3.1 INTRODUCTION

The Panoche Energy Center (PEC) is a proposed simple-cycle electrical generating facility located within western Fresno County adjacent to the Panoche Hills and east of San Benito county line. The project site is approximately 50 miles west of the city of Fresno. The generating facility will include four General Electric LMS100 natural gas-fired combustion turbine generators (CTGs), each equipped with water injection to the combustors for reducing production of oxides of nitrogen (NO_x), a selective catalytic reduction (SCR) system with 19 percent aqueous ammonia injection to further reduce NO_x emissions, and an oxidation catalyst to reduce carbon monoxide (CO). The total net generating capacity will be approximately 400 megawatts (MW).

The GE LMS100 is the first inter-cooled gas turbine system developed especially for the power generation industry, utilizing the better of two technologies: heavy-duty gas turbines and aero-derivative gas turbine technology. The LMS100 produces approximately 100 MW at an efficiency that is 10 percent higher than other commercial simple-cycle turbines. The LMS100 is specifically designed for cyclic applications providing flexible power and 10 minute starts.

The LMS100 design is built upon proven current technology, which includes the GE CF6-80 turbines and the MS6001FA. The GE CF6-80 has more than 100 million operating hours of airline service and the GE F technology units have more than 8 million operating hours in power generation services. The LMS100 technology is GE Power's growth platform in the peaking and loading power generation market.

Electricity generated by the PEC will be delivered to the existing Pacific Gas and Electric (PG&E) electrical transmission system at the adjacent Panoche Substation. Interconnection at this substation will minimize impacts to the PG&E transmission system while providing efficient peaking power for use during peak demand.

Process water and non-potable water uses will be supplied to the PEC from two new groundwater wells drilled onsite into the Westside Sub-basin of the San Joaquin Valley Groundwater Basin. These wells will draw water from a brackish aquifer. Potable water will supplied to the PEC by a bottled water service.

Process wastewater will be disposed of using a deep well injection system. Sanitary wastes will be directed to a septic system and leach field designed to treat the sanitary flow from the administration and control building and restrooms.

3.2 FACILITY LOCATION

The project area is located in the unincorporated area of western Fresno County, adjacent to the Panoche Hills and east of the San Benito County line. The site is approximately 50 miles west of the City of Fresno and approximately 2 miles east of Interstate 5. The site is more specifically described as the Southwest Quarter of Section 5, Township 15 South, Range 13 East, on the United States Geological Survey (USGS) Quadrangle map (Figure 3.2-1). The assessor's parcel number (APN) is 027-060-78S.

The facility site will be located on a 12.8-acre site within a 128-acre parcel. The construction laydown area, including laydown and parking, consists of an 8-acre portion of the 128-acre parcel immediately south of the 12.8-acre plant site. The plant site and construction area are leased by the applicant from the property owners. The 128-acre parcel is currently in agricultural production with pomegranate trees. Offsite improvements associated with the project include a 400-foot paved access road south of West Panoche Road to the plant site, 2,400 linear feet of new gas pipeline, 300-foot transmission line to tie into the Panoche Substation, and the PG&E expansion of the Panoche Substation by approximately 1.1 acres south of the existing substation boundary.

3.3 SITE DESCRIPTION

The site is in an agricultural area and is currently planted in pomegranate trees. Power line easements are located along the western boundary and adjacent to the northeast corner of the site. The site is essentially flat, with a slight slope down to the northeast.

3.3.1 Topography

The site topography is shown on Figure 3.2-1. The site elevation is about 420 feet above mean sea level and slopes gently down to the southeast at approximately one percent grade. The surface is composed of sands, silts, and clays.

3.3.2 Geologic Setting and Seismology

The geologic and seismologic setting of the plant site is summarized in this section. Additional discussions of the facility area geology and seismology are presented in Section 5.3.

3.3.2.1 Subsurface Conditions

A geotechnical site subsurface investigation, consisting of 20 borings with depths up to 70 feet, was conducted by URS in 2006. Soils encountered in the borings were sands, silts, and clays that are common to alluvial fan deposits in the area. The soils were generally loose and dry. No groundwater was encountered within the depth explored. The geotechnical report is presented in Appendix I.

3.3.2.2 Seismic Conditions

Most of Fresno County is situated within an area of relatively low seismic activity; the southern Coast Ranges have been the most tectonically active area within the County. The principal earthquake hazard at the site is groundshaking. The nearest Earthquake Fault Zone as defined by the Alquist-Priolo Earthquake Fault Zoning Act of 1994 is the Ortigalita fault zone, which is about 19.4 miles from the site at its closest point.

The project site is within seismic zone 4 of the Uniform Building Code (International Conference of Building Officials, 1997), which is the highest earthquake hazard zone recognized by the code. However, estimated peak site accelerations are relatively low for a site included in seismic zone 4. The closest type A fault to the site is the San Andreas fault, which is about 28.2 miles from the site at its closest point. The closest type B fault to the site is a segment of the Great Valley thrust faults, which is about 5.3 miles from the site at its closest point.

The seismicity and regional faults are discussed more completely in Section 5.3 (Geological Hazards and Resources).

3.3.2.3 Liquefaction Potential

Due to the low groundwater table and nature of the alluvial deposits, the potential for liquefaction to occur is considered to be remote. This is supported by laboratory tests performed during the site investigation program (Appendix I).

3.3.3 Hydrological Setting

The western San Joaquin Valley in the vicinity of the project area can be characterized as semi-arid. The valley experiences long, hot, dry summers and relatively mild winters. Based on a 128-year record for the Fresno weather station approximately 35 miles east of the site, the average annual temperature is 63.2 degrees Fahrenheit and average annual precipitation is 11.23 inches. Precipitation in the area is characterized by long dry summers and intermittent wet periods.

3.3.3.1 Surface Water

There are no long-term natural or artificial water bodies in the vicinity of the site. Surface streams are dry most of the year. Flow in streambeds in the Panoche Fan area occurs as brief runoff events following precipitation. The largest streambed in the area is Panoche Creek, which flows from the southwest approximately two miles northwest of the project site, which can be seen on Figure 3.2-1. In the immediate vicinity of the site, precipitation runoff occurs as sheet flow to the northeast across the alluvial fan surface of the site. A shallow unlined ditch north of the site is included within the special flood hazard area inundated by the 100-

year flood with no base flood elevation determined (Zone A) on the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map. The site is generally located within areas determined to be outside the 500-year floodplain (Zone X).

3.3.3.2 Groundwater

Groundwater in the western San Joaquin Valley occurs in thick alluvial aquifers that fill the valley. Aquifers underlying the site include a lower confined zone and an upper semiconfined zone that are separated by the Corcoran Clay of the Tulare Formation. The site is located in the Westside Sub-basin of the San Joaquin Valley Groundwater Basin.

Historically, groundwater was extensively used for agricultural development of the area surrounding the site. Groundwater withdrawal caused compaction of aquifer systems and extensive ground subsidence. Pumping of groundwater for agricultural use was substantially reduced following delivery of surface water to the region in the late 1960s, and land subsidence due to groundwater withdrawal has slowed considerably or stopped in most of the San Joaquin Valley. Agricultural use of groundwater in the area is limited except in times or drought when surface water supplies are curtailed.

3.4 FACILITY DESCRIPTION

3.4.1 Overview

The generating facility will consist of four (4) General Electric LMS100 natural gas-fired CTGs, each equipped with water injection to the combustors for reducing production of NO_x, a SCR system with 19 percent aqueous ammonia injection to further reduce NO_x emissions and an oxidation catalyst to reduce CO emissions. The total net generating capacity will be approximately 400 MW. Auxiliary equipment will include inlet air filters with evaporative coolers, turbine compressor section inter-cooler, mechanical draft cooling tower, circulating water pumps, water treatment equipment, natural gas compressors, generator step-up and auxiliary transformers, and water storage tanks. Table 3.4-1 provides major equipment information for the PEC.

A CTG’s power output is defined in this section by its capacity factor. The capacity factor averages the engine’s output and divides that by the engine’s rated output for a typical day. Each CTG will generate 100 MW net at summer design ambient conditions. The project will have an annual capacity factor of approximately 57 percent, depending on dispatch to meet annual demand.

Associated equipment will include emission control systems necessary to meet the proposed emission limits. Stack emission NO_x in normal operation will be controlled to 2.5 parts per million, volumetric dry (ppmvd) corrected to 15 percent oxygen through a combination of water injection in the combustors and operation of the SCR system. The oxidation catalyst

TABLE 3.4-1
MAJOR EQUIPMENT INFORMATION

		Dimensions		
Description	Capacity	Length (ft)	Width (ft)	Height (ft)
Combustion Turbine Generators (4)	103 MW	130	30	40
Inter-cooler Heat Exchangers (4)	105 MMBtu/hr[1]	44	15	13.5
CTG Stacks (4)	--	--	14.5 diameter	90
Variable Bleed Vents, with Silencers (4)	--	--	12	53
CTG Auxiliary Skid	--	34	13	15
Hot SCR	--	70	25	35
Cooling Tower (5 Cells)	440 MMBtu/hr	151	42	42
Raw Water Storage Tank	500,000 gal	--	44, diameter	44
Demineralized Water Storage Tank	240,000 gal	--	35, diameter	35
Waste Water Collection Tank	20,000 gal	--	15, diameter	15
Administration/Control Building	--	65	40	20
Warehouse/Maintenance Building	--	60	40	28
Water Treatment Building	--	124	80	14
Electrical Building	--	56	15	20
Gas Compressor Enclosures (3)	--	27	17	15

[1] MMBtu/hr = million British Thermal Units per hour

will limit normal operation carbon monoxide stack emissions to 6 ppmvd adjusted to 15 percent oxygen.

Electric power generated at the PEC facility will be sold to PG&E under a 20- year power purchase agreement (PPA) between PEC and PG&E. Design of the plant and equipment selection is based on requirements in the PPA. The agreement was executed in April 2006 and requires that the facility be online by August 1, 2009 in order to avoid delay–related damages.

The PEC will connect to the PG&E electrical transmission system at the adjacent Panoche Substation. The connection will require approximately 300 feet of 230 kilovolt (kV) transmission line located within the plant site and PG&E's substation. Interconnection at this substation minimizes impacts to the PG&E transmission system while providing efficient peaking power for use during peak demand as projected by PG&E.

Refer to the appendices for the engineering design criteria for the project.

3.4.2 Site Access

Access to the site will be from Davidson Avenue, approximately 400 feet south of the intersection with West Panoche Road via a 24-foot-wide newly paved road. The existing access will be improved for the project. Improvements will require a 50 foot access easement, widening the road surface, improving drainage, and laying gravel on approximately 400 feet of road surface from the intersection with West Panoche Road to the facility's main gate. These improvements will support the expected traffic loads and reduce dust emissions. The newly paved road will have two 12-foot-wide lanes with 5-foot-wide gravel shoulders and contoured drainage ditches.

3.4.3 Site Layout

The site layout is depicted on Figure 3.4-1 and a site elevation view of the new plant is illustrated on Figure 3.4-2. Figure 3.4-1 shows the location and size of the proposed plant facilities and off site improvements including the improved access road, the gas pipeline, the 230kV transmission line, the expansion area for the PG&E electrical substation, the construction lay down area, and a basin for storm water retention.

The facility is situated on approximately 12.8 acres of land. Surrounding the equipment is a network of roads for fire equipment and facility maintenance access. The administration building and water treatment buildings are located in the southwest area of the plot. The area required for PG&E's substation expansion is 1.1 acres. The storm water retention basin will require approximately 0.8 acres.

The plant facilities have been arranged for optimum use of the property as well as to ensure ease of operation. Investigations and evaluations have been conducted to define the specific facility equipment requirements and the suitability of the proposed project site to accommodate these facilities. Grading and drainage for the project site is shown in Figure 3.4-3.

3.4.4 Power Plant Cycle

Approximately 100 MW of electricity is produced by each of the four simple-cycle LMS100 CTGs. Output is dependent on inlet air ambient conditions and inlet evaporative cooling. The CTG design incorporates a compressor intercooler and increased firing temperatures in order to achieve a high efficiency. The CTGs are equipped with hot SCRs to reduce NO_x, CO, and volatile organic compound (VOC) emissions.

The following paragraphs describe the major components of the generating facility.

3.4.4.1 Combustion Turbine Generator

Thermal energy is produced in the CTGs through the combustion of natural gas, which is converted into mechanical energy required to drive the combustion turbine compressors and electric generators.

Four General Electric LMS100 CTGs have been selected for the plant. The LMS100 integrates features of GE Energy’s frame and aero-derivative CTG design features. The low-pressure compressor is derived from the heavy-duty frame engine designs and the high-pressure compressor, combustor, and power turbine components are derived from the aero-derivative designs. Each CTG consists of a stationary combustion turbine-generator and associated auxiliary equipment.

Turbine compressor inlet air is drawn through the air inlet ductwork above the combustion turbine. The inlet air filter removes dust and particulate from the intake air. During hot weather the filtered air is cooled by contact with water in the evaporative cooler section of the air inlet ductwork. Filtered and cooled air drawn into the gas turbine low-pressure compressor suction is compressed to an intermediate pressure.

Compressing the air causes the air temperature to rise. Cooling the intermediate pressure air before final compression improves the efficiency of the compression process. Hot intermediate pressure air is cooled in a water-cooled heat exchanger, external to the compressor, before it enters the high-pressure compressor suction.

The cooled compressed air then flows to the combustion turbine combustor where high-pressure natural gas is injected into the compressed air and ignited. Water is injected into the combustor to temper the combustion temperature, which reduces the production of thermal NO_x.

Heated air and combustion gas pass from the combustor through the expansion section of the turbine, causing it to rotate. The expander draws energy from the hot compressed gases causing them to cool as they progress through the expander.

Exhaust gas exits the expansion turbine and then passes through NO_x and CO emissions control catalysts before discharge from the exhaust stacks.

The expander section produces enough power to drive both the compressor and the electric generator. Integrating the intercooler between compressor stages in the LMS100, together with higher combustor firing temperatures, has resulted in relatively high efficiencies.

Each CTG will also have a variable bleed valve vent that allows the venting of compressed air to the atmosphere under certain transient compressor operating conditions.

