

Project Description

The Mariposa Energy Project (MEP) will be a nominal 200-megawatt (MW) peaking facility consisting of four General Electric (GE) LM6000 PC-Sprint natural gas-fired combustion turbine generators (CTG) and associated equipment. The project consists of construction of new generation as well as connection to natural gas, water, and electrical transmission interties.

2.1 Project Location

The facility will be located southeast of the intersection of Bruns Road and Kelso Road on a 10-acre portion of a 158-acre parcel (known as the Lee Property) immediately south of the Pacific Gas and Electric Company (PG&E) Bethany Compressor Station and 230-kV Kelso Substation. The proposed power plant site is located in the southern portion of the Lee Property, between two small hills.

The project site is in northeastern Alameda County, in an unincorporated area designated for Large Parcel Agriculture by the East County Area Plan. The Assessor's parcel number is 099B-7050-001-10. The site is located in Township 2S, Range 3E, Section 1 (Mount Diablo Base and Meridian). Access is via an access road that runs east from Bruns Road to the MEP site, within the Lee Property.

The 6.5-MW Byron Power Cogen Plant currently occupies 2 acres of the 158-acre parcel. The remainder of the parcel is non-irrigated grazing land. There was prior wind turbine development on the project site and the southern portion of the parcel. Minor debris from that development remains on site.

2.2 Location of Offsite Linear Facilities

Figure 1.1-3 shows the site location and linear facilities. MEP will interconnect to the Kelso Substation via a new 0.7-mile, 230-kV transmission line that will run north on the Lee Property, then across Kelso Road to the existing Kelso Substation. The natural gas pipeline will consist of approximately 580 feet of new 4-inch-diameter pipe that will run directly northeast from the project site to interconnect with PG&E's existing high-pressure natural gas pipeline (Line 2). A new gas metering station will be constructed on the project site.

Service water will be provided from a new connection to the Byron Bethany Irrigation District (BBID) via a new pump station and a 6-inch-diameter, 1.8-mile-long pipeline placed in or along the east side of Bruns Road, from existing Canal 45 south to the MEP site. Approximately 1,000 feet of pipeline will be located adjacent to Bruns Road on BBID property from the pump station to the new BBID headquarters facility. South of the BBID headquarters, the route will be located within the Bruns Road right-of-way under the paved section of road. The pipeline route will follow the site access road from Bruns Road to the project site. Associated facilities will include a concrete turnout structure at the canal bank

and a small pump station consisting of a pre-cast concrete manhole wet well, redundant vertical turbine pumps, pipe manifold and valving, electrical cabinet, and instrumentation.

Temporary construction facilities will include a 5-acre worker parking and laydown area immediately east of the project site, a 1-acre water supply pipeline parking and laydown area located at the BBID headquarters facility on Bruns Road, and a 0.6-acre laydown area along the transmission line route adjacent to the PG&E Kelso Substation and Bethany Compressor Station.

2.3 Generating Facility Description, Design, and Operation

MEP will be a nominal 200-MW (194 MW net at 59 degrees Fahrenheit [°F]), simple-cycle generating facility consisting of four power blocks. Each power block will contain one GE LM6000 PC-Sprint natural gas-fired combustion turbine. The generated power will be delivered to the grid via the Kelso Substation. MEP will be designed, constructed, and operated in accordance with applicable laws, ordinances, regulations and standards (LORS). The power plant facilities will be designed and constructed in accordance with the design criteria provided in Appendix 2A.

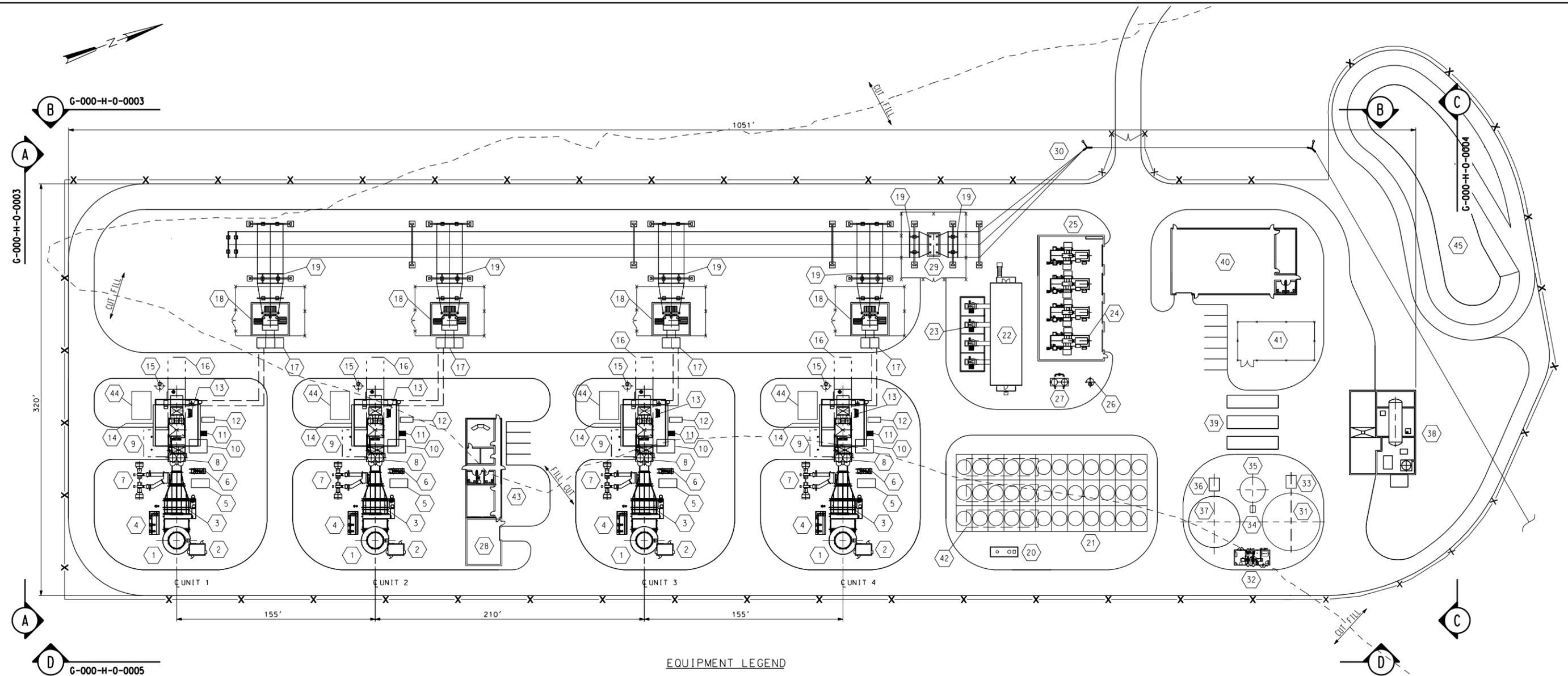
2.3.1 Site Arrangement and Layout

Figure 2.3-1, General Arrangement, and Figures 2.3-2a and 2.3-2b, which show typical elevation views, illustrate MEP's design. The main access to the site will be from Bruns Road (see Figure 1.1-3). A portion of the power block will be paved to provide internal access to all project facilities and onsite buildings. The areas around equipment, where not paved, will have gravel surfacing.

2.3.2 Process Description

The generating facility will consist of four GE LM6000 PC-Sprint CTGs equipped with selective catalytic reduction (SCR) air emissions control equipment and associated support equipment for nitrogen oxides (NO_x) and carbon monoxide (CO) control. The new facility will provide a total nominal generation rating of 200 MW and net capacity of 194 MW, at average annual ambient conditions of 59°F.

Each CTG will generate approximately 50 MW (gross) at base load under average ambient conditions. The project is expected to have an overall annual availability of 92 to 98 percent, including scheduled and forced outages. The design of the plant will provide for operating flexibility. Each CTG is designed to start and ramp up to full power in 10 minutes. This fast-start capability is well-adapted to meeting changing market conditions. Each CTG also provides various ancillary services, such as ramp-up, ramp-down, and spinning reserve, allowing MEP to readily adapt to changing conditions in the energy and ancillary services markets.



EQUIPMENT LEGEND

- | | | |
|--------------------------------|--|--|
| 1. EXHAUST STACK | 16. ROTOR PULL SPACE | 31. 45' DIA. RAW WATER/FIRE WATER STORAGE TANK |
| 2. CEMS STATION | 17. SWGR. GENERATOR BREAKER (TYP OF 2 UNITS) | 32. FIRE PROTECTION WATER PUMPS |
| 3. SCR/CO CATALYST | 18. GENERATOR STEP-UP TRANSFORMER (GSU) | 33. RAW WATER TRANSFER PUMPS |
| 4. AMMONIA INJECTION SKID | 19. DISCONNECT | 34. WASTE WATER TRANSFER PUMPS |
| 5. LUBE OIL FIN FAN COOLER | 20. OIL/WATER SEPARATOR | 35. 25' DIA. WASTE WATER STORAGE TANK |
| 6. WATER INJECTION SKID | 21. CHILLER/AIR COOLED RADIATOR SYSTEM | 36. DEMIN WATER TRANSFER PUMPS |
| 7. TEMPERING AIR FANS | 22. POWER DISTRIBUTION CENTER (PDC) | 37. 40' DIA. DEMIN WATER STORAGE TANK |
| 8. GAS TURBINE GENERATOR (CTG) | 23. AUX TRANSFORMERS | 38. AQUEOUS AMMONIA UNLOADING/STORAGE AREA |
| 9. TURBINE REMOVAL AREA | 24. FUEL GAS COMPRESSORS | 39. DEMIN WATER TRAILERS |
| 10. AUXILIARY SKID | 25. FUEL GAS COMPRESSOR ENCLOSURE | 40. WAREHOUSE & MAINT. BUILDING |
| 11. SPRINT SKID | 26. FUEL GAS WASTE SUMP | 41. GAS METERING STATION |
| 12. FINAL GAS FUEL FILTER | 27. FUEL GAS COALESCING FILTERS | 42. CHILLER SKIDS (3) |
| 13. CO2 BOTTLE STORAGE | 28. AIR COMPR/DRYER/RECEIVER ENCLOSURE | 43. CONTROL/ADMIN. BUILDING |
| 14. CTG INLET AIR FILTER | 29. CIRCUIT BREAKER | 44. CTG ELECT. MODULE |
| 15. WATER WASH DRAINS TANK | 30. OVERHEAD POWER LINES | 45. RETENTION POND |

