project modification pursuant to section 1769. Implementation of a project modification without first securing BLM and either Energy Commission or Energy Commission staff approval, may result in enforcement action that could result in civil penalties in accordance with section 25534 of the Public Resources Code.

A petition is required for amendments and for staff approved project modifications as specified below. Both shall be filed as a "Petition to Amend." Staff will determine if the change is significant or insignificant. For verification changes, a letter from the project owner is sufficient. In all cases, the petition or letter requesting a change should be submitted to BLM's AO and the CPM, who will file it with the Energy Commission's Dockets Unit in accordance with Title 20, California Code of Regulations, section 1209.

The criteria that determine which type of approval and the process that applies are explained below. They reflect the provisions of Section 1769 at the time this condition was drafted. If the Commission's rules regarding amendments are amended, the rules in effect at the time an amendment is requested shall apply.

Amendment

The project owner shall petition the Energy Commission, pursuant to Title 20, California Code of Regulations, Section 1769(a), when proposing modifications to the project (including linear facilities) design, operation, or performance requirements. If a proposed modification results in deletion or change of a condition of certification, or makes changes that would cause the project not to comply with any applicable laws, ordinances, regulations or standards, the petition will be processed as a formal amendment to the Energy Commission's final decision, which requires public notice and review of the BLM-Energy Commission staff analysis, and approval by the full Energy Commission. The petition shall be in the form of a legal brief and fulfill the requirements of Section 1769(a). Upon request, the CPM will provide you with a sample petition to use as a template.

The ROW holder shall file an application to amend the BLM ROW grant for any substantial deviation or change in use. The requirements to amend a ROW grant are the same as when filing a new application including paying processing and monitoring fees and rent.

Staff Approved Project Modification

Modifications that do not result in deletions or changes to conditions of certification, and that are compliant with laws, ordinances, regulations and standards may be authorized by BLM's AO and the CPM as a staff approved project modification (SAPM) pursuant to section 1769(a) (2). Once staff files an intention to approve the proposed project modifications, any person may file an objection to staff's determination within 14 days of service on the grounds that the modification does not meet the criteria of section 1769 (a)(2). If a person objects to staff's determination, the petition must be processed as a formal amendment to the decision and must be approved by the full commission at a noticed business meeting or hearing. BLM and the Energy Commission intend to

integrate a process to jointly approve SAPMs to avoid duplication of approval processes and ensure appropriate documentation for the public record.

Change of Ownership

Change of ownership or operational control also requires that the project owner file a petition pursuant to section 1769(b). This process requires public notice and approval by the full Commission and BLM. The petition shall be in the form of a legal brief and fulfill the requirements of Section 1769(b). Upon request, the CPM will provide you with a sample petition to use as a template. The transfer of ownership of a BLM ROW grant must be through the filing of an application for assignment of the grant.

Verification Change

A verification may be modified by BLM's AO and the CPM without requesting an amendment to the ROW Grant or Energy Commission decision if the change does not conflict with the conditions of certification and provides an effective alternate means of verification.

E.9 CBO DELEGATION AND AGENCY COOPERATION

In performing construction and operation monitoring of the project, BLM and Energy Commission staff act as, and have the authority of, the Chief Building Official (CBO). BLM and Energy Commission staff may delegate CBO responsibility to either an independent third party contractor or the local building official. BLM and the Energy Commission intend to avoid duplication by integrating the responsibilities of the CBO with those of a BLM compliance inspector and will work jointly in the selection of a CBO. BLM and Energy Commission staff retain CBO authority when selecting a delegate CBO, including enforcing and interpreting federal, state and local codes, and use of discretion, as necessary, in implementing the various codes and standards.

BLM and Energy Commission staff may also seek the cooperation of state, regional and local agencies that have an interest in environmental protection when conducting project monitoring.

E.10 ENFORCEMENT

BLM's legal authority to enforce the terms and conditions of its ROW Grant is specified in 43 CFR 2807.16 to 2807.19. BLM may issue an immediate temporary suspension of activities it they determine a holder has violated one or more of the terms, conditions, or stipulation of the grant. BLM may also suspend or terminate a ROW grant if a holder does not comply with applicable laws and regulation or any terns, conditions, or special stipulations contained in the grant. Prior to suspending or terminating a ROW grant, BLM will provide written notice to the holder stating it intends to suspend or terminate and will provide reasonable opportunity to correct any noncompliance.