The CTGs will be equipped with the following required accessories to provide safe and reliable operation:

- Evaporative coolers
- Inlet air filters
- Metal acoustical enclosure (contains CTGs and accessory equipment, housed outdoors)
- Duplex shell and tube lube oil coolers for the turbine and generator
- Annular standard combustor combustion system
- Compressor wash system
- Fire detection and protection system
- Compressor intercooler
- Hydraulic starting system
- Combustor water injection system
- Compressor variable bleed valve vent

The combustion gases exit the turbine at approximately 770 degrees Fahrenheit (°F) and then pass through the hot SCR system for NO_x emission control and an oxidizing catalyst for control of CO and VOC emissions. The SCR system is used in conjunction with ammonia injection for the control of NO_x emissions. A 19 percent aqueous ammonia solution is injected into the CTG exhaust gas stream that passes over a catalyst bed that reduces the oxides of nitrogen to inert nitrogen. The SCR equipment includes a reactor chamber, catalyst modules, ammonia storage system, ammonia vaporization and injection system, and monitoring equipment and sensors. The ammonia unloading area will consist of a curbed concrete pad and containment vault. After passing through the SCR system, the exhaust gases exit through the attached stack.

3.4.4.2 Performance Data

Each CTG will generate approximately 100 MW under most ambient conditions. The CTGs are expected to operate no more than 5,000 hours per year (each CTG), with an expected plant capacity factor of 57 percent. Figures 3.4-4, 3.4-5, and 3.4-6 show the generating facility heat and mass balance for the design hot day (114°F), the design average day (63.3 F) and the design cold day (16.8°F), respectively.

The full load performance of each CTG at 59°F and 60 percent relative humidity is as follows:

- Power Output 103 MW at the generator terminals

- Fuel Flow 805 MBtu/h, lower heating value (LHV) or 38,800 lb/hr
- Heat Rate 7,815 Btu/kilowatt hour (kWh), LHV

Auxiliary power loads for CTG auxiliaries and for the balance-of-plant (BOP) equipment will reduce the net electrical power output transmitted from the generator terminals to the transmission grid.

3.4.4.3 Emissions Data

After commissioning of the CTG units, the emissions from the stack for each CTG at full load conditions are as follows:

- 2.5 ppmvd corrected to 15 percent oxygen NO_x
- 6.0 ppmvd corrected to 15 percent oxygen CO
- 2.0 ppmvd corrected to 15 percent oxygen VOC
- 10 lb/hr particulate matter under 10 microns in diameter (PM_{10})
- 10.0 ppmvd corrected to 15 percent oxygen ammonia slip (NH_3 slip)

3.4.5 Major Electrical Equipment and Systems

The bulk of the electric power generated by the facility will be transmitted to the power grid through the 230-kV interconnection with the PG&E Panoche Substation. A small amount of electric power will be utilized onsite to power auxiliaries such as pumps, natural gas compressors, cooling tower fans, control systems, and general facility electric loads including lighting, heating, and air conditioning. Some of the auxiliary power will also be converted from alternating current (AC) to direct current (DC), and will be used as backup power for control systems and other uses.

CTGs will generate power at 13.8kV. It will be stepped-up by four fan-cooled generator step-up transformers (GSUs) to 230kV for transmission to the PG&E substation and grid. The auxiliary power will be back-fed through two of the step-up transformers. Once the units are running, they will supply their own auxiliary power. Surge arresters will be provided at the high-voltage bushings to protect the transformers from surges on the 230kV system caused by lightning strikes or other system disturbances. The transformers will be set on concrete pads within berms designed to contain the transformer mineral oil in the event of a leak or spill. Fire protection systems will be provided around the transformers. The high-voltage side of the step-up transformers will be connected to gas-insulated (sulfur hexafluoride [SF_6]) circuit breakers located in the facility's 230kV switchyard. The switchyard will have a 230kV single strain bus system. The switchyard to PG&E Panoche Substation will be connected via overhead 230kV transmission line. The power will be finally transmitted to the

PG&E grid via transmission lines owned by PG&E. The 230kV transmission interconnection to the PG&E Panoche Substation is approximately 300 feet long and will require a support tower, to be located adjacent to the substation within PG&E's existing transmission corridor easement.

Each subsection generally describes provisions that will be incorporated into the system's design. Specific equipment and system ratings will be established during detailed design.

3.4.5.1 Step-up Transformers

An overall one-line diagram of the proposed facility electrical generation and distribution system is shown on Figure 3.4-7. The power will be generated at 13.8kV by the four power blocks, each consisting of one GE LMS100 gas turbine generator. The electricity generated at 13.8kV will be stepped up to 230kV for transmission. The output of each generator will be connected by isolated phase bus to a two-winding, oil-filled generator step-up transformer. Surge arresters at the high voltage bushings will protect the transformer from surges in the 230kV systems resulting from lightning strikes or other system disturbances. The transformers will be set on concrete pads with oil containment provisions provided. A deluge type fire protection system will be provided for each step-up transformer. Firewalls will be installed between transformers to protect each transformer from a fire from any adjacent transformers. The firewall will also offer a degree of protection to other equipment and structures in the immediate area.

3.4.5.2 230kV Switchyard

The 230kV switchyard will provide means of connecting the facility to the PG&E single transmission line for transmission of power to loads remote from the plant via PG&E's existing substation.

The 230kV switchyard will consist of a 230kV single strain bus, in a 4-circuit breaker configuration. The switchyard will consist of 230kV circuit breakers and disconnect switches and structural H frames. The outgoing transmission line will connect the plant to the PG&E substation. All equipment required to interface with the plant will be provided. The interconnection point will be at the transmission takeoff tower located in the switchyard.

3.4.5.3 AC Power Distribution

When the facility is shut down, electricity for the PEC will be provided by PG&E by backfeeding from the PG&E transmission system at Panoche Substation. When the facility generation is in operation, BOP electricity will be supplied internally.

Auxiliary power to the facility loads will be distributed at 4.16kV AC by two auxiliary transformers, one at CTG-1 and the second at CTG-3 with the 13.8kV high voltage winding connected at the generator side of the step-up transformer. The auxiliary transformers will be responsible for supplying all electrical power to BOP auxiliary equipment. The auxiliary transformers are oil-filled, 2-winding, 3-phase, 60 hertz; with delta connected high side winding and wye-connected, resistance-grounded low side winding. An off-load tap changer will be supplied on the high voltage side of the auxiliary transformers. The auxiliary transformer 4.16kV secondary winding will be connected, by way of non-segregated phase bus duct, to the 4.16kV switchgear through a normally closed main switchgear breaker.

The 4,160-volt (V) switchgear lineup will supply power to the various 4.16kV motors and to the secondary unit substation (SUS) transformers rated 4.16kV to 480V for 480V power distribution. The switchgear will have vacuum operated metal-clad breakers for the main feeds. Fused contactors will be used for power distribution to SUS and motors. The 4.16kV system will be low resistance grounded to limit the maximum ground fault current.

Each auxiliary transformer will supply power to two combustion turbine auxiliary loads in normal operation. The auxiliary power transformer will be sized to take care of the complete auxiliary load of the entire facility in case there is any failure or shut down of one of the auxiliary power transformer or the generator step up transformer. The 4.16kV switchgear is equipped with a tie breaker for interconnecting both the buses.

The SUS transformers will be oil-filled outdoor type and will each supply 480V, 3-phase power to the SUS buses through normally closed SUS main breakers. The 480V system will be high resistance grounded to minimize the need for individual ground fault protection.

The SUS transformers will be sized to provide 480V auxiliary load to the entire facility. The two 480V switchgears are designed to be interconnected in case of emergency to supply power only from one 480V bus.

The SUSs will provide power through feeder breakers to the various large 480V motors and to motor control centers (MCCs). The MCCs will distribute power to smaller 480V motors, to 480V power panels, and other intermediate 480V loads. The normal supply for the two BOP MCCs will be from the SUS transformers, but automatic transfer switches will allow supply from an alternate source. The MCCs will distribute power to 480-480/277V isolation transformers when 277V, single-phase lighting loads are to be served. The 480V power panels will distribute power to small 480V loads.

Power for the AC power supply (120/208V) system will be provided by the 480V MCCs and 480V power panels. Transformation of 480V power to 120/208V power will be provided by 480-120/208V dry-type transformers.

3.4.5.4 DC Power Supply

The DC power supply system for BOP loads will consist of one 125V DC battery bank, two 125V DC full capacity battery chargers, metering, ground detectors, and distribution panels. One 125V DC battery bank will be dedicated to the essential service uninterruptible power supply (UPS) system. The other 125V DC battery bank will feed all other station DC loads. Additional 125V DC systems may also be supplied as part of the CTG equipment.

Under normal operating conditions, the battery chargers will supply DC power to the DC loads. The battery chargers will receive 480V, 3-phase AC power from the AC power supply (480V) system and continuously float-charge the battery while supplying power to the DC loads. The ground detection scheme will detect grounds on the DC power supply system.

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

The BOP 125V DC system will be used to provide control power to the 4,160V switchgear, the 480V SUSs, and to critical control circuits.

3.4.5.5 Uninterruptible Power Supply System

The CTGs will also have an essential service 120V AC, single-phase, 60 hertz power source to supply AC power to essential instrumentation, critical equipment loads, and unit protection and safety systems that require uninterruptible AC power. Both the essential service AC system and the DC power supply system will be designed to ensure that all critical safety and unit protection control circuits always have power and can take the correct action on a unit trip or loss of plant AC power.

The essential service AC system will consist of one full-capacity inverter, a solid-state transfer switch, a manual bypass switch, an alternate source transformer and voltage regulator, and AC panel boards for each CTG.

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

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

3.4.5.6 Emergency Power System

In the event of a total loss of auxiliary power, or in situations when the utility transmission system is out of service, the emergency power required for emergency lighting and CTG critical loads, such as turbine lube oil pumps and jacking gear motors, will be provided from batteries.

3.4.6 Fuel Gas System

At full load, each CTG will require approximately 805 MMBtu/hr LHV of natural gas, for a total plant demand of 3,220 MMBtu/hr (LHV). The project will connect to a PG&E high-pressure gas trunk line located east of PG&E's electrical substation through a lateral pipeline up to 16 inches in diameter. The high-pressure lateral pipeline will be approximately 2,400 feet in length. The lateral pipeline will connect to the project site along the east side. A new gas metering station and associated on-site piping will be located on the eastern side of the site.

Gas pressure available from PG&E varies seasonally. The gas supply pressure at the plant boundary metering station is between approximately 500 and 1,000 pounds per square inch (psi). The CTGs require the fuel pressure at the turbine connection to be approximately 950 psi.

To assure adequate fuel flow and pressure for the entire project, three 50 percent capacity electric motor driven fuel gas compressors (two operating and one installed spare) will be provided to boost the natural gas pressure as needed by the CTGs. The compressors will be reciprocating type compressors that have lubricated, double-acting, single stage, two throw, horizontally opposed cylinders. The gas compressors will be located in the southeast corner of the site.

To protect the compressors from liquid slugs and debris, the natural gas is filtered and separated from entrained liquids before flowing into the compressors. Gas exiting the compressors is cooled by a trim cooler and passed through filter coalescers and a liquid separator to prevent potential liquid ingestion into the turbine combustors.

3.4.7 Water Supply and Treatment

PEC process water will be supplied via two on-site production wells connected to a lower aquifer. Process water uses include fire protection water, plant service water, sanitary water, cooling tower makeup, combustion turbine NO_x injection (after treatment), and combustion turbine inlet air evaporative cooler makeup (partly from treated water). The CTG injection water will be treated using a reverse osmosis (RO) system, followed by trailer-mounted demineralizers.

These wells will also supply facility showers, sinks, toilets, eye wash stations, and safety showers in hazardous chemical areas. Signs will be posted to alert personnel that production well water is not for human consumption.

Potable drinking water will be supplied by a bottled water purveyor.

The well locations are shown on the site layout drawing, Figure 3.4-1.

3.4.7.1 Water Balance

The water balance diagrams (Figures 3.4-8 and 3.4-9) show all of the various water flow streams for the maximum use day and the average day. Table 3.4-2 shows the maximum daily, average daily, and average annual water supply and disposal flows.

The PPA with PG&E calls for delivery of 400 MW to the electric grid. PEC considered the use of dry cooling to minimize water use. This option is not practical for ambient temperatures of up to 114K during peak conditions, as required by the contract, when power is most critical to the citizens of California.

The LMS100's unique design utilizes an intercooler for the inlet air as it is compressed, allowing for approximately 10 percent greater thermal efficiency than existing commercial simple cycle peaking units. This design also requires an efficient methodology to reject the intercooled air heat under these difficult peak ambient conditions.

Power output decreases up to 25MW per unit with dry cooling under these conditions. This would require the installation of a 5^{th} LMS100 to achieve the 400MW contractual requirement. The use of dry cooling would result in a significant decrease in thermal efficiency; increase in fuel burned and increased air pollutant emissions. The use of dry cooling would negate the efficiency advantage of the LMS100 design at this site.

3.4.7.2 Water Quality

The production well water has a relatively high total dissolved solids (TDS) content of approximately 1.550 ppm, as well as high silica levels of 40-50 ppm. The typical water quality data is listed in Water Quality Section 5.5, Table 5.5-7.

TABLE 3.4-2
DAILY AND ANNUAL WATER FLOWS

Flow Stream	Maximum Daily 1,000 gal/day	Average Daily 1,000 gal/day	Average Annual Acre-ft/year
Production Well Supply			
Cooling Tower Makeup	1,647	1,238	793
Demineralizer System	534	511	328
Evap Cooler Makeup	62	14	9
Plant Service Water	7	7	5
Total Process Water	2,250	1,770	1,135
Waste Water Injection			
Cooling Tower Blowdown	514	388	248
RO System Rejects	133	128	82
Evap Cooler Blowdown	31	7	4
Plant Drains	14	14	9
Intercooler Condensation	48	3	2
Total	740	540	345
Septic System (Sanitary drains only)	0.375	0.250	0.280

Notes:
The maximum daily use is based on 24 hours of full load operation during the design hottest day (114°F day/80°F night).
The average daily use is 24 hours of the average of the full load use at the average monthly temperatures for every month.
The average annual use is based on 5,000 hours/year at the average daily rate, corresponding to the maximum plant capacity factor of 57 percent.