NOTE:
FINISHED GRADE EL. 125'-6"
T.O. CONC. EL. 126'-0"

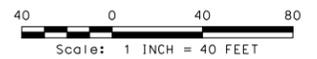
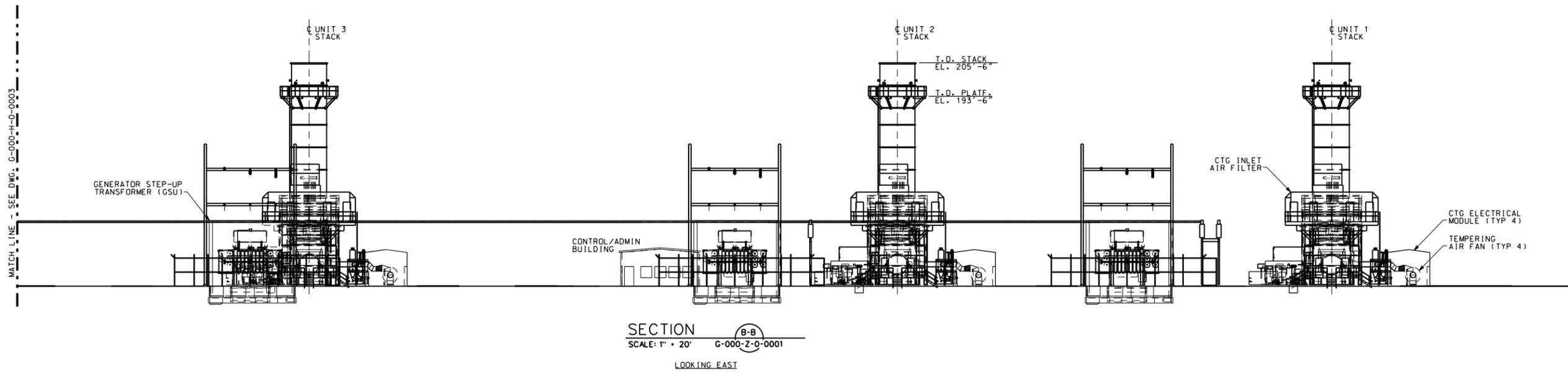
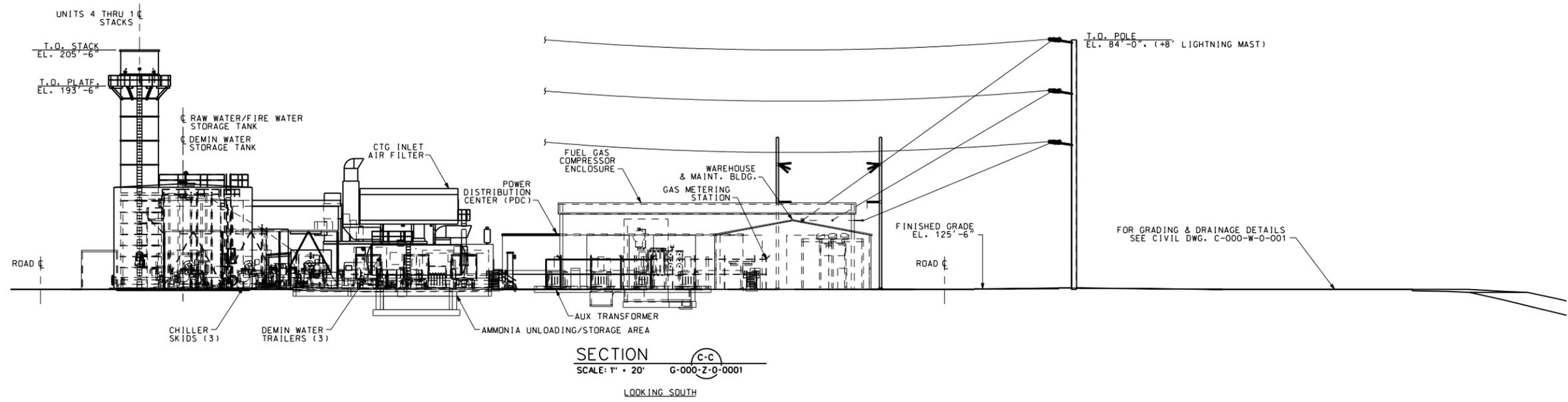


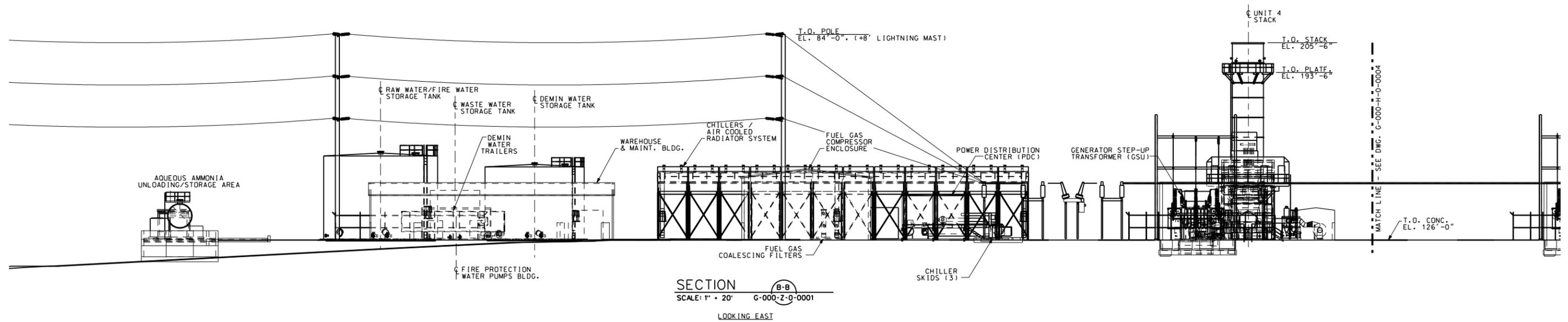
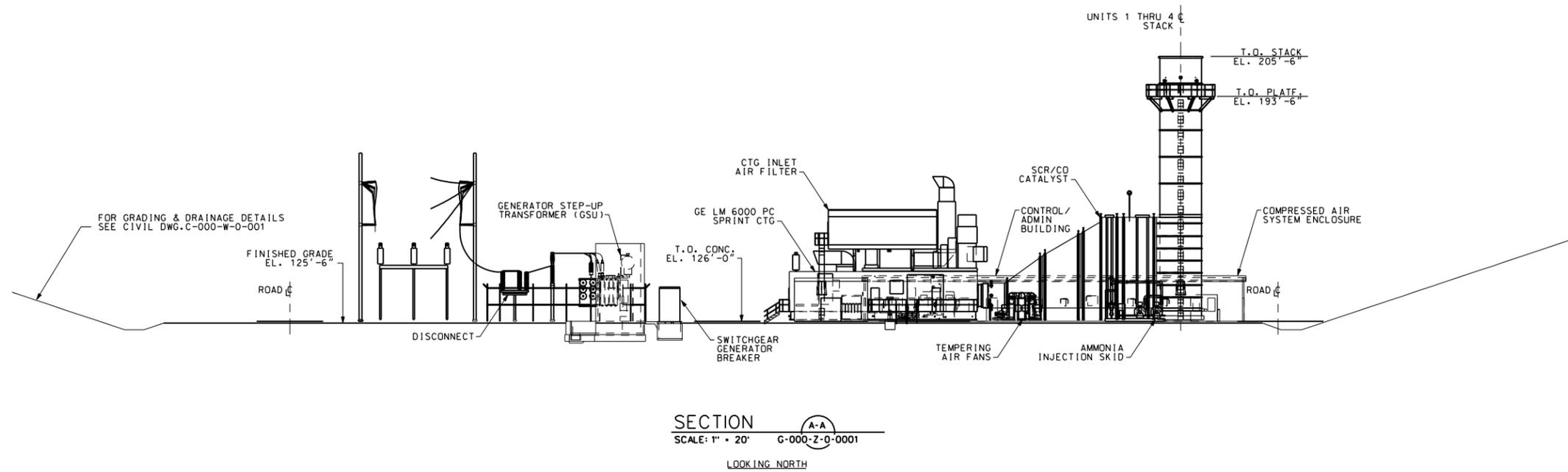
FIGURE 2.3-1
GENERAL ARRANGEMENT
Mariposa Energy Project
Alameda County, California



NOTE:
FINISHED GRADE EL. 125'-6"
T.O. CONC. EL. 126'-0"

20 0 20 40
Scale: 1 INCH = 20 FEET

FIGURE 2.3-2A
ELEVATIONS
Mariposa Energy Project
Alameda County, California



NOTE:
FINISHED GRADE EL. 125'-6"
T.O. CONC. EL. 126'-0"

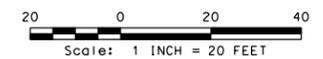


FIGURE 2.3-2B
ELEVATIONS
Mariposa Energy Project
Alameda County, California

The CTGs operate most efficiently when the inlet air temperature is maintained at 46°F. Two R134A air-cooled inlet air chiller packages, with a total nominal chilling capacity of 7,000 tons, will cool the inlet air to the required temperature. The MEP heat and mass balance diagram is shown on Figure 2.3-3. This balance is based on an ambient dry bulb temperature of 59°F (annual average), an ambient wet bulb temperature of 52°F (annual average). Heat and mass balance calculations are documented in Appendix 2B. Actual net output of the system will vary in response to ambient air temperature conditions, chiller demand, generator power factor, firing conditions of the combustion turbine and other operating factors. Full load output (net) of the facility under expected operating conditions will range from approximately 188 MW to 194 MW. The CTGs can operate at partial load, with the CTGs operating down to minimum load (50 percent). Operational modes will be driven by good operating practices, market conditions, and dispatch requirements.

