ENGINEERING ASSESSMENT

FACILITY DESIGN

Testimony of Steve Baker

SUMMARY OF CONCLUSIONS

The California Energy Commission staff concludes that the design, construction, and eventual closure of the Orange Grove 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.

INTRODUCTION

Facility design encompasses the civil, structural, mechanical, and electrical engineering design of the Orange Grove Project (OGP). 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.

LAWS, ORDINANCES, REGULATIONS, AND STANDARDS

Lists of LORS applicable to each engineering discipline (civil, structural, mechanical, and electrical) are described in the AFC (OGE 2008a, Appendix 2A; OGE 2008c). 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 Diego 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)

SETTING

The OGP will be located on approximately 8.5 acres in a former citrus grove in rural northern San Diego County (OGE 2008a, AFC §§ 1.1, 1.5.1, 1.7.11, 2.1, 2.2). The site lies in Seismic Risk Zone 4 (OGE 2008a, AFC § 6.3.1.5.2). For more information on the site and related project description, please see the **PROJECT DESCRIPTION** section of this document. Additional engineering design details are contained in the AFC and supplement (OGE 2008a, AFC Appendix 2A; OGE 2008c).

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 OGE 2008c 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** subsection 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; used for the storage, containment, or handling of hazardous or toxic materials; or capable of becoming 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.

The OGP 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 would be designed and built in conformance with a quality program intended to ensure 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 OGP is actually designed, procured, fabricated, and installed as described in this analysis (OGE 2008a, AFC § 2.10).

COMPLIANCE MONITORING

Under Section 104.1 in Appendix Chapter 1 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 103.3 in Appendix Chapter 1 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, section 108 in Appendix Chapter 1, 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, consistent with CBC section 108, pays in lieu of CBC permit fees to cover the costs of these reviews and inspections.

Engineering and compliance staff will invite San Diego 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) that 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.

FACILITY CLOSURE

The removal of a facility from service (decommissioning) when it reaches the end of its useful life ranges from "mothballing" to the removal of all equipment and appurtenant facilities and subsequent restoration of the site. Future conditions that could affect decommissioning are largely unknown at this time.

In order to ensure that decommissioning will be completed in a manner that is environmentally sound, safe, and protects the public health and safety, the applicant shall submit a decommissioning plan to the Energy Commission for review and approval before the project's decommissioning begins. The plan shall include a discussion of:

- proposed decommissioning activities for the project and all appurtenant facilities that were constructed as part of the project;
- all applicable LORS and local/regional plans and proof of adherence to those applicable LORS and local/regional plans;
- the activities necessary to restore the site if the plan requires removal of all equipment and appurtenant facilities; and
- decommissioning alternatives other than complete site restoration.

Satisfying the above requirements should serve as adequate protection, even in the unlikely event that the project is abandoned. Staff has proposed general conditions (see **General Conditions**) to ensure that these measures are included in the Facility Closure Plan.

CONCLUSIONS AND RECOMMENDATIONS

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 OGP 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** section 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.

CONDITIONS OF CERTIFICATION

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 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 laws, ordinances, regulations and standards (LORS) in effect at the time initial design plans are submitted to the chief building official (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 (2007 CBC, Appendix Chapter 1, § 101.2, Scope). 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 compliance project manager (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 (2007 CBC, Appendix Chapter 1, § 110, Certificate of Occupancy).

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, 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 within 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)
Combustion Turbine (CT) Foundation and Connections	2
CT Generator Foundation and Connections	2
SCR Catalyst System Structure Foundation and Connections	2
SCR Exhaust Stack Foundation and Connections	2
Tempering Air Fans (Blowers) Foundation and Connections	2
CEMS Station Foundation and Connections	2
CT Auxiliary Skid Foundation and Connections	2
CT Fire Protection System Foundation and Connections	2
SPRINT/Spray Mist Cooler Skid Foundation and Connections	2
NOx Water Injection Skid Foundation and Connections	2
Packaged CT Inlet Air Chiller System Foundation and Connections	1
Chilled Water Pumps Foundation and Connections	1
3-Cell Cooling Tower, Cooling Tower Foundation and Connections	1
Cooling Water Pumps Foundation and Connections	2
Ammonia Delivery Skid Foundation and Connections	4
Offsite Water Booster Pump Station Foundation and Connections	1
Natural Gas Fuel Filter Foundation and Connections	2
Air Compressor Skid Foundation and Connections	1
Step-Up Transformer Foundation and Connections	2
Station Service Transformer Foundation and Connections	2
Auxiliary Transformer Foundation and Connections	2
Service Building Foundation and Connections	1
Wastewater Drainage Sump System Foundation and Connections	1
Demineralized Water Storage Tank Foundation and Connections	1
Demineralized Water Forwarding Pumps Foundation and Connections	1
Reverse Osmosis System Foundations and Connections	1
Raw Water Storage Tank Foundation and Connections	1
Fuel Gas Compressor Foundation and Connections	2
Wastewater Storage Tank Foundation and Connections	1
Reclaim Water Storage Tank Foundation and Connections	1
Containment Tank Foundation and Connections	1
Oil/Water Separator Foundation and Connections	1
Black Start Diesel Generator Foundation and Connections	1

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 (2007 CBC, Appendix Chapter 1, § 108, Fees; Chapter 1, Section 108.4, Permits, Fees, Applications and Inspections), 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, structural engineer, or civil engineer, as the resident engineer in charge of the project (2007 California Administrative Code, § 4-209, Designation of Responsibilities). 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 resident engineer 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 resident engineer 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 shall have the authority to halt construction and to require changes or remedial work if the work does not meet requirements.

If the resident engineer 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 within a 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 resident engineer and any other delegated engineers assigned to the project. The project owner shall notify the CPM of the CBO's approvals of the resident engineer and other delegated engineer(s) within five days of the approval.

If the resident engineer or the delegated engineer(s) is subsequently reassigned or replaced, the project owner has five 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 five 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 (2007 CBC, Appendix Chapter 1, § 104, Duties and Powers of Building Official).

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; and 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 resident engineer 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 (2007 CBC, Appendix J, § J104.3, Soils Report; Chapter 18, § 1802.2, Foundation and Soils Investigations);

3. Be present, as required, during site grading and earthwork to provide consultation and monitor compliance with requirements set forth in the 2007 CBC, Appendix J, section J105, Inspections, and the 2007 California Administrative Code, section 4-211, Observation and Inspection of Construction (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 resident engineer.

   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 (2007 CBC, Appendix Chapter 1, § 114, Stop Orders).

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 California Administrative Code, section 4-211, Observation and Inspection of Construction (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 resident engineer 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 within a 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 within a 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 five days of the approval.

If the designated responsible engineer is subsequently reassigned or replaced, the project owner has five 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 five days of the approval.

GEN-6 Prior to the start of an activity requiring special inspection, 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, Chapter 17, Section 1704, Special Inspections; Chapter 17A, Section 1704A, Special Inspections; and Appendix Chapter 1, Section 109, Inspections. 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. Observe the work assigned for conformance with the approved design drawings and specifications;

3. Furnish inspection reports to the CBO and resident engineer. All discrepancies shall be brought to the immediate attention of the resident engineer for correction, then, if uncorrected, to the CBO and the CPM for corrective action (2007 CBC, Chapter 17, § 1704.1.2, Report Requirements); and

4. Submit a final signed report to the resident engineer, 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 within a 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 five 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 five 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 (2007 CBC, Appendix Chapter 1, § 109.6, Approval Required; Chapter 17, § 1704.1.2, Report Requirements). 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 five 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 an alternative site approved by the CPM during the operating life of the project (2007 CBC, Appendix Chapter 1, § 106.3.1, Approval of Construction Documents). 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" files (Adobe .pdf 6.0), 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 investigation reports required by the 2007 CBC, Appendix J, section J104.3, Soils Report, and Chapter 18, section 1802.2, Foundation and Soils Investigation.

Verification: At least 15 days (or within a 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 (2007 CBC, Appendix Chapter 1, § 114, Stop Work Orders).

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, Appendix Chapter 1, section 109, Inspections, and Chapter 17, section 1704, Special Inspections. 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 (2007 CBC, Chapter 17, § 1704.1.2, Report Requirements). 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 five 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 five 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 (2007 CBC, Chapter 17, § 1703.2, Written Approval).

Verification: Within 30 days (or within a 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 (2007 CBC, Appendix Chapter 1, § 109.6, Approval Required);

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 (2007 California Administrative Code, § 4-210, Plans, Specifications, Computations and Other Data);

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 (2007 CBC, Appendix Chapter 1, § 106.3.4, Design Professional in Responsible Charge); and

5. Submit to the CBO the responsible design engineer's signed statement that the final design plans conform to applicable LORS (2007 CBC, Appendix Chapter 1, § 106.3.4, Design Professional in Responsible Charge).

Verification: At least 60 days (or within a 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 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, Chapter 17, section 1704, Special Inspections, and section 1709.1, Structural Observations.

Verification: If a discrepancy is discovered in any of the above data, the project owner shall, within five 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 (2007 CBC, Chapter 17, § 1704.1.2, Report Requirements). The NCR shall reference the condition(s) of certification and the applicable CBC chapter and section. Within five 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 five days, the reason for disapproval, and the revised corrective action necessary to obtain the 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 (2007 CBC, Appendix Chapter 1, § 106.1, Submittal Documents; § 106.4, Amended Construction Documents; 2007 California Administrative Code, § 4-215, Changes in Approved Drawings and Specifications).

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, Chapter 3, Table 307.1(2), shall, at a minimum, be designed to comply with the requirements of that chapter.

Verification: At least 30 days (or within a 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 (2007 CBC, Appendix Chapter 1, § 106.1, Submittal Documents; § 109.5, Inspection Requests; § 109.6, Approval Required; 2007 California Plumbing Code, § 301.1.1, Approvals).

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 (2007 CBC, Appendix Chapter 1, § 106.3.4, Design Professional in Responsible Charge), 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 Diego County codes.

The CBO may deputize inspectors to carry out the functions of the code enforcement agency (2007 CBC, Appendix Chapter 1, § 103.3, Deputies).

Verification: At least 30 days (or within a 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 (2007 CBC, Appendix Chapter 1, § 109.5, Inspection Requests).

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 within a 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 (2007 CBC, Appendix Chapter 1, § 109.3.7, Energy Efficiency Inspections; § 106.3.4, Design Professionals in Responsible Charge).

Verification: At least 30 days (or within a 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 (2007 CBC, Appendix Chapter 1, § 106.1, Submittal Documents). 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 (2007 CBC, Appendix Chapter 1, § 109.6, Approval Required; § 109.5, Inspection Requests). 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 within a 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.

REFERENCES

OGE2008a – OGE/S. Thome (tn46770) Application for Certification Orange Grove Energy dated 6/19/08. Submitted to Dockets 6/19/08.

OGE2008c – OGE/S. Thome (tn46979) Supplement to AFC dated 7/8/08. Submitted to Dockets 7/8/08.

GEOLOGY AND PALEONTOLOGY

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

SUMMARY OF CONCLUSIONS

The proposed Orange Grove Project (OGP) is located in an active geologic area of the Peninsular Ranges Geomorphic Province in north-central San Diego County in Southern California. Because of its geologic setting, the site could be subject to intense levels of earthquake-related ground shaking. While the potential for earthquake ground rupture is low, the site is within 50 miles of several active faults. The effects of strong ground shaking would need to be mitigated, to the extent practical, through structural design required by the California Building Code (CBC 2007) and the project geotechnical report. The California Building Code (2007) requires that structures be designed to resist seismic stresses from ground acceleration and, to a lesser extent, liquefaction potential. A preliminary geotechnical investigation has been performed and presents standard engineering design recommendations to be observed during construction.

There are no known viable geologic or mineralogical resources at the proposed OGP site. Regionally, paleontological resources have been documented within Quaternary terrace deposits and older alluvium similar to deposits that underlie the project site, but no significant fossils were found during cursory field explorations at the plant site. Potential impacts would need to 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 (Energy Commission) staff believes that the potential is low for significant adverse impacts to the project from geologic hazards during its design life and to potential geologic, mineralogic, and paleontologic resources from the construction, operation, and closure of the proposed project. It is staff's opinion that the OGP can 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.

INTRODUCTION

In this section, Energy Commission staff discusses the potential impacts of geologic hazards on the proposed OGP project as well as geologic, mineralogic, and paleontologic resources. Staff's objective is to ensure that there would be no consequential adverse impacts to significant geological and paleontological resources during the project construction, operation, and closure and that operation of the plant would not expose occupants to high-probability geologic hazards. A brief geological and paleontological overview is provided. The section concludes with staff's proposed monitoring and mitigation measures for geologic hazards and geologic, mineralogic, and palentologic resources, with the proposed Conditions of Certification.

LAWS, ORDINANCES, REGULATIONS, AND STANDARDS

Applicable laws, ordinances, regulations, and standards (LORS) are listed in the application for certification (AFC) (OGE 2008a). The following briefly describes the current LORS for both geologic hazards and resources and mineralogic and paleontologic resources.

Geology and Paleontology Table 1
Laws, Ordinances, Regulations, and Standards (LORS)

Applicable Law	Description
Federal	The proposed OGP is not located on federal land. There are no federal LORS for geologic hazards and resources for this site.
State	
California Building Code (CBC), 2007	The CBC (2007) includes a series of standards that are used in project investigation, design, and construction (including grading and erosion control).
Alquist-Priolo Earthquake Fault Zoning Act, Public Resources Code (PRC), section 2621–2630	Mitigates against surface fault rupture of known active faults beneath occupied structures. Requires disclosure to potential buyers of existing real estate and a 50-foot setback for new occupied buildings. The site is not located within a designated Alquist-Priolo Fault Zone.
The Seismic Hazards Mapping Act, PRC Section 2690–2699	Areas are identified that are subject to the effects of strong ground shaking, such as liquefaction, landslides, tsunamis, and seiches.
PRC, Chapter 1.7, sections 5097.5 and 30244	Regulates removal of paleontological resources from state lands, defines unauthorized removal of fossil resources as a misdemeanor, and requires mitigation of disturbed sites.
Warren-Alquist Act, PRC, sections 25527 and 25550.5(i)	The Warren-Alquist Act requires the Energy Commission to "give the greatest consideration to the need for protecting areas of critical environmental concern, including, but not limited to, unique and irreplaceable scientific, scenic, and educational wildlife habitats; unique historical, archaeological, and cultural sites…" With respect to paleontologic resources, the Energy Commission relies on guidelines from the Society for Vertebrate Paleontology, indicated below.
Society for Vertebrate Paleontology (SVP), 1995	The "Measures for Assessment and Mitigation of Adverse Impacts to Non-Renewable Paleontological Resources: Standard Procedures" is a set of procedures and standards for assessing and mitigating impacts to vertebrate paleontological resources. The measures were adopted in October 1995 by the SVP, a national organization of professional scientists.
Local	
San Diego County Code of Regulatory Ordinances	Title 8, Division 7 establishes need for grading permit and requirements for clearing and grading.
San Diego County General Plan	Part V establishes policies to guide efforts to minimize risk from seismic, flooding, and other geologic hazards.