3.4.7.3 Water Treatment

3.4.7.3.1 Cooling Tower Makeup Water. There will be one cooling tower for the facility. The tower will provide heat rejection for the intercooler and lube oil coolers connected to each of the facility's four LMS100 CTGs (see Table 3.4-3).

The makeup water will be brackish well water and is expected to have a total dissolved solids content of approximately 1,550 ppm as fed to the cooling tower. The circulating water will be continuously treated and controlled in order to achieve approximately 3 cycles of concentration. The 3-cycle limit is determined by the high silica concentration (40-50 ppm) from the production well water, where silica concentrations in the circulating water system greater than 150 ppm will begin to deposit and severely foul the cooling tower equipment.

Makeup water will be pumped from the raw water storage tank to the cooling tower basin as required to replace water lost from evaporation, drift, and blowdown. A chemical feed system

TABLE 3.4-3
COOLING WATER MAXIMUM FLOWS

Parameter	Cooling Tower[1]	Evaporative Coolers
Circulating Water, gpm	27,600	1,500
Number of Cells	5	--
Makeup, gpm	1,300	120
Blowdown, gpm	410	20
Drift, gpm	0.14	--
Evaporation, gpm	900	90

[1] All numbers are estimates for full load at 114°F dry bulb, 74°F wet bulb.

will supply water conditioning chemicals to the circulating water to minimize corrosion and control the formation of mineral scale and bio-fouling. Sulfuric acid will be fed into the circulating water system in proportion to makeup water flow for alkalinity reduction to control the scaling tendency of the circulating water. The acid feed equipment will consist of a bulk sulfuric acid storage tank and two full-capacity sulfuric acid metering pumps.

To further inhibit scale formation, an alkaline scale inhibitor solution will be fed into the circulating water system in an amount proportional to the circulating water blowdown flow. The scale inhibitor feed equipment will consist of a chemical solution bulk storage tank and two full-capacity scale inhibitor metering pumps.

To prevent bio-fouling in the circulating water system, a sodium hypochlorite solution will be fed into the system. The hypochlorite feed equipment will consist of a bulk storage tank and two full-capacity hypochlorite metering pumps. Two full-capacity metering pumps will be provided for feeding either stabilized bromine or sodium bromide as supplemental biocides.

In general, the cooling tower water treatment system will be used to maintain the circulating water quality within the requirements of the cooling tower vendor, as shown in Table 3.4-4.

3.4.7.3.2 <u>Demineralized Water</u>. The water injected into the CTG for NO_x control must be free of contaminants. Raw well water will be filtered and sent through a RO system to remove all of the suspended solids and most of the dissolved solids from the water. The RO system rejects approximately 25 percent of the feed water, along with the impurities that were removed. The product water from the RO system is sent through trailer-mounted demineralizers and then to a 240,000-gallon demineralized water storage tank. The demineralizer trailers will be regenerated by an offsite contractor. In addition to being used for CTG NO_x control, a portion of the demineralized water will also be used for CTG

TABLE 3.4-4
CIRCULATING WATER QUALITY LIMITS, PPM

Constituent	Concentration
Alkalinity, as $CaCO_3$	100 to 500
Silica, as SiO_2	<150
Iron	<3.0
Manganese	<0.1
Sulfides	<1.0
Ammonia	<50
TDS	<5,000
Calcium as $CaCO_3$	<800
Chlorides, as Cl	<450
Nitrates, as NO_3	<300

compressor washing and for 50 percent of the CTG inlet air evaporative cooler makeup water.

3.4.7.3.3 <u>CTG Inlet Air Evaporative Coolers Makeup Water</u>. The makeup water to the CTG evaporative coolers will be a blend of water from the raw water storage tank and from the demineralized water storage tank. This will allow the coolers to operate at 4 to 6 cycles of concentration.

The fraction of demineralized water that is fed to the coolers will be adjusted to meet the manufacturers recommended makeup water quality, as shown in Table 3.4-5.

TABLE 3.4-5
EVAPORATIVE COOLER MAKEUP WATER

Constituent	Concentration
Calcium Hardness, as $CaCO_3$	50 - 150
Alkalinity, as $CaCO_3$	50 - 150
Chlorides, as Cl	<40
Silica, as SiO_2	<150
Iron	<0.2
Vanadium	<1.0
Lead	<1.0
TDS	<500
TSS	<5

3.4.7.4 Waste Water Treatment and Discharge

Wastewater will be disposed of using a new deep well injection system. The combined wastewater discharge from the plant will consist of cooling tower blowdown, RO rejects, evaporative cooler blowdown, CTG intercooler condensation, and water effluent from the oil-water separator. Table 3.4-6 shows the major waste water streams and the resultant waste water for disposal. Refer to the water balances on Figures 3.4-8 and 3.4-9 for flows.

TABLE 3.4-6
PROCESS WASTE CHARACTERIZATION

	Units	Cooling Tower Blowdown	Evap. Cooler Blowdown	RO System Rejects	Combined Waste Water
General					
pH		7 - 8	7 - 8	7 - 8	7 - 8
Total Suspended Solids	ppm				
Total Dissolved Solids	ppm	4,940	3,100	5,150	5,000
Ion Chemistry, mg/l as $CaCO_3$					
Total Alkalinity		560	350	580	560
Hardness		620	390	650	630
Calcium	Ca	300	200	320	310
Magnesium	Mg	320	200	330	320
Sodium	Na	3,000	1,860	3,100	3,000
Potassium	K	16	10	17	16
Bicarbonate	HCO_3	560	350	580	560
Sulfate	SO_4	2,500	1,560	2,600	2,520
Chloride	Cl	550	340	570	560
Nitrate-Nitrite	NO_3	7	4	7	7
Chemicals, mg/l	as Such				
Arsenic	As	.038	.024	.040	.040
Boron	B	10	6	10	10
Fluoride	F	2	2	2	2
Silica	SiO_2	135	85	140	135

3.4.7.4.1 Treatment and Disposition of Liquid Process Wastes. Based on an evaluation of alternative wastewater systems, it was determined that the most cost-effective approach to disposing the wastewater is by installing a deep well injection system. The recommended system consists of at least two Class I non-hazardous deep injection wells. A wastewater collection tank will collect the blowdown from the cooling tower and the evaporative coolers, along with RO reject water and the oil-water separator effluent. The collected wastewater will be discharged into a deep well injection system (approximately 5,000 feet below ground surface [bgs]).

3.4.7.4.2 <u>Plant Drains and Wash-down</u>. Plant drains are routed to an oil-water separator. The effluent from this unit will flow to the wastewater collection tank.

3.4.7.4.3 <u>Domestic/Sanitary Wastewater</u>. The sanitary waste drains are sent to a septic tank and leach field in ground that has been determined to be acceptable by a percolation test.

3.4.7.4.4 <u>Storm Water Drainage</u>. Storm water will be conveyed by overland flow and swales to an infiltration basin located at the southeast corner of the proposed site. The infiltration basin will serve as a storm water treatment facility to manage the quantity of storm water runoff from the proposed site.

3.4.8 Waste Management

Waste management is the process whereby all wastes produced at PEC are properly collected, treated if necessary, and disposed of. Wastes include wastewater, solid non-hazardous waste, and both liquid and solid hazardous waste. Appendix S contains the storm water calculations.

3.4.8.1 <u>Solid Waste – Non-Hazardous</u>

PEC will produce maintenance and plant wastes typical of natural gas-fueled power generation operations. Generation plant wastes include oily rags, broken and rusted metal and machine parts, defective or broken electrical materials, empty containers, and other solid wastes, including the typical refuse generated by workers. Recyclable materials will be taken offsite. Waste collection and disposal will be in accordance with applicable regulatory requirements to minimize health and safety effects. See Table 3.4-6 for process waste characterization.

3.4.8.1.1 <u>Construction Waste</u>. Construction of the PEC will generate wastes typical for the construction of simple-cycle, natural gas-fired combustion turbine power generation plants. Typical wastes will include packing materials and dunage, surplus excavated materials, excess materials trimmed from standard dimension materials whether wood, metal, wire, or other basic building materials, concrete spoil, temporary weather covers, consumable abrasive and cutting tools, broken tools, parts and electrical and electronic components, construction equipment maintenance materials, empty containers, oily rags, and other solid wastes, including the typical refuse generated by workers.

Solid waste will be segregated, where practical, for recycling. Non-recyclable waste will be placed in covered dumpsters and removed on a regular basis by a certified waste-handling contractor for disposal at a Class III landfill.

Hazardous wastes generated during construction and operation will be handled and disposed of in accordance with applicable laws, ordinances, regulations, and standards (LORS). Hazardous wastes will be either recycled or disposed of in a licensed Class I disposal facility, as appropriate.

Some hazardous solid waste, such as welding materials and dried paint, may also be generated. The hazardous waste will be collected in satellite accumulation containers near the points of generation. This waste will be moved daily to the contractor's 90-day hazardous waste storage area. The waste will be delivered to an authorized hazardous waste management facility, before the expiration of the 90-day storage limit.

Startup will generate wastes typical of normal operation plus initial cleaning wastes such as rags, consumable materials, and failed components. See Table 3.4-7 for a list of solid waste expected to be generated during construction.

TABLE 3.4-7
SOLID WASTE GENERATED DURING CONSTRUCTION

Waste Stream	Waste Classification	Amount	Treatment
Paper, Wood, Glass, and Plastics from packing material, waste lumber, insulation, and empty non-hazardous chemical containers	Non-hazardous	50 tons	Onsite Dumpsters; Waste disposal facility (Class III landfill)
Excess Concrete	Non-hazardous	34 tons	Recycle or Waste disposal facility (Class III landfill)
Metal, including steel from welding/cutting operations, packing materials, empty non-hazardous chemical containers, aluminum waste from packing material, and electrical wiring	Non-hazardous	13 tons	Recycle or Waste disposal facility (Class III landfill)
Oily Rags	Hazardous	2 to 3 55-gal drums	Recycled or disposed by certified oil recycler
Empty hazardous material containers-drums	Hazardous, Recyclable	2 cu. yard/week	Recondition, recycle, or Waste disposal facility (Class I)

3.4.8.1.2 Operations Waste. Operation of the facility will generate wastes resulting from processes, routine facility maintenance, and office activities. Non-hazardous waste during operation of the facility will be recycled to the greatest extent practical, and the remainder removed on a regular basis by a certified waste-handling contractor.

The plant will produce maintenance and plant waste typical of power generation operations. The following types of non-hazardous solid waste may be generated: paper, wood, plastic, cardboard, broken and rusted metal and machine parts, defective or broken electrical materials, empty non-hazardous containers, and other miscellaneous solid wastes including the typical refuse generated by workers.

Office paper, newsprint, aluminum cans, wood, insulation, yard debris, concrete, gravel, scrap metal, cardboard, glass, plastic containers, and other non-hazardous waste material will be recycled to the extent practical, and the remainder will be removed on a regular basis by a certified waste-handling contractor for disposal at a Class III landfill.

Hazardous waste will be accumulated at the generating facility according to California Code of Regulations (CCR) Title 22 requirements for satellite accumulation. Hazardous waste will be collected by a licensed hazardous waste hauler, using a hazardous waste manifest. Waste will only be shipped to authorized hazardous waste management facilities. Biannual hazardous waste generator reports will be prepared and submitted to the Department of Toxic Substances Control (DTSC). Copies of manifests, reports, waste analyses, and other documents will be kept onsite and will remain accessible for inspection for at least 3 years.

Waste lubricating oil will be recovered and recycled by a waste oil-recycling contractor. Spent oil filters and oily rags will be recycled. Spent SCR and oxidation catalysts will be recycled by the supplier, if possible, or disposed of in a Class I landfill. Laboratory analysis wastes will be recycled if possible, or disposed of in a Class I landfill. See Table 3.4-8 for a list of solid waste expected to be generated during operation.

TABLE 3.4-8
SOLID WASTE GENERATED DURING OPERATION

Waste Stream	Waste Classification	Amount	Treatment
SCR Catalysts Unit	Hazardous	500 lbs every 3 to 5 years	Recycled by SCR manufacturer or disposed of in Class I landfill
CO Catalyst Units	Hazardous	500 lbs every 3 to 5 years	Recycled by manufacturer
Oily Rags	Hazardous	200 lbs/year	Recycled or disposed by certified oil recycler

3.4.8.2 Liquid Wastes – Non-Hazardous

Non-Hazardous liquid wastes which are non-recoverable, such as saline cooling tower blowdown, will be deep well injected for disposal. Sanitary wastewater will be collected and disposed by leach field.

3.4.9 Management and Disposal of Hazardous Material and Hazardous Waste

Hazardous material and hazardous waste will be segregated, collected, and disposed in accordance with all applicable LORS.

3.4.9.1 Chemical Management

There will be a variety of chemicals stored and used during the construction and operation of PEC. The storage, handling, and use of all chemicals will be conducted in accordance with applicable laws, ordinances, regulations, and standards (LORS).

Chemicals will be stored in appropriate chemical storage facilities. Bulk chemicals will be stored in storage tanks, and other chemicals will be stored in returnable delivery containers. Chemical storage and chemical feed areas will be designed to retain leaks and spills. Dike and drain piping design will allow a full-tank-capacity spill without overflowing the dikes. For multiple tanks located within the same diked area, the capacity of the largest single tank will determine the volume of the diked area and drain piping. Drain piping for volatile chemicals will be trapped and isolated from other drains to eliminate noxious or toxic vapors. After neutralization, if required, water collected from the chemical storage areas will be directed to the cooling tower basin, or trucked offsite for disposal at an approved wastewater disposal facility.

The aqueous ammonia storage and unloading area will have spill containment and ammonia vapor detection equipment. Aqueous ammonia will be transported and stored in a 20,000-gallon tank onsite, as a 19 percent solution, by weight.

Safety showers and eyewashes will be provided in the vicinity of all chemical storage and use areas. Hose connections will be provided near the chemical storage and feed areas to flush spills and leaks to the plant wastewater collection system.

Approved personal protective equipment will be used by plant personnel during chemical spill containment and cleanup activities. Personnel will be properly trained in the handling of these chemicals and instructed in the procedures to follow in case of a chemical spill or accidental release. Adequate supplies of absorbent material will be stored onsite for spill cleanup.