The emissions of each CTG are stabilized at permitted levels within 30 minutes of startup. Hot flue gas exits the CTGs and enters the emissions control equipment. The proposed emissions limits will be met using an SCR process that will include NO_x and CO catalysts as well as aqueous ammonia injection. Emissions will be monitored by a continuous emissions monitoring system (CEMS) before exiting the stack. Stack NO_x emissions will be controlled by a combination of water injection in the CTGs and the SCR system. An oxidation (CO) catalyst will be installed in the SCR to limit CO emissions.

As a peaking power plant, MEP will operate during times of very high electrical load, during periods when intermittent renewable source generation experiences fluctuation, when baseload plants are not operating or being brought on-line, or during emergency conditions. Although the facility will be licensed and permitted to operate up to 4,000 hours per year (46 percent of the time) plus 300 start and stop cycles, as a peaking power plant its actual capacity factor will be much less. A California Energy Commission (CEC) Staff analysis, for example, showed that, in 2004, 19 simple-cycle peaking plants in California with a gross generating capacity of 50 MW or more operated an average of 6.2 percent of the time (range 0.3 to 31.9 percent) (Table 2.3-1), which is equivalent to 543 hours per year. Only 4 of these 19 plants operated more than 10 percent of the time (CEC, 2006). Based on these data, an annual operating profile of approximately 600 hours per year plus 200 start and stop cycles is expected.

TABLE 2.3-1
2004 Capacity Factors of California Simple-Cycle Peaking Plants Greater than or Equal to 50 MW*

Facility Name	Generating Capacity (MW)	Hours of Operation	Capacity Factor (pct)
Harbor (City of Los Angeles)	282	1,266	14.5
Oakland Power Plant	224	95	1.1
Los Esteros Critical Energy Fac.	180	1,498	17.1
Tracy Peaker	169	67	0.8
Potrero Power	156	306	3.5
Indigo Energy Facility	150	505	5.8
Gilroy Peaker	135	521	5.9
Larkspur Energy Facility	100	373	4.3
Henrietta Peaker	98	112	1.3

TABLE 2.3-1
2004 Capacity Factors of California Simple-Cycle Peaking Plants Greater than or Equal to 50 MW*

Facility Name	Generating Capacity (MW)	Hours of Operation	Capacity Factor (pct)
Hanford Energy Park Peaker	92	105	1.2
Pittsburg Power Plant	74	2,794	31.9
Lake (City of Burbank)	70	636	7.3
Agua Mansa Power Plant	61	401	4.6
Roseville (NCPA)	50	22	0.3
Panoche Peaker	50	41	0.5
Almond Power Plant (TID)	50	1,110	12.7
Vaca-Dixon No. 1	50	93	1.1
Panoche No. 2	50	90	1.0
Border	50	194	2.2
Average	110	538	6.2

*Cogeneration plants are excluded because their capacity factors may be more dependent on steam host demand than on electrical demand.

Source: CEC, 2006

2.3.3 Generating Facility Cycle

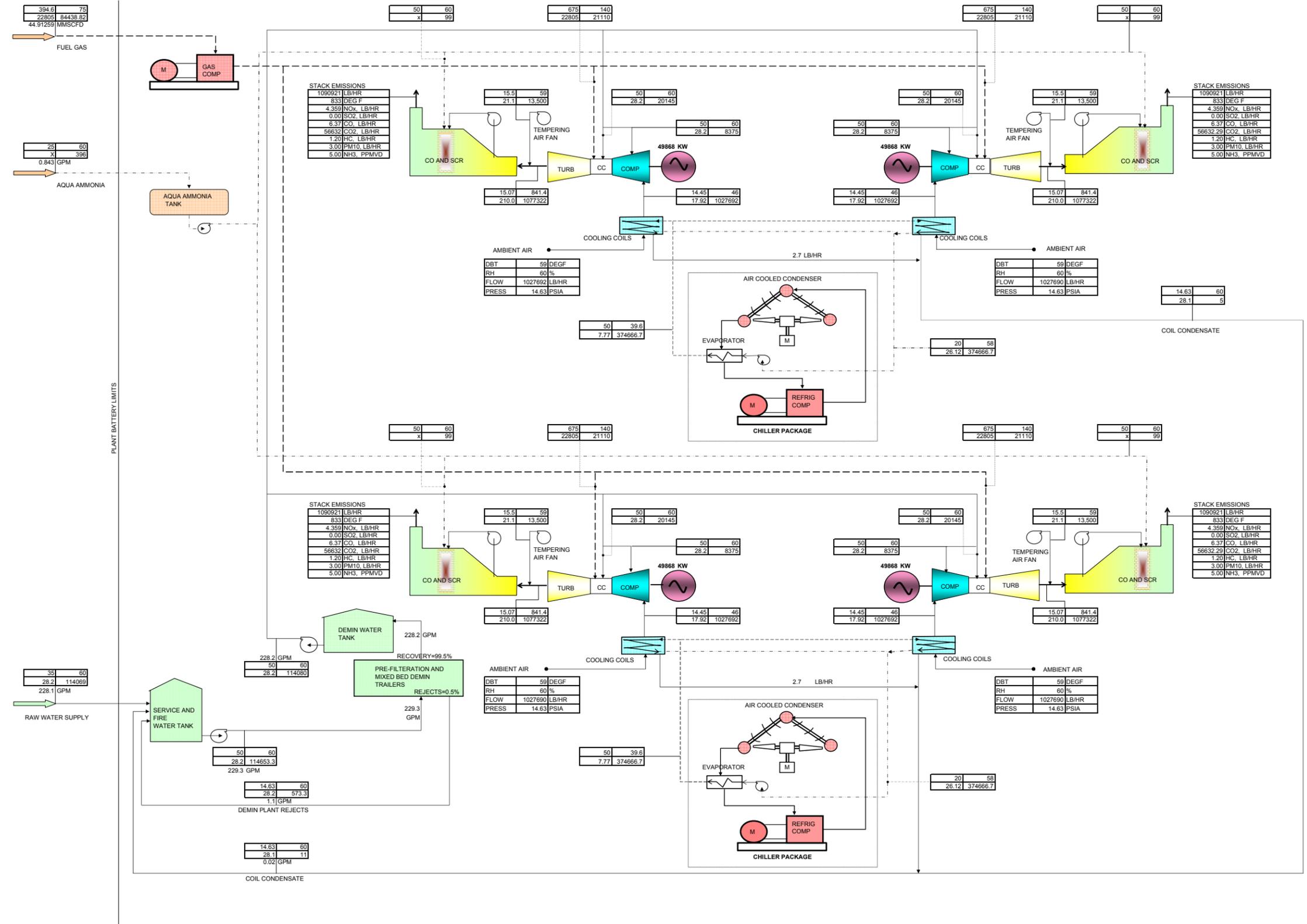
In the CTGs, combustion air flows through the inlet air chiller coils, filters, and associated air inlet ductwork; is compressed in the gas turbine compressor section; and then flows to the CTG combustor. Natural gas is injected along with the compressed air into the combustor and then ignited. The hot combustion gases expand through the power turbine section of the CTG, causing the shaft to rotate and drive the electric generator and CTG compressor.

2.3.4 Combustion Turbine Generators

Thermal energy is produced in each CTG through the combustion of natural gas, which is converted into mechanical energy required to drive the combustion turbine compressors and electric generators. The GE LM6000 PC-Sprint CTG is a two-shaft/two-spool engine consisting of a compressor, a high-pressure turbine, and a low-pressure turbine. The engine is shock-mounted and connected to a 2-pole, air-cooled generator operating at 13.8 kV and 60 hertz (Hz).

Each CTG system consists of a stationary combustion turbine generator, supporting systems, and associated auxiliary equipment. The CTGs will be equipped with the following required accessories to provide safe and reliable operation:

- Air inlet system complete with a modular, multistage filtration system
- Weatherproof acoustic enclosures with explosion-proof lighting
- Fuel system, including an electronically controlled fuel metering valve



- NOTES
1. THE SCR TEMPERING AIR FANS OPERATE TO MAINTAIN THE FLUE GAS TEMPERATURE BELOW 850DEGF
 2. FUEL GAS SUPPLY PRESSURE TO SITE IS ASSUMED AT 380PSIG
 3. GAS TURBINE LUBE OIL COOLERS WILL BE AIR COOLED
 4. DILUTION AIR FLOWS FOR SCR ARE NOT SHOWN
 5. DEMINERALIZER REGENERATION WILL BE OFF SITE
 6. AIR COOLED CHILLER POWER UTILIZATION FACTOR=0.84 KW/TON OF REFRIGERATION

STACK EMISSION LIMITS

NOx	2.5PPMVD @ 15% O2
CO	6.0 PPMVD @ 15% O2
VOC	2.0PPMVD @ 15% O2
NH3 SLIP	5.0 PPMVD @ 15% O2
PM-10	3.0 LB/HR

WATER CONSUMPTION SUMMARY

DEMIN WATER , GPM	228.2
RAW WATER SUPPLY TO SITE, GPM	228.1
COOLING TOWER MAKEUP	0.00
POWER AUGMENTATION, PER ENGINE, GPM	16.75
WASTE WATER FROM SITE, GPM	0.00

PLANT PERFORMANCE SUMMARY-ESTIMATE

GAS TURBINE GROSS OUTPUT , KW/UNIT	49868
NUMBER OF GAS TURBINES	4
TOTAL GROSS OUTPUT, KW	199470.5
PLANT AUXILIARY LOSSES, KW	5685
230KV TRANSMISSION LINE LOSSES, KW	25.5
PLANT NET OUTPUT, KW	193759.5
FUEL INPUT/ UNIT, MMBTU/HR (HHV)	481.41
TOTAL PLANT FUEL INPUT, MMBTU/HR (HHV)	1925.627
NET PLANT HEAT RATE, BTU/KWH (HHV)	9938.24
NET PLANT HEAT RATE, BTU/KWH (LHV)	8968.6

PARAMETERS

PSIA	°F
BTU/LB	PPH

FIGURE 2.3-3
HEAT AND MASS BALANCE DIAGRAM
 Mariposa Energy Project
 Alameda County, California

- Two lube oil systems: one synthetic for the gas turbine and one mineral for the generator. The lube oil reservoirs, valve trim and piping are stainless steel. Lube oil cooling is provided by an air-cooled fin fan cooler.
- Electro-hydraulic start system
- 24-volt direct current (DC) valve regulated lead acid (VLRA) type battery system
- Generator protective relays
- Water injection for NO_x control
- Compressor wash system
- Fire detection and protection system
- Turbine/generator base plate

2.3.5 Major Electrical Equipment and Systems

The electric power generated by this facility will be transmitted to the electrical grid, with the exception of the power required for onsite auxiliaries such as pumps, fans, gas compressors, and other parasitic loads. A station battery system shall be used to provide backup power for critical loads and control systems. Transmission and auxiliary uses are discussed in the following subsections.