SETTING

The proposed OGP would be constructed in unincorporated San Diego County on approximately 8.5 acres of currently vacant land within a 202 acre parcel owned by San Diego Gas & Electric (SDG&E). The site is located approximately 0.1 mile north of the intersection of California State Route 76 (SR 76) and Pala Del Norte Road west of the city of Pala in north-central San Diego County. The proposed generating plant would be a peaker facility capable of generating 96 megawatts (MW) of electricity from two natural gas-fired combustion turbine generators during periods of high electrical demand. Auxiliary components would include selective catalytic reduction pollution and carbon monoxide catalyst air emissions control systems, turbine water-injection to reduce nitrous oxide emissions, and a reverse osmosis system to recycle process waste water. A buried 0.3-mile-long electrical transmission connection would connect the facility to an existing SDG&E substation. A 2.4-mile-long natural gas pipeline would supply fuel to the plant. Onsite water distribution and septic leach field pipelines, fence and sound attenuation wall, control building, and storm water runoff retention basin would also be built.

Make-up water for evaporative cooling and other minor in-plant use would come from the Fallbrook Public Utility District and would be trucked to the site.

REGIONAL SETTING

The proposed OGP would be located in an active geologic area of the Peninsular Ranges Geomorphic Province which extends from the Los Angeles Basin in the north some 900 miles south to the tip of Baja California in Mexico (Norris and Webb 1990). The Peninsular Ranges Geomorphic Province varies from approximately 30 to 100 miles in width. The site is located in the north-central portion of San Diego County on the flank of the Sierra Nevada Batholith which rises abruptly to the east. The Peninsular Ranges Geomorphic Province is characterized by primarily Mesozoic volcanic and metamorphic highland and mountain masses on the east, which slope steeply downward to alluvial, colluvial, and uplifted marine deposits along the Pacific Coast to the west.

Mountains of the Peninsular Range are commonly offset by northwest-trending right-lateral strike-slip faults. Some major fault systems found within the Peninsular Range Geomorphic Province are the San Andreas (southern section), San Jacinto (Coyote Creek, Borrego Mountain, and Anza Sections), the Whittier-Elsinore (Coyote Mountain and Julian Sections), and, more locally, the Temecula Section of the Elsinore Fault Zone. Major offshore fault zones to the west of the proposed OGP site include the Newport-Inglewood-Rose Canyon Zone, the Coronado Bank Zone, the San Diego Trough, and the San Clemente Fault.

PROJECT SITE DESCRIPTION

The site proposed for the OGP site lies on poorly to moderately indurated, Quaternary age, alluvial fan deposits which slope moderately to the southeast at a gradient of approximately 10%. The site is surrounded on the north, west, and east by relatively steeply sloping hillsides of Cretaceous gabbro associated with the Sierra Nevada Batholith. SR 76 runs from southwest to northeast along the southern site boundary.

The proposed 2.4-mile-long natural gas line will tap an existing line west of the site. The proposed alignment essentially follows SR 76 crossing younger and older alluvial fan deposits of Quaternary age as well as granitic bedrock.

A closed and abandoned former aggregate mine is present at the toe of the fan in the bed of the San Luis Rey River immediately south of SR 76. An existing SDG&E electrical substation is present north of SR 76, just south of the proposed OGP site.

The proposed site is located in an abandoned citrus grove which reportedly has subsurface irrigation pipelines still in place (OGE 2008a). Site access is obtained from SR 76 via unpaved Pala Del Norte Road. The shallow subsurface beneath the site is composed of a surficial layer of 12 to 18 inches of fine to coarse grained sand and silty sand with cobbles and boulders. This overlies firm to hard sandy lean clay with gravel, cobbles, and boulders to the explored depth of 40 feet below ground surface (bgs) (PSI 2007).

Depth to ground water beneath the site is unknown. Ground water was not encountered in exploration boreholes drilled to 40 feet bgs (PSI 2007).

ASSESSMENT OF IMPACTS AND DISCUSSION OF MITIGATION

This section considers two types of impacts. The first is geologic hazards, which could impact the proper functioning of the proposed facility and create life/safety concerns. The second is the potential impacts the proposed facility could have on existing geologic, mineralogic, and paleontologic resources in the area.

METHOD AND THRESHOLD FOR DETERMINING SIGNIFICANCE

No federal LORS concerning geologic hazards and geologic and mineralogic resources apply to this project. The California Building Standards Code (CBSC) and CBC (2007) provide geotechnical and geological investigation and design guidelines, which engineers must follow when designing a facility. As a result, the criteria used to assess the significance of a geologic hazard include evaluating each hazard's potential impact on the design and construction of the proposed facility. Geologic hazards include faulting and seismicity, liquefaction, dynamic compaction, hydrocompaction, subsidence, expansive soils, landslides, tsunamis, seiches, and others, as may be dictated by site-specific conditions.

The California Environmental Quality Act (CEQA) guidelines, Appendix G, provide a checklist of questions that lead agencies typically address.

- Section (V) (c) includes guidelines that determine if a project will either directly or indirectly destroy a unique paleontological resource or site or a unique geological feature.
- Sections (VI) (a), (b), (c), (d), and (e) focus on whether or not the project would expose persons or structures to geologic hazards.
- Sections (X) (a) and (b) concern the project's effects on mineral resources.

Staff has reviewed geologic and mineral resource maps for the surrounding area, as well as site-specific information provided by the applicant, to determine if geologic and mineralogic resources exist in the area and to determine if operations could adversely affect geologic and mineralogic resources.

Staff reviewed existing paleontologic information and requested records searches from the San Bernardino County Museum, the San Diego Natural History Museum, and the Natural History Museum of Los Angeles County for the site area. Site-specific information generated by the applicant for the proposed OGP project was also reviewed. All research was conducted in accordance with accepted assessment protocol (SVP 1995) to determine whether any known paleontologic resources exist in the general area. If present or likely to be present, Conditions of Certification which outline required procedures to mitigate impacts to potential resources, are proposed as part of the project's approval.

DIRECT/INDIRECT IMPACTS AND MITIGATION

Ground shaking represents the main geologic hazard at this site. This potential hazard can be effectively mitigated through facility design by incorporating recommendations contained in a project geotechnical report. Conditions of Certification **GEN-1, GEN-5,** and **CIVIL-1** in the **FACILITY DESIGN** section should also mitigate these impacts to a less than significant level.

Economic deposits of sand and gravel have been identified and historically mined in the site vicinity. The H.G. Fenton Materials Company formerly produced sand and gravel from quarry pits immediately south of the site in the bed of the San Luis Rey River and the river bed has been assigned the subclassification of Sector D within an area which is regionally designated as Mineral Resource Zone 2 or an area of known or potential economic mineral deposits (CDMG 1996). Energy Commission staff review of the site geotechnical boring (PSI 2007) indicates that there is no potential for economical deposits of aggregate in the areas explored.

No important paleontological resources were observed on the proposed OGP site during the cursory paleontological field survey conducted for the AFC (OGE 2008a). Additionally, records searches conducted by the Natural History Museum of Los Angeles County for the site area did not reveal the presence of known paleontological resources and indicate the likelihood of such resources to be present in the near-surface young alluvium is very low (McLeod 2008). Staff has not yet received a response for a similar request to the San Diego Natural History Museum. Staff considers the probability that paleontological resources would be encountered during grading, excavation, and trenching to be low.

This assessment is based on SVP criteria and the paleontological report appended to the AFC. Proposed Conditions of Certification **PAL-1** to **PAL-7** are designed to mitigate paleontological resource impacts, as discussed above, to less than significant levels. These conditions essentially require a worker education program in conjunction with the monitoring of earthwork activities by a qualified professional paleontologist (a paleontologic resource specialist, or PRS).

The proposed Conditions of Certification allow the Energy Commission's compliance project manager (CPM) and the applicant to adopt a compliance monitoring scheme ensuring compliance with LORS applicable to geologic hazards and the protection of geologic, mineralogic, and paleontologic resources.

Based on the information below, it is staff's opinion that the potential for significant adverse, direct or indirect impacts to the project, from geologic hazards, and to potential geologic, mineralogic, and paleontologic resources, from the proposed project, is low.

GEOLOGICAL HAZARDS

The AFC (OGE 2008a) provides documentation of potential geologic hazards at the proposed OGP plant site, including site-specific subsurface information (PSI 2007). Review of the AFC, coupled with staff's independent research, indicates that the possibility of geologic hazards at the plant site, during its practical design life, is low, and geologic hazards, such as potential for expansive clay soils and settlement due to compressible soils, hydrocompaction, or dynamic compaction, are addressed in the project geotechnical report per CBC (2007) requirements (PSI 2007).

Staff's independent research included the review of available geologic maps, reports, and related data of the proposed OGP plant site. Geological information was available from the California Geological Survey (CGS), California Division of Mines and Geology (CDMG), the U.S. Geological Survey (USGS), and other governmental organizations. Since 2002 the CDMG has been known as the California Geological Survey.

Faulting and Seismicity

Type A faults have slip-rates of $\geq$5 mm per year and are capable of producing an earthquake of magnitude 7.0 or greater. Type B faults have slip-rates of 2 to 5 mm per year and are capable of producing an earthquake of magnitude 6.5 to 7.0. The fault type, potential magnitude, and distance from the proposed OGP site of Type A and B faults within 62 miles (100 kilometers) of the site are summarized in Table 1. The listed fault characteristics were derived from a number of sources (Blake 2000; Jennings and Saucedo 2002; USGS 2006; CDMG 2003; CGS 2002a; SCEC 2006).

Geology and Paleontology Table 2
Active Faults Relative to the OGP Site

Fault Name	Distance From Site (miles)	Maximum Earthquake Magnitude (Mw)	Estimated Peak Site Acceleration (g)	Movement and Strike	Slip Rate mm/yr	Fault Type
Elsinore (Temecula Segment)	4.7	6.8	0.281	Right-Lateral Strike Slip (Northwest)	5.0	A
Elsinore (Julian Segment)	5.7	7.1	0.297	Right-Lateral Strike Slip (Northwest)	5.0	A
Newport – Inglewood (Offshore)	23.2	7.1	0.112	Right-Lateral Strike Slip (Northwest)	1.5	B
Elsinore (Glen Ivy Segment)	24.0	6.8	0.093	Right-Lateral Strike Slip (Northwest)	5.0	A
Rose Canyon (Offshore)	24.4	7.2	0.113	Right-Lateral Strike Slip (Northwest)	1.5	B
San Jacinto - Anza	27.3	7.2	0.104	Right-Lateral Strike Slip (Northwest)	12.0	A
San Jacinto – San Jacinto Valley	28.6	6.9	0.086	Right-Lateral Strike Slip (Northwest)	12.0	A
Earthquake Valley	32.8	6.5	0.062	Right-Lateral Strike Slip (Northwest)	2.0	B
San Jacinto – Coyote Creek	35.4	6.6	0.062	Right-Lateral Strike Slip (Northwest)	4.0	A
San Joaquin Hills	36.5	6.6	0.074	Blind Thrust (Reverse) North	0.5	B
Coronado Bank (Offshore)	40.3	7.6	0.095	Right-Lateral Strike Slip (Northwest)	3.0	B
Chino – Central Ave. (Elsinore)	41.8	6.7	0.070	Right Lateral – Reverse Oblique (Southwest)	1.0	B
Whittier	45.8	6.8	0.057	Right Lateral – Reverse Oblique (Northeast)	2.5	A
San Jacinto – San Bernardino	46.0	6.7	0.053	Right-Lateral Strike Slip (Northwest)	12.0	A
San Andreas – San Bernardino	46.0	6.7	0.053	Right-Lateral Strike Slip (Northwest)	24.0	A
San Andreas – SB – Coachella M-1b-2	47.5	7.5	0.079	Right-Lateral Strike Slip (Northwest)	25.0	A
San Andreas – Whole M-1a	47.5	8.0	0.103	Right-Lateral Strike Slip (Northwest)	34.0	A
San Andreas – SB – Coachella M-2b-2	47.5	7.7	0.088	Right-Lateral Strike Slip (Northwest)	25.0	A
Palos Verdes	48.2	7.3	0.071	Right-Lateral Strike Slip (Northwest)	3.0	B
Newport – Inglewood (LA Basin)	50.1	7.1	0.062	Right-Lateral Strike Slip (Northwest)	1.0	B
Elsinore (Coyote Mountain)	51.0	6.8	0.052	Right-Lateral Strike Slip (Northwest)	4.0	A
Pinto Mountain	53.1	7.2	0.062	Left-Lateral Strike Slip	2.5	B
San Andreas – Coachella M-1c-5	53.6	7.2	0.062	Right-Lateral Strike Slip	25.0	A
San Jacinto - Borrego	53.9	6.6	0.045	Right-Lateral Strike Slip (Northwest)	4.0	A
Burnt Mountain	57.5	6.5	0.040	Right-Lateral Strike Slip (Northwest)	0.6	B
Puente Hills Blind Thrust	58.8	7.1	0.066	Reverse (North)	0.7	B
Cucamonga	59.7	6.9	0.059	Reverse (North)	5.0	B
North Frontal Zone (West)	60.0	7.2	0.069	Reverse (South)	1.0	B
Eureka Peak	60.7	6.4	0.037	Right-Lateral Strike Slip (Northwest)	0.6	B
San Jose	61.6	6.4	0.044	Left Lateral – Reverse Oblique (Northwest)	0.5	B
North Frontal Zone (East)	62.0	6.7	0.052	Reverse (South)	0.5	B

Energy Commission staff reviewed numerous CDMG and USGS publications as well as informational websites in order to gather data on the location, recency, and type of faulting in the project area. No active faults are shown on published maps as crossing the boundary of new construction on the proposed OGP site. The closest mapped faults to the proposed plant site are the Temecula and Julian Segments of the Elsinore Fault Zone at approximately 4.7 and 5.7 miles to the northeast, respectively. These faults are considered active Type A faults because they show Holocene movement of 5.0mm or greater per year. Other major regional faults and fault systems are present both onshore and offshore at distances of 23 miles or more from the proposed OGP site and include the San Jacinto Fault System which is considered to be the most active fault system within the southern Sierra Nevada Batholith.