A list of the chemicals anticipated to be used at the generating facility and their locations is provided in the Hazardous Materials Handling section (Section 5.15). This list identifies each chemical by type, intended use, and estimated quantity to be stored onsite.

3.4.9.2 Hazardous Wastes

Several methods will be used to properly manage and dispose of hazardous wastes generated by PEC. Workers will be trained to handle hazardous wastes generated at the site.

Waste lubricating oil will be recovered and reclaimed by a waste oil recycling contractor. Spent lubrication oil filters will be disposed of in a Class I landfill.

Spent SCR and oxidation catalysts will be reclaimed by the supplier or disposed of in accordance with regulatory requirements.

The only chemical cleaning wastes are the detergent solutions used during turbine washing. These wastes, which contain primarily dust from the air and potentially compressor blade metals, will be temporarily stored onsite in portable tanks, monitored, and disposed of offsite by the chemical cleaning contractor in accordance with applicable regulatory requirements.

3.4.10 Emissions Control and Monitoring Equipment

Air emissions from the combustion of natural gas in the CTGs will be controlled using state-of-the-art systems. Emissions that will be controlled include:

- Oxides of nitrogen (NO_x)
- Carbon monoxide (CO)
- Particulate matter (PM)
- Volatile organic compounds (VOCs)
- Oxides of sulfur (SO_x)

SO_x emissions will be controlled by the use of natural gas, which is low in sulfur, as the sole fuel for the CTGs. Utilization of SCR and oxidation catalyst promotes formation of SO_3 from SO_2.

Air emissions from the diesel-driven firewater pump are minimized by the use of a California Air Resources Board (CARB) compliant low emission diesel engine fueled with CARB compliant diesel fuel.

3.4.10.1 NO_x Production and Control Mechanisms

Water injection to the CTG combustors in conjunction with selective catalytic reduction (SCR) will be used to control NO_x concentrations in the exhaust gas emitted to the atmosphere to 2.5 ppmvd adjusted to 15 percent oxygen from the gas turbines/SCR systems.

The SCR process will use 19 percent aqueous ammonia (NH_3) as the reducing agent to activate the catalyst. Diluted ammonia vapor will be injected into the exhaust gas stream via a grid of nozzles located upstream of the catalyst module. The subsequent chemical reaction on the catalyst will reduce NO_x to nitrogen and water. Ammonia slip, or the concentration of unreacted ammonia in the exiting exhaust gas, will be limited to 10 ppmvd adjusted to 15 percent oxygen on a dry basis. The SCR equipment will include a reactor chamber, catalyst modules, ammonia storage system, ammonia vaporization and injection system, and monitoring equipment and sensors.

3.4.10.2 Dry Low NO_x Combustors

Dry low NO_x combustors are not available in the LMS100 CTGs, and are therefore not considered for this project. While GE Energy anticipates future units will be capable of using dry low NO_x combustors, this design option is not presently suitable for CTGs in peaking service.

3.4.10.3 CO and VOC Emissions

An oxidizing catalytic converter will be used to reduce the CO concentration in the exhaust gas emitted to the atmosphere to 6 ppmvd adjusted to 15 percent oxygen from the gas turbines.

VOCs include all unburned hydrocarbons except methane. VOC emissions are low due to proper combustion controls in the CTG. No other controls are required for VOC reduction.

3.4.10.4 Particulates

Particulate emissions will be controlled by the use of natural gas, which is low in particulates, as the sole fuel for the CTGs.

3.4.10.5 Emission Monitoring

A Continuous Emissions Monitoring System (CEMS) will sample, analyze, and record fuel gas flow rate, NO_x and CO concentration levels, and percentage of O_2 in the stack gas. This system will generate reports of emissions data in accordance with permit requirements and will send alarm signals to the plant's control system when emissions approach or exceed pre-selected limits.

3.4.11 Fire Protection System

3.4.11.1 Firewater System

The fire protection system will mitigate personnel injury, loss of life, property loss, and plant downtime due to fire. The fire protection system will consist of a 500,000-gallon raw water/firewater storage tank, a packaged fire pump system, a dedicated underground firewater distribution system with fire hydrants, sprinkler systems, and deluge systems as required by the National Fire Protection Association (NFPA) code. In addition, the combustion turbines and electrical buildings will be protected by a carbon dioxide fire protection system.

There will be a dedicated volume in the 500,000-gallon storage tank that will provide 2 hours of protection from an onsite worst-case single fire.

Water from the raw water storage tank will be delivered to the underground firewater loop by means of the packaged fire pump system. This system will consist of a diesel-driven pump, a motor-driven pump, and a jockey pump. The main firewater pump will be the electric motor-driven pump. The diesel-driven pump will be the emergency firewater pump if the motor-driven pump fails due to electrical power failure or mechanical problems. The jockey pump maintains the pressure in the firewater loop.

The firewater distribution system will be designed in conformance with NFPA codes. The system will have sectionalizing valves so that a failure in any part of the system can be isolated while allowing the remainder of the system to function properly. Fire hydrants and fixed suppression systems will be supplied from the firewater loop. Fire hydrants will be spaced at approximately 300-foot intervals around the facility in accordance with NFPA 850 and local fire codes.

3.4.11.2 Fixed Fire Protection Systems

The fire protection water supply is shown on Figure 3.4-10. Fixed fire protection systems will be provided for the station oil-filled generator step-up transformers and the turbine lubrication oil system. In addition, buildings will have sprinkler systems as required by NFPA and local fire codes. Sprinkler and fixed-spray systems will be designed and installed in accordance with NFPA 13 and NFPA 15.

3.4.11.3 Fire Alarm and Detection

Fire alarms will be installed in buildings in accordance with NFPA 72 and as required by local fire codes. The alarm system will include alarm annunciation, supervisory, and trouble signals. Alarms will require urgent action by the plant operators. Supervisory signals indicate abnormal conditions that require investigation. Trouble signals indicate adverse conditions such as ground fault or power supply problem that should be rectified by qualified personnel.

3.4.11.4 Portable Extinguishers

Hand-held CO_2 and dry chemical fire extinguishers will be located throughout the plant in accordance to NFPA 10.

3.4.11.5 Miscellaneous Fire Safety Items

All material used in construction of the plant and its auxiliary systems will be free of asbestos and will meet the fire and smoke rating requirements of NFPA 255.

3.4.12 Plant Auxiliaries

3.4.12.1 Lighting

Lighting will be provided in the following areas:

- Interior of buildings such as office, control, and maintenance
- Exterior at entrances to buildings
- Platforms and walkways
- Transformer and switchyard areas
- Plant roads
- Parking areas
- Entry gate
- Cooling tower

The amount of lighting will meet the requirements from a security, normal operations and maintenance, and safety standpoint. Lighting in areas not normally accessed as part of routine operation or to ensure safety of personnel and property (high illumination areas not normally occupied on a continuous basis) will be controlled by either switches or motion detectors.

Emergency lighting fixtures with integral battery packs will be located in areas of regular personnel traffic to allow exit from areas where normal lighting has failed. In areas with major control equipment and electrical distribution equipment, emergency lighting located in these areas will be sufficient to allow operations to reestablish auxiliary power during normal lighting failure.

3.4.12.2 Grounding and Lightning Protection

Electrical systems are susceptible to ground faults, lightning, and switching surges, all of which can lead to a rise in unit ground potential. This rise is a hazard to both site personnel and electrical equipment. Hence, a grounding system will be instituted to provide an adequate path to allow the dissipation of ground fault currents and thereby minimizing rises in the ground potential.

The station-grounding grid will be designed with sufficient capacity to dissipate heat from the ground current under the most severe fault conditions in places of high ground fault current concentration. The grid spacing will be set to maintain safe step voltage gradients.

Bare copper conductors will be installed below grade in a grid pattern. Each junction of the grid will be bonded together by either an exothermal welding process or mechanical connectors.

Ground resistivity readings, performed as part of the subsurface investigations, will be used to determine the necessary numbers of ground rods and grid spacing to ensure safe step and touch potentials under fault conditions.

Grounding cables will be brought from the ground grid to connect to building steel and non-energized metallic parts of electrical equipment. Insulated grounding conductors to the isolated ground will be provided for sensitive control systems.

Lightning protection will be furnished for buildings and structures in accordance with NFPA 780 or UL 96 and UL 96A.

3.4.12.3 Cathodic Protection

There will be cathodic protection system for buried carbon steel pipes and structures (except rebar). Cathodic protection will be provided by an impressed current system, a sacrificial system, or a combination of both.

3.4.12.4 Freeze Protection

Electric heat tracing shall be used on piping susceptible to freezing. Main components of a freeze protection system are the power distribution panel, the thermostat or controller, and the heating cable. The power distribution panel provides the electrical requirements, circuit monitoring, and alarm indication of the heat tracing system. The thermostat or controller senses ambient temperatures. These devices control individual heat tracing cable circuits, the power distribution panel, and the activation of circuits. Thermostats are either mechanical or electronic for simple toggle control and/or control and monitoring functions, and ground fault protection as required. The heating cable runs along the piping. The cable wraps around the pipe at locations of fittings and other parts more sensitive to freezing. The heating cable is self-regulating. Small capacity storage tanks (water and chemical) shall be freeze-protected by electrical heating pads.

3.4.12.5 Programmable Logic Controller

The programmable logic controller (PLC) provides modulating control, digital control, monitoring, and indicating functions for the plant power block systems.

The following functions will be provided:

- Controlling the CTGs and other systems in a coordinated manner
- Controlling the BOP systems in response to plant demands
- Monitoring controlled plant equipment and process parameters and delivery of this information to plant operators
- Monitoring the CTG CEMS units for critical alarms, and collecting data for historical log-in
- Providing control displays (printed logs, operator interface) for signals generated within the system or received from input/output (I/O) signals
- Providing consolidated plant process status information through displays presented in a timely and meaningful manner
- Providing alarms for out-of-limit parameters or parameter trends, displaying on operator interface units, and recording on an alarm log printer
- Providing storage and retrieval of historical data

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

- Liquid crystal display (LCD) flat screen operator displays
- Engineer work station
- Distributed processing units
- I/O consoles
- Printers
- Data link to the combustion turbine

The PLC will have redundant processing units linked to a group of operator consoles and the engineer work station by redundant data highways. Each processor will be programmed to perform specific dedicated tasks for control information, data acquisition, and annunciation. By being redundant, no single processor failure can cause or prevent a unit trip.

The PLC will interface with the control systems furnished by the CTG supplier to provide supervisory remote control capabilities, as well as data acquisition, annunciation, and historical storage of turbine and generator operating information.

3.4.12.6 Plant Instrument and Service Air System

The plant service and instrument air system consists of one packaged air compressor skid and a distribution system with a main header and branches that distribute air to various locations in the power block. The main components of the air compressor skid include two 100 percent air compressors, two 100 percent air dryers with pre-filters and after-filters, and an air receiver.

The air compressors will be oil-flooded, air-cooled, rotary screw air compressors with a discharge pressure rated at 125 psig, and sized for instrument and service air capacity requirements. The compressors will be provided with inlet filters, after-coolers, TEFC motors, controls, automatic condensate trap, piping, and valves.

The air dryers are heatless, dual tower, regenerative desiccant type. Coalescing pre-filters, particulate after-filters, a moisture-indicating instrument, and a regulator will be supplied with the dryer.

The air receiver will be American Society of Mechanical Engineers (ASME) code rated. Typically a vertical vessel, the receiver will have a pressure safety valve to prevent over-pressure.

The main header will distribute air from the receiver and deliver it by a network of branches from the header throughout the plant, where needed. A pressure-regulating valve will be provided at each service and utility station in order to prevent the service air system from degrading the instrument air pressure.

Service air headers will be routed to hose connections located at various points throughout the facility. Instrument air will be routed to locations within the facility equipment areas and within the water treatment facility where pneumatic operators and devices will be located.

3.4.13 Heating, Ventilation, and Air Conditioning

The heating, ventilation, and air conditioning (HVAC) system will provide an acceptable environment for personnel comfort and equipment operation within the plant buildings.

Only the Administration and Control Buildings will be air-conditioned. The HVAC system will be designed in accordance with the California Building Code (CBC) and the Uniform Mechanical Code (UMC) as prescribed by the CCR.

Air conditioning in the control room and administrative areas will maintain a suitable environment for plant personnel. If required for proper equipment operation, humidity control will be provided in the control room.

Outside air ventilation systems will be provided for buildings where air conditioning is not required. Electric heaters will be used for winter heating.

Every building and respective portion of the building will be supplied with fresh air in accordance with the CBC; American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE) Standard 62; and the CCR.

3.4.14 Plumbing

The plumbing system will supply potable water to all plumbing fixtures and will collect and convey waste fluids to the waste collection system. The system will be designed and constructed in accordance with the California Plumbing Code.

3.5 CIVIL/STRUCTURAL FEATURES

This section describes the buildings, structures, and other civil/structural features that will constitute the facility as shown on Figure 3.4-1 (Site Plan).

3.5.1 Overview

The power block will consist of four separate simple-cycle combustion turbine power generation trains, each consisting of one General Electric Energy LMS100 CTG, an Air Inlet System, an Intercooler and Variable Bleed Valve Silencer, a SCR system, one stack, a power control module, an intercooler motor control center, a fuel gas filter/separator, and a step-up transformer.

In addition to the four combustion turbine power generation trains, there will be a five-cell cooling tower, an ammonia storage tank, a natural gas compressor facility, a water treatment facility, and two auxiliary transformers. There will also be BOP mechanical and electrical equipment.

The major equipment will be supported on reinforced concrete foundations at grade, with pile-supports as necessary. Individual reinforced pads at grade will be used to support the BOP mechanical and electrical equipment. The gas compressors will be in an enclosed acoustic building for noise attenuation. The water treatment equipment will also be in an enclosed building.

3.5.2 Stacks

The SCR system will include an integral stack/silencer system. The stack will be a self-supporting steel stack, 90 feet tall, and will include the associated appurtenances, such as sampling ports, exterior ladders, side step platforms, a lighting system if required by FAA regulations, and electrical grounding.

3.5.3 Buildings

The plant buildings will include an administration and control building, a warehouse building, a water treatment building, a firewater pump building, switchgear modules, and a gas compressor building. Building dimensions are shown on Figure 3.5-1. The administration and control building will house the administrative areas and the control room for the new facility. All of the buildings will be supported on mat foundations or individual spread footings.