2.3.5.1 Alternating Current (AC) Power—Transmission

Power will be generated by the four CTGs at 13.8 kV and then stepped up using four 13.8/230-kV, oil-filled generator step-up transformers, to support connection to the local 230-kV network. Figure 2.3-4 provides an overall single-line diagram of the facility's electrical system. Surge arrestors protect the transformer from surges in the 230-kV system caused by lightning strikes or other system disturbances. The transformers will be set on a concrete foundation that includes a secondary oil containment reservoir to contain the transformer oil in the event of a leak or spill. The high-voltage side of the generator step-up transformer will be connected to a single-circuit, three-phase, 230-kV transmission line, which will be connected to the PG&E 230-kV switchyard at the Kelso Substation located north of the MEP site on Bruns Road.

A detailed discussion of the electric transmission system is provided in Section 3.0.

2.3.5.2 AC Power—Distribution to Auxiliaries

Auxiliary power will be supplied at 4,160 volts and 480 volts through a double-ended, 4,160-volt switchgear lineup and a double-ended, 480-volt switchgear lineup. Each 13.8/4.16-kV unit auxiliary transformer will supply primary power to the medium-voltage switchgear and the corresponding medium-voltage motor control center (MCC). The unit auxiliary transformer primary (13.8 kV) will be connected to the 15-kV switchgear lineup on the low-voltage side of one of the generator step-up transformers. This interface point allows the switchgear to be backfed from the local grid when the CTGs are not running, or directly from the CTGs when they are in operation. Each CTG will have a 15-kV rated breaker between the generator and the generator step-up transformer for generator synchronization and isolation.

The 4,160-volt switchgear/MCC lineup supplies power to all medium-voltage loads as well as the two station service transformers, rated 4,160/480 volts, for 480-volt power distribution. Each station service transformer will be oil-filled and sized to supply 480-volt, 3-phase power to the plant 480-volt MCCs. The MCCs will provide power to the 480-volt motor loads as well as other low-voltage plant loads.

2.3.5.3 125-Volt DC Power Supply System

One common 125-volt DC power supply system consisting of one 100-percent-capacity battery bank, two 100-percent static battery chargers, a switchboard, and two or more distribution panels will be supplied for the balance-of-plant and essential CTG equipment. Each CTG will be provided with its own separate battery systems and redundant chargers.

Under normal operating conditions, the battery chargers supply DC power to the DC loads. The battery chargers are fed by 480-volt AC (VAC) and continuously charge the battery banks while supplying power to the DC loads.

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

The 125-volt DC system will also be used to provide control power to the 4,160-volt switchgear, the 480-volt load centers, critical control circuits, the plant control system, and the emergency DC motors.

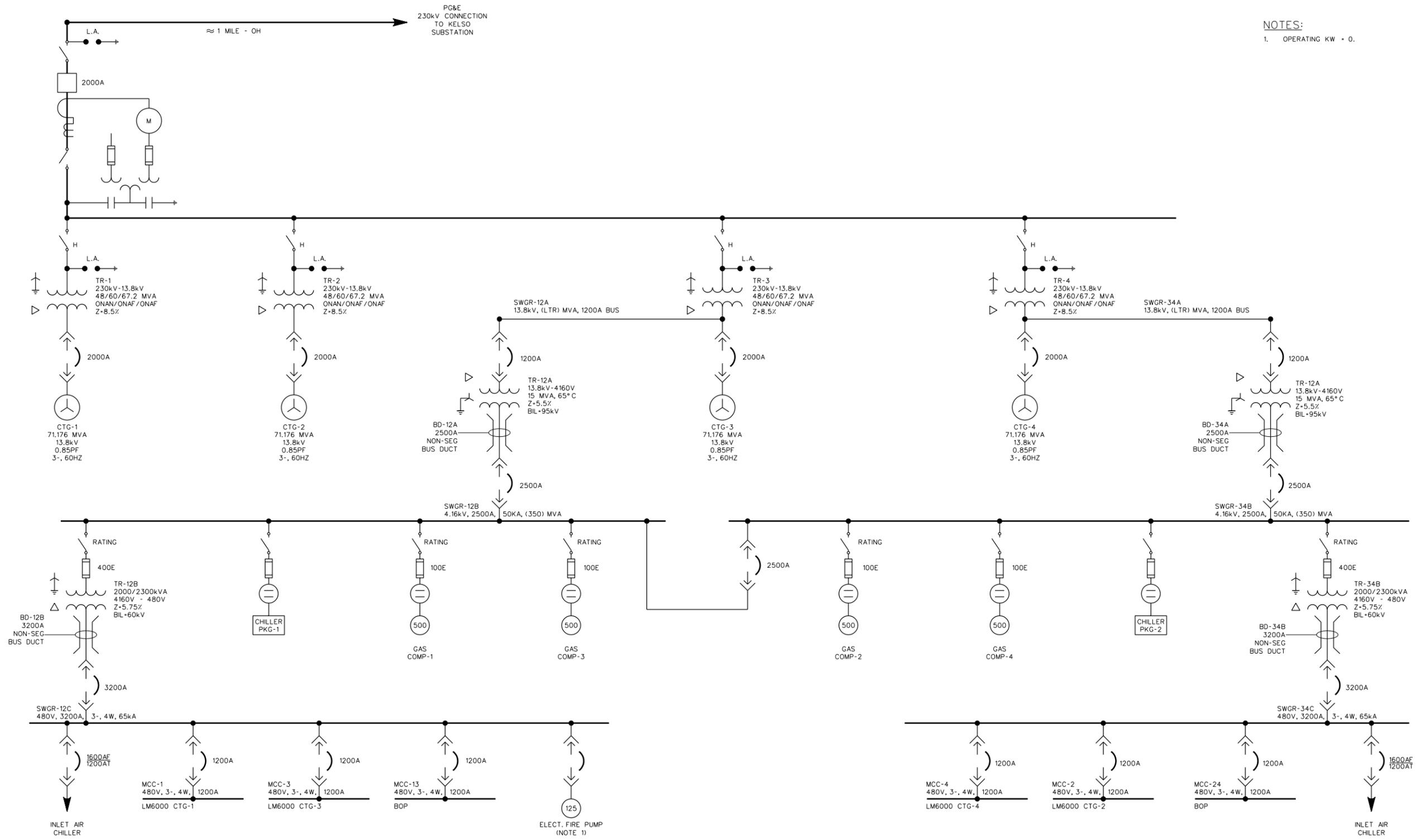
2.3.5.4 Uninterruptible Power Supply System

The CTGs and power block will have an essential service 120-VAC, single-phase, 60-Hz uninterruptible power supply (UPS) supplying power to essential instrumentation, critical equipment loads, and unit protection and safety systems that require uninterrupted AC power.

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

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

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



NOTES:
1. OPERATING KW = 0.

FIGURE 2.3-4
FACILITY SINGLE LINE DIAGRAM
Mariposa Energy Project
Alameda County, California

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

2.3.6 Fuel System

The CTGs will be designed to burn natural gas only. The natural gas requirement during base load operation at annual average ambient temperature is approximately 1,926 million British thermal units per hour (MMBtu/hr) (higher heat value [HHV] basis, total for four CTG units), or 44.9 million dry standard cubic feet. Seasonal temperature fluctuations do not significantly influence fuel demand because the inlet combustion air temperature is held constant at 46°F by inlet air chillers.

Natural gas will be delivered to the site via a tap off an existing PG&E natural gas pipeline (Line 2) located approximately 580 feet east of MEP. The new gas supply piping will consist of a 4-inch-diameter pipeline (see Section 4.0). At the plant site, the natural gas will flow through an 8-inch turbine-meter set, gas scrubber/filtering equipment, a gas pressure control station, electric-driven booster compressors coalescing and final fuel filters, and a fuel gas heater prior to entering the combustion turbines.

A minimum floating delivery pressure of 350 pounds per square inch gauge, as measured downstream of a non-regulated meter set, will be provided by PG&E. Four 100-percent-capacity, electric-driven fuel gas compressors will be provided to boost the pressure to that required by the CTGs. The gas compressors will be located outdoors and will be housed in an acoustical enclosure to reduce the compressor noise level.

2.3.7 Inlet Air Chiller System

Combustion air will be maintained at an optimum inlet temperature of 46°F through the use of air-cooled inlet air chillers. Two chiller packages will be provided, sized to serve the four CTGs.

The air chillers will cool a water/glycol mixture, which is circulated through coils in the CTG inlet air filter housing.

Mariposa Energy has elected to use R134A as the chiller refrigerant working fluid. While this refrigerant has a reduced operating efficiency compared with anhydrous ammonia, it was selected to minimize the transportation, storage, and use of hazardous materials in association with the project. The refrigerant is circulated through the shell side of a shell and tube heat exchanger, where it removes heat from the chilled water system before flowing to a compressor. The compressor pumps the fluid through an air-cooled heat exchanger, where the heat is rejected to the atmosphere. The cooled refrigerant is returned to the shell and tube heat exchanger.

2.3.8 Water Supply and Use

This subsection describes the quantity of water required, the sources of the water supply, and water treatment requirements. Two water balance diagrams are included, representing two operating conditions. Figures 2.3-5a and 2.3-5b represent: (1) annual average operation at 59°F with four CTGs operating at 100 percent load, and (2) typical summer operation case at 93°F with four CTGs operating at 100 percent load.