The Alquist-Priolo Act of 1973 and subsequent California state law (California Code of Regulations 2001) require that all occupied structures be set back 50 feet or more from the surface trace of an active fault. Since no active faults have been documented within the proposed OGP power plant site, setbacks from occupied structures would not be required.

Based on the soil profile generated for this site by the geotechnical investigation, the site soil class is assumed to be seismic Class C (PSI 2007). The estimated peak horizontal ground acceleration for the power plant is 0.78 times the acceleration of gravity (0.78g) for bedrock acceleration based on 2% probability of exceedence in 50 years under 2007 CBC criteria (USGS 2008).

Liquefaction

Liquefaction is a condition in which a saturated cohesionless soil may lose shear strength because of sudden increase in pore water pressure caused by an earthquake. However, the potential for liquefaction of strata deeper than approximately 40 feet below surface is considered negligible due to the increased confining pressure and because geologic strata at this depth are generally too compact to liquefy. The reported deep ground water table of greater than 40 feet would indicate no significant potential for liquefaction and standard penetration testing (blow-counts) reported in the project-specific geotechnical report (PSI 2007) indicate strata beneath the water table are generally too dense to liquefy. Liquefaction potential at the proposed OGP site was also addressed in the project geotechnical report per CBC (2007) and Condition of Certification **GEN-1** requirements.

Lateral Spreading

Lateral spreading of the ground surface can occur within liquefiable beds during seismic events. Lateral spreading generally requires an abrupt change in slope—that is, a nearby steep hillside or deeply eroded stream bank, etc.—but can also occur on gentle slopes such as are present at the project site. Other factors such as distance from the epicenter, magnitude of the seismic event, and thickness and depth of liquefiable layers also affect the amount of lateral spreading. Because the proposed OGP site is not subject to significant liquefaction, the potential for lateral spreading of the site surface during seismic events is negligible.

Dynamic Compaction

Dynamic compaction of soils results when relatively unconsolidated granular materials experience vibration associated with seismic events. The vibration causes a decrease in soil volume, as the soil grains tend to rearrange into a more dense state (an increase is soil density). The decrease in volume can result in settlement of overlying structural improvements. Site specific geotechnical investigation indicates the alluvial deposits which underlie the site are generally too dense to allow significant dynamic compaction (PSI 2007).

Hydrocompaction

Hydrocompaction (also known as hydro-collapse) is generally limited to young soils that were deposited rapidly in a saturated state, most commonly by a flash flood. The soils dry quickly, leaving an unconsolidated, low density deposit with a high percentage of voids. Foundations built on these types of compressible materials can settle excessively, particularly when landscaping irrigation dissolves the weak cementation that is preventing the immediate collapse of the soil structure. Site specific geotechnical investigation indicates alluvial deposits which underlie the site are generally too dense to experience significant hydrocompaction (PSI 2007).

Subsidence

Local subsidence or settlement may occur when areas containing compressible soils are subjected to foundation loads. Site-specific geotechnical investigation indicates the alluvial deposits which underlie the site are generally compacted to a medium-dense to very dense consistency and therefore are considered unlikely to support site-wide subsidence (PSI 2007).

Regional ground subsidence is typically caused by petroleum or ground water withdrawal that increases the effective unit weight of the soil profile, which in turn increases the effective stress on the deeper soils. This results in consolidation or settlement of the underlying soils. The nearest known petroleum or gas fields are located in the Los Angeles Basin roughly 50 miles northwest of the potential project site (CDC 2001), and the site water supply would be provided by a local water purveyor and not by ground water removal from beneath the site. Therefore, subsidence due to petroleum, natural gas, or ground water production is considered very unlikely.

Expansive Soils

Soil expansion occurs when clay-rich soils with an affinity for water exist in place at a moisture content below their plastic limit. The addition of moisture from irrigation, precipitation, capillary tension, water line breaks, etc. causes the clay soils to absorb water molecules into their structure, which in turn causes an increase in the overall volume of the soil. This increase in volume can correspond to excessive movement (heave) of overlying structural improvements. Geotechnical testing at the OGP site indicates potentially expansive soils are present to depths of between 2.5 to 10 feet bgs beneath portions of the site (PSI 2007). Over-excavation, backfill with suitable fill material, and compaction would be necessary beneath foundations and other load

bearing structures in areas of expansive soils to minimize potential shrink-swell movements. This mitigation is detailed in the project geotechnical investigation (PSI 2007).

Landslides

The site selected for the proposed OGP site slopes gently to the south-southwest at a gradient only of approximately 10%. No historic landslides have been mapped in the project vicinity. The crystalline plutonic rocks which form steep hillsides east, west, and north of the site reportedly have high shear strength and are not heavily fractured (OGE 2008a). Therefore the potential for mass wasting in the form of massive rock falls and subsequent run out across the alluvial fan is considered to be low.

Flooding

The Federal Emergency Management Agency (FEMA) has identified the OGP site as lying in Unshaded Zone X, or outside the limits of the 500-year floodplain (FEMA 1996).

Tsunamis and Seiches

Due to the site elevation and distance from the ocean and the absence of large nearby lakes or reservoirs, the potential for impact to the site from tsunamis and seiches is considered to be negligible.

GEOLOGIC, MINERALOGIC, AND PALEONTOLOGIC RESOURCES

Energy Commission staff has reviewed applicable geologic maps, reports, and on-line resources for this area (Blake 2000; CDC 2001; CDMG 2003, 1999, 1998, 1994, 1993, 1990, 1983, 1975, and 1962; CGS 2007 and 2002a and b; Kennedy and Welday 1980; Kennedy and Tan 1977; Kennedy 2000; Tan 2000; Norris and Webb 1990; SCEC 2006; and USGS 2006; OGE 2008a). Staff did not identify any geological or mineralogical resources at the potential energy facility location. Sand and gravel has been historically mined immediately south of the site, however this quarry is no longer in production and the proposed OGP site lies outside the designated mineral resource zone which encompasses the bed of the San Luis Rey River (CDMG 1996). Energy Commission staff review of the geotechnical borings (PSI 2007) did not indicate aggregate potential at the exploration sites.

Energy Commission staff reviewed the paleontological resources assessment in Section 6.8 of the AFC (OGE 2008a). Staff has also reviewed paleontological literature and records searches conducted by the San Diego Natural History Museum (Soetaert 2008), and the Natural History Museum of Los Angeles County (McCleod 2008). No paleontological resources have been documented on the proposed OGP plant site or along the proposed path of offsite facilities.

Although Quaternary alluvial deposits like those which underlie the potential project site, are known to contain a wide variety of vertebrate fossils, none have been identified at the site or within a 1-mile radius of the site. McLeod (2008) reports a tooth from a fossil horse *Equus* was found in the vicinity of Pala but its exact collection location is unknown. Even if on-site construction were to include significant amounts of grading, foundation excavation, and utility trenching, staff considers the probability that paleontological resources would be encountered during such activities to be low. There

is minor potential to encounter significant vertebrate fossils if drilled shaft foundations or other deep excavations are required to support heavily loaded structures. Any fossil brought to the surface by drilling operations would be badly disturbed and out of context as well. Given the relatively small diameter of the borings, and the general scarcity of significant fossils, the chances of intersecting strata bearing significant fossils would seem remote.

The proposed natural gas line would require trenching for 2.4 miles, some of which would include horizontal borings under SR 76. Typically, trenching for gas lines is relatively shallow, in the range of 3 to 5 feet. Much of the alignment has already been disturbed. The southwest half of the alignment is mapped as lying within younger (Holocene) age alluvial flood plain deposits of the San Luis Rey River. Farther to the east the proposed gas line trench would encounter granitic bedrock and then the older Quaternary age alluvial fan deposits of the plant site (Kennedy 2000; Tan 2000). The granitic bedrock has no potential for fossils and the Holocene age flood plain deposits are generally too young (at shallow depth) to harbor paleontologic resources (McLeod 2008).

This assessment is based on SVP criteria, the paleontological report included in the AFC (OGE 2008a), and the independent paleontological assessment of McLeod (2008). Proposed Conditions of Certification **PAL-1** to **PAL-7** are designed to mitigate paleontological resource impacts, as discussed above, to less than significant levels. These conditions essentially require a worker education program in conjunction with the monitoring of earthwork activities by a qualified professional paleontologist (a paleontologic resource specialist, or PRS).

The proposed Conditions of Certification allow the Energy Commission's compliance project manager (CPM) and the applicant to adopt a compliance monitoring scheme ensuring compliance with LORS applicable to geologic hazards and the protection of geologic, mineralogic, and paleontologic resources.

Construction Impacts and Mitigation

The design-level geotechnical investigation, required for the project by the CBC (2007) and Condition of Certification **GEN-1,** provides standard engineering design recommendations for mitigation of earthquake ground shaking and excessive settlement. (See **PROPOSED CONDITIONS OF CERTIFICATION, FACILITY DESIGN.**)

As noted above, no viable geologic or mineralogic resources are known to exist in the vicinity of the proposed OGP construction site, although sand and gravel quarries are present within the bed of the San Luis Rey River. No paleontologic resources have been identified at the site or in the immediate site vicinity or along proposed linears. Construction of the proposed project would include grading, foundation excavation, and utility trenching. Based on the soils profile, SVP assessment criteria, and the depth of the potentially fossiliferous geologic units, staff considers the probability of encountering paleontological resources to be low.

Proposed Conditions of Certification **PAL-1 to PAL-7** are designed to mitigate any paleontological resource impacts, as discussed above, to a less than significant level. If

final project design does not include drilled shafts or other deep excavations that extend into older Quaternary deposits these conditions may not be necessary.

Essentially, Conditions of Certification **PAL-1 to PAL-7** require a worker education program in conjunction with monitoring of earthwork activities by qualified professional paleontologists (paleontologic resource specialist, or PRS). Earthwork is halted any time potential fossils are recognized by either the paleontologist or the worker. When properly implemented, the Conditions of Certification yield a net gain to the science of paleontology since fossils that would not otherwise have been discovered can be collected, identified, studied, and properly curated. A paleontological resource specialist is retained, for the project by the applicant, to produce a monitoring and mitigation plan, conduct the worker training, and provide the monitoring. During the monitoring, the PRS can and often does petition the Energy Commission for a change in the monitoring protocol. Most commonly, this is a request for lesser monitoring after sufficient monitoring has been performed to ascertain that there is little change of finding significant fossils. In other cases, the PRS can propose increased monitoring due to unexpected fossil discoveries or in response to repeated out-of-compliance incidents by the earthwork contractor.

Based upon the literature and archives search, field surveys, and compliance documentation for the proposed OGP, the applicant has offered monitoring and mitigation measures to be followed during the construction of the OGP. Energy Commission staff believes that the facility can also be designed and constructed to minimize the effect of geologic hazards at the site during project design life.

Operation Impacts and Mitigation

Operation of the proposed new gas-fired peaker generating facility should not have any adverse impact on geologic, mineralogic, or paleontologic resources.

CUMULATIVE IMPACTS AND MITIGATION

The proposed OGP is situated in a seismically active geologic environment. Strong ground shaking potential must be mitigated through foundation and structural design as required by the CBC (2007). Expansive soils must be mitigated in accordance with a design-level project geotechnical investigation and proposed Conditions of Certification **GEN-1, GEN-5, and CIVIL-1** under **FACILITY DESIGN**. Paleontological resources have been documented in the general area of the project and in sediments similar to those that are present beneath the proposed site. However, to date, no fossils have been found during field studies of the proposed OGP site. The potential impacts to paleontological resources due to construction activities would be mitigated as required by proposed Conditions of Certification **PAL-1 to PAL-7**.

Staff believes that the potential for significant adverse cumulative impacts to the proposed project from geologic hazards, during the project's design life, is low, and that the potential for impacts to geologic, mineralogic, and paleontologic resources is very low.

Based upon the literature and archives search, field surveys, and compliance documentation for the proposed OGP project, the applicant proposes monitoring and

mitigation measures for construction of the OGP, and staff agrees with the applicant that the project can be designed and constructed to minimize the effects of geologic hazards at the site and that impacts to fossils encountered during construction would be mitigated to levels of insignificance.

The proposed Conditions of Certification allow the Energy Commission CPM and the applicant to adopt a compliance monitoring scheme ensuring compliance with applicable LORS for geologic hazards and geologic, mineralogic, and paleontologic resources.

FACILITY CLOSURE

Facility closure activities are not expected to impact geologic, paleontologic, or mineralogic resources since no such resources are known to exist at the project location. In addition, the decommissioning and closure of the project should not negatively affect geologic, mineralogic, or paleontologic resources since the majority of the ground disturbed during plant decommissioning and closure would have been already disturbed, and mitigated as required, during construction and operation of the project.

RESPONSE TO AGENCY AND PUBLIC COMMENTS

Staff has not received any agency or public comments regarding geologic hazards, mineral resources, or paleontology at this time.

CONCLUSIONS

The applicant should easily be able to comply with applicable LORS, provided that the proposed Conditions of Certification are followed. The design and construction of the project should have no adverse impact with respect to geologic, mineralogic, and paleontologic resources. Staff proposes to ensure compliance with applicable LORS through the adoption of the proposed Conditions of Certification listed below.

PROPOSED CONDITIONS OF CERTIFICATION

General Conditions of Certification with respect to engineering geology are proposed under Conditions of Certification **GEN-1, GEN-5, and CIVIL-1** in the **FACILITY DESIGN** section. Proposed paleontological Conditions of Certification follow. It is staff's opinion that the likelihood of encountering paleontologic resources is low at the plant site and along proposed linear facilities. Staff would consider reducing monitoring intensity, at the recommendation of the project paleontologic resource specialist, following examination of sufficient, representative deep excavations.

PAL-1 The project owner shall provide the compliance project manager (CPM) with the resume and qualifications of its paleontological resource specialist (PRS) for review and approval. If the approved PRS is replaced prior to completion of project mitigation and submittal of the Paleontological Resources Report, the project owner shall obtain CPM approval of the replacement PRS. The project owner shall keep resumes on file for qualified paleontological resource

monitors (PRMs). If a PRM is replaced, the resume of the replacement PRM shall also be provided to the CPM.