The Energy Commission's legal authority to enforce the terms and conditions of its Decision is specified in Public Resources Code sections 25534 and 25900. The Energy Commission may amend or revoke the certification for any facility, and may impose a civil penalty for any significant failure to comply with the terms or conditions of the

Energy Commission Decision. The specific action and amount of any fines the Energy Commission may impose would take into account the specific circumstances of the incident(s). This would include such factors as the previous compliance history, whether the cause of the incident involves willful disregard of LORS, oversight, unforeseeable events, and other factors the Energy Commission may consider.

ENERGY COMMISSION NONCOMPLIANCE COMPLAINT PROCEDURES

Any person or agency may file a complaint alleging noncompliance with the conditions of certification. Such a complaint will be subject to review by the Energy Commission pursuant to Title 20, California Code of Regulations, section 1237, but in many instances the noncompliance can be resolved by using the informal dispute resolution process. Both the informal and formal complaint procedure, as described in current State law and regulations, are described below. They shall be followed unless superseded by future law or regulations.

The Energy Commission has established a toll free compliance telephone number of 1-800-858-0784 for the public to contact the Energy Commission about power plant construction or operation-related questions, complaints or concerns.

Informal Dispute Resolution Process

The following procedure is designed to informally resolve disputes concerning the interpretation of compliance with the requirements of this compliance plan. The project owner, the Energy Commission, or any other party, including members of the public, may initiate an informal dispute resolution process. Disputes may pertain to actions or decisions made by any party, including the Energy Commission's delegate agents.

This process may precede the more formal complaint and investigation procedure specified in Title 20, California Code of Regulations, section 1237, but is not intended to be a substitute for, or prerequisite to it. This informal procedure may not be used to change the terms and conditions of certification as approved by the Energy Commission, although the agreed upon resolution may result in a project owner, or in some cases the Energy Commission staff, proposing an amendment.

The process encourages all parties involved in a dispute to discuss the matter and to reach an agreement resolving the dispute. If a dispute cannot be resolved, then the matter must be brought before the full Energy Commission for consideration via the complaint and investigation procedure.

Request for Informal Investigation

Any individual, group, or agency may request the Energy Commission to conduct an informal investigation of alleged noncompliance with the Energy Commission's terms and conditions of certification. All requests for informal investigations shall be made to the designated CPM.

Upon receipt of a request for informal investigation, the CPM shall promptly notify the project owner of the allegation by telephone and letter. All known and relevant information of the alleged noncompliance shall be provided to the project owner, BLM

and to the Energy Commission staff. The CPM will evaluate the request and the information to determine if further investigation is necessary. If the CPM find that further investigation is necessary, the project owner will be asked to promptly investigate the matter. Within seven working days of the CPM's request, provide a written report to the CPM of the results of the investigation, including corrective measures proposed or undertaken. Depending on the urgency of the noncompliance matter, the CPM may conduct a site visit and/or request the project owner to also provide an initial verbal report, within 48 hours.

Request for Informal Meeting

In the event that either the party requesting an investigation or the Energy Commission staff is not satisfied with the project owner's report, investigation of the event, or corrective measures proposed or undertaken, either party may submit a written request to the CPM for a meeting with the project owner. Such request shall be made within 14 days of the project owner's filing of its written report. Upon receipt of such a request, the CPM shall:

1. immediately schedule a meeting with the requesting party and the project owner, to be held at a mutually convenient time and place;
2. secure the attendance of appropriate Energy Commission staff and staff of any other agencies with expertise in the subject area of concern, as necessary;
3. conduct such meeting in an informal and objective manner so as to encourage the voluntary settlement of the dispute in a fair and equitable manner;
4. After the conclusion of such a meeting, promptly prepare and distribute copies to all in attendance and to the project file, a summary memorandum that fairly and accurately identifies the positions of all parties and any understandings reached. If an agreement has not been reached, the CPM shall inform the complainant of the formal complaint process and requirements provided under Title 20, California Code of Regulations, section 1230 et seq.

Formal Dispute Resolution Procedure-Complaints and Investigations

Any person may file a complaint with the Energy Commission's Dockets Unit alleging noncompliance with a Commission decision adopted pursuant to Public Resources Code section 25500. Requirements for complaint filings and a description of how complaints are processed are in Title 20, California Code of Regulations, section 1237.