MEP will use water supplied by BBID via a new 6-inch-diameter, 1.8-mile-long water supply pipeline. This source will also provide water for fire protection, service water, potable water, safety showers, and sanitary uses. Plant drains will collect area washdown, sample drains, and drainage from facility equipment areas. Water from these areas will be collected in a system of floor drains, hub drains, sumps, and piping and will be routed to the wastewater collection system. Drains that potentially could contain oil or grease will first be routed through an oil/water separator. Wastewater from occasional combustion turbine water washes will be collected in a water wash drains tank. The wastewater will be discharged to the existing oil/water separator, where oil waste will be collected to drums and hauled offsite via a licensed waste hauler.

The non-oily waste stream will pass through a walnut shell, activated carbon vessel followed by a surge tank and 5 micron bag filters before being sent to the wastewater tank and eventually recycled back to the raw water storage tank.

A more detailed description of the water supply system, treatment, and permits is provided below and in Section 5.15, Water Resources.

2.3.8.1 Water Requirements

Mariposa Energy has taken advantage of available opportunities to minimize water usage for the project. MEP will utilize an air-cooled condenser rather than evaporative cooling for the inlet air chiller condensers to significantly reduce the amount of fresh water required for operation. Evaporative cooling is typically the largest use of water associated with power generation facilities. Additionally, approximately 85 percent of the process wastewater will be treated and recycled onsite as process water.

Under the maximum-permitted operating scenario of 4,000 hours per year plus 300 startup and shutdown events at the average annual temperature design case, MEP will use approximately 187 acre-feet of water per year, for all plant uses. As shown in Table 2.3-1, simple-cycle peakers in California larger than 50 MW generally average a 6 percent capacity factor. At a more realistic operating scenario of 600 hours per year (6.8 percent capacity factor) with 200 startup and shutdown cycles under the average annual temperature design case, annual average water use will be 34.8 acre-feet. A breakdown of the estimated average daily quantity of water, required for operation of MEP, is presented in Table 2.3-2.

The daily water requirements shown are estimated quantities based on the simple-cycle plant operating at full load. Water requirements shown in Table 2.3-2 are based on an ambient temperature of 59°F (approximate annual average dry bulb temperature) and 93°F (summer daytime temperature design case), respectively. Because MEP will have air-cooled condensers rather than evaporative cooling, water usage actually decreases at higher ambient temperatures. Chiller coil condensate (moisture from the inlet air) is captured and used for process water (approximately 19 gpm at 93°F). Additionally, consumptive uses are slightly lower at higher temperatures, as shown in Figure 2.3-5b. Annual usage estimates are conservatively based on 236 gpm (59°F), which assumes negligible condensate capture, for the maximum operating scenario of 4,000 hours of operation per year, plus 300 startup and shutdown cycles, and the more realistic scenario of 600 hours per year, plus 200 startup and shutdown cycles.

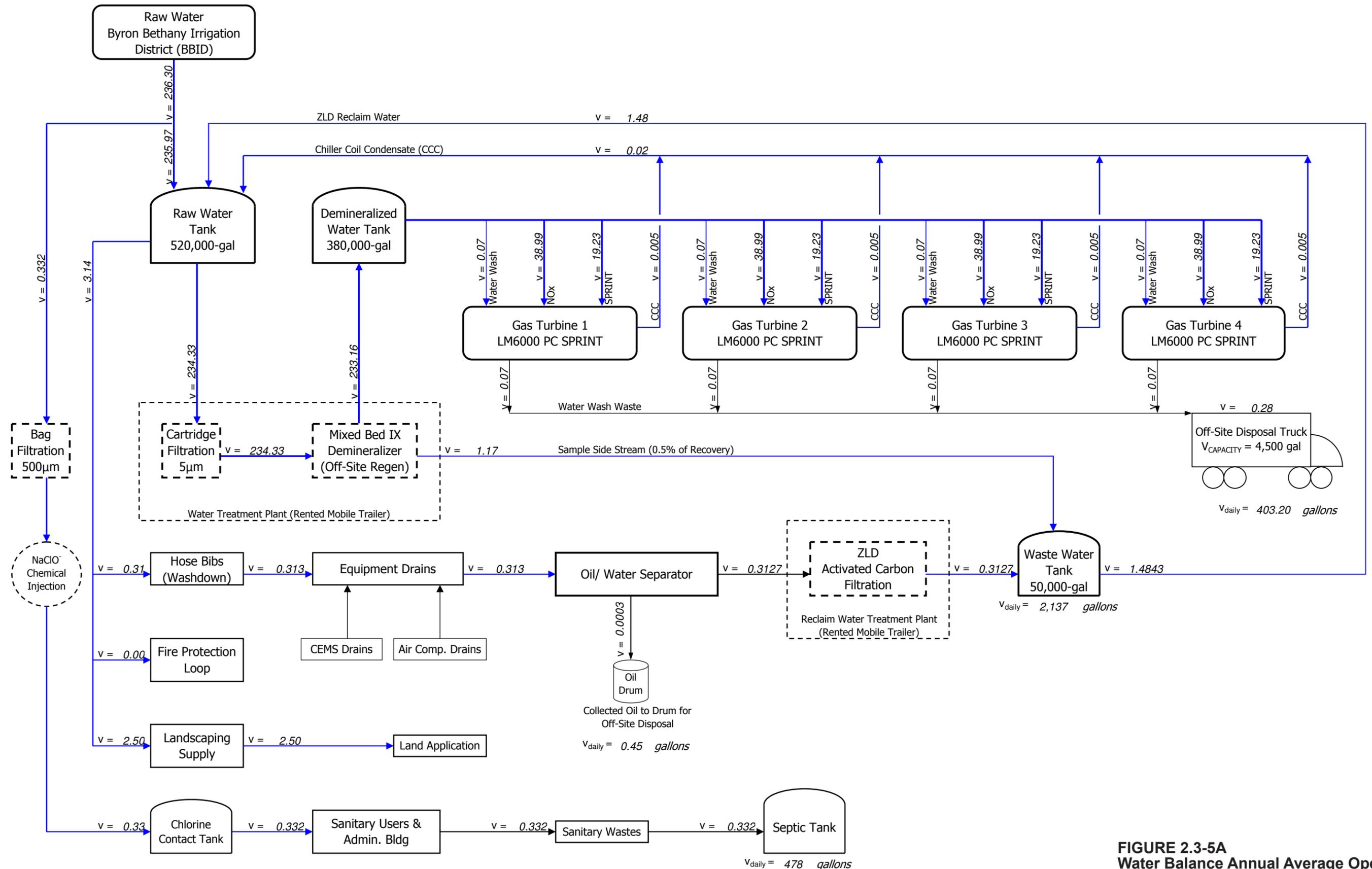


FIGURE 2.3-5A
Water Balance Annual Average Operation
 Mariposa Energy Project
 Alameda County, California

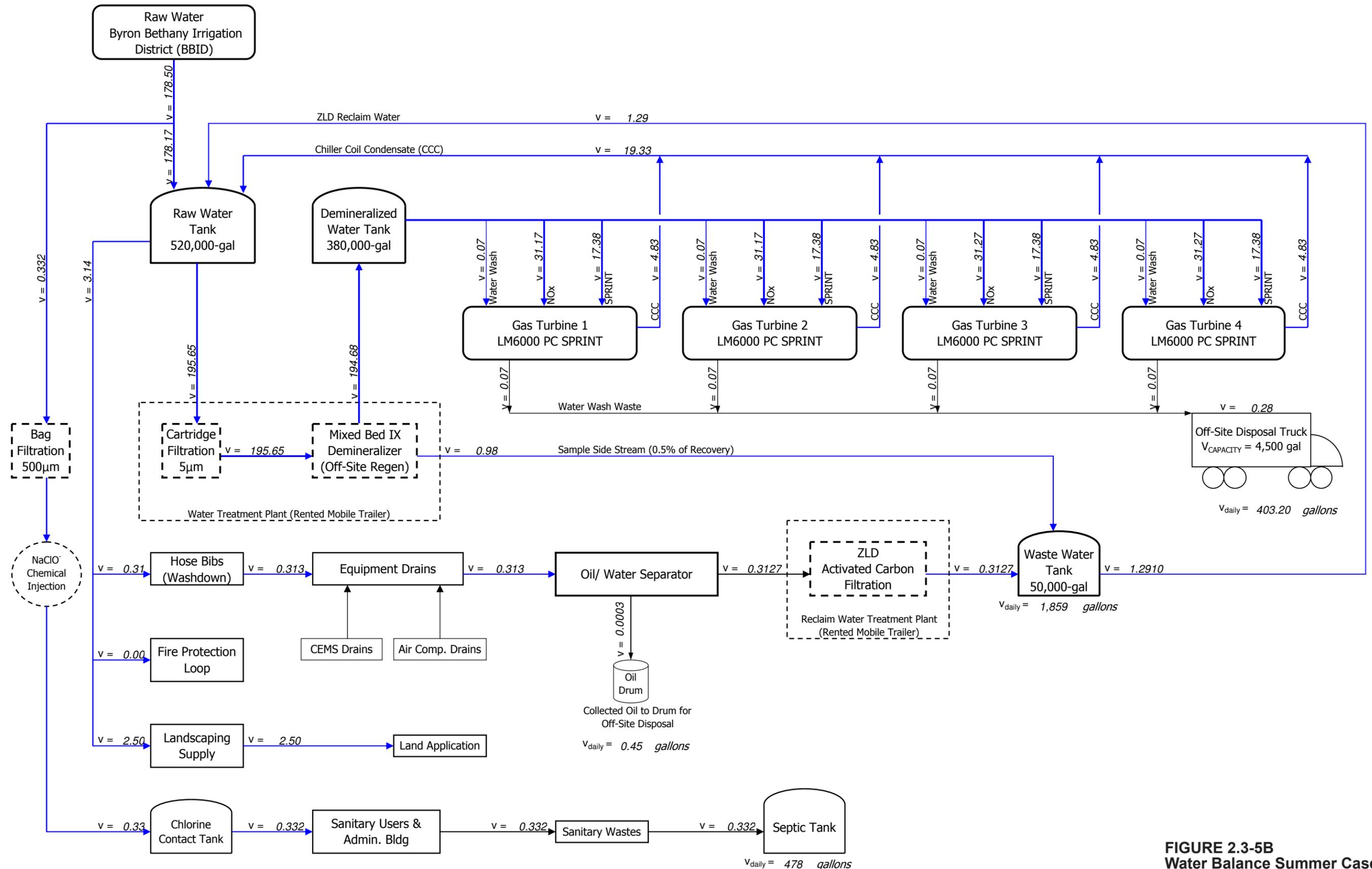


FIGURE 2.3-5B
Water Balance Summer Case (93°F)
 Mariposa Energy Project
 Alameda County, California

TABLE 2.3-2
Estimated Daily and Annual Water Use for MEP Operations

Water Use	Average Daily Use (59°F) (gpm)	Summer Daily Use (93°F) (gpm)	Average Annual Use (afy)
Process water:	236.0	178.2	
Maximum permitted scenario ^a			187
Expected scenario ^b			34.8
Sanitary and domestic water	0.33	0.33	
Maximum permitted scenario ^a			0.26
Expected scenario ^b			0.05
Total usage:	236.3	178.5	
Maximum permitted scenario ^a			187
Expected scenario ^b			34.8

^a Maximum permitted scenario is based on the maximum contracted scenario of 4,000 hours per year plus 300 start and stop cycles (conservatively estimated at 30 minutes per start and 30 minutes per stop), at the annual average temperature design conditions.