The PRS resume shall include the names and phone numbers of references. The resume shall also demonstrate to the satisfaction of the CPM the appropriate education and experience to accomplish the required paleontological resource tasks.

As determined by the CPM, the PRS shall meet the minimum qualifications for a vertebrate paleontologist as described in the Society of Vertebrate Paleontology (SVP) guidelines of 1995. The experience of the PRS shall include the following:

1. Institutional affiliations, appropriate credentials, and college degree;

2. Ability to recognize and collect fossils in the field;

3. Local geological and biostratigraphic expertise;

4. Proficiency in identifying vertebrate and invertebrate fossils; and

5. At least three years of paleontological resource mitigation and field experience in California and at least one year of experience leading paleontological resource mitigation and field activities.

The project owner shall ensure that the PRS obtains qualified paleontological resource monitors to monitor as he or she deems necessary on the project. Paleontologic resource monitors (PRMs) shall have the equivalent of the following qualifications:

- BS or BA degree in geology or paleontology and one year of experience monitoring in California; or
- AS or AA in geology, paleontology, or biology and four years' experience monitoring in California; or
- Enrollment in upper division classes pursuing a degree in the fields of geology or paleontology and two years of monitoring experience in California.

Verification:

1. At least 60 days prior to the start of ground disturbance, the project owner shall submit a resume and statement of availability of its designated PRS for on-site work.

2. At least 20 days prior to ground disturbance, the PRS or project owner shall provide a letter with resumes naming anticipated monitors for the project, stating that the identified monitors meet the minimum qualifications for paleontological resource monitoring required by the condition. If additional monitors are obtained during the project, the PRS shall provide additional letters and resumes to the CPM. The letter shall be provided to the CPM no later than one week prior to the monitor's beginning on-site duties.

3. Prior to the termination or release of a PRS, the project owner shall submit the resume of the proposed new PRS to the CPM for review and approval.

PAL-2 The project owner shall provide to the PRS and the CPM, for approval, maps and drawings showing the footprint of the power plant, construction lay-down areas, and all related facilities. Maps shall identify all areas of the project where ground disturbance is anticipated. If the PRS requests enlargements or strip maps for linear facility routes, the project owner shall provide copies to the PRS and CPM. The site grading plan and plan and profile drawings for the utility lines would be acceptable for this purpose. The plan drawings should show the location, depth, and extent of all ground disturbances and be at a scale between 1 inch = 40 feet and 1 inch = 100 feet. If the footprint of the project or its linear facilities changes, the project owner shall provide maps and drawings reflecting those changes to the PRS and CPM.

If construction of the project proceeds in phases, maps and drawings may be submitted prior to the start of each phase. A letter identifying the proposed schedule of each project phase shall be provided to the PRS and CPM. Before work commences on affected phases, the project owner shall notify the PRS and CPM of any construction phase scheduling changes.

At a minimum, the project owner shall ensure that the PRS or PRM consults weekly with the project superintendent or construction field manager to confirm area(s) to be worked the following week and until ground disturbance is completed.

Verification:

1. At least 30 days prior to the start of ground disturbance, the project owner shall provide the maps and drawings to the PRS and CPM.

2. If there are changes to the footprint of the project, revised maps and drawings shall be provided to the PRS and CPM at least 15 days prior to the start of ground disturbance.

3. If there are changes to the scheduling of the construction phases, the project owner shall submit a letter to the CPM within five days of identifying the changes.

PAL-3 The project owner shall ensure that the PRS prepares, and the project owner submits to the CPM for review and approval, a paleontological resources monitoring and mitigation plan (PRMMP) to identify general and specific measures to minimize potential impacts to significant paleontological resources. Approval of the PRMMP by the CPM shall occur prior to any ground disturbance. The PRMMP shall function as the formal guide for monitoring, collecting, and sampling activities and may be modified with CPM approval. This document shall be used as the basis of discussion when on-site decisions or changes are proposed. Copies of the PRMMP shall reside with the PRS, each monitor, the project owner's on-site manager, and the CPM.

The PRMMP shall be developed in accordance with the guidelines of the Society of Vertebrate Paleontology (SVP 1995) and shall include, but not be limited, to the following:

1. Assurance that the performance and sequence of project-related tasks, such as any literature searches, pre-construction surveys, worker environmental training, fieldwork, flagging or staking, construction monitoring, mapping and data recovery, fossil preparation and collection, identification and inventory, preparation of final reports, and transmittal of materials for curation will be performed according to PRMMP procedures;

2. Identification of the person(s) expected to assist with each of the tasks identified within the PRMMP and the Conditions of Certification;

3. A thorough discussion of the anticipated geologic units expected to be encountered, the location and depth of the units relative to the project when known, and the known sensitivity of those units based on the occurrence of fossils either in that unit or in correlative units;

4. An explanation of why, how, and how much sampling is expected to take place and in what units. Include descriptions of different sampling procedures that shall be used for fine-grained and coarse-grained units;

5. A discussion of the locations of where the monitoring of project construction activities is deemed necessary, and a proposed plan for monitoring and sampling;

6. A discussion of procedures to be followed in the event of a significant fossil discovery, halting construction, resuming construction, and how notifications will be performed;

7. A discussion of equipment and supplies necessary for collection of fossil materials and any specialized equipment needed to prepare, remove, load, transport, and analyze large-sized fossils or extensive fossil deposits;

8. Procedures for inventory, preparation, and delivery for curation into a retrievable storage collection in a public repository or museum, which meet the Society of Vertebrate Paleontology’s standards and requirements for the curation of paleontological resources;

9. Identification of the institution that has agreed to receive data and fossil materials collected, requirements or specifications for materials delivered for curation and how they will be met, and the name and phone number of the contact person at the institution; and

10. A copy of the paleontological Conditions of Certification.

Verification: At least 30 days prior to ground disturbance, the project owner shall provide a copy of the PRMMP to the CPM. The PRMMP shall include an affidavit of authorship by the PRS and acceptance of the PRMMP by the project owner evidenced by a signature.

PAL-4 Prior to ground disturbance and for the duration of construction activities involving ground disturbance, the project owner and the PRS shall prepare and conduct weekly CPM-approved training for the following workers: project managers, construction supervisors, foremen and general workers involved with or who operate ground-disturbing equipment or tools. Workers shall not excavate in sensitive units prior to receiving CPM-approved worker training. Worker training shall consist of a CPM-approved video or in-person presentation. The training program may be combined with other training programs prepared for cultural and biological resources, hazardous materials, or other areas of interest or concern. No ground disturbance shall occur prior to CPM approval of the Worker Environmental Awareness Program (WEAP), unless specifically approved by the CPM.

The WEAP shall address the possibility of encountering paleontological resources in the field, the sensitivity and importance of these resources, and legal obligations to preserve and protect those resources.

The training shall include:

1. A discussion of applicable laws and penalties under the law;

2. Good quality photographs or physical examples of vertebrate fossils for project sites containing units of high paleontologic sensitivity;

3. Information that the PRS or PRM has the authority to halt or redirect construction in the event of a discovery or unanticipated impact to a paleontological resource;

4. Instruction that employees are to halt or redirect work in the vicinity of a find and to contact their supervisor and the PRS or PRM;

5. An informational brochure that identifies reporting procedures in the event of a discovery;

6. A WEAP certification of completion form signed by each worker indicating that he/she has received the training; and

7. A sticker that shall be placed on hard hats indicating that environmental training has been completed.

Verification:

1. At least 30 days prior to ground disturbance, the project owner shall submit the proposed WEAP, including the brochure, with the set of reporting procedures for workers to follow.

2. At least 30 days prior to ground disturbance, the project owner shall submit the script and final video to the CPM for approval if the project owner is planning to use a video for interim training.

3. If the owner requests an alternate paleontological trainer, the resume and qualifications of the trainer shall be submitted to the CPM for review and approval prior to installation of an alternate trainer. Alternate trainers shall not conduct training prior to CPM authorization.

4. In the monthly compliance report (MCR), the project owner shall provide copies of the WEAP certification of completion forms with the names of those trained and the trainer or type of training (in-person or video) offered that month. The MCR shall also include a running total of all persons who have completed the training to date.

PAL-5 The project owner shall ensure that the PRS and PRM(s) monitor consistent with the PRMMP all construction-related grading, excavation, trenching, and augering in areas where potential fossil-bearing materials have been identified, both at the site and along any constructed linear facilities associated with the project. In the event that the PRS determines full-time monitoring is not necessary in locations that were identified as potentially fossil bearing in the PRMMP, the project owner shall notify and seek the concurrence of the CPM.

The project owner shall ensure that the PRS and PRM(s) have the authority to halt or redirect construction if paleontological resources are encountered. The project owner shall ensure that there is no interference with monitoring activities unless directed by the PRS. Monitoring activities shall be conducted as follows:

1. Any change of monitoring from the accepted schedule in the PRMMP shall be proposed in a letter or email from the PRS and the project owner to the CPM prior to the change in monitoring and will be included in the monthly compliance report. The letter or email shall include the justification for the change in monitoring and be submitted to the CPM for review and approval.

2. The project owner shall ensure that the PRM(s) keep a daily monitoring log of paleontological resource activities. The PRS may informally discuss paleontological resource monitoring and mitigation activities with the CPM at any time.

3. The project owner shall ensure that the PRS notifies the CPM within 24 hours of the occurrence of any incidents of non-compliance with any paleontological resources Conditions of Certification. The PRS shall recommend corrective action to resolve the issues or achieve compliance with the Conditions of Certification.

4. For any significant paleontological resources encountered, either the project owner or the PRS shall notify the CPM within 24 hours, or Monday

morning in the case of a weekend event, where construction has been halted because of a paleontological find.

The project owner shall ensure that the PRS prepares a summary of monitoring and other paleontological activities placed in the monthly compliance reports. The summary will include the name(s) of PRS or PRM(s) active during the month; general descriptions of training and monitored construction activities; and general locations of excavations, grading, and other activities. A section of the report shall include the geologic units or subunits encountered, descriptions of samplings within each unit, and a list of identified fossils. A final section of the report will address any issues or concerns about the project relating to paleontologic monitoring, including any incidents of non-compliance or any changes to the monitoring plan that have been approved by the CPM. If no monitoring took place during the month, the report shall include an explanation in the summary as to why monitoring was not conducted.

Verification: The project owner shall ensure that the PRS submits the summary of monitoring and paleontological activities in the MCR. When feasible, the CPM shall be notified 10 days in advance of any proposed changes in monitoring different from the plan identified in the PRMMP. If there is any unforeseen change in monitoring, the notice shall be given as soon as possible prior to implementation of the change.

PAL-6 The project owner, through the designated PRS, shall ensure that all components of the PRMMP are adequately performed including collection of fossil materials, preparation of fossil materials for analysis, analysis of fossils, identification and inventory of fossils, the preparation of fossils for curation, and the delivery for curation of all significant paleontological resource materials encountered and collected during project construction.

Verification: The project owner shall maintain in his/her compliance file copies of signed contracts or agreements with the designated PRS and other qualified research specialists. The project owner shall maintain these files for a period of three years after project completion and approval of the CPM-approved paleontological resource report (see Condition of Certification **PAL-7**). The project owner shall be responsible for paying any curation fees charged by the museum for fossils collected and curated as a result of paleontological mitigation. A copy of the letter of transmittal submitting the fossils to the curating institution shall be provided to the CPM.

PAL-7 The project owner shall ensure preparation of a Paleontological Resources Report (PRR) by the designated PRS. The PRR shall be prepared following completion of the ground-disturbing activities. The PRR shall include an analysis of the collected fossil materials and related information and submit it to the CPM for review and approval.

The report shall include, but is not limited to, a description and inventory of recovered fossil materials; a map showing the location of paleontological resources encountered; determinations of sensitivity and significance; and a statement by the PRS that project impacts to paleontological resources have been mitigated below the level of significance.

Verification: Within 90 days after completion of ground-disturbing activities, including landscaping, the project owner shall submit the PRR under confidential cover to the CPM.

Certification of Completion
Worker Environmental Awareness Program
Orange Grove Power Plant Project (08-AFC-4)

This is to certify these individuals have completed a mandatory California Energy Commission-approved Worker Environmental Awareness Program (WEAP). The WEAP includes pertinent information on cultural, paleontological, and biological resources for all personnel (that is, construction supervisors, crews, and plant operators) working on site or at related facilities. By signing below, the participant indicates that he/she understands and shall abide by the guidelines set forth in the program materials. Include this completed form in the Monthly Compliance Report.

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Cultural Trainer:_____ Signature: _____ Date: ___/___/___

PaleoTrainer: _____ Signature: _____ Date: ___/___/___

Biological Trainer: _____ Signature: _____ Date: ___/___/___

REFERENCES

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POWER PLANT EFFICIENCY

Testimony of Erin Bright

SUMMARY OF CONCLUSIONS

The Orange Grove project, if constructed and operated as proposed, would generate a nominal 96 MW of peak electric power. While the project would consume substantial amounts of energy, with an overall project fuel efficiency of approximately 38% lower heating value (LHV) at maximum full load, it would do so in the most efficient manner practicable. The project would not require additional sources of energy supply, would not consume energy in a wasteful or inefficient manner, and would not create significant adverse impacts on energy supplies or resources.

INTRODUCTION

The Energy Commission makes findings as to whether energy use by the Orange Grove project would result in significant adverse impacts on the environment, as defined in the California Environmental Quality Act (CEQA). If the Energy Commission finds that Orange Grove's consumption of energy would create a significant adverse impact, it must determine whether there are any feasible mitigation measures that could eliminate or minimize the impacts. In this analysis, staff addresses the possibility of inefficient and unnecessary consumption of energy.

In order to support the Energy Commission's findings, this analysis will:

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

LAWS, ORDINANCES, REGULATIONS, AND STANDARDS

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

SETTING

Orange Grove Energy, L.P. (Orange Grove Energy) proposes to construct and operate a 96-MW (nominal net output) natural gas fired, simple cycle electrical generating facility in rural San Diego County, California. The Orange Grove project (Orange Grove) would provide peaking power to the San Diego region to support local reliability as a response to a Request for Offers by San Diego Gas & Electric Company (SDG&E).