KEY EVENTS LIST

PROJECT:

DOCKET #:

COMPLIANCE PROJECT MANAGER:

BLM AUTHORIZED OFFICER:

EVENT DESCRIPTION	DATE
Certification Date	
Obtain Site Control	
Online Date	
POWER PLANT SITE ACTIVITIES	
Start Site Mobilization	
Start Ground Disturbance	
Start Grading	
Start Construction	
Begin Pouring Major Foundation Concrete	
Begin Installation of Major Equipment	
Completion of Installation of Major Equipment	
First Combustion of Gas Turbine	
Obtain Building Occupation Permit	
Start Commercial Operation	
Complete All Construction	
TRANSMISSION LINE ACTIVITIES	
Start T/L Construction	
Synchronization with Grid and Interconnection	
Complete T/L Construction	
FUEL SUPPLY LINE ACTIVITIES	
Start Gas Pipeline Construction and Interconnection	
Complete Gas Pipeline Construction	
WATER SUPPLY LINE ACTIVITIES	
Start Water Supply Line Construction	
Complete Water Supply Line Construction	

COMPLIANCE TABLE 1
SUMMARY of COMPLIANCE CONDITIONS OF CERTIFICATION

CONDITION NUMBER	SUBJECT	DESCRIPTION
COMPLIANCE-1	**Unrestricted Access**	The project owner shall grant BLM and Energy Commission staff and delegate agencies or consultants unrestricted access to the power plant site.
COMPLIANCE-2	**Compliance Record**	The project owner shall maintain project files on-site. BLM and Energy Commission staff and delegate agencies shall be given unrestricted access to the files.
COMPLIANCE-3	**Compliance Verification Submittals**	The project owner is responsible for the delivery and content of all verification submittals to BLM's Authorized Officer and the CPM, whether such condition was satisfied by work performed or the project owner or his agent.
COMPLIANCE-4	**Pre-construction Matrix and Tasks Prior to Start of Construction**	• Construction shall not commence until the all of the following activities/submittals have been completed: property owners living within one mile of the project have been notified of a telephone number to contact for questions, complaints or concerns, a pre-construction matrix has been submitted identifying only those conditions that must be fulfilled before the start of construction, all pre-construction conditions have been complied with, BLM's Authorized Officer and the CPM have issued a letter to the project owner authorizing construction.
COMPLIANCE-5	**Posting of A Surety Bond**	The project owner shall post a surety bond adequate to cover the cost of decommissioning and restoration including the removal of the project features that have been constructed for that that portion of the site and restoring the native topography and vegetation.

COMPLIANCE TABLE 1
SUMMARY of COMPLIANCE CONDITIONS OF CERTIFICATION

CONDITION NUMBER	SUBJECT	DESCRIPTION
COMPLIANCE-6	**Compliance Matrix**	The project owner shall submit a compliance matrix (in a spreadsheet format) with each monthly and annual compliance report which includes the status of all compliance conditions of certification.
COMPLIANCE-7	**Monthly Compliance Report including a Key Events List**	During construction, the project owner shall submit Monthly Compliance Reports (MCRs) which include specific information. The first MCR is due the month following the Energy Commission business meeting date on which the project was approved and shall include an initial list of dates for each of the events identified on the Key Events List.
COMPLIANCE-8	**Annual Compliance Reports**	After construction ends and throughout the life of the project, the project owner shall submit Annual Compliance Reports instead of Monthly Compliance Reports.
COMPLIANCE-9	**Confidential Information**	Any information the project owner deems confidential shall be submitted to BLM and the Energy Commission's Dockets Unit with a request for confidentiality.
COMPLIANCE-10	**Annual Fees**	Payment of Annual Energy Facility Compliance Fee to the Energy Commission;
COMPLIANCE-11	**Reporting of Complaints, Notices and Citations**	Within 10 days of receipt, the project owner shall report to BLM's Authorized Officer and the CPM, all notices, complaints, and citations.
COMPLIANCE-12	**Planned Facility Closure**	The project owner shall submit any revisions or changes to the Closure, Revegetation and Restoration Plan to BLM's Authorized Officer and the CPM at least 12 months prior to commencement of a planned closure.
COMPLIANCE-13	**Unplanned Temporary Facility Closure**	To ensure that public health and safety and the environment are protected in the event of an unplanned temporary closure, the project owner shall submit an On-Site Contingency Plan no less than 60 days after a NTP is issued for each power plant.