^b Expected scenario is based on the more realistic operating profile of six hundred hours per year plus 200 start and stop cycles), at the annual average temperature design conditions.

afy = acre-feet per year

gpm = gallons per minute

2.3.8.2 Water Quality

Section 5.15, Water Resources, includes a projection of the water quality based on available testing data from BBID.

2.3.8.3 Water Treatment

Service water includes all water uses at the plant except for the demineralized water used for water injection and turbine washes. No additional treatment of the raw water is required for use as service water. Raw supply water from BBID will be used for service water, chiller fill and make-up, and for fire protection. This untreated service water will be used for general (non-potable) needs such as landscaping and hose bibs (equipment and surface washdown).

Rental demineralizer equipment including trailers or portable demineralizer skids will supply demineralized water to the plant. A portion of the incoming raw water will be treated by a truck-mounted demineralizer and then stored in a demineralized water storage tank. The high quality demineralized water will be used for the combustion turbine water injection for NO_x reduction, on-line water wash of the combustion turbine compressor section, and water injection required by the SPRINT system for operation.

The demineralizer equipment will include a number of cation and anion, or mixed bed ion exchange (IX) vessels. There will be no chemical feed systems that will supply water conditioning chemicals to the IX system. The IX vessels are composed of cross-linked cation resins and porous Type I strong base anion resins. Regeneration of IX resins occurs offsite at the vendor's location, resulting in a true zero discharge system. A rinse is used on the selected resins to prevent any residual quality control test water from remaining in the

trailer when it is delivered to the user. Table 2.3-3 presents the purity requirements for demineralized water.

The product water from the demineralizer system will be stored in a 380,000-gallon demineralized water tank, which is nominally sufficient for 27.5 hours of plant use.

Potable water will be provided via a tie from the BBID supply pipeline, for safety showers, eye-wash stations, drinking water, and sanitary facilities. BBID raw water will be filtered through a 500-micron bag filter followed by a 5-micron cartridge filter prior to being injected with sodium hypochlorite for disinfection. The treated water will then be fed to a 1,000-gallon aboveground polyethylene chlorine contact tank providing a minimum 120-minute contact time. Sodium hypochlorite will provide disinfection and prevent biofouling in the potable water system. The hypochlorite feed equipment will consist of a small storage tank and two full-capacity hypochlorite metering pumps.

TABLE 2.3-3
LM6000 Demineralized Water Purity Requirements

Parameter	Units	Value
Total Solids	ppm	5.0
Total Dissolved Solids	ppm of TDS	3.0
Silica	mg/L as SiO ₂	0.1
Conductivity @ 25°C*	micromho/centimeter	0.1
pH*	Std. Unit	6.5 – 7.5
Chloride	mg/L as Cl ⁻	0.5
Sulfate	mg/L as SO ₄ ²⁻	0.5

* measured in the absence of carbon dioxide (CO₂)

°C = degrees Celsius

mg/L = milligrams per liter

ppm = parts per million

micromho/centimeter = microsiemens/centimeter

2.3.9 Waste Management

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

2.3.9.1 Wastewater Collection, Treatment, and Disposal

MEP has been designed as a zero-liquid-discharge (ZLD) facility. Process wastewater will be either recycled or removed for offsite disposal. The primary wastewater collection system will collect process wastewater and stormwater runoff from all of the plant equipment areas and route it to sumps and the onsite oil/water separator before treating the water by an activated carbon filtration ZLD system and recycling it within the plant process water system. The secondary wastewater collection system will collect sanitary wastewater from sinks, toilets, showers, and other sanitary facilities, and route it to an onsite septic tank for

either discharge through an onsite leach field or removal by a licensed waste hauler for offsite treatment. Non-process area stormwater will be routed to an onsite extended detention basin with multi-stage discharge structure. The water balance diagrams, Figures 2.3-5a and 2.3-5b show the expected MEP wastewater streams and flow rates.

2.3.9.1.1 Plant Drains and Oil/Water Separator

General plant drains will collect containment area washdown, sample drains, and drainage from facility equipment drains. Water from these areas will be collected in a system of floor drains, hub drains, sumps, and piping and routed through an oil/water separator prior to reuse within the plant.

The non-oily oil/water separator effluent stream will pass through a truck-mounted ZLD treatment system before being sent to the 50,000-gallon wastewater tank and eventually recycled back to the raw water storage tank. The truck-mounted ZLD system will include a walnut shell activated carbon vessel followed by a surge tank and 5 micron bag filters. Any oily waste collected in the oil/water separator will be transferred to drums and hauled offsite for proper disposal.

Wastewater from infrequent combustion turbine water washes and from the fuel filtration skid(s) will be collected in holding tanks or sumps and will be trucked offsite for disposal at an approved wastewater disposal facility.

2.3.9.1.2 Process Water Treatment Wastes

The process water treatment will include 5-micron cartridge filtration followed by mixed IX demineralizers. The system will be housed in a trailer-mounted unit, which will be regenerated offsite. No wastewater will be generated from the water treatment process or IX resin regeneration, since regeneration of the cationic and anionic resin will occur offsite via contracted vendor.

Based on the BBID raw water analysis presented in Section 5.15, the IX demineralizer mobile rental trailer has a treatment capacity of 373,000 gallons, and the ZLD mobile trailer has a treatment capacity of one million gallons. Table 2.3-4 presents the required number of trailers per year.

TABLE 2.3-4
Estimated Truck-Mounted Mobile Trailer Change-out Frequency

Trailer Capacity Use	Number of Trailers per Year	
	Maximum-Permitted Operation	Expected Operation
IX Demineralizer Trailer 24.9 hours/trailer	173	24
ZLD Trailer	1	1

^a Maximum-permitted scenario is based on the maximum contracted scenario of 4,000 hours per year plus 300 start and stop cycles (conservatively estimated at 30 minutes per start and 30 minutes per stop), at the annual average temperature design conditions.

^b Expected scenario is based on the more realistic operating profile of six hundred hours per year plus 200 start and stop cycles), at the annual average temperature design conditions.

2.3.9.2 Solid Nonhazardous Wastes

MEP will produce construction, operation and maintenance nonhazardous solid wastes typical of power generation operations. No demolition, or associated waste, is anticipated. Construction wastes generally include soil, scrap wood, excess concrete, empty containers, scrap metal, and insulation. Generation plant wastes include oily rags, scrap metal and plastic, insulation material, defective or broken electrical materials, empty containers, and other solid wastes, including the typical refuse generated by workers. Solid wastes will be trucked offsite for recycling or disposal.

2.3.9.3 Hazardous Wastes

Several methods will be used to properly manage and dispose of hazardous wastes generated by MEP. Waste lubricating oil will be recovered and recycled 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 recycled by the supplier or disposed of in accordance with regulatory requirements. Workers will be trained to handle hazardous wastes generated at the site.

Chemical cleaning wastes will consist of alkaline and acid cleaning solutions, used during pre-operational chemical cleaning, and turbine washwater effluent. These wastes, which are subject to high metal concentrations, will be temporarily stored onsite in portable tanks or sumps, and disposed of offsite by the chemical cleaning contractor in accordance with applicable regulatory requirements.

2.3.10 Management of Hazardous Materials

A variety of chemicals will be stored and used during the construction and operation of MEP. The storage, handling, and use of all chemicals will be conducted in accordance with applicable LORS. Chemicals will be stored in appropriate chemical storage facilities. Bulk chemicals will be stored in storage tanks, and most other chemicals will be stored in returnable delivery containers. Chemical storage and chemical feed areas will be designed to contain leaks and spills. Concrete containment pits and drain piping design will allow a full-tank capacity spill without overflowing the containment area. For multiple tanks located within the same containment area, the capacity of the largest single tank will determine the volume of the containment area and drain piping. Drain piping for reactive chemicals will be trapped and isolated from other drains to eliminate noxious or toxic vapors.

The aqueous ammonia storage and delivery area will have spill containment and ammonia vapor detection equipment, as described in Section 5.5, Hazardous Materials Handling.

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

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

2.3.11 Emission Control and Monitoring

Air emissions from the combustion of natural gas in the CTGs will be controlled using state-of-the-art systems. To ensure that the systems perform correctly, continuous emissions monitoring for NO_x and CO will be performed. Section 5.1, Air Quality, includes additional information on emission control and monitoring.

2.3.11.1 NO_x Emission Control

The CTGs selected for the project include demineralized water injection and SCR to control emissions of NO_x. One-hour NO_x emissions will be controlled at the stack to 2.5 parts per million by volume, dry basis (ppmvd), corrected to 15 percent oxygen. The SCR process will use 19-percent aqueous ammonia. Ammonia slip, or the concentration of unreacted ammonia in the stack exhaust, will be limited to 5 ppmv, averaged over 1 hour. The SCR equipment will include a reactor chamber, catalyst modules, ammonia storage system, ammonia vaporization and injection system, and monitoring equipment and sensors. The project will use an ammonia delivery system, which consists of a 10,000-gallon ammonia tank, spill containment basin, and refilling station with a spill containment basin and sump.