The applicant intends to operate each of the plant's two GE LM6000PC SPRINT combustion turbine generators no more than 3,200 engine hours per year (6,400 engine hours total), or approximately 36.5% of the year (OGE2008a, AFC §§ 2.3). Each

combustion turbine generator would utilize a mechanical inlet air chiller with a packaged three-cell cooling tower to maintain maximum output and efficiency at escalated temperatures. Natural gas would be conveyed to the plant via a new 10-inch diameter pipeline, 2.4-miles long, to connect with an SDG&E gas transmission main (OGE2008a, AFC §§ 2.1, 2.5.2).

ASSESSMENT OF IMPACTS

METHOD AND THRESHOLD FOR DETERMINING SIGNIFICANCE OF ENERGY RESOURCES

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" (Cal. Code Regs., tit. 14, § 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 wasteful, inefficient, and unnecessary consumption of energy (Cal. Code regs., tit. 14, § 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.

PROJECT ENERGY REQUIREMENTS AND ENERGY USE EFFICIENCY

At full load operation, Orange Grove is expected to consume natural gas at a rate of 860 million Btu per hour LHV (OGE2008a, AFC Table 2.3-2; Appendix 2C, Figure 2C-1). This is a substantial rate of energy consumption and could potentially impact energy supplies. Under expected project conditions, electricity would be generated at a thermal efficiency of approximately 38% LHV at full load operation (OGE2008a, AFC Table 2.3-2; Appendix 2C, Figure 2C-1).

ADVERSE EFFECTS ON ENERGY SUPPLIES AND RESOURCES

The applicant has described its sources of supply of natural gas for the project in the Application for Certification (OGE2008a, AFC §§ 1.1, 1.5.2, 2.1, 2.5.2). Natural gas for Orange Grove would be supplied by a new 10-inch diameter natural gas transmission pipeline that would connect the plant site to an existing SDG&E gas main. The pipeline would be constructed by Orange Grove Energy, but only the onsite portion would be owned, operated and maintained by Orange Grove Energy. SDG&E would own, operate and maintain the portion of the pipeline running from the main line to the site's metering

station. The SDG&E natural gas supply represents an adequate source for a project of this size; it is highly unlikely that the project could pose a significant adverse impact on natural gas supplies in California.

ADDITIONAL ENERGY SUPPLY REQUIREMENTS

Natural gas fuel would be supplied to the project by SDG&E via a new 10-in diameter high pressure pipeline (OGE2008a, AFC §§ 1.1, 1.5.2, 2.1, 2.5.2). SDG&E is a resource with adequate delivery capacity for a project of this size. There is no real likelihood that Orange Grove would require the development of additional energy supply capacity.

COMPLIANCE WITH ENERGY STANDARDS

No standards apply to the efficiency of Orange Grove or other non-cogeneration projects.

ALTERNATIVES TO REDUCE WASTEFUL, INEFFICIENT, AND UNNECESSARY ENERGY CONSUMPTION

Orange Grove could be deemed to create significant adverse impacts on energy resources if alternatives existed that would reduce the project's use of fuel. Evaluation of alternatives to the project that could reduce wasteful, inefficient, or unnecessary energy consumption first requires examination of the project's energy consumption. Project fuel efficiency, and therefore its rate of energy consumption, is determined by the configuration of the power producing system and by the selection of equipment used to generate power.

Project Configuration

The project objective is to provide additional peak electricity generation to the San Diego region in response to a request for offers by SDG&E. The applicant expects that Orange Grove would operate mostly to meet peak demand and provide local reliability service, allowing SDG&E to meet resource adequacy requirements (OGE2008a, AFC § 1.2, 2.1, 2.3). A simple cycle configuration is consistent with and supports this expectation due to its operating flexibility.

Orange Grove would be configured as two simple cycle power plants in parallel, in which electricity is generated by one natural gas-fired combustion turbine generator (CTG) per plant, two combustion turbine generators total. This configuration, with its short start-up time and fast ramping[1] capability, is well suited to providing peaking power. Further, when reduced output is required, one of the turbine generators can be shut down, allowing the remaining machine to produce half of the full power at optimum efficiency, rather than operating a single, larger machine at an inefficient part load output.

The applicant intends for this facility to operate in peaking duty up to a total of 6,400 engine hours for the two CTGs (3,200 hours per turbine operating at full load). This is equivalent to both of the turbines operating approximately 36.5% of the year (OGE2008a, AFC § 2.3, 2.4; Table 2.3-2). While the applicant may design the project,

[1] "Ramping" is increasing and decreasing electrical output to meet fluctuating load requirements.

and acquire air emissions offsets, to operate several thousand hours annually, history shows that actual dispatch will likely limit project operation to only two hundred or three hundred hours annually (the historical average capacity factor of peaker plants in California is less than 5%[2]).

Equipment Selection

Modern gas turbines embody the most fuel-efficient electric generating technology available today. The applicant would employ two General Electric LM6000PC SPRINT gas turbine generators (OGE2008a, AFC § 1.1, 2.3.1). The LM6000PC SPRINT gas turbine to be employed at Orange Grove represents one of the most modern and efficient such machines now available. The SPRINT version of this machine is nominally rated at 50 MW and 40.3% efficiency LHV at ISO[3] conditions (GTW 2008). This rating differs from the projected efficiency for Orange Grove of 38% LHV because of efficiency losses from parasitic loads and increased flow losses due to the selective catalytic reduction units used on the exhaust of each unit.

Efficiency of Alternatives to the Project

Alternative Generating Technologies

Alternative generating technologies for Orange Grove are considered in the AFC (OGE2008a, AFC § 5.6). Fossil fuels (oil and coal), biomass, geothermal, hydroelectric, solar, and wind technologies are all considered. Biomass and fossil fuels other than natural gas cannot meet air quality limitations. Renewables require more physical area and are not always available when peaking power is needed. Given the project objectives, location, and air pollution control requirements, staff agrees with the applicant that only natural gas-burning technologies are feasible.

Natural Gas-Burning Technologies

Fuel consumption is one of the most important economic factors in selecting an electric generator; fuel typically accounts for over two-thirds of the total operating costs of a fossil-fired power plant (Power 1994). Under a competitive power market system, where operating costs are critical in determining the competitiveness and profitability of a power plant, the plant owner is thus strongly motivated to purchase fuel-efficient machinery.

Capital cost is also important in selecting generating machinery. Recent progress in the development of gas turbines, incorporating technological advances made in the development of aircraft (jet) engines, combined with the cost advantages of assembly-line manufacturing, has made available machines that not only offer the lowest available fuel costs, but at the same time sell for the lowest per-kilowatt capital cost.

The applicant plans to employ two General Electric LM6000PC SPRINT gas turbine generators (OGE2008a, AFC § 1.1, 2.3.1). The SPRINT version of this machine is

[2] As shown in Efficiency Table 1 of the Final Staff Assessment for the Chula Vista Energy Upgrade Project (Docket 07-AFC-4).

[3] International Standards Organization (ISO) standard conditions are 15°C (59°F), 60% relative humidity, and one atmosphere of pressure (equivalent to sea level).

nominally rated at 50 MW and 40.3% efficiency LHV at ISO[4] conditions (GTW 2008). (Staff compares alternative machines' ISO ratings as a common baseline, since project-specific ratings are not available for the alternative machines.) Alternative machines that can meet the project's objectives are the SGT-800 and FT8 TwinPac which, like the LM6000, are aeroderivative machines, adapted from Siemens Power Generation and Pratt & Whitney aircraft engines, respectively.

The Siemens SGT-800 gas turbine generator in a simple cycle configuration is nominally rated at 47 MW and 37.5% LHV at ISO conditions (GTW 2008).

The Pratt & Whitney FT8 TwinPac gas turbine generator in a simple cycle configuration is nominally rated at 51 MW and 38.4% LHV at ISO conditions (GTW 2008).

Machine	Generating Capacity (MW)	ISO Efficiency (LHV)
GE LM6000PC SPRINT	**50**	**40.3 %**
Siemens SGT-800	47	37.5 %
P & W FT8 TwinPac	51	38.4 %

Source: GTW 2008

The LM6000PC SPRINT is further enhanced by the incorporation of spray intercooling (thus the name, SPRay INTercooling). This takes advantage of the aeroderivative machine's two-stage compressor.[5] By spraying water into the airstream between the two compressor stages, the partially compressed air is cooled, reducing the amount of work that must be performed by the second stage compressor. This reduces the power consumed by the compressor, yielding greater net power output and higher fuel efficiency. The benefits in generating capacity and fuel efficiency increase with rising ambient air temperatures (GTW 2000).

While the LM6000 enjoys a slight advantage in fuel efficiency over the alternative machines, any differences among the three in actual operating efficiency would be relatively insignificant. Other factors such as generating capacity, cost, and ability to meet air pollution limitations are some of the factors considered in selecting the turbine model.

Inlet Air Cooling

A further choice of alternatives involves the selection of gas turbine inlet air-cooling methods.[6] The two commonly used techniques are the evaporative cooler, or fogger, and the chiller (mechanical or absorption); both techniques increase power output by cooling the gas turbine inlet air. In general terms, a mechanical chiller can offer greater power output than the evaporative cooler on hot, humid days, but consumes electric

4 International Standards Organization (ISO) standard conditions are 15°C (59°F), 60% relative humidity, and one atmosphere of pressure (equivalent to sea level).

5 The larger industrial type gas turbines typically are single-shaft machines, with single-stage compressor and turbine. Aeroderivatives are two-shaft (or, in some cases, three-shaft) machines, with two-stage (or three-stage) compressors and turbines.

6 A gas turbine's power output decreases as ambient air temperatures rise. The LM6000 SPRINT produces peak power at 50°F; this peak output can be maintained in much hotter weather by cooling the inlet air.

power to operate its refrigeration process, thus slightly reducing overall net power output and, thus, overall efficiency. An absorption chiller uses less electric power, but necessitates the use of a substantial inventory of ammonia. An evaporative cooler or a fogger boosts power output best on dry days; it uses less electric power than a mechanical chiller, possibly yielding slightly higher operating efficiency. The difference in efficiency among these techniques is relatively insignificant.

The applicant proposes to employ a mechanical chiller with a three-cell evaporative cooling tower to cool the chiller condensers (OGE2008a, AFC §§ 2.3.1, 5.10). Given the relative lack of clear superiority of one system over the other, staff agrees that the applicant's approach would yield no significant adverse energy impacts. However, staff believes that the dry cooling option identified by the applicant (OGE2008a, AFC § 5.10), in which a dry cooling tower would replace the evaporative cooling tower for the chiller condensers, would also result in no significant adverse energy impacts, but would reduce other project impacts such as water use.

In conclusion, the project configuration (simple cycle) and generating equipment chosen appear to represent the most efficient feasible combination to satisfy the project objectives. There are no alternatives that could significantly reduce energy consumption.

CUMULATIVE IMPACTS

No nearby projects have been identified that could potentially combine with the Orange Grove project to create cumulative impacts on natural gas resources. SDG&E is a resource with adequate delivery capacity for a project of this size. Staff believes the SDG&E system is capable of supplying Orange Grove without adversely impacting its other natural gas customers.

NOTEWORTHY PROJECT BENEFITS

The applicant expects Orange Grove to help meet anticipated local electricity generation requirements for the San Diego region. By doing so in a fuel-efficient manner with GE LM6000 SPRINT gas turbines, one of the most modern and efficient such machines now available, the Orange Grove project would benefit electric consumers in California.

CONCLUSIONS

The project, if constructed and operated as proposed, would generate a nominal 96 MW of peaking electric power, at an overall project fuel efficiency of approximately 38% LHV at maximum full load. While it would consume substantial amounts of energy, it would do so in the most efficient manner practicable. 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 the project. Staff therefore concludes that the project would present no significant adverse impacts upon energy resources. No cumulative impacts on energy resources are likely.

PROPOSED CONDITIONS OF CERTIFICATION

No conditions of certification are proposed.

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POWER PLANT RELIABILITY

Testimony of Erin Bright

SUMMARY OF CONCLUSIONS

The applicant predicts an equivalent availability factor of 97.7%, which staff believes is achievable. Based on a review of the proposal, staff concludes that the Orange Grove project would be built and operated in a manner consistent with industry norms for reliable operation. This should provide an adequate level of reliability. No conditions of certification are proposed.

INTRODUCTION

In this analysis, Energy Commission staff addresses the reliability issues of the proposed Orange Grove project to determine if the power plant is likely to be built in accordance with applicable laws, ordinances, regulations, and standards (LORS) and with typical industry norms for reliability of power generation. Staff uses this level of reliability as a benchmark because it ensures that the resulting project would likely not 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 applicable LORS and with typical industry norms for reliability of power generation. While Orange Grove Energy, L.P. has predicted an equivalent availability factor approaching 98% for the Orange Grove project (Orange Grove) (see below), staff uses typical industry norms as a benchmark, rather than the applicant's projection, to evaluate the project's reliability.

LAWS, ORDINANCES, REGULATIONS, AND STANDARDS

Although no federal, state, or local/county LORS apply to the reliability of this project, recently adopted laws and regulations influence the project's operational requirements (see "Setting," below).

SETTING

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 process; protocols have been developed and put in place allowing sufficient reliability to be maintained under the competitive market system. “Must-run” power purchase agreements and “participating generator” agreements, for example, are two mechanisms that have been employed to ensure an adequate supply of reliable power.

In September 2005, California AB 380 (Núñez, Chapter 367, Statutes of 2005) became law. This modification to the Public Utilities Code requires the California Public Utilities Commission to consult with the California ISO to establish resource adequacy requirements for all load-serving entities (basically, public and privately owned utility companies). These requirements include maintaining a minimum reserve margin (extra generating capacity to serve in times of equipment failure or unexpected demand) and maintaining sufficient local generating resources to satisfy the load-serving entity’s peak demand and operating reserve requirements.

In order to fulfill this mandate, the California ISO has begun to establish specific criteria for each load-serving entity under its jurisdiction. These criteria guide each load-serving entity in deciding how much generating capacity and ancillary services to build or purchase, after which the load-serving entity issues power purchase agreements to satisfy these needs. Orange Grove acquired its power purchase agreement from San Diego Gas and Electric Company (SDG&E) as a result of SDG&E’s plans to meet reliability requirements imposed by the California ISO.