3.5.4 Transformer Foundations and Fire Walls

There will be four 13.8kV to 230kV step-up oil-filled transformers and two auxiliary oil-filled transformers. Each will be supported on reinforced concrete foundations at grade, with pile-supports as necessary. Construction of a concrete retention basin around each transformer will provide oil containment, in the event of a failure of a transformer. Concrete firewalls are planned for each step-up transformer and auxiliary transformer to limit a potential transformer fire to its concrete basin area.

3.5.5 Yard Tanks

The yard water storage tanks will include the demineralized water storage tank (240,000 gallons), the raw water/firewater storage tank (500,000 gallons), and the wastewater collection tank (20,000 gallons).

The yard storage tanks will be vertical, cylindrical, field-erected, or shop-fabricated steel tanks. Each tank will be supported on a suitable foundation consisting of either a reinforced concrete ring wall with an interior bearing layer of compacted sand for the tank bottom, or a reinforced concrete mat.

3.5.6 Roads

The new facilities will be served by the road network shown on Figure 3.4-1 (Site Plan). The new site will be accessed from Panoche Road via a new asphalt paved entrance road shown on Figure 3.4-1 (Site Plan). All new roads, miscellaneous access drives, and permanent parking areas within the site boundaries will be asphalt paved.

3.5.7 Site Security Fencing

A chain-link security fence surrounding the perimeter of the site will enclose the new facility. In addition, the switchyard will be enclosed within a chain-link fence for the safety of the workforce. A controlled-access gate will be located at the entrance off the new access road from Panoche Road. During construction, a temporary chain-link security fence will be erected around the outside perimeter of the laydown site. This fence will be removed at the conclusion of the construction phase.

3.5.8 Site Grading and Drainage

The plant site will consist of paved roads, paved parking areas, and graveled areas. Storm water will be conveyed by overland flow and swales to an infiltration basin located at the southeast corner of the proposed site. The infiltration basin will serve as a storm water treatment facility to manage the quantity of storm water runoff from the proposed site. The infiltration basin is sized to capture 85 percent of the annual storm water runoff from the site according to standards set in the "California Storm Water BMP Handbook." The infiltration basin will also serve to manage peak storm water runoff during 100-year 24-hour storm events. The peak runoff for the developed conditions will not exceed the peak runoff rate of the existing conditions. The site grading and drainage plan for the project is shown on Figure 3.4-3.

A Storm Water Pollution Prevention Plan (SWPPP) will be prepared prior to construction of the PEC. This plan will be utilized at the PEC site to control and minimize storm water during the construction of the facility. The plan will use best management practices such as stabilized construction entrances, silt fencing, berms, hay bales, and detention basins to control runoff from all construction areas.

3.5.9 Site Flood Issues

According to the Federal Emergency Management Agency (FEMA), a portion of the site is within the 100-year flood plain. The site will be raised in conformance with the Fresno County Ordinance Title 15, Flood Hazard Areas to ensure that in the event of a 100-year storm, the site and equipment is not subjected to any flood damage. Storm water will be conveyed by overland flow and swales to an infiltration basin located at the southeast corner of the proposed site. The infiltration basin will serve as a storm water treatment facility to manage the quality and quantity of storm water runoff from the proposed site.

3.5.10 Sanitary System

The sanitary system will consist of a septic system and leach field designed to handle the sanitary flow from the administration and control building and other restrooms, if any, located on the site. The septic tank and leach field will be located directly south of the administration and control building.

3.5.11 Earthwork

Excavation work will consist of the removal, storage, and/or disposal of earth, sand, gravel, vegetation, organic matter, loose rock, boulders, and debris to the lines and grades necessary for construction. Materials suitable for backfill will be stockpiled at designated locations using proper erosion protection methods. Excess material will be removed from the site and disposed of at an acceptable location. If contaminated material is encountered during excavation, its disposal will comply with applicable LORS.

The site is currently an agricultural area. Existing trees and topsoil will be removed. Fill will be imported to establish finish grade. Finish grade will be approximately one to three feet higher than existing grade. The quantity of fill for the project is approximately 60,000 cubic yards.

Graded areas will be smooth, compacted, free from irregular surface changes, and sloped to drain. Cut and fill slopes for permanent embankments will be designed to withstand horizontal ground accelerations for Seismic Zone 4. For slopes requiring soil reinforcement to resist seismic loading, geogrid reinforcement will be used for fills and soil nailing for cuts. Slopes for embankments will be no steeper than 2:1 (horizontal:vertical). Construction will be at one to three feet above existing grade, which is fairly level; therefore major cuts and fills are not anticipated.

Areas to be backfilled will be prepared by removing unsuitable material and rocks. The bottom of an excavation will be examined for loose or soft areas. Such areas will be excavated fully and backfilled with compacted fill.

Backfilling will be done in layers of uniform, specified thickness. Soil in each layer will be properly moistened to facilitate compaction to achieve the specified density. To verify compaction, representative field density and moisture-content tests will be performed during compaction. Structural fill supporting foundations, roads, and parking areas will be compacted to at least 95 percent of the maximum dry density as determined by American Society for Testing Materials (ASTM) D-1557 as described in Appendix L, Geotechnical Report. Embankments, dikes, bedding for buried piping, and backfill surrounding structures will be compacted to a minimum of 90 percent of the maximum dry density. Backfill placed in remote and/or unsurfaced areas will be compacted to at least 85 percent of the maximum dry density.

Where fills are to be placed on subgrades sloped at 6:1 (horizontal:vertical) or greater, keys into the existing subgrade may be provided to help withstand horizontal seismic ground accelerations.

The subgrades (original ground), subbases, and base courses of roads will be prepared and compacted in accordance with California Department of Transportation (Caltrans) standards. Testing will be in accordance with ASTM and Caltrans standards.

3.6 ELECTRICAL INTERCONNECTION

The new generation will be interconnected to the PG&E transmission grid through the facility's 230kV outdoor switchyard via a 230kV transmission line to the PG&E Panoche Substation. To accommodate the new generation by the four new combustion turbine generators, the Panoche Substation and the transmission system owned by PG&E may be upgraded in accordance with the final PG&E facility study report.

3.6.1 Panoche Substation Expansion

The project will interconnect to PG&E's existing Panoche Substation's 230kV bus. The 230kV conductor will exit from the northeast corner of the project site and run northeast approximately 300 feet to tie in to the Panoche Substation. There is limited space within the existing Panoche Substation, and PG&E will extend the existing 230kV bus. Approximately 320 feet x 150 feet of land on the south side of the existing 230kV bus will be acquired by PG&E to accommodate this expansion. The land to be acquired currently supports agricultural production.

3.6.2 Transmission Line Specifications

The onsite interconnection facilities will consist of an outdoor switchyard which includes:

- A transmission line strain bus
- Bus structures
- Transmission line dead end structure
- Line surge arresters
- High voltage disconnect switches
- High voltage circuit breakers
- Metering and relaying devices
- Foundations
- Ground grid

- Fencing
- Any other components necessary to connect the generators to the switchyard

The switchyard design will be coordinated with PG&E as required. The new overhead transmission line from the switchyard to the substation will be 230kV.

3.6.2.1 Conductor

The generation-tie line connecting the project to the expanded existing Panoche Substation will be constructed using 795 aluminum conductor steel reinforced (ACSR) conductor or equivalent.

3.6.2.2 Ground Wire

The transmission line will have shield or ground wires in place. The location of the shield wires in relation to conductors shall be in accordance with best industry practices and determined by the surrounding terrain. The shield wire shall be extra high strength galvanized steel or copper-clad steel as determined by the location and the detailed design.

3.6.2.3 Route

The proposed transmission line will originate from the plant switchyard located on the north side of the site. The 230kV transmission line will exit from the northeast corner of the project site and run northeast approximately 300 feet to tie into the Panoche Substation.

3.6.2.4 Panoche Substation Interconnect

In order to interconnect to the Panoche Substation it is necessary for PG&E to extend the existing 230kV double busses on the south side of the substation outside the existing fence line by about 150 feet for two new 230kV bays, one for the relocation of the Gates-Panoche Line #1 and the other for the new generation-tie line. The relocation of the Gates-Panoche Line #1 and use of the existing spare bay are necessary to provide for the interconnection. The main ground grid will be expanded to cover the two new bays. Lighting and fencing for the new area will also be installed by PG&E.

3.6.3 Transmission Structures

The proposed 230kV transmission lines will be overhead conductor design with a transmission line span of 300 feet. There will be two dead-end take off structures. One structure will be at the originating outdoor switchyard located in the new facility and the other structure will be a dead end structure to terminate the incoming 230kV line at the PG&E Panoche Substation.

3.6.3.1 Types

The take off or the dead end structures will be H or A frame type. They will be 65 feet high with additional 15-foot lightning masts. The power conductor will be attached 50 feet from the ground and the shield wire will be attached at a height of 65 feet. There will be three additional structures in the facility outdoor 230kV switchyard to support the strain bus assembly.

3.6.3.2 Foundations

Foundations will be required for 230kV disconnect switches, 230kV circuit breakers, voltage and current transformers, strain bus termination structures, and outgoing dead end structure. The foundations will be drilled pier concrete foundations with the necessary anchor bolts.

3.6.3.3 Access to Structures

The entire interconnection phase of the project will be located within the confines of the generating facility outdoor switchyard and the PG&E substation. The transmission line will have only a 300-foot span. It will originate at the facility outdoor switchyard dead end structure and terminate at the Panoche Substation incoming dead end structure. No access to the electrical interconnection facilities will be required across any private property. The public will not have access to any portions of the transmission lines or the switchyard.

3.6.4 Panoche Energy Center Transmission System Evaluation

The existing 230kV Panoche Substation consists of a double-bus, single breaker configuration and currently has 11 230kV line circuits without bus sectionalizing breakers. The substation also contains a single 115kV bus. The substation interconnects the transmission system with other 230kV and 115kV facilities and transmission lines in the area. A System Impact Study was provided by PG&E dated July 2005, and a reevaluation of the study is pending. The System Impact Study evaluates the impact on the PG&E system based on power flows on the existing transmission system. The study also provides a short circuit analysis and an assessment of the stability of the system under various contingencies. A Facilities Study was also conducted by PG&E in March 2006, which identifies mitigation measures for transmission facility overloads and upgrades if necessary due to the added generation.

Figure 3.6-1 is a single line diagram showing the connection of the project to the Panoche Substation and PG&E's transmission system.

In order to interconnect this project, some major modifications are required:

- Install a pair of bus sectionalizing breakers to split the busses into two double-bus sections. In order to split the bus and install a pair of bus sectionalizing breakers, it is necessary to relocate the existing 230kV line breaker CB 232 and its associated breaker disconnect and bypass switches. This is the 230kV Gates-Panoche 230kV Line #1.
- Install one 230kV bus parallel breaker on the section on the north side, using the existing spare bay.
- Extend the existing 230kV double busses on the south side outside the existing fence line by about 150 feet (requires additional land of approximately 150 feet north-south and 320 feet west-east, minimum), for two new 230kV bays, one for the relocation of the Gates-Panoche Line #1 and the other for the new generation-tie line. The main ground grid will be expanded to cover the two new bays. Lighting and fencing for the new area will also be installed.

The generation-tie line connecting the project to the expanded Panoche Substation will be constructed using 795 ACSS conductor or equivalent. Figure 3.6-2 shows the approximate location of the project and the transmission facilities in the area.

3.6.4.1 Transmission System Reliability Criteria

PG&E performed the evaluation of the transmission system based on criteria as established by the North American Electric Reliability Council (NERC), the Western Electricity Coordinating Council (WECC), the California Independent System Operator (CAISO), and the PG&E reliability criteria. These criteria will be monitored throughout the transmission system evaluations to address any changes to the criteria, which may impact the evaluation.

3.6.4.2 System Impact Study/Facilities Study

PG&E has completed a system impact study (SIS) for the project. The study included three (3) power flow base case conditions to evaluate the transmission system impacts of the project. Power flow analysis and governor power flow analysis was conducted using all three base cases. The 2008 Summer Peak Full Loop Base Case was used for dynamic stability analysis. The base cases for power flow and dynamic simulation took into account all approved PG&E transmission system reinforcement projects that will be operational by June 2008. The study also considered the planned generating facilities in PG&E’s service territory whose schedules are concurrent with or precede the schedule for Panoche Energy Center.

A facilities study was also conducted by PG&E in March 2006, which identifies mitigation measures for transmission facility overloads and upgrades if necessary due to the added generation. The facilities study recommended a network upgrade item that is uncertain due to a number of projects dropping out of the queue. This study identified a proposal to re-conductor the Los Banos - Westley 230kV Line with bundled 1113kcmil AAL conductor or equivalent (37.4 miles). PEC believes that a requested re-study will show that the project should not be responsible for the re-conductoring. Any required resulting environmental evaluation will be addressed if the re-study shows this re-conductoring is required.

3.6.4.3 Electric Effects

The electric effects of the high voltage lines fall into two categories: corona effects and field effects. Corona is a the ionization of the air that occurs at the surface of the energized conductor and suspension hardware due to very high electric field strength at the surface of the metal during certain conditions. Corona may result in radio and television reception interference, audible noise, light, and production of ozone. A transmission line's field effects are the voltages and currents that may be induced in nearby conduction objects.

3.6.4.3.1 Generation of Electric and Magnetic Fields. Power lines, electrical wiring, electrical machinery, and appliances all produce electric and magnetic fields, commonly referred to as EMF. The EMF produced by the alternating current from the PEC has a frequency of 60 Hertz (Hz), which means that the intensity and orientation of the field changes 60 times per second. When a conductor is energized, both an electric and magnetic field will form around the conductor directly proportional to the energization voltage and current, respectively. Both electric and magnetic field magnitudes are inversely proportional to the distance from the conductors, meaning that EMF will attenuate as a function of distance from the conductors.

In order to reduce electric and magnetic fields, overhead transmission lines are designed to carry power over three conductors with currents and voltages that are 120 degrees out of phase with each other. Combined, the phase differences tend to cancel out the fields from the conductors. However, within a close range, for instance when a person stands on the ROW under a transmission line, one conductor will be significantly closer and hence, will contribute a net uncanceled field at the person's location.