2.3.11.2 Carbon Monoxide and Volatile Organic Compound Emission Control

The combustion turbine combustors incorporate staged combustion of a pre-mixed fuel/air charge, resulting in high thermal efficiencies with reduced CO and volatile organic compound (VOC) emissions. CO and VOC emissions will be further controlled by means of CO oxidation catalysts. Oxidation catalysts will limit 3-hour stack CO emissions to 6.0 ppmvd. VOC emissions will also be limited to 2.0 ppmvd, during a 1-hour period.

2.3.11.3 Particulate Emission Control

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

2.3.11.4 Continuous Emission Monitoring

For each CTG, a separate CEMS will sample, analyze, and record fuel gas flow rate, NO_x and CO concentration levels, and percentage of oxygen in the exhaust gas from the stacks. The CEMS sensors will transmit data to a data acquisition system (DAS) that will store the data and generate emission reports in accordance with permit requirements. The DAS will also include alarm features that will send signals to the plant SCS when the emissions approach or exceed pre-selected limits.

2.3.12 Fire Protection

The fire protection system will be designed to protect personnel and limit property loss and plant downtime in the event of a fire. The system will include a fire protection water system, carbon dioxide (CO₂) fire suppression systems for the CTGs, and portable fire extinguishers.

The source of fire protection water will be the plant raw water supply. A fire loop will be designed to protect MEP, and the system will be designed in accordance with:

- Federal, state and local fire codes, occupational health and safety regulations, and other jurisdictional requirements;
- California Building Code (CBC); and
- National Fire Protection Association (NFPA) standard practices.

The fire water supply and pumping system will provide fire-fighting water to yard hydrants, hose stations, and water spray and sprinkler systems. The system will be capable of supplying maximum water demand for any automatic sprinkler system, plus water for fire hydrants and hose stations. Hydraulic calculations will be performed to demonstrate that the fire protection loop has sufficient capacity to provide all the required fire-fighting water for the power plant. A plant firewater loop, designed and installed in accordance with NFPA 24, will be provided to reach all parts of the facility. Both the fire hydrants and the fixed suppression systems will be supplied from the firewater loop. The firewater systems will have sectionalizing valves to allow a failure in any part of the system to be isolated, so that the remainder of the system can continue to function properly. The MEP fire protection system will include a backup diesel fire pump rated at 200 horsepower or less.

Fixed fire suppression systems will be installed at determined fire risk areas such as the gas compressors and turbine lube oil equipment. Separation criteria, as defined by NFPA and the CBC, shall be used to determine spacing of the transformers, ammonia storage, and other areas that pose a fire risk or health hazard, such as natural gas-fired equipment, lube oil and hydraulic oil piping and containment, ammonia storage and unloading equipment, and the fire pump skid.

Sprinkler systems will also be installed in the control room building, the warehouse/maintenance building, and fire pump enclosure as required by NFPA and local code requirements.

The CO₂ fire-suppression system provided for each CTG will include a CO₂ storage tank, CO₂ piping and nozzles, fire detection sensors, and a control system. The control system will automatically shut down the affected CTG turbines, turn off ventilation, close ventilation openings, and release CO₂ upon detection of a fire. The CO₂ fire suppression systems will cover the turbine enclosure and accessory equipment enclosure of each CTG.

Portable CO₂ and dry chemical extinguishers will be located throughout the power plant site, including switchgear rooms, with size, rating, and spacing in accordance with NFPA 10.

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

2.3.13 Plant Auxiliaries

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

2.3.13.1 Lighting

The lighting system provides personnel with illumination for operation under normal conditions and for egress or manual equipment operations under emergency conditions. The system also provides 120-volt convenience receptacles.

The lighting system will be designed in accordance with Illuminating Engineering Society of North America and calculated average illumination levels with 0.8 maintenance factor. The lighting plan will include the following components:

- Photo cells to control outdoor lighting
- Frequently switched indoor lighting (such as office and maintenance areas) will be controlled by wall-mounted switches. Infrequently switched indoor lighting (such as in equipment buildings) will be controlled by panel board circuit breakers.
- Self-contained battery-backed emergency lighting and exit signs will be furnished to provide safe personnel egress from buildings during a total loss of plant power. Emergency lighting will be designed to maintain the necessary illumination for a minimum of 90 minutes.
- All 120-volt outdoor receptacles will be fed from GFCI-type receptacles. Receptacles will be located so equipment at grade can be reached with a 75-foot extension cord.
- Fixtures will be placed to provide lighting levels that are in compliance with the Occupational Safety and Health Administration (OSHA) safety standards.

2.3.13.2 Grounding

The electrical system is susceptible to ground faults, lightning, and switching surges that can constitute a hazard to site personnel and electrical equipment. The station grounding system provides a path to permit the dissipation of hazardous energy created by these events.

Site ground resistivity readings shall be used to determine quantity of grounding electrodes and grid spacing to ensure safe step and touch potentials under severe fault conditions.

Bare copper conductors will be installed belowgrade based on the calculated grid spacing. Each junction of the grid will be electrically bonded together.

All building steel and non-energized metallic parts of electrical equipment shall be electrically bonded to the ground grid.

2.3.13.3 Supervisory Control System

The SCS provides modulating control, digital control, monitoring, and indicating functions for the plant power block systems.

The SCS will provide the following functions:

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

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

- PC-based operator consoles with LCD video monitors
- Complete distributed control system equipment and architecture
- I/O cabinets
- Historical data unit
- Printers
- Data links to the combustion turbine and steam turbine control systems

The SCS will have a functionally distributed architecture allowing integration of balance-of-plant equipment that may be controlled locally via a programmable logic controller.

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

The system will be designed with sufficient redundancy to preclude a single device failure from significantly affecting overall plant control and operation. The design will also ensure critical control and safety systems have redundancy of control and uninterruptable power sources.

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

2.3.13.4 Cathodic Protection

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

2.3.13.5 Freeze Protection System

Freeze protection for abovegrade and belowgrade piping and instrumentation lines will be evaluated and installed, as necessary, based on the expected minimum ambient temperature at the plant. Given that the record minimum temperature in Byron was 17°F, freeze protection is not expected to be required for large piping, but may be required for instrumentation air tubing.

2.3.13.6 Service Air

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

2.3.13.7 Instrument Air

The instrument air system will provide dry, filtered air to pneumatic operators and devices. Air from the service air system is dried, filtered, and pressure-regulated before delivery to the instrument air piping network. An instrument air header will be routed to locations within the facility equipment areas and within the water treatment facility where pneumatic operators and devices will be located.

2.3.14 Interconnect to Electrical Grid

The four CTGs will connect to the regional electrical grid via a new 0.7-mile, 230-kV transmission line that will run from the site north to the PG&E Kelso Substation (see Section 3.0, Electric Transmission).

2.3.15 Project Construction

Construction of the generating facility, from site preparation and grading to commercial operation, is expected to take place from April 2011 to July 2012 (14 months total). Major milestones are listed in Table 2.3-5.

TABLE 2.3-5
Major Project Milestones

Activity	Date
Begin Construction	April 2011
Startup and Test	January 2012
Commercial Operation	July 2012

There will be an average and peak workforce of approximately 90 and 177, respectively, of construction craft people, supervisory, support, and construction management personnel onsite during construction (see Table 5.10-9).

Typically, noisy construction will be scheduled to occur between 7 a.m. and 7 p.m. on weekdays and 8 a.m. and 5 p.m. on Saturdays. Additional hours may be necessary to make up schedule deficiencies, or to complete critical construction activities (e.g., pouring

concrete at night during hot weather, working around time-critical shutdowns and constraints). During some construction periods and during the startup phase of the project, some activities will continue 24 hours per day, 7 days per week.

The peak construction site workforce level is expected to last from Month 5 through Month 8 of the construction period, with the peak being Month 7.

Table 2.3-6 provides an estimate of the average and peak construction traffic during the 14-month construction period for the plant.

TABLE 2.3-6
Estimated Average and Peak Construction Traffic

Vehicle Type	Average Daily Trips	Peak Daily Trips
Construction Workers	81	159
Deliveries	9	18
Total	90	177

The MEP site lease arrangement provides for a 5-acre construction laydown and worker parking area on the 158-acre parcel. Figure 1.1-3 shows the project site in relation to the construction laydown and parking area.

2.3.16 Generating Facility Operation

MEP will have an operations and maintenance manager, business supervisor, and instrument technician working during the standard 5-day, 8-hours per day work week. Additionally, the facility will be manned by an operator on a 24-hour basis, using rotating 12-hour shifts.

MEP is expected to have an annual plant availability of 92 to 98 percent, including scheduled outages for maintenance and forced outages. Mariposa Energy expects to operate MEP as a peaker unit, with some amount of load following and cycling. It is expected that the primary purpose of MEP will be to provide generation capacity during peak season (summer) high demand periods. The facility is expected to be operated during high demand times (typically afternoon hours) to supplement base-load and renewable generation capacity. The exact operational profile of the plant, however, cannot be defined in detail since operation of the facility depends on the variable demand in the MEP service area.

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

- **Load Following.** During peak season (summer) and to a lesser extent non-peak seasons (primarily spring and fall), the facility would be operated at loads that may vary between maximum continuous output (all of the CTGs operating at base load) and minimum load (one CTG operating as low as 50-percent load) to meet electrical demand at all times of the day.
- **Daily Cycling.** During high demand periods, the facility may be operated in daily cycling mode, where the plant is operated at loads up to maximum continuous output

during the day and totally shut down at night or on weekends. This mode of operation may occur either with daily nighttime shutdowns or with weekend shutdowns depending on electrical demand, hydroelectric power availability, and other issues.

- Full Shutdown. This would occur if forced by equipment malfunction, fuel supply interruption, transmission line disconnect, or scheduled maintenance.