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 would each exhibit a level of reliability similar to that of power plants of past decades. However, there has been valid cause to believe that, under free market competition, financial pressures on power plant owners to minimize capital outlays and maintenance expenditures may act to reduce the reliability of many power plants, both existing and newly constructed (McGraw-Hill 1994). It is possible that, if significant numbers of power plants were to exhibit individual reliability sufficiently lower than this historical level, the assumptions used by California ISO to ensure system reliability would prove invalid, with potentially disappointing results. 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 a 96-MW (nominal output) simple cycle peaking power plant to support increasing local demand in the San Diego region (OGE2008A, AFC §§ 1.2, 2.1, 2.3). Orange Grove is expected to achieve an equivalent availability factor of 97.7% (OGE2008A, AFC §§ 2.3.1, 2.10.1).

ASSESSMENT OF IMPACTS

METHOD FOR DETERMINING RELIABILITY

The Energy Commission must make findings as to the manner in which the project is to be designed, sited, and operated to ensure safe and reliable operation (Cal. Code Regs., tit. 20, § 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 the project exhibits reliability at least equal to that of other power plants on that system.

The equivalent availability factor for a power plant is the percentage of the time that it is available to generate power; both planned and unplanned outages subtract from its availability. Measures of power plant reliability are based on its actual ability to generate power when it is considered available and are affected by 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. Throughout its intended 25-year life (OGE2008A, AFC § 4.0), Orange Grove would be expected to perform reliably. Power plant systems must be able to operate for extended periods without shutting down for maintenance or repairs. Achieving this reliability is accomplished by ensuring 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 they compare favorably, staff can conclude that the power plant would be as reliable as other power plants on the electric system and would therefore not degrade system reliability.

EQUIPMENT AVAILABILITY

Equipment availability would be ensured by use of appropriate quality assurance/quality control (QA/QC) programs during 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

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 implementation of this program to yield typical reliability of design and construction. To ensure such implementation, staff has proposed appropriate conditions of certification under the **FACILITY DESIGN** section of this document.

PLANT MAINTAINABILITY

Equipment Redundancy

A peaking generating facility commonly offers adequate opportunity for maintenance work during its downtime; the applicant proposes to operate Orange Grove no more than 6,400 machine-hours per year, or about 36% of the year (OGE2008A, AFC §§ 2.3, 2.4). During periods of extended dispatch, however, as could occur if other major generating or transmission assets were disabled, the facility may be required to operate for extended periods. A typical approach for achieving reliability in such circumstances is to provide redundant examples of those pieces of equipment most likely to require service or repair.

The applicant plans to provide appropriate redundancy of function for the project. The fact that the project consists of two combustion turbine-generators operating in parallel as independent equipment trains provides inherent reliability. A single equipment failure cannot disable more than one train, thus allowing the plant to continue to generate (at reduced output). In addition, all plant ancillary systems are also designed with adequate redundancy to ensure continued operation in the face of equipment failure (OGE2008A, AFC §§ 2.10.1, 2.12; Table 2.3-1). Staff believes that equipment redundancy would be sufficient for a project such as this.

Maintenance Program

Equipment manufacturers provide maintenance recommendations with their products; the applicant would base its maintenance program on these recommendations. The program would encompass preventive and predictive maintenance techniques. Maintenance outages would be planned for periods of low electricity demand. In light of these plans, staff expects that the project would be adequately maintained to ensure acceptable reliability.

FUEL AND WATER AVAILABILITY

For any power plant, the long-term availability of fuel and of water for cooling or process use is necessary to ensure reliability. The need for reliable sources of fuel and water is obvious; lacking long-term availability of either source, the service life of the plant may be curtailed, threatening the supply of power as well as the economic viability of the plant.

Fuel Availability

Orange Grove would burn natural gas supplied by SDG&E. Natural gas fuel would be supplied to the project via a new 2.4 mile long, 10-inch diameter pipeline from SDG&E's existing T-1600 transmission line (OGE2008A, AFC §§ 1.1, 1.5.2, 2.1, 2.5.2). The SDG&E natural gas system represents a resource of considerable capacity and offers access to adequate supplies of gas. Staff agrees with the applicant's prediction that there would be adequate natural gas supply and pipeline capacity to meet the project's needs.

Water Supply Reliability

Orange Grove would obtain both recycled and fresh water from the Fallbrook Public Utility District and would have this water trucked in to the site. No water pipelines are planned. The applicant estimates that the plant would require two trucks, one each for recycled and fresh water, delivering once per hour to satisfy water needs during full load plant operation, approximately 60 days per year.

Recycled water would be stored in a 414,000 gallon water storage tank and would serve as cooling tower makeup to cool the gas turbine inlet air chillers. Fresh water would be stored in a 535,000 gallon water storage tank and would serve as makeup for various systems including sanitation, fire, and demineralized water. Demineralized water would be stored in a separate 100,000 gallon storage tank and would be used for gas turbine SPRINT injection water and combustor injection water for NOx emission control (OGE2008a, AFC §§ 1.1, 2.6.2). The water storage planned for the plant equates

to 45.4 hours of full load operation, or a little less than four 12-hour days. The applicant reports that some reclaimed water could be could be treated and used in place of fresh water, in the case of an interruption in water delivery, to allow for an additional 39.4 hours of full load operation, or a total of approximately seven 12-hour days of continuous full load operation (OGE2008a, AFC §§ 2.6.2, 2.10.1).

Staff believes these sources, given the on-site storage capacity, yield sufficient likelihood of a reliable supply of water. (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. High winds, tsunamis (tidal waves), and seiches (waves in inland bodies of water) would not likely represent a hazard for this project, but seismic shaking (earthquake) and flooding may present credible threats to reliable operation.

Seismic Shaking

The site lies in Seismic Risk Zone 4 and is located in a zone of seismic activity (OGE2008A, AFC § 6.3.1.5.2); see the **GEOLOGY AND PALEONTOLOGY** section of this document. The project would be designed and constructed to the Seismic Zone 4 standards of the latest appropriate LORS (OGE2008A, AFC §§ 2.10.3, 6.3.1).

Compliance with current LORS applicable to seismic design represents an upgrading of performance during seismic shaking compared to older facilities, due to the fact that these LORS have been periodically and continually upgraded. By virtue of being 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 **FACILITY DESIGN** section of this document. In light of the historical performance of California power plants and the electrical system in seismic events, staff believes there is no special concern with power plant functional reliability affecting the electric system's reliability due to seismic events.

Flooding

The site, except for a portion of the gas pipeline, does not lie within either a 100-year or 500-year floodplain (OGE2008A, AFC §§ 6.3.1.6.3, 6.5.2.1.2). Staff believes there should be no significant concerns with power plant functional reliability due to flooding. For further discussion, see the **SOIL AND WATER RESOURCES** and **GEOLOGY AND PALEONTOLOGY** sections of this Staff Assessment.

COMPARISON WITH EXISTING FACILITIES

The North American Electric Reliability Corporation (NERC) keeps industry statistics for availability factors (as well as many other related reliability data). NERC continually polls utility companies throughout the North American continent on project reliability data through its Generating Availability Data System and periodically summarizes and

publishes the statistics on the Internet (http://www.nerc.com). NERC reports the following summary generating unit statistics for the years 2002 through 2006 (NERC 2007):

- for Gas Turbine units (50 MW and larger):
  - Equivalent Availability Factor = 91.82%

The gas turbines that will be employed in the project have been on the market for several years and can be expected to exhibit typically high availability. The applicant's prediction of an annual availability factor approaching 98% (OGE2008A, AFC §§ 2.3.1, 2.10.1) appears reasonable compared to the NERC figure for similar plants throughout North America (see above). In fact, these new machines can well be expected to outperform the fleet of various (mostly older) gas turbines that make up the NERC statistics. Further, since the plant would consist of two parallel gas turbine generating trains, maintenance can be scheduled during those times of year when the full plant output is not required to meet market demand, typical of industry standard maintenance procedures. The applicant's estimate of plant availability, therefore, appears realistic. The stated procedures for assuring design, procurement, and construction of a reliable power plant appear to follow industry norms, and staff believes they are likely to yield an adequately reliable plant.

NOTEWORTHY PROJECT BENEFITS

The applicant proposes to provide peaking power to serve the needs of the San Diego Region, to meet SDG&E resource adequacy requirements, and to provide additional local generating capacity (OGE2008A, AFC §§ 1.2, 2.1, 2.3). The fact that the project consists of two combustion turbine generators configured as independent equipment trains provides inherent reliability. A single equipment failure cannot disable more than one train, thus allowing the plant to continue to generate (at reduced output). In light of this and the additional reliability-enhancing features of the project described above, the applicant's prediction of an equivalent availability factor approaching 98% appears achievable. Staff believes this should provide an adequate level of reliability.

CONCLUSION

Orange Grove predicts an equivalent availability factor of 97.7%, which staff believes is achievable. Based on a review of the proposal, staff concludes that the plant would be built and operated in a manner consistent with industry norms for reliable operation. This should provide an adequate level of reliability. No conditions of certification are proposed.

PROPOSED CONDITIONS OF CERTIFICATION

No conditions of certification are proposed.

REFERENCES

GE 2008 - General Electric website www.gepower.com, January 2008.

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

NERC 2007 - North American Electric Reliability Corporation. 2002–2006 Generating Availability Report, November 8, 2007.

OGE2008a – OGE/S. Thome (tn46770). Application for Certification Orange Grove Energy dated 6/19/08. Submitted to Dockets 6/19/08.

TRANSMISSION SYSTEM ENGINEERING

Testimony of Ajoy Guha, P. E. and Mark Hesters

SUMMARY OF CONCLUSIONS

The proposed interconnection facilities for the Orange Grove Project (OGP) including the direct interconnection facilities (the 69 kV switchyard, the generator underground cable tie line to the existing San Diego Gas &Electric (SDG&E) Pala 69 kV substation and its termination),as well as the SDG&E network upgrades and changes would be adequate in accordance with industry standards and good utility practices, and are acceptable to staff according to engineering Laws, Ordinances, Regulations and Standards (LORS).

The System Impact Study (SIS) and Facilities Study (FS) report indicate that there would be adverse impacts on the SDG&E transmission system caused by the addition of the OGP. The interconnection of the OGP causes overloads violations under contingency conditions, as well as frequency and voltage deviations during transient system conditions due to faults. The mitigation plan identified in the SIS and FS report would eliminate the adverse impacts, and involves Special Protection Systems, downstream network upgrades. In order to comply with California Environmental Quality Act (CEQA) the downstream network upgrades, the reconductoring of the Pala-Monserate 69 kV line and one span of the Monserate-Monserate Tap 69 kV line with higher size conductors, require environmental analysis sufficient to meet the CEQA requirements for indirect project impacts.

The California Independent System Operator (California ISO) instead of issuing final approval letter would perform an Operational study/procedure examining the impacts of the OGP on the grid based on the expected May 31, 2009 Commercial operation date (COD).The OGP would, therefore, conform to the applicable laws, ordinances, regulations and standards (LORS) and CEQA review upon satisfactory compliance of the recommended Conditions of Certifications.

The OGP, as a local generator, would meet the increasing load demand in northern San Diego County, provide additional reactive power and voltage support in the local network, enhance reliability and may reduce system losses in the SDG&E local network.

INTRODUCTION

The Transmission System Engineering (TSE) analysis examines whether or not the facilities associated with the proposed interconnection conforms to all applicable LORS required for safe and reliable electric power transmission. Staff's analysis evaluates the power plant switchyard, outlet line, termination and downstream facilities identified by the applicant. Additionally, under the 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 (California Code of Regulations, title 14, §15378). Therefore, the Energy Commission must identify the system impacts and necessary new or modified transmission facilities downstream of the proposed interconnection that are required for interconnection and represent the "whole of the action." The

downstream network upgrade mitigation measures that will be required to maintain system reliability for the addition of the power plant, are used to identify the requirement for any general CEQA analysis.

Energy Commission staff relies on the interconnecting authority for the analysis of impacts on the transmission grid as well as the identification and approval of required new or modified facilities downstream from the proposed interconnection that would be required as mitigation measures. The proposed Orange Grove project would interconnect to the SDG&E transmission network and requires analysis by SDG&E and approval of the California ISO.

SDG&E'S ROLE

SDG&E is responsible for ensuring electric system reliability in the SDG&E system for addition of the proposed generating plant. SDG&E will provide the analysis and reports in their System Impact and Facilities studies, and their approval for the facilities and changes required in the SDG&E system for addition of the proposed transmission modifications.

CALIFORNIA ISO'S ROLE

The California ISO is responsible for ensuring electric system reliability for all participating transmission owners and is also responsible for developing the standards necessary to achieve system reliability. The California ISO will review the studies of the SDG&E system to ensure adequacy of the proposed transmission interconnection. The California ISO will determine the reliability impacts of the proposed transmission modifications on the SDG&E 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 will, therefore, review the System Impact Study (SIS) performed by SDG&E and/or any third party, provide their analysis, conclusions and recommendations. On satisfactory completion of the SDG&E Facility study and in accordance with the Large Generator Interconnection Procedure (LGIP) in the California ISO Tariff, the California ISO would execute the Large Generator Interconnection Agreement (LGIA) between the California ISO and the project owner. California ISO would then perform an Operational study examining the impacts of the project on the grid based on the expected 2009 COD. The California ISO may also provide written and verbal testimony on their findings at the Energy Commission hearings, if necessary.

LAWS, ORDINANCES, REGULATIONS AND STANDARDS (LORS)

- California Public Utilities Commission (CPUC) General Order 95 (GO-95), "Rules for Overhead Electric Line Construction," formulates uniform requirements for construction of overhead lines. Compliance with this order ensures adequate service and safety to persons engaged in the construction, maintenance and operation or use of overhead electric lines and to the public in general.
- California Public Utilities Commission General Order 128 (GO-128), "Rules for Construction of Underground Electric Supply and Communications Systems,"

formulates uniform requirements and minimum standards to be used for underground supply systems to ensure adequate service and safety to persons engaged in the construction, maintenance and operation or use of underground electric lines and to the public in general.