The magnitude of the EMF depends on the current in the conductor, geometry of the structures, degree of cancellation from other conductors, and the distance of the receptor from the conductors. Maximum magnetic fields are produced at the maximum conductor currents. For the purpose of the EMF analyses, the maximum line loading is assumed to be 400 MW. This loading converts to approximately 1,100 amps per phase at 230kV.

3.6.4.3.2 Hazardous and Nuisance Shocks. A conducting object such as a vehicle or person in an electric field will experience induced voltages and currents. The strength of the induced current will depend upon the electric field strength, the size and shape of the conduction object, and the object-to-ground resistance. When a conducting object is isolated from the ground and a grounded person touches the object, a perceptible current or shock may occur as the current flows to the ground. The mitigation for hazardous and nuisance shocks is to ensure that metallic objects on or near the ROW are grounded and that sufficient clearances are provided at roadways and parking lots to keep electric fields at these locations low enough to prevent vehicle short-circuit currents from exceeding 5 mA.

Similarly, magnetic fields also induce voltages and currents in conducting objects. Typically this requires a long metallic object, such as a wire fence or above-ground pipeline that is grounded at only one location. Again, a person closing an electrical loop by grounding the object at a different location will experience a shock similar to one caused by the electric field described above. The mitigation for magnetic field effects is to ensure multiple grounds for fences or pipelines, especially those oriented parallel to the transmission line.

Furthermore, the proposed 230kV transmission interconnection will be constructed in conformance with California Public Utility Commission (CPUC) General Order (GO) 95 requirements and Title 8 CCR 2700 requirements. In this way, hazardous shocks are highly unlikely to occur as a result of the project construction, operation, and maintenance.

3.6.4.3.3 <u>Corona Effect</u>. The corona effect is the ionization of the air that occurs at the surface of the energized conductor and suspension hardware due to very high electric field strength that typically takes places at the surface of the conductor during certain conditions. Corona may result in certain radio and television reception interference, audible noise, light, and production of ozone, which are described in further detail below. The effects of corona are greatest at locations on the conductor where the field is enhanced by protrusions, such as nicks, insects, or drops of water (for instance during wet weather).

Well-maintained transmission lines will produce minimal corona effects. As previously noted, the project transmission line will be designed according to CPUC and California code, which will also serve to keep noise and interference effects from reaching undesirable levels. Any complaints will be logged, investigated, and to the degree possible, mitigated.

- **Audible Noise.** Corona-generated audible noise from transmission lines is generally characterized as a cracking/hissing noise. The Electric Power Research Institute (EPRI) has conducted several transmission line studies[1] which measure the sound levels for several line sizes with wet conductors, and found that the noise produced by a conductor attenuates by two to three decibels (dB) for each doubling of the distance from the source.
- **Radio and Television Interference.** Corona-generated radio interference is most likely to affect the amplitude modulation (AM) broadcast band (535 to 1,605 kilohertz); frequency modulation (FM) radio is rarely affected. Only AM receivers located very near to transmission lines have the potential to be affected by interference.

[1] *Transmission Line Reference Book, 345kV and Above.* EPRI. 1975, 1982.

- **Visible Light.** Corona may be visible at night as a bluish glow or as bluish plumes. On the transmission lines in the area, the corona levels are so low that the corona on the conductors usually is observable only under the darkest conditions with the aid of binoculars.
- **Photochemical Reactions.** When coronal discharge is present, the air surrounding the conductors is ionized and many chemical reactions take place producing small amounts of ozone and other oxidants. Approximately 90 percent of the oxidants are ozone, while the remaining 10 percent are composed principally of nitrogen oxides.

3.7 PIPELINE

The project includes a natural gas supply pipeline (lateral connection from trunk line and onsite).

3.7.1 Natural Gas Supply Line

Natural gas will be delivered to the plant site from a connection to a PG&E trunk line. A new gas compressor, metering, and regulator station will be provided on the east side of the site. The gas will be metered by PG&E as it enters the project site. The gas will be compressed as required and directed to each CTG. Additional flow metering will be provided at each CTG.

3.7.1.1 Description

Piping will be installed underground from the connection at the PG&E trunk line to the point where it enters the project site. The piping will be routed to the aboveground gas metering and regulation station and either routed aboveground or belowground to the gas compressors. From the gas compressors the pipeline will be routed underground to each CTG. The gas piping system will be constructed of carbon steel materials suitable for the design pressures and temperatures. Isolation and control valves will be provided as required by design, operational, and safety requirements.

3.7.1.2 Pipeline Routes

The PEC project will require the construction of approximately 2,400 linear feet of offsite pipeline, up to 16-inches in diameter, to supply natural gas to the project site. Primary and alternate routes for the pipeline are indicated in Figure 3.4-1. The primary route runs north of the PG&E electrical substation along Panoche Road. An alternate route is under consideration which would be located to the south of the substation. Either route is technically acceptable.

3.7.1.3 Buried Pipe

Construction will primarily use an open trench method.

The pipeline will be constructed of carbon steel in accordance with the American Petroleum Institute (API) specifications for gas pipelines or specifications of the ASTM. The pipe will have corrosion-protection coating that is either factory- or field-applied. Joints will be welded, inspected using x-ray, and wrapped with a corrosion-protection coating.

Construction of the natural gas pipeline is described in the following subsections.

3.7.1.3.1 Trenching. The width of the trench is dependent on the soil type encountered and requirements of governing agencies. The optimal dimensions of the trench will be about 18 inches wide and 48 inches deep. For loose soil, a trench of up to 8 feet wide at the top and 2 feet wide at the bottom may be required. The pipeline will be buried with a minimum 36-inch cover. The excavated soil will be piled on one side of the trench and later used for backfilling after the pipe is installed in the trench.

3.7.1.3.2 Stringing. The pipe will be laid out (stringing) on wooden skids along the side of the open trench during installation.

3.7.1.3.3 Installation. Installation consists of:

- Welding, coating, and bending of pipe
- Laying sand or fine spoil on the trench floor
- Lowering the pipe string into the trench

Welding will meet the applicable API and ASTM standards and shall be performed by qualified welders. Welds will undergo radiographical inspection by an independent, qualified radiography contractor. All coatings will be checked for holidays and will be repaired before lowering the pipe into the trench.

3.7.1.3.4 Backfilling. Backfilling consists of returning excavated soil back into the trench around and on top of the pipe, and up to the original grade of the surface. The backfill will be compacted to protect the stability of the pipe and minimize subsequent subsidence.

3.7.1.3.5 Plating. Plating consists of covering any open trenches, for safety purposes, with solid rectangular plates in areas of foot or vehicular traffic at the end of a workday. Plywood plates can be used in areas of foot traffic and steel plates on areas of vehicular traffic.

3.7.1.3.6 Pneumatic Testing. Pneumatic testing consists of plugging both open ends of a pipeline that is to be tested, filling the pipe with air up to a pressure specified by code requirements, and maintaining the pressure for a period of time.

3.7.1.3.7 Clean up. Clean up consists of restoring the ground surface by removing construction debris, grading the surface to its original state, and replanting vegetation.

3.7.1.3.8 Commissioning. Commissioning consists of cleaning and drying the interior of the pipeline, purging air from the pipeline, and filling the pipeline with natural gas.

3.7.1.3.9 Safety. Safety consists of complying with all applicable CalOSHA, OSHA, and other regulations and standards as well as contractor's specific safety plans for the project, which will address specific pipeline safety issues.

3.8 PROJECT CONSTRUCTION

Construction of the generating facility, from site preparation and grading to commercial operation, is expected to take place from October 2007 to August 2009.

3.8.1 Power Plant Facility

3.8.1.1 Project Schedule and Workforce

The major construction schedule milestones are listed below.

Activity	Date
Begin Construction	October 2007
Startup and Test	February 2009
Commercial Operation	August 2009

As shown in Table 3.8-1, there will be an average monthly and peak monthly workforce of approximately 150 and 364, respectively, of construction craft people, supervisory, support, and construction management personnel onsite during construction.

Construction will most typically take place between the hours of 6 a.m. and 6 p.m., Monday through Saturday. Additional hours may be necessary to make up schedule deficiencies, or to complete critical construction activities. During some construction periods and during the startup phase of the project, some activities will continue 24 hours per day, seven days per week.

The peak construction site workforce level is expected to last from Month 7 through Month 11 of the construction period following commencement of construction.

3.8.1.2 Execution Plans – Engineering and Construction Phases

This is an engineering, procurement, and construction (EPC) type project. As such, a single General Contractor will be selected for the design, procurement, and construction of the facility. Subcontractors will be selected by the General Contractor for specialty work portions as needed.

TABLE 3.8-1
PROJECT WORKFORCE PROJECTIONS

	Months After Commencement of Site Work												Commissioning				
Discipline	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Total
Insul. Workers								12	12	12	25	6	4				71
Boilermakers						21	21	21	21	21	21	17	16	16			175
Carpenters and Cement Finishers	2	6	10	16	19	16	19	22	29	22	12	6	6	3	2		190
Electricians	2	4	6	8	10	12	22	42	51	55	57	64	25	15	7	7	387
Ironworkers		4	7	46	43	46	46	43	37	33	29	26	12	4			376
Laborers	4	5	6	17	23	47	47	47	47	23	11	6	6	5	3	3	300
Millwrights				10	12	20	42	62	62	62	45	13	13	2	1	1	345
Operating Engineers	2	4	10	10	10	19	19	16	13	6	2	2	2	1	1		117
Painters						6	13	13	13	6	6	3	3	3			66
Pipe fitters				4	9	13	13	24	58	17	9	6	3	2			158
Sheet metal wkrs						4	9	11	13	11	11	11	3	2			75
Surveyors	3	7	7	4	4	3	3	3									34
Teamsters	1	4	8	10	16	9	9	8	8	8	4	3	2	2	2		94
Comm. Group											3	4	4	5	5	5	26
Total Workforce	14	34	54	125	146	216	263	324	364	276	235	167	99	60	21	16	2,414

3.8.1.2.1 Engineering and Pre-Construction Mobilization. Engineering activities will begin following the California Energy Commission (CEC) Final Approval of the project, which is anticipated by early summer, 2007. Staff from the engineering and construction groups will work together in the same office to prepare a safe, qualitative, cost effective, and sequentially effective plan for the project. The initial focus will include the purchase and delivery of engineered equipment and specialty, long-lead material. Facility design will include early milestones to complete the civil, structural, and mechanical equipment aspects of the project. As the ground breaking occurs and site grading commences, the design and procurement continues to support the overall schedule and reliability of the final project. Contractor is anticipated to mobilize within four months after notice to proceed.

3.8.1.2.2 Construction Facilities. Mobile trailers or similar suitable facilities (e.g., modular offices) will be used as construction offices for owner, contractor, and subcontractor personnel.

3.8.1.2.3 Construction Parking. Construction parking areas will be within existing site boundaries of the designated laydown area, south of the plant site. Construction access will be from West Panoche Road, via a new access road, as shown on Figure 3.4-1. These areas will provide adequate parking space for construction personnel and visitors during construction and will be maintained for stability and safety.

3.8.1.2.4 Laydown and Storage. Areas within the site boundary and the eight-acre laydown area immediately to the south of the site, shown on Figure 3.4-1, will be used as off-load and staging areas. These areas will be restored to agricultural use once construction is complete.

3.8.1.2.5 Emergency Facilities. The General Contractor will have a Safety Coordinator who will prepare a site-specific safety plan. Emergency services will be coordinated with the County of Fresno Fire Department and local hospital in the City of Mendota. An urgent care facility will be contacted to set up non-emergency physician referrals. First aid kits will be provided in the construction offices and regularly maintained. At least one person trained in first aid will be part of the construction crew. In addition, all foremen and supervisors will be given first aid training.

3.8.1.2.6 Construction Utilities. During construction, temporary utilities will be provided for the construction offices, laydown area, and the project site.

Temporary construction power will initially be provided by using diesel- and gas-powered generators. Eventually, temporary construction power will be supplied by a connection to the adjacent PG&E electrical substation.

Water trucks and potable water delivery will initially provide construction water. As the project matures and the build-out of water wells is completed, the onsite water wells will then be used as the source of construction water.

Portable toilets will be provided throughout the site during construction.

3.8.1.2.7 Site Services. The General Contractor will provide the following site services:

- Environmental health and safety training
- Site security
- Site first aid
- Construction testing (e.g., nondestructive examination, soil compaction)
- Site fire protection and extinguisher maintenance
- Furnishing and servicing of sanitary facilities
- Trash collection and disposal

- Disposal of hazardous materials and waste in accordance with local, state, and federal regulations

3.8.1.2.8 Construction Equipment and Materials Delivery. Materials and supplies will be delivered to the site by truck. Truck deliveries of construction materials and equipment will generally occur on weekdays between 6:00 a.m. and 6:00 p.m., however, some larger heavy load deliveries may be delivered outside those hours. Site access will be controlled for personnel and vehicles.

3.9 FACILITY OPERATIONS AND MAINTENANCE

This section discusses operation and maintenance procedures that will be followed by the PEC staff to ensure safe, reliable, and environmentally acceptable operation of the power plant, transmission system, and pipelines. Additional information will be provided in the attached appendices.

3.9.1 Introduction

PEC will require approximately 12 full time employees. Plant operations will be directed from a new control room. All system equipment will be controlled through a PLC and the project equipment will be integrated into this proven control system.

3.9.2 Power Plant Facility

The PEC is designed as a simple cycle, intermediately loaded peaking facility with four LMS100 CTGs. The project will be designed to emphasize efficiency and flexibility.

3.9.2.1 Peaker Plant Operation

The plant will be operated to provide its maximum available electrical output during the periods when the demand for electricity is greatest. As an intermediate load and peaking facility, the plant is estimated to operate no more than 5,000 hours per year. The plant will be dispatched by PG&E in accordance with their economic dispatch procedures. The project equipment will be integrated with a PEC plant performance monitoring program that allows plant staff to make critical decisions as to when the equipment performance has deteriorated to the extent requiring corrective action. This program also allows the plant staff to accurately determine the cost of electrical production. This ability in conjunction with an experienced and adaptable staff will allow the plant to be operated and maintained in the most efficient method possible.

Planned maintenance will be coordinated to coincide with periods of low power demand on the CAISO system.