COMPLIANCE TABLE 1
SUMMARY of COMPLIANCE CONDITIONS OF CERTIFICATION

CONDITION NUMBER	SUBJECT	DESCRIPTION
COMPLIANCE-14	**Unplanned Permanent Facility Closure**	To ensure that public health and safety and the environment are protected in the event of an unplanned temporary closure, the project owner shall submit an On-Site Contingency Plan no less than 60 days after a NTP is issued for each power plant.
COMPLIANCE-15	**Post-certification changes to the ROW Grant and/or Decision**	The project owner must petition the Energy Commission and file an application to amend the ROW grant to delete or change a condition of certification, modify the project design or operational requirements and/or transfer ownership of operational control of the facility.

ATTACHMENT 1
COMPLAINT REPORT / RESOLUTION FORM

Complaint Log Number:_____ Docket Number:_____

Project Name:_____

COMPLAINANT INFORMATION

Name:_____ Phone Number:_____

Address:_____

COMPLAINT

DATE COMPLAINT RECEIVED:_____ TIME COMPLAINT RECEIVED:_____

COMPLAINT RECEIVED BY: ☐ TELEPHONE ☐ IN WRITING (COPY ATTACHED)

DATE OF FIRST OCCURRENCE:_____

DESCRIPTION OF COMPLAINT (INCLUDING DATES, FREQUENCY, AND DURATION):_____

FINDINGS OF INVESTIGATION BY PLANT PERSONNEL:_____

DOES COMPLAINT RELATE TO VIOLATION OF BLM ROW GRANT? ☐ YES ☐ NO

DOES COMPLAINT RELATE TO VIOLATION OF A CEC REQUIREMENT? ☐ YES ☐ NO

DATE COMPLAINANT CONTACTED TO DISCUSS FINDINGS:_____

DESCRIPTION OF CORECTIVE MEASURES TAKEN OR OTHER COMPLAINT RESOLUTION:_____

DOES COMPLAINANT AGREE WITH PROPOSED RESOLUTION?☐ YES ☐ NO

IF NOT, EXPLAIN:_____

_____

CORRECTIVE ACTION

IF CORRECTIVE ACTION NECESSARY, DATE COMPLETED:_____

DATE FIRST LETTER SENT TO COMPLAINANT (COPY ATTACHED):_____

DATE FINAL LETTER SENT TO COMPLAINANT (COPY ATTACHED):_____

OTHER RELEVANT INFORMATION:_____

_____

"This information is certified to be correct."

PLANT MANAGER SIGNATURE:_____ DATE:

(ATTACH ADDITIONAL PAGES AND ALL SUPPORTING DOCUMENTATION, AS REQUIRED)

LIST OF PREPARERS

CALICO SOLAR PROJECT
08-AFC-13
LIST OF PREPARERS

Executive Summary ..... Christopher Meyer

Introduction ..... Christopher Meyer

Proposed Project ..... Christopher Meyer

Alternatives ..... Susan Lee and Emily Capello

Cumulative Scenario ..... Susan Lee and Emily Capello

Air Quality ..... William Walters

Biological Resources ..... Chris Huntley and Scott White

Cultural Resources and Native American Values ..... BLM Staff

Geology & Paleontology ..... Dal Hunter

Hazardous Materials Management ..... Rick Tyler and Alvin Greenberg

Public Health and Safety ..... Alvin Greenberg

Hydrology, Water Use, and Water Quality ..... Casey Weaver

Land Use, Recreation, and Wilderness ..... Negar Vahidi and Susanne Huerta

Noise and Vibration ..... Erin Bright

Socioeconomics and Environmental Justice ..... Kristin Ford

Traffic and Transportation ..... Marie McLean

Transmission Line Safety and Nuisance ..... Obed Odoemelam

Visual Resources ..... William Kanemoto and James Jewell

Waste Management ..... Ellie Townsed-Hough

Worker Safety and Fire Protection ..... Rick Tyler and Alvin Greenberg

Facility Design ..... Shahab Khoshmashrab

Geologic Stability ..... Dal Hunter

Power Plant Efficiency ..... Shahab Khoshmashrab

Power Plant Reliability ..... Shahab Khoshmashrab

Transmission System Engineering ..... Sudath A. Edirisuriya and Mark Hesters

General Conditions ..... Mary Dyas

Project Assistant ..... April Albright