- The National Electric Safety Code, 1999 provides electrical, mechanical, civil and structural requirements for overhead electric line construction and operation.
- NERC/WECC Planning Standards: The Western Electricity Coordinating Council (WECC) Planning Standards are merged with the North American Electric Reliability Council (NERC) Planning Standards and provide the system performance standards used in assessing the reliability of the interconnected system. These standards require the continuity of service to loads as the first priority and preservation of interconnected operation as a secondary priority. Certain aspects of the NERC/WECC standards are either more stringent or more specific than the NERC standards alone. These standards provide planning for electric systems so as to withstand the more probable forced and maintenance outage system contingencies at projected customer demand and anticipated electricity transfer levels, while continuing to operate reliably within equipment and electric system thermal, voltage and stability limits. These standards include the 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 the 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 the results of power flow and stability simulations verify defined performance levels. Performance levels are defined by specifying the allowable variations in thermal loading, voltage and frequency, and loss of load that may occur on systems during various disturbances. Performance levels range from no significant adverse effects inside and outside a system area during a minor disturbance (loss of load or a single transmission element out of service) to a level that seeks to prevent system cascading and the subsequent blackout of islanded areas during a major disturbance (such as loss of multiple 500 kV lines along a common right of way, and/or multiple generators). While controlled loss of generation or load or system separation is permitted in certain circumstances, their uncontrolled loss is not permitted (WECC 2006).
- NERC Reliability Standards for the Bulk Electric Systems of North America provide national policies, standards, principles and guidelines to assure the adequacy and security of the electric transmission system. The NERC Reliability Standards provide for system performance levels under normal and contingency conditions. With regard to power flow and stability simulations, while these Reliability Standards are similar to NERC/WECC Standards, certain aspects of the NERC/WECC Standards are either more stringent or more specific than the NERC Standards for Transmission System Contingency Performance. The NERC Reliability Standards apply not only to interconnected system operation but also to individual service areas (NERC 2006).
- California ISO Planning Standards also provide standards, and guidelines to assure the adequacy, security and reliability in the planning of the California ISO transmission grid facilities. The California ISO Grid Planning Standards incorporate

the NERC/WECC and NERC Reliability Planning Standards. With regard to power flow and stability simulations, these Planning Standards are similar to the NERC/WECC or NERC Reliability Planning Standards for Transmission System Contingency Performance. However, the California ISO Standards also provide some additional requirements that are not found 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 when there are any impacts to the California ISO grid due to facilities interconnecting to adjacent controlled grids not operated by the California ISO (California ISO 2002a).

- California ISO/Federal Energy Regulatory Commission (FERC) Electric Tariff provides guidelines for construction of all transmission additions/upgrades (projects) within the California ISO controlled grid. The California ISO determines the "Need" for the proposed project where it will promote economic efficiency or maintain system reliability. The California ISO also determines the Cost Responsibility of the proposed project and provides an Operational Review of all facilities that are to be connected to the California ISO grid (California ISO 2007a).

PROJECT DESCRIPTION

The OGP would be located in an 8.5-acre site within the existing 202-acre property owned by SDG&E north State Route 76 and Pala Del Norte Road, and east of Interstate 15 in rural north San Diego County. The OGP plant will consist of two natural gas-fired combustion turbine generator (CTG) units (General Electric LM 6000 model) operating in simple cycle mode with a total 96 MW nominal output. Each CTG unit rated 71.2 MVA, 13.8 kV would be connected through a 3,000-ampere segregated bus duct and a 3,000-ampere, 13.8 kV breaker to the low voltage terminal of a dedicated 45/60/75 MVA, 13.8/69 kV generation step-up (GSU) transformer with a specified impedance of 8.00% @45 MVA (OGE2008a, pages 3-2 and 3-3).

SWITCHYARD AND INTERCONNECTION FACILITIES

The new OGP 69 kV switchyard is proposed as a 2,000-ampere single bus arrangement with three 1,200-ampere 69 kV circuit breakers. Two of the breakers would be connected by short overhead conductors to the high voltage terminals of the respective GSU transformer. The remaining breaker would be used for the new 69 kV underground transmission cable connecting to the existing SDG&E Pala 69 kV substation (OGE2008a, pages 3-2 and 3-3).

The new OGP 69 kV switchyard would be interconnected to the Pala substation 69 kV bus by building a new 0.3-mile long 1,750 kcmil aluminum cross-linked polyethylene (XLPE) 69 kV underground cable line . The cable would be installed within PVC conduits in an underground raceway system encased with concrete and be located in a 20-foot wide right- of-way within the existing SDG&E site. The length of the underground cable within the Pala substation boundary would be 150 feet, if the OGP (queue position # 201) interconnects after the higher generation queue project #173 (a 49.9 MW generator) interconnects at the Pala substation. However, the length of the underground cable inside the Pala substation boundary would be 250 feet, if the OGP interconnects before queue project #173 or queue project #173 withdraws from the

queue. The applicant would build, own and operate the OGP 69 kV switchyard.and the 69 kV interconnection underground cable (OGE2008a, pages 3-2 and 3-3).

The interconnection underground cable would be terminated at the 69 kV Pala substation by building a new 69 kV switch bay. If the OGP interconnects before the queue project #173 or queue project #173 withdraws from the queue, then extension of the existing 2,000-ampere Pala substation bus would be necessary. The new switch bay would consist of a 2,000-ampere 69 kV breaker with two 2,000-ampere disconnect switches. SDG&E would build, own and operate the interconnecting facilities within the fence line of the Pala substation including the new 69 kV switch bay and the new 150 or 250-foot portion of the underground cable ((OGE2008a, pages 3-2 and 3-3)).

The configuration of the OGP 69 kV switchyard, the generator underground cable tie line to the existing SDG&E Pala substation and its termination is in accordance with industry standards and good utility practices, and is acceptable to staff.

TRANSMISSION SYSTEM IMPACT ANALYSIS

For the interconnection of a proposed generating unit or transmission facility to the grid, the interconnecting utility and the control area operator are responsible for ensuring grid reliability. For the OGP, SDG&E and California ISO are responsible for ensuring grid reliability. In accordance with the FERC/California ISO/Utility Tariffs, System Impact and Facilities Studies are conducted to determine the preferred and alternate interconnection methods to the grid, the downstream transmission system impacts and the mitigation measures needed to ensure system conformance with performance levels required by the utility reliability criteria, NERC planning standards, WECC reliability criteria, and California ISO reliability criteria. Staff relies on the studies and any review conducted by the responsible agencies to determine the effect of the 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 (NERC 2006, WECC 2006, California ISO 2002a and 2007a).

The System Impact and Facilities Studies analyze the grid with and without the proposed 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 by which grid reliability is determined. The studies must analyze the impact of the project for the proposed first year of operation and thus are based on a forecast of loads, generation and transmission. Load forecasts are developed by the interconnected utility, which would be SDG&E in this case. Generation and transmission forecasts are established by an interconnection queue. The studies are focused 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 duties.

If the studies show that the interconnection of the project causes the grid to be out of compliance with reliability standards, the study will then identify mitigation alternatives or ways in which the grid could be brought into compliance with reliability standards. If the interconnecting utility determines that the only feasible mitigation includes transmission modifications or additions which require CEQA review as part of the

"whole of the action," the Energy Commission must analyze those modifications or additions according to CEQA requirements.

SCOPE OF SYSTEM IMPACT STUDY AND FACILITIES STUDY

The October 22, 2007 System Impact Study (SIS) was prepared by the California ISO in coordination with SDG&E to evaluate the impact of the proposed OGP plant to the Pala substation 69 kV bus. Based on the estimated COD of May, 2008, the study was conducted with a 2008 summer peak case and a 2008-09 light winter case derived from the WECC full-loop base cases. A future year analysis was also performed using a 2012 summer peak case derived from the annual California ISO Transmission Expansion Plan. The 2008 summer peak base cases were prepared with and without the proposed OGP 99 MW generation output with a 1-in-10 year heat wave SDG&E summer peak load forecast (4,742 MW) and assumed an import level of 2,833 MW. The 2008-09 light winter cases were prepared with an off-peak SDG&E load forecast (38% of the peak load or 1,778 MW) and imports of 848 MW. The 2012 summer peak case was prepared with 1-in-10 year heat wave SDG&E load forecast (4,981 MW) and import of 3,584 MW. Each of the base cases included planned California ISO approved transmission upgrades that would be operational by 2007/2008, and all queue generation higher than the OGP, including queue project #173 interconnected at the Pala 69 kV substation. The 2012 summer peak case also included the expected impacts of the California Solar initiative (60 MW load reduction) and the Demand Response programs (29 MW load reduction). The study included power flow analysis, a short circuit analysis and a transient stability analysis. According to the mutual agreement between the power plant owner, the California ISO and SDG&E, post-transient voltage and reactive power deficiency analyses were waived for the OGP because no negative impacts were expected (TRC2008d).

The May 2, 2008 Facilities Study (FS), prepared by the California ISO in coordination with SDG&E, considered the estimated COD delayed to May, 2009 and conducted additional power flow analyses, re-examined transient stability analysis with revised machine data (TRC2008c). The FS also determined the scope of work and cost estimates considering that the OGP may interconnect to the SDG&E network under the following three possible scenarios:

- After queue project #173.
- Before queue project #173.
- If queue project #173 withdraws from the queue.

The scope of work and cost estimates included the OGP generation tie line and its termination at the Pala substation, and the necessary downstream delivery network upgrades in the SDG&E system, assuming SDG&E would engineer, construct, own and maintain the interconnecting facilities and its termination within the Pala substation and the downstream delivery network upgrades and changes (OGP SIS, FS Tables 8.1, 8.2 & 8.3.).

POWER FLOW STUDY RESULTS AND MITIGATION

The SIS and FS demonstrate that the OGP generation output would not cause any normal (N-0) overload or voltage criteria violations for any of the 2008 or 2012 system conditions studied with all transmission facilities in service. However, under certain

contingency conditions the existing SDG&E transmission facilities were unable to reliably accommodate interconnection of the OGP and downstream delivery network upgrades would be required to maintain reliability. The Power flow study results are tabulated in Tables 6.1 & 6.2 of the SIS (OGE2008d).

The SIS identified the following overloads due to the addition of the proposed OGP under certain contingencies and corresponding mitigation measures:

- Pala-Monserate Tap 69 kV line: New overloads ranging from 178-197% were identified on the line during the 2008 and 2012 system conditions studied, for the single (N-1) contingency of the Lilac-Pala 69 kV line. New overloads ranging from 118-181% were also identified on the line during the 2008 and 2012 system conditions studied, for the Category C (N-2) contingency of the Lilac 69 kV S bus.

  Mitigation: Reconductoring the line with 636 kcmil ACSS (Aluminum conductor steel supported) conductor, replacing the Pala substation getaways with 3,000 kcmil copper conductor and changing relay settings at Pala substation for the line. Staff considers the mitigation acceptable.

- Monserate-Monserate Tap 69 kV line: New overloads ranging from 133-160% were identified on the line during the 2008 and 2012 system conditions studied, due to the single (N-1) contingency of the Lilac-Pala 69 kV line. A new overload of 147% were also identified on the line during the 2008 light winter system conditions for the Category C contingency of the Lilac 69 kV S bus.

  Mitigation: Replacing Monserate substation getaways with 3,000 kcmil copper conductor and reconductoring one span of the line with 636 kcmil ACSS. Staff considers the mitigation acceptable.

- Monserate-Avocado Tap 69 kV line: A new overload of 110% was identified on the line during the 2008 light winter system conditions for the single (N-1) contingency of the Lilac-Pala 69 kV line.

  Mitigation: Changing relay settings at Monserate 69 kV substation for the line. Staff considers the mitigation acceptable.

- Pala-Lilac 69 kV line: New overloads ranging from 171-189% were identified on the line during the 2008 and 2012 system conditions studied, for the single (N-1) contingency of the Avocado-Monserate 69 kV line. New overloads ranging from 171 to 189% were also identified on the line during the 2008 and 2012 system conditions studied, for the double (N-2) contingencies of the Penasquitos-Escondido #1& #2 230 kV lines.

  Mitigation: Replacing the Pala substation getaways with 3,000 kcmil copper conductor and the 69 kV breaker for the line at the Lilac 69 kV substation. Changing relay settings for the line at the Pala and Lilac 69 kV substations. A SDG&E project is scheduled to upgrade the existing 69 kV breaker at the Lilac 69 kV substation for the line in June, 2008. Staff considers the mitigation acceptable.

- Warners- Rincon 69 kV line: A new overload of 110% was identified on the line during the 2012 system summer peak conditions for the single (N-1) contingency of the Creelman-Sycamore 69 kV line.

Mitigation: Installing a Special Protection Scheme (SPS) to trip Warners-Santa Ysabel 69 kV line during the contingency overload of the Warners-Rincon 69 kV line and subsequently curtail OGP generation, if necessary. The SPS will be temporary until the line is reconductored or further evaluated by SDG&E. Staff considers the mitigation acceptable.

- Rincon-Lilac 69 kV line: A new overloads of 106% were identified on the line during the 2012 system summer peak conditions for the single (N-1) contingency of the Felicita-Valley Center 69 kV line.

  Mitigation: Installing a SPS to trip the Warners-Ricon 69 kV line during the contingency overload of the Rincon-Lilac 69 kV line and subsequently curtail OGP generation, if necessary. The SPS will be temporary until the line is reconductored or further evaluated by SDG&E. Staff considers the mitigation acceptable.

The FS determined that the downstream SDG&E network upgrades would remain same as above if the OGP interconnects before or after queue project #173. If the queue 173 withdraws from the queue and the OGP interconnects, then the SDG&E network upgrades as stated above for the overload violations at the Monserate-Avocado Tap and Rincon-Lilac 69 kV lines would not be required for the OGP interconnection (TRC2008c, pages 4-8).

SHORT CIRCUIT STUDY RESULTS

Three line-to-ground and single line-to-ground faults were simulated with and without the OGP to determine if there are any overstressed circuit breakers in the project vicinity caused by the addition of the project. Study results indicate no circuit breaker fault duty violations attributable to the OGP. The study determined that the OGP is not responsible for mitigation of any pre-project overstressed breakers. SDG&E has various planned projects to mitigate the pre-project overstressed breakers. The short circuit analysis results are shown in the Appendix G of the SIS (TRC2008d, Appendix G).

TRANSIENT STABILITY STUDY RESULTS AND MITIGATION

Transient stability analysis is performed to determine whether the transmission system would remain stable with the addition of the OGP. SDG&E performed the analysis for the 2008 summer peak and 2008-09 light winter system conditions with simulated faults under selected critical contingencies. Both the SIS and FS results concluded that the transmission system would remain stable for all contingency simulations studied, but there are frequency and voltage criteria violations. If queue project #173 is interconnected, there are frequency and voltage criteria violations at the 69 kV Pala substation bus in both pre and post-project cases, and frequency criteria violations at the queue project #173-13.8 kV generator bus in the post-project case. For the pre-project frequency criteria violations, queue project #173 is responsible for mitigation. If queue project #173 is not interconnected, there are frequency deviation violations at the OGP 69 kV, OGP 13.8 kV and Pala substation 69kV buses (TRC2008c, page 9).