3.9.2.1.1 Annual Operating Practices. Generally, the plant will be operated to provide its maximum electrical output when the demand for electricity is highest. Planned maintenance will be coordinated with demand fluctuations so that outages occur during periods of low demand. Normally, this work will be planned during non-peak periods when electrical demand is low.

3.9.2.1.2 Operation with Seasonal Variation in Ambient Temperature. Unit output is sensitive to the temperature and density of the ambient air taken into the CTG inlet and used in the combustion process. The temperature and humidity of the air ingested into the gas turbine inlets affect power output. The gas turbine will be equipped with evaporative coolers that will be operated when needed to enhance the power output of the gas turbines. Evaporative coolers will also reduce the inlet air temperatures whenever the ambient temperature is higher than 60°F.

3.9.2.1.3 Startup and Shutdown. The time required for startup is approximately 10 minutes. The PG&E contract allows for 365 startups and shutdowns per unit in a one-year period.

3.9.2.2 Control Philosophy

The control system will consist of a state-of-the-art, integrated, microprocessor-based PLC. The control system will provide for startup, shutdown, and control of plant operation limits and will provide protection for the equipment.

Interlock and logic systems will be provided via hard-wired relays, and/or PLCs.

Process switches (i.e., pressure, temperature, level, flow) used for protective functions will be connected directly to the PLC and the protective system.

3.9.2.3 Degree of Automation

The plant will be designed with automation where practical in order to reduce the required actions performed by operating personnel. Through subsystem automation and use of the PLC, the number of individual control switches and indicators that confront the operator will be greatly reduced. This will reduce the complexity and size of the main control room workstations and panels.

3.9.2.4 Centralized Control

The majority of the equipment that is required to support the operation of the plant will be located in the control and electrical equipment rooms. The control room contains the PLC CRT-based operator workstations and the auxiliary control panels. In addition, the control room contains the alarm, utility, and log printers.

Local control panels or stations will be furnished only where operator attention is required to set up a system for operation, or where the equipment requires intermittent attention during plant operation. Main control room indicators and control functions will only be duplicated for those variables critical to plant availability.

3.9.2.5 Distributed Control and Monitoring System

3.9.2.5.1 PLC Configuration. Redundant microprocessor-based controllers will communicate via a high speed communications network.

The overall network will provide unit-wide data access for centralized operation through operator workstations.

Remote I/O will be used where practical to reduce the quantity of long cable runs for the PLC interface with remote equipment.

3.9.2.5.2 PLC Functions and Tasks. The PLC will perform the following functions and miscellaneous tasks:

- Perform analog and digital plant control functions to accommodate an operator interface for controlling the power plant equipment
- Monitor both analog and digital signals to provide the operator/engineer with access to data around the plant
- Perform alarm monitoring in the main control room for the entire plant
- Provide graphic displays, including both control- and information-type displays, for all systems and equipment, including electrical systems
- Provide data logging and reporting via displays and printed reports
- Provide long-term data storage of process history

3.9.3 Transmission System Operation and Maintenance

PEC will be responsible for the maintenance, inspection, and normal operation of the new 300-foot 230kV interconnecting transmission line in agreement with PG&E and ISO protocols. Operation of the electrical interconnection facilities will be locally controlled at the new generating plant. Operation may also be remotely monitored and controlled by PG&E via the PEC supervisory control and data acquisition system (SCADA). Control and protection equipment at the plant and within the PG&E switchyard will monitor and control the safe operation of the line, and will automatically trip the plant (or a portion of it) and/or the line in the event of a fault. The PEC will have continuous access to all of the electrical interconnection facilities in the event of an emergency.

The control, protection, and metering equipment for the interconnection will be tested for proper operation. The protection and metering equipment will be calibrated and tested approximately every 12 months in accordance with the PEC and PG&E procedures. Inspections of the transmission line and structures are anticipated to occur every 6 to 12 months. Periodic cleaning of the transmission line and switchyard insulators and bushings may be required to remove contamination. The cleaning will be performed based on visual inspections scheduled by plant and switchyard operating personnel. Washing operations will consist of spraying insulators with deionized water through high-pressure equipment mounted on a truck.

3.9.4 Pipelines

There are no water lines that leave the PEC property. A natural gas pipeline from PG&E Gas Line 2 to the project will be owned by PG&E. Operation and maintenance of the natural gas pipeline from the existing fuel gas supply lines will be performed by PG&E in accordance with applicable Federal Energy Regulatory Commission (FERC) and U.S. Department of Transportation (DOT) regulations. This piping system will receive periodic inspections as part of PG&E's pipeline maintenance program. Industrial wastewater will be discharged to the onsite deep well injection system. The connection to the system will be built, owned, and operated by the PEC.

3.10 FACILITY CLOSURE

Facility closure can be either temporary or permanent. Facility closure can result from two circumstances: 1) the facility is closed suddenly and/or unexpectedly due to unplanned circumstances, such as a natural disaster or other unexpected event (e.g., a temporary shortage of facility fuel); or 2) the facility is closed in a planned, orderly manner, such as at the end of its useful economic or mechanical life or due to gradual obsolescence. The two types of closure are discussed in the following sections.

3.10.1 Temporary Closure

Temporary or unplanned closure can result from a number of unforeseen circumstances, ranging from natural disaster to economic forces. For a short term unplanned closure, where there is no facility damage resulting in a hazardous substance release, the facility would be kept "as is," ready to resume operating when the unplanned closure event is rectified or ceases to restrict operations.

In the event that there is a possibility of a hazardous substances release, the project owner will notify the CEC compliance unit and follow emergency plans that are appropriate to the emergency Risk Management Plan (RMP). Depending upon the expected duration of the shutdown, chemicals may be drained from the storage tanks and other equipment. All waste (hazardous and non-hazardous) will be disposed of according to LORS in effect at the time of the closure. Facility security will be retained so that the facility is secure from trespassers.

3.10.2 Permanent Closure

The anticipated life of the generation facility is 30 years. However, if the facility were economically viable at the end of the 30-year operating period, it could continue to operate for a much longer period of time. As power plant operators continuously upgrade their generation equipment, and maintain the equipment up to industry standards, there is every expectation that the generation facility will have value beyond its expected life.

3.10.3 Closure Mitigation

At the time of facility closure, decommissioning will be completed in a manner that: 1) protects the health and safety of the public; and, 2) is environmentally acceptable. One year prior to a planned closure, the project owner will submit a specific decommissioning plan that would include the following:

- Identification, discussion, and scheduling of the proposed decommissioning activities to include the power plant, applicable transmission lines, and other pertinent facilities constructed as part of the project.
- Description of the measures to be taken that will ensure the safe shutdown and decommissioning of all equipment, including the draining and cleaning of all tankage, and the removal of any hazardous waste.
- Identification of all applicable LORS in effect at the time, and how the specific decommissioning will be accomplished in accordance with the LORS.
- Notification of state and local agencies, including the CEC.
- Once land is used for industrial or commercial purposes, it rarely reverts back to its natural state. Reuse of the land will be encouraged in this case, as opposed to taking additional land for future industrial or commercial purposes. If the plant site is to return to its natural state, the specific decommissioning plan will include the removal of all aboveground and underground objects and material, and an erosion control plan that is consistent with sound land management practices.

In the event of an unplanned closure due to earthquake damage or other circumstances, the project owner will meet with the CEC and local agencies and submit a detailed decommissioning closure plan in a timely manner.

No decommissioning plan will be submitted for a temporary shutdown.

3.11 SAFETY, AVAILABILITY, AND RELIABILITY

3.11.1 Safety Precautions and Emergency Systems

Safety precautions and emergency systems will be implemented as part of the design and construction of the plant to ensure safe and reliable operation of project facilities. Administrative controls will include classroom and hands-on training in operating and maintenance procedures and general safety items, and a well-planned maintenance program. These will work with the system design and monitoring features to enhance safety and reliability.

Safety, auxiliary, and emergency systems will consist of lighting, grounding, DC backup for controls, fire and hazardous materials safety systems, security systems, and natural gas, steam, and chemical safety systems. The plant will include its own utilities and services such as emergency power, plant and instrument air, fire suppression, and potable water systems.

3.11.1.1 Safety Precautions

3.11.1.1.1 Worker Safety. The PEC will implement programs to assure that compliance with federal and state occupational safety and health program requirements is maintained. In addition to compliance with these programs, the PEC will identify and implement plant specific programs that effectively assess potential hazards and mitigate them on a routine basis.

A more complete discussion of worker safety is provided in Section 5.17.

3.11.1.1.2 Hazardous Materials Handling. Hazardous materials will be stored and used at the PEC during both construction and operation. Design and construction of hazardous materials storage and dispensing systems will be in accordance with applicable codes, regulations, and standards. Hazardous materials storage areas will be curbed or diked to contain spills or leaks.

Potential hazards that are associated with hazardous materials will be further mitigated by implementing a hazards communication (HAZCOM) program. This program involves thorough training of employees on proper identification, handling, and emergency response to spills or accidental releases.

Emergency eyewashes and showers will be provided at appropriate locations. Appropriate Personal Protective Equipment (PPE) will be provided during both construction and operation of the facility. A more detailed discussion of hazardous materials handling is presented in Section 5.15.

3.11.1.1.3 Security. The plant site will be enclosed by a security fence. Access gates will be provided, as required. In addition to the perimeter security fence, the substation and transformer area will be fenced and provided with access gates. Security will be maintained on a 24-hour basis with either surveillance devices or personnel.

3.11.1.1.4 Public Health and Safety. The programs implemented to protect worker health and safety will also benefit public health and safety. Facility design will include controls and monitoring systems to minimize the potential for upset conditions that could result in public exposure to acutely hazardous materials. Potential public health impacts associated with operation of the project will be mitigated by development and implementation of an Emergency Response Plan (ERP), a HAZCOM Program, a Spill Prevention, Control, and Countermeasures (SPCC) Plan, safety programs, and employee training.

PEC will coordinate with local emergency responders, provide them with copies of the plant site ERP, conduct plant site tours to point out the location of hazardous materials and safety equipment, and encourage these providers to participate in annual emergency response drills.

3.11.1.2 Emergency Systems

3.11.1.2.1 Fire Protection Systems. The PEC will have onsite fire protection systems and will be supported by local fire protection services. Section 3.4.11 includes a detailed description of the fire protection systems.

Portable and fixed fire suppression equipment and systems will be included in the project. Portable fire extinguishers will be located at strategic locations throughout the project site. Smoke detectors, sprinkler systems, and fire hydrants with hoses will be utilized. Based on detailed design, the fixed fire protection system may also include a carbon dioxide or a deluge spray system.

Employees will be given fire safety training including instruction in fire prevention, the use of portable fire extinguishers and hose stations, and reporting fires to the local fire department. Employees will only suppress fires in their incipient stage. Fire drills will be conducted at least twice each year for each work area.

The Fresno County Fire Protection Division (FCFPD) Station #96**,** located at 101 McCabe, Mendota, with an estimated response time of 15-20 minutes, will provide primary fire protection, fire fighting, and emergency response services to the PEC site. The County Fire Marshall will perform a final fire safety inspection upon completion of construction and, thereafter, will conduct periodic fire safety inspections. Prior to startup the FCFPD will be requested to visit the project site to become familiar with the site and with project emergency response procedures.

3.11.1.2.2 Medical Services and Emergency Response. The PEC will have an ERP. The ERP will address potential emergencies, including chemical releases, fires, and injuries, and will describe emergency response equipment and its location, evacuation routes, procedures for reporting to local emergency response agencies, responsibilities for emergency response, and other actions to be taken in the event of an emergency.

Employee response to an emergency will be limited to an immediate response to minimize the risk of escalation of the accident or injury. Employees will be trained to respond to fires, spills, earthquakes, and injuries. A first-aid facility with adequate first-aid supplies and personnel qualified in first-aid treatment will be onsite.

3.11.2 Aviation Safety – Power Generation Stacks

The FAA Regulations Part 77 establishes standards for determining obstructions in navigation space and sets forth requirements for notification of proposed construction. These regulations require notification of any construction over 200 feet in height above ground level. The closest airfield with regularly scheduled commercial flights is Fresno, approximately 50 miles away. A small general aviation airport in Firebaugh (Firebaugh Airport), is also located approximately 24 miles from the site.

The stack will be 90 feet above ground. A Notice of Construction or Alteration will not be required to be filed with the FAA. Local air uses, such as crop dusting operations, will be reviewed to determine the need for other aviation safety markings.

3.11.3 Transmission Line Safety and Nuisance

3.11.3.1 Transmission Line Description

The onsite interconnection facilities will consist of 230kV outdoor switchyard, line surge arresters, high voltage disconnect switches, high voltage circuit breakers, metering and relaying devices, foundations, ground grid, fencing, and all other components necessary to connect the output of the generators to the PG&E substation. The transmission line will be approximately 300 feet long.

3.11.3.2 Audible Noise and Radio and TV Interference

An electric field is generated in the air surrounding a transmission line conductor when the transmission line is in operation. A corona discharge occurs at the conductor surface when the intensity of the electric field at the conductor surface exceeds the breakdown strength of the surrounding air. The electrical energy released from the conductors during this process is known as corona loss and is manifested as audible noise and radio/television interference.

Energized electric transmission lines can also generate audible noise by a process called corona discharge, most often perceived as a buzz or hum. This condition is usually worse when the conductors are wet. The EPRI has conducted several transmission line tests and studies which measured sound levels for several power line sizes with wet conductors *(Transmission Line Reference Book, 345 kV and Above,* EPRI, 1975,1982). The *Transmission Line Reference Book, 345 kV and Above* also notes that the noise produced by a conductor attenuates (decreases) by two to three dB for each doubling of the distance from the source.

Radio and TV interference, known as gap-type noise, is caused by a film on the surface of two hardware pieces that are in contact. The film acts as an insulator between the surfaces. This results in small electric arcs that produce noise and interference. This type of noise is not a problem in well-maintained transmission lines. Well-trained transmission line maintenance crews will maintain the project transmission line; therefore, problems that might occur can be readily pinpointed and corrected. Further, it is unlikely that the project transmission line would have any effect on radio or television reception, particularly noting the distance to the nearest residential development.

There are many factors contributing to the pre-project ambient noise levels in the plant area. The project transmission line will be designed such that noise from the line will continue to be well below undesirable levels. Any noise or radio/TV interference complaints will be logged, investigated and, to the degree possible, mitigated.

3.11.3.3 Induced Currents and Hazardous/Nuisance Shocks

3.11.3.3.1 Introduction. Touching metallic objects near a transmission line can cause hazardous or nuisance shocks, if the line is not properly constructed. Since the electric fields of the transmission line are negligible above ground, and the line is built in conformance with California Public Utility Commission General Order 95 requirements and Title 8 CCR 2700 requirements, hazardous shocks are highly unlikely to occur as a result of the project construction and operation.

3.11.3.3.2 Electromagnetic Fields. EMF occur independently of one another as electric and magnetic fields at the 60-Hz frequency used in transmission lines, and both are created by electric charges. Electric fields exist when these charges are not moving. Magnetic fields are created when the electric charges are moving. The magnitude of both electric and magnetic fields falls off rapidly as the distance from the source increases (proportional to the inverse of the square of distance). Refer to Section 3.6.4.3 for a discussion of the EMF from the facility.

California does not presently have a regulatory level for magnetic fields. However, the values estimated for the project are well below those established by states that do have limits. Other states have established regulations for magnetic fields strengths that have limits ranging from

150 milligauss to 250 milligauss at the edge of the ROW, depending on voltage. The CEC does not presently specify limits on magnetic fields for 230 kV transmission lines.

3.11.4 Facility Availability

This facility consists of four simple cycle gas turbines and generators that are specifically designed for peaking services. To support dispatch service, each turbine generator is commonly operated between 50 and 100 percent of base load , hence the facility will be operated to support dispatch service and automatic generation control in response to customer demands for electricity.

The facility will be designed for an operating life of 30 years. Reliability and availability projections are based on this operating life. Operations and maintenance procedures will be consistent with industry standard practices to maintain the useful life status of the plant components.

The percent of time that the power plant is projected to be operated is defined as the “service factor.” The service factor considers the amount of time that a unit is operating and generating power, whether at full or partial load. PEC will be licensed to operate up to 5,000 hours per year, as required by PG&E, which equates to a potential service factor of 57 percent. This differs from the equivalent availability factor (EAF), which considers the projected percent of energy production capacity achievable.

The EAF may be defined as a weighted average of the percent of full energy production capacity achievable. The projected EAF for PEC is estimated to be approximately 95 to 99 percent.

The EAF, which is a weighted average of the percent of energy production capacity achievable, differs from the “availability of a unit,” which is the percent of time that a unit is available for operation, whether at full load, partial load, or standby.

3.11.5 Equipment Reliability and Redundancy

The following sections identify equipment redundancy as it applies to project availability. Table 3.11-1 identifies specific equipment quantities and redundancy notes.

3.11.5.1 Combustion Turbine

The power block consists of four separate combustion turbine generators operating in parallel in the simple-cycle mode. Each combustion turbine generator power train will provide

TABLE 3.11.1
EQUIPMENT QUANTITIES/REDUNDANCY

Description	Number	Note
CTGs	Four trains	
Circulating Water Pumps	Two, 50% capacity	
Cooling Tower	One, five-cell tower	The fifth cell is extra
Demineralized-RO System	Two, 60% trains	
Natural Gas Compressor	Three, 50% capacity	
Generator Step-Up Transformers	Four (one per CTG)	

approximately 25 percent of the total facility output. The major components of each turbine generator power train consist of the following systems.

3.11.5.2 Combustion Turbine Generator Subsystems

The combustion turbine subsystems include the combustion turbine, inlet air filtration and evaporative inlet cooling system, intercooling system, generator and excitation systems, and turbine control and instrumentation. The combustion turbine consists of a compressor, intercooler system, a combustion section, and a turbine section. Compressed air from the compressor section is cooled by the intercooler and then heated by the combustion of natural gas in the combustion section. The heated compressed gasses expand in the turbine section where the expansion turns the rotor to produce mechanical energy to drive the compressor section and the generator. Exhaust gas from the combustion turbine will be directed into a SCR system to control NO_x emissions and an oxidation catalyst to control CO emissions. The generator will be air-cooled. The generator excitation system will be a solid-state static system. A combustion turbine control and instrumentation system (interfaced with the plant control system) will cover the turbine governing system and the turbine protection system.

3.11.5.3 Control and Information System

Critical functions and parameters will have redundant sensors and controls. Measurement redundancy will be provided for all critical plant parameters. The control system will be designed with a redundancy level such that critical controls and indications do not fail due to a single component failure.

Control systems in general, and especially the equipment protection systems, will be designed according to stringent reliability criteria.

Distributed control system (DCS) microprocessors will be fully redundant with automatic tracking and switchover capability in the event of a failure of the primary microprocessor. Two fully redundant data communications networks will be provided. The system will permit either network to be disconnected and reconnected while the system remains online and in control. The control system will incorporate online, self-diagnostic features to verify proper operation of system hardware, software, and related support functions such as control power, field contact interrogating power, and system modules in position.

The Mark IVe CTG control system includes controllers that are arranged in a single, dual or triple modular redundant arrangement, depending on the criticality of the system being controlled. In addition to the Mark IVe controllers, there are independent generator monitors for vibration, fire, and gas.

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

3.11.5.4 <u>Demineralized Water System</u>

Demineralized water system will provide high-purity water to be used for evaporation in the turbine inlet evaporator coolers and injection water into the turbine combustor for NO_x control. The demineralized water system will consist of two 60 percent capacity mixed-bed demineralizer trains. Make-up water to the demineralized water system will be from a 500,000-gallon raw water/firewater storage tank. Demineralized water will be stored in a 240,000-gallon demineralized water storage tank.

3.11.5.5 <u>Water Injection Makeup and Storage System</u>

The water injection makeup and storage subsystem will provide demineralized water storage and pumping capabilities to supply high-purity water for water injection. Major components of the system are the demineralized water storage tank (240,000 gallons), providing approximately a 12-hour supply of demineralized water at peak load and two full-capacity, horizontal, centrifugal, cycle makeup water pumps.

3.11.5.6 <u>Circulating Water System</u>

The circulating water system will provide cooling water to four combustion turbine intercoolers and four lube oil systems. There will be two 50 percent capacity circulating water pumps that will be the prime movers for this system.

3.11.6 Power Plant Performance Efficiency

CTG output and efficiency are dependent on inlet air conditions. P E C will use evaporative coolers to improve output and efficiency at high ambient temperatures. The LMS100 design incorporates a compressor intercooler and increased firing temperatures in order to achieve a gross CTG efficiency of approximately 46 percent.

3.11.7 Fuel/Water Availability

3.11.7.1 Gas Supply

PEC will be fueled from PG&E natural gas Transmission Line 2 that runs north-south along the east side of PG&E's Panoche Substation. The gas interconnection line will be approximately 2,400 feet of 16-inch pipeline routed west from the pipeline along Panoche Road in front of the Panoche substation and south along the west boundary of the sub station to the site. The proposed pipeline would have a sufficient capacity to supply 3,600 MMBtu/hr at a pressure in the range of 500 psig to 1,000 psig.

3.11.7.2 Water Availability

PEC is located in the Westside Sub-basin of the San Joaquin Valley Groundwater Basin. The USGS estimated the water in storage in 1961 was 52 million acre-feet. This estimate was to a depth of less than or equal to 1,000 feet. Using an average depth to groundwater in October 1984 of 111 feet, a specific yield of 9 percent over an area of 600,000 acres, the available storage is estimated to be 6 million acre-feet. This area has increased imported water supplies and as a result has reduced groundwater pumping. The proposed annual water use of 1,154 acre-feet a year will not exceed the safe perennial yield of groundwater in the Westside Sub-basin, which is approximately 200,000 acre-feet. Refer to Section 5.5 for a detailed discussion of the water supply and availability.

3.11.8 Project Quality and Control

The general contractor, the design-engineer contractor, and all significant vendors, suppliers, and subcontractors for the project will be required to develop a project-specific quality program prior to beginning work. Each program will define quality goals, processes to measure events, and incentive programs. Quality standards will include safety and environmental compliance objectives.

3.11.8.1 Quality Assurance

The quality assurance manual will define the quality management system and processes, management responsibility and organization, project execution, and measurement methods. Other elements of the quality assurance program will include a procedure manual, standards, job quality analysis, quality tours, preventive action planning, internal and external assessment, training, and trending.

Key quality indicators will be tracked and include surveillance, deficiencies, non-conformances, weld reject rate, audit results, quality incidents, and rework. The quality indicators will be metrically measured and reported.

3.11.8.2 Quality Control Records

Quality records will be maintained during the detailed design phase of the project, during the construction phase and during plant commissioning. Quality records include written documentation that procedures and standards are followed including inspection and testing reports, audit checklists, audit reports, and quality incident investigation reports.

3.12 LAWS, ORDINANCES, REGULATIONS, AND STANDARDS

The applicable laws, ordinances, regulations, and standards (LORS) for each engineering discipline are included as part of Appendices A through D.

Adequacy Issue:	Adequate ____	Inadequate ____	DATA ADEQUACY WORKSHEET	Revision No. 0	Date ____
Technical Area:	Facility Design	Project:		Technical Staff:	
Project Manager:		Docket:		Technical Senior:	

SITING REGULATIONS	INFORMATION	AFC PAGE NUMBER AND SECTION NUMBER	ADEQUATE YES OR NO	INFORMATION REQUIRED TO MAKE AFC CONFORM WITH REGULATIONS
Appendix B (g) (14) (B) (iii)	Water inundation zones, such as the 100-year flood plain and tsunami run-up zones.	- Section 3.5.9		
Appendix B (g) (14) (D) (i)	Precipitation and storm runoff patterns; and	- Section 3.5.8		
Appendix B (g) (14) (D) (ii)	Drainage facilities and design criteria.	- Section 3.4.7.4 - Section 3.5.8 - Figure 3.4-3 - Appendix C - Appendix S		
Appendix B (g) (14) (E) (ii)	The effects of construction activities and plant operation on water quality; and	- Section 3.4.7.4.4 - Section 3.5.8		
Appendix B (g) (14) (iii)	The effects of the project on the 100-year flood plain or other water inundation zones.	- Section 3.5.9		
Appendix B (h) (1) (A)	Tables which identify laws, regulations, ordinances, standards, adopted local, regional, state, and federal land use plans, and permits applicable to the proposed project, and a discussion of the applicability of each. The table or matrix shall explicitly reference pages in the application wherein conformance, with each law or standard during both construction and operation of the facility is discussed;	- Engineering Design Criteria: Appendices C-H		
Appendix B (h) (1) (B)	Tables which identify each agency with jurisdiction to issue applicable permits and approvals or to enforce identified laws, regulations, standards, and adopted local, regional, state and federal land use plans, and agencies which would have permit approval or enforcement authority, but for the exclusive authority of the commission to certify sites and related facilities.	- Appendices C-H		
Appendix B (h) (2)	A discussion of the conformity of the project with the requirements listed in subsection (h)(1)(A).	- Appendices C-H		

Adequacy Issue: Adequate ____ Inadequate ____

DATA ADEQUACY WORKSHEET

Revision No. 0 Date ____

Technical Area: **Facility Design** Project: ____ Technical Staff: ____

Project Manager: ____ Docket: ____ Technical Senior: ____

Siting Regulations	Information	AFC Page Number and Section Number	Adequate Yes or No	Information Required to Make AFC Conform with Regulations
Appendix B (h) (3)	The name, title, telephones number, and address, if known, of an official within each agency who will serve as a contact person for the agency.	- Appendices C-H		
Appendix B (h) (4)	A schedule indicating when permits outside the authority of the commission will be obtained and the steps the applicant has taken or plans to take to obtain such permits.	- Section 5.5		
Appendix B (i) (1) (A)	A description of the site conditions and investigations or studies conducted to determine the site conditions used as the basis for developing design criteria. The descriptions shall include, but not be limited to, seismic and other geologic hazards, adverse conditions that could affect the project's foundation, adverse meteorological and climatic conditions, and flooding hazards, if applicable.	- Section 3.5.11 - Section 3.5.9		
Appendix B (i) (1) (B)	A discussion of any measures proposed to improve adverse site conditions.	- Section 3.5.11		
Appendix B (i) (1) (C)	A description of the proposed foundation types, design criteria (including derivation), analytical techniques, assumptions, loading conditions, and loading combinations to be used in the design of facility structures and major mechanical and electrical equipment.	- Appendix L		
Appendix B (i) (1) (D)	For each of the following facilities and/or systems, provide a description including drawings, dimensions, surface-area requirements, typical operating data, and performance and design criteria for protection from impacts due to adverse site conditions:			
Appendix B (i) (1) (D) (i)	The power generation system;	- Section 3.4.4 - Table 3.4-1 - Figure 3.5-1		

Adequacy Issue: Adequate ____ Inadequate ____ **DATA ADEQUACY WORKSHEET** Revision No. 0 Date ____

Technical Area: **Facility Design** Project: ____ Technical Staff: ____

Project Manager: ____ Docket: ____ Technical Senior: ____

Siting Regulations	Information	AFC Page Number and Section Number	Adequate Yes or No	Information Required to Make AFC Conform with Regulations
Appendix B (i) (1) (D) (ii)	The heat dissipation system;	- Section 3.4.7.3.1 - Table 3.4-1 - Figure 3.5-1		
Appendix B (i) (1) (D) (iii)	The cooling water supply system, and, where applicable, pre-plant treatment procedures;	- Section 3.4.7.3.1 - Table 3.4-1 - Figure 3.4-8 - Figure 3.4-9 - Figure 3.5-1		
Appendix B (i) (1) (D) (iv)	The atmospheric emission control system;	- Section 3.4.10 - Section 3.4.7.3.2 - Figure 3.5-1		
Appendix B (i) (1) (D) (v)	The waste disposal system and on-site disposal sites;	- Section 3.4.7.4 - Section 3.4.8 - Section 3.4.9.2 - Table 3.4-1 - Figure 3.5-1		
Appendix B (i) (1) (D) (vii)	The geothermal resource conveyance and re-injection lines (if applicable);	N/A		
Appendix B (i) (1) (D) (viii)	Switchyards/transformer systems; and	- Section 3.4.5		
Appendix B (i) (1) (D) (ix)	Other significant facilities, structures, or system components proposed by the applicant.	- Electrical Interconnection: 3.6 - Pipeline: 3.7		