Mitigation: The FS determined that whether or not queue #173 is interconnected, the OGP must implement a protection scheme in their plant that will utilize its own equipment protection relays for tripping the OGP generators in order to eliminate the

identified frequency and voltage deviation violations in the SDG&E system and for faults at the Pala substation 69 kV bus. Staff concurs with the mitigation (TRC2008c, page 9).

CALIFORNIA ISO REVIEW

In accordance with the provisions of the LGIP as in the California ISO Tariff, the California ISO in coordination with SDG&E performed the October 22, 2007 SIS and the May 2, 2008 FS. The studies evaluated the system impacts of the proposed 96 MW net generation output from the OGP to the SDG&E Pala 69 kV substation (with and without queue project #173) and determined the mitigation measures needed to eliminate the adverse impacts. The FS determined the scope of work and cost estimates for the interconnection and downstream SDG&E delivery network upgrade transmission facilities, which include reconductoring the Pala-Monserate 69 kV line and one span of the Monserate-Monserate Tap 69 kV line. The California ISO suggested that in order to get an exemption from the California Public Utility Commission's (CPUC) GO-131-D permit required by SDG&E and thereby expediting CPUC approval to proceed for construction of the network upgrades, the power plant owner as part of their AFC may provide the full scope of SDG&E network upgrade facilities along with the Environmental Analysis reports according to the CEQA review to the lead agency, in this case the Energy Commission.

In order to expedite the construction schedule with a longer lead time to accommodate the proposed in-service date of April 1, 2009, the California ISO also proposed that the power plant owner has the option to sign an Engineering and Procurement (E&P) Agreement with SDG&E to begin design and procurement phases for the interconnection and network upgrade facilities. Per section 9 of the LGIP, such E &P Agreement may be utilized by the project owner prior to the execution of the LGIA for the OGP between the California ISO and the project owner (TRC2008c, pages 40, 41).

Further the California ISO instead of issuing the final approval letter, would perform an Operational study/Procedure examining the impacts of the OGP generation output on the SDG&E grid based on the expected May 31, 2009 COD.

Performance of the Operational study/Procedure based on 2009 COD and execution of the LGIA would ensure system reliability in the California ISO grid and compliance with WECC/NERC and California ISO Planning standards (WECC 2006, NERC 2006, California ISO 2002a and 2007a).

DOWNSTREAM FACILITIES

Besides the interconnection facilities which include the new OGP 69 kV switchyard and the proposed new 69 kV underground cable tie line between the OGP 69 kV switchyard and the Pala 69 kV substation, accommodating the interconnection of the OGP at the Pala substation 69 kV bus would require installation of a new 69 kV switch bay consisting of a 2,000-ampere breaker with two 2,000-ampere disconnect switches It will be necessary to extend the 69 kV Pala substation bus in case the OGP interconnects before queue project #173 or queue project #173 withdraws from the queue. The construction for the Pala Substation expansion would be done by SDG&E within the existing fence line of the Pala substation.

Further, to maintain reliability in the SDG&E transmission network for the addition of the OGP, it would be necessary to reconductor the Pala-Monserate 69 kV line and one span of the Monserate-Monserate Tap 69 kV line with higher size conductor. SDG&E would be responsible for reconductoring the lines which would occur within the existing SDG&E right-of way between the Monserate and Pala substations with some adjacent temporary laydown and stringing sites. The remaining network upgrades according to the mitigation plan would be done by SDSG&E within the fence line of the SDG&E substations.

CUMULATIVE IMPACTS

Since the OGP as a local generation is being connected to the rural sparse 69 kV subtransmission network with long transmission lines, staff believes that the OGP generation would create some cumulative effects in the area network.

The cumulative marginal impacts due to the OGP, as identified in the SIS and FS, would be mitigated. Staff also believes that there would be some positive impacts because the OGP as a local generation would meet the increasing load demand in the northern San Diego County, provide additional reactive power and voltage support in the local network, enhance reliability and may reduce system losses in the SDG&E local network.

ALTERNATIVE TRANSMISSION ROUTES

The new OGP 69 kV switchyard would be interconnected to the existing SDG&E Pala substation 69 kV bus by building a new 0.3-mile 69 kV underground cable tie line that would follow the shortest and economic route with least infrastructure improvement through a 20-foot right-of-way within the existing SDG&E property. An alternate transmission interconnection to a 230 kV line away from the Pala substation in the area would involve construction of longer overhead lines in a new right-of-way with a new substation with more environmental impacts and higher costs. As such the transmission line or route selected by the applicant being shortest and economic is permissible under the provisions of CEQA (OGE2008a, pages 3-2 and 3-3).

CONFORMANCE WITH LORS AND CEQA REVIEW

The proposed new interconnecting facilities, the OGP 69 kV switchyard, the generator underground cable tie to the existing SDG&E Pala 69 kV substation and its termination, and SDG&E network upgrades and changes would be built according to the NESC standards, and GO-95 and GO-128 Rules. The new facilities and changes would be adequate in accordance with industry standards and good utility practices, and are acceptable to staff according to engineering LORS. The CPV Sentinel project would, therefore, meet the requirements and standards of all applicable LORS and CEQA review upon satisfactory compliance of the Conditions of Certifications (OGE2008a, table 3.3-1).

RESPONSE TO AGENCY AND PUBLIC COMMENTS

No agency or public comments related to the TSE discipline have been received.

CONCLUSIONS AND RECOMMENDATIONS

The proposed new interconnecting facilities, the OGP 69 kV switchyard, the generator underground cable tie line to the existing SDG&E Pala 69 kV substation and its termination, and SDG&E network upgrades and changes would be built according to the NESC standards, and GO-95 and GO-128 Rules. The new facilities and changes would be adequate in accordance with industry standards and good utility practices, and are acceptable to staff according to engineering LORs. The applicant's submission of a California ISO Operational Study report and the execution of LGIA would ensure system reliability in the California ISO grid and conformance with the reliability LORS.

The SIS and FS demonstrate that the addition of the OGP would cause some adverse impacts on the SDG&E system. OGP causes overload violations under certain emergency contingency conditions, and for frequency and voltage deviations during transient system conditions due to faults. The mitigation plan described in the SIS and FS would be adequate to eliminate the adverse impacts and involves installation of SPSs, and downstream network upgrades and changes in the SDG&E system including reconductoring of the Pala-Monserate 69 kV line and one span of the Monserate-Monserate Tap 69 kV line with higher size conductor, and a relay protection scheme in the OGP plant.

The OGP would, therefore, conform to the applicable LORS and CEQA review upon satisfactory compliance of the recommended Conditions of Certifications.

The OGP as a local generation would meet the increasing load demand n the rural northern San Diego County, provide additional reactive power and voltage support in the local network, enhance reliability and may reduce system losses in the SDG&E local network.

RECOMMENDATIONS

If the Energy Commission approves the project, staff recommends the following Conditions of Certification to ensure system reliability and conformance with LORS.

CONDITIONS OF CERTIFICATIONS FOR TSE

TSE-1 The project owner shall furnish to the CPM and to the 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 (or a lesser number of days mutually agreed to by the project owner and the CBO) prior to the start of construction, 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 **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.

Table 1
Major Equipment List

Breakers
Step-up Transformer
Switchyard
Busses
Surge Arrestors
Disconnects and Wave-traps
Take off facilities
Electrical Control Building
Switchyard Control Building
Transmission Pole/Tower
Insulators and Conductors
Grounding System

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 with 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 (or a lesser number of days mutually agreed to by the project owner and the CBO) prior to the start of rough grading, 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 five days of the approval.

If the designated responsible engineer is subsequently reassigned or replaced, the project owner has five 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 five days of the approval.

TSE-3 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 corrective action. (1998 CBC, 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 five days, the reason for disapproval, and the revised corrective action required to obtain 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:

A. receipt or delay of major electrical equipment;

B. testing or energization of major electrical equipment; and

C. the number of electrical drawings approved, submitted for approval, and still to be submitted.

Verification: At least 30 days (or a lesser number of days mutually agreed to by the project owner and the CBO) prior to the start of each increment of construction, 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 send the CPM 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 will 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 to the CBO as determined by the CBO.

A. The power plant switchyard and outlet line shall meet or exceed the electrical, mechanical, civil and structural requirements of CPUC General Order 95 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.

B. Breakers and busses in the power plant switchyard and other switchyards, where applicable, shall be sized to accommodate full output from the project and to comply with a short-circuit analysis.

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

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

E. Termination facilities shall comply with applicable SDG&E interconnection standards.

F. The project owner shall provide to the CPM:

A line route drawing after selecting one of the alternate route options for the generator interconnection 69 kV tie line.

The Special Protection System (SPS) sequencing and timing if applicable,

A letter stating that the mitigation measures or projects selected by the transmission owners for each criteria violation are acceptable,

The Operational study report based on 2009 or current Commercial Operation Date (COD) system conditions (including operational mitigation measures) from the California ISO and/or SDG&E.

A copy o\f the executed LGIA signed by the California ISO and the project owner.

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

A. Design drawings, specifications and calculations conforming with CPUC General Order 95 or NESC, Title 8, 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.

B. 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.

C. 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-5** a) through f) above.

D. A line route drawing after selecting one of the alternate route options for the generator interconnection 69 kV tie line.

E. The Special Protection Scheme (SPS) sequencing and timing if applicable shall be provided concurrently to the CPM.

F. A letter stating that the mitigation measures or projects selected by the transmission owners for each criteria violation are acceptable.

G. The Operational study report based on 2009 or current COD system conditions (including operational mitigation measures) from the California ISO and/or SDG&E.

H. A copy of the executed LGIA signed by the California ISO and the project owner.

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

TSE-6 The project owner shall inform the CPM and CBO of any impending changes that may not conform to requirements **TSE-5** a) through f), and have not received CPM and CBO approval, and request approval to implement such changes. A detailed description of the proposed change and complete engineering, environmental, and economic rationale for the change shall accompany the request. Construction involving changed equipment or substation configurations shall not begin without prior written approval of the changes by the CBO and the CPM.

Verification: At least 60 days prior to the construction of transmission facilities, the project owner shall inform the CBO and the CPM of any impending changes that` may not conform to requirements of **TSE-5** and request approval to implement such changes.

TSE-7 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 Cal-ISO letter to the CPM when it is sent to the California ISO one week prior to initial synchronization with the grid. The project owner shall contact the California ISO Outage Coordination Department, Monday through Friday, between the hours of 0700 and 1530 at (916) 351-2300 at least one business day prior to synchronizing the facility with the grid for testing. A report of 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-8 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:

A. “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", and applicable interconnection standards, NEC, related industry standards, and these conditions shall be provided concurrently.

B. An "as built" engineering description of the mechanical, structural, and civil portion 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 portion 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".

C. 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.

REFERENCES

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

California ISO (California Independent System Operator) 1998b. California ISO Dispatch Protocol posted April 1998.

California ISO (California Independent System Operator) 2002a. California ISO Planning Standards, February 7, 2002.

California ISO (California Independent System Operator) 2007a. California ISO, FERC Electric Tariff, First Replacement Vol. No. 1, March 2007.

NERC (North American Electric Reliability Council) 2006. Reliability Standards for the Bulk Electric Systems of North America, May 2, 2006.

OGE2008a – OGE/S. Thome (tn46770) Application for Certification Orange Grove Energy dated 6/19/08. Submited to Dockets 6/19/08.

OGE2008c – OGE/S. Thome (tn46979) Supplement to AFC dated 7/8/08. Submitted to Dockets 7/8/08.

TRC2008c – J. Stenger (tn46884) Interconnection Facilities Impact Study Report dated 5/2/08 previously included inAppendix 3-B. Submitted to Dockets 6/26/08.

TRC2008d– J. Stenger (tn46885) Intercommedtion System Impact Study Report dated 10/22/07 previously included in AFC Appendix 3-A. Submitted to Dockets 6/26/08.

TRC2008f – J. Stenger (tn47854) Data Responses 1-73 dated 8/29/08. Submitted to Dockets 8/29/08.

WECC (Western Electricity Coordinating Council) 2006. NERC/WECC Planning Standards, August 2006.

DEFINITION OF TERMS

ACSR	Aluminum cable steel reinforced.
AAC	All Aluminum conductor.
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.
Kiloampere (kA)	1,000 Amperes
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	Congestion management is a scheduling protocol, which provides that dispatched generation and transmission loading (imports) would not violate criteria.
Emergency Overload	See Single Contingency. This is also called an L-1.
Hertz	The unit for System Frequency.
Kcmil or KCM	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. 1,000 Volts.
Loop	An electrical cul de sac. A transmission configuration that interrupts an existing circuit, diverts it to another connection and returns it back to the interrupted circuit, thus forming a loop or cul de sac.
MVAR or Megavars	Megavolt 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, equals the product of the line voltage in kilovolts, current in amperes, the square root of 3, and divided by 1000.
Megawatt (MW)	A unit of power equivalent to 1,341 horsepower.
Normal Operation/ Normal Overload	When all customers receive the power they are entitled to without interruption and at steady voltage, and no element of the transmission system is loaded beyond its continuous rating.

N-1 Condition	See Single Contingency.
Outlet	Transmission facilities (circuit, transformer, circuit breaker, etc.) linking generation facilities to the main grid.
Power Flow Analysis	A power flow analysis is 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	Reactive power is generally associated with the reactive nature of inductive loads like 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)	A remedial action scheme is an automatic control provision, which, for instance, would trip a selected generating unit upon a circuit overload.
SSAC	Steel Supported Aluminum Conductor.
SF6	Sulfur hexafluoride is an insulating medium.
Single Contingency	Also known as emergency or N-1 condition, occurs 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.
SVC	Static VAR Compensator: An equipment made of Capacitors and Reactors with electronic controls for producing and controlling Reactive Power in the Power System.
Switchyard	A power plant switchyard (switchyard) is an integral part of a power plant and is used as an outlet for one or more electric generators.
Thermal rating	See ampacity.
TSE	Transmission System Engineering.
TRV	Transient Recovery Voltage
Tap	A transmission configuration creating an interconnection through a sort single circuit to a small or medium sized load or a generator. The new single circuit line is inserted into an existing circuit by utilizing breakers at existing terminals of the circuit, rather than installing breakers at the interconnection in a new switchyard.
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.
VAR	Voltage Ampere Reactive, a measure for Reactive power in the power system.