In the unlikely event of a longer-term cessation of operations, Mariposa Energy will maintain security of the facilities on a 24-hour basis, and will notify the California Energy Commission (CEC). Depending on the length of shutdown, a contingency plan for the temporary cessation of operations may be implemented. Such contingency plan will be in conformance with all applicable LORS and protection of public health, safety, and the environment. The plan, depending on the expected duration of the shutdown, could include the draining of all chemicals from storage tanks and other equipment and the safe shutdown of all equipment. All wastes will be disposed of according to applicable LORS. If the cessation of operations becomes permanent, the plant will be decommissioned (see Section 2.5, Facility Closure).

2.4 Engineering

In accordance with CEC regulations, this section, together with the engineering appendixes, Section 3.0 (Electric Transmission), and Section 4.0 (Natural Gas Supply), presents information concerning the design and engineering of MEP. The LORS applicable to MEP's engineering are provided along with a list of agencies that have jurisdiction, the contact persons within those agencies, and a list of the permits that will be required.

2.4.1 Facility Design

Summary descriptions of the design criteria for all of the major engineering disciplines are included in Appendix 2A, Design Criteria:

Appendix 2C contains a Preliminary Geotechnical Report for the MEP site based on borings taken at the project site.

Design and engineering information and data for the following systems are found in the following subsections of this Application for Certification:

- Power Generation – See Section 2.3.5, Combustion Turbine Generators. Also see Appendix 2A and Sections 2.3.6 through 2.3.14, which describe the various plant auxiliaries.
- Heat Dissipation – See Section 2.3.8.
- Water Supply System – See Section 2.3.9, Water Supply and Use; and Appendix 2A.
- Air Emission Control System – See Section 2.3.12, Emission Control and Monitoring, and Section 5.1, Air Quality.
- Waste Disposal System – See Section 2.3.10 and Section 5.14, Waste Management.
- Noise Abatement System – See Section 5.7, Noise.

- Switchyards/Transformer Systems – See Section 2.3.6, Major Electrical Equipment and Systems; Section 2.3.14.2, Grounding; Section 2.3.6.1, AC Power – Transmission; Section 2.3.15, Interconnect to Electrical Grid; Section 3.0, Electric Transmission; and Appendix 2A.

2.4.1.1 Facility Safety Design

MEP will be designed to maximize safe operation. Potential hazards that could affect the facility include earthquake, flood, and fire. Facility operators will be trained in safe operation, maintenance, and emergency response procedures to minimize the risk of personal injury and damage to the plant.

2.4.1.1.1 Natural Hazards

The principal natural hazard associated with the MEP site is earthquakes. Structures will be designed to meet the seismic requirements of CCR Title 24 and the 2007 CBC. Section 5.4, Geologic Hazards and Resources, includes a review of potential geologic hazards, seismic ground motion, and potential for soil liquefaction due to ground-shaking. Potential seismic hazards will be mitigated by implementing the 2007 CBC construction guidelines.

Appendix 2A, Design Criteria, includes the structural seismic design criteria for the buildings and equipment.

Flooding is not a hazard of concern. According to the Federal Emergency Management Agency, the site is not within either the 100- or 500-year flood plain. Section 5.15, Water Resources, includes additional information on the potential for flooding.

2.4.1.1.2 Emergency Systems and Safety Precautions

This section discusses the fire protection systems, emergency medical services, and safety precautions to be used by project personnel. Section 5.10, Socioeconomics, includes additional information on area medical services, and Section 5.16, Worker Health and Safety, includes additional information on safety for workers. Appendix 2A provides the design practices and codes applicable to safety design for the project. Compliance with these requirements will ensure public and employee safety during construction and operations.

Fire Protection Systems

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

Onsite Fire Protection Systems

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

- Carbon Dioxide and Dry Chemical Fire Protection Systems – These systems protect the combustion turbines and certain accessory equipment compartments from fire. The systems will have fire detection sensors in all protected compartments. Actuating one sensor will provide a high-temperature alarm on the combustion turbine control panel. Actuating a second sensor will trip the combustion turbine, turn off ventilation, close ventilation openings, and automatically release the gas and chemical agents. The gas and chemical agents will be discharged at a design concentration adequate to extinguish the fire.

- Fire Hydrants/Hose Stations – This system will supplement the plant’s fixed fire suppression systems. Water will be supplied from the plant fire water system.
- Fire Extinguisher – The plant administrative/control building, the warehouse/maintenance building, and other structures will be equipped with fixed fire suppression systems and portable fire extinguishers as required by the local fire department.

Local Fire Protection Services

In the event of a major fire, the plant personnel will be able to call upon the Alameda County Department for assistance. The Tracy Fire Department may also serve the project due to closer proximity. The Hazardous Materials Business Plan (see Section 5.5, Hazardous Materials Handling) for the plant will include all information necessary to allow fire-fighting and other emergency response agencies to plan and implement safe responses to fires, spills, and other emergencies.

Personnel Safety Program

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

2.4.2 Facility Reliability

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

2.4.2.1 Facility Availability

The facility will be designed to operate between about 12.5 percent (50 percent of one of four turbines) and 100 percent of base load, or nominally 25 MW to 200 MW, to support dispatch service in response to customer demands for electricity.

MEP will be designed for an operating life of 40 years. Reliability and availability projections are based on this operating life. Operation and maintenance procedures will be consistent with industry standard practices to maintain the useful life of plant components.

The percent of time that the simple-cycle 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. The projected service factor for the simple-cycle power block, which considers projected percent of time of operation, differs from the equivalent availability factor (EAF), which considers the projected percent of energy production capacity achievable.

The EAF may be defined as a weighted average of the percent of full energy production capacity achievable. The projected equivalent availability factor for MEP is estimated to be approximately 92 to 98 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.

2.4.2.2 Redundancy of Critical Components

The following subsections identify equipment redundancy as it applies to project availability. A summary of equipment redundancy is shown in Table 2.4-1. Final design could differ.

TABLE 2.4-1
Major Equipment Redundancy

Description	Number
Simple-cycle CTGs	Four
Fuel gas booster compressors	Four—100-percent capacity
Demineralizer system	Two—100-percent capacity
Zero liquid discharge (ZLD) system	One—100-percent capacity
Inlet air chiller	Two—100 percent capacity

2.4.2.2.1 Plant Power Generation Process Description

Four separate CTG power generation trains will operate in parallel in a simple-cycle mode. Each CTG will provide approximately 25 percent of the total plant power output.

The major components of the plant process consist of the following subsystems.

Combustion Turbine Generator Subsystems

The combustion turbine subsystems include the combustion turbine, inlet air filtration, chiller coils, generator and excitation systems, turbine lube oil system, hydraulic system, and turbine control and instrumentation. The combustion turbine will produce thermal energy through the combustion of natural gas and the conversion of the thermal energy into mechanical energy through rotation of the combustion turbine that drives the compressor and generator.

The generator is air cooled. The generator excitation system will be a solid-state static system. Combustion turbine control and instrumentation (interfaced with the SCS) will cover the turbine governing system, and the protective system.

The plant power generation process is served by the following balance-of-plant systems.

Supervisory Control System

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

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

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

Plant operation will be controlled from the operator panel located in the control room. The operator panel will consist of two individual video/keyboard consoles. Each video/keyboard console will be an independent electronic package so that failure of a single package does not disable more than one video/keyboard.

Demineralized Water System

The demineralized water system will consist of two, 100-percent truck-mounted water mixed bed demineralizers for an onsite water treatment system consisting of cartridge filtration and a mixed bed IX. The mixed bed IX mobile trailer is composed of six resin vessels: two cation vessels, three strong base anion vessels, and one mixed bed vessel. Two 100-percent-capacity horizontal centrifugal demineralized water transfer pumps will provide water to the demineralized water treatment system. Demineralized water will be stored in a 380,000-gallon demineralized water storage tank.

Two 100-percent-capacity horizontal centrifugal demineralized water transfer pumps will provide water to the SPRINT and water injection systems as well as to the water wash system.

Service Water Storage

A combined service water/fire protection water storage tank will store 520,000 gallons of water from BBID. Fire water pumps will take suction from the bottom portion of the tank. The tank will contain a stand pipe, and service water transfer pumps will take suction from above the required fire water storage volume.

Two 100-percent capacity service water transfer pumps will provide fill and makeup water to the air-cooled chillers and will supply the truck-mounted water demineralizers.

Compressed Air

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

2.4.2.3 Fuel Availability

Fuel will be delivered via a new 4-inch-diameter pipeline serving the project site. This pipeline will interconnect with PG&E's existing high-pressure natural gas pipeline (Line 2). It is possible that the connecting line to MEP could become temporarily inoperable due to a breach in the line or from other causes, resulting in fuel not being available at MEP. A will-serve letter from PG&E is included in Appendix 2E.

2.4.2.4 Water Availability

Under average annual temperature design conditions, MEP will use up to 187 acre-feet per year of water for turbine water injection, compressor water washes and other process uses. Potable water for drinking, safety showers, and sanitary uses will be produced by bag filtration and chlorination of BBID raw water. Fire protection water, service water, and landscape irrigation uses will also be served from BBID.

The availability of water to meet MEP needs is discussed in more detail in Section 5.15, Water Resources. A will-serve letter from BBID is included in Appendix 2D.

2.4.2.5 Project Quality Control

The quality control program that will be applied to MEP is summarized in this subsection. The objective of the Quality Control Program is to ensure that all systems and components have the appropriate quality measures applied; whether during design, procurement, fabrication, construction, or operation. The goal of the quality control program is to achieve the desired levels of safety, reliability, availability, operability, constructability, and maintainability for the generation of electricity.

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

2.4.2.5.1 Project Stages

For quality assurance planning purposes, the project activities have been divided into eight stages that apply to specific periods during the project. As the project progresses, the design, procurement, fabrication, erection, and checkout of each generating facility system will progress through the eight stages defined below:

- **Conceptual Design Criteria.** Activities such as definition of requirements and engineering analyses.
- **Detail Design.** Activities such as the preparation of calculations, drawings, and lists needed to describe, illustrate, or define systems, structures, or components.
- **Procurement Specification Preparation.** Activities necessary to compile and document the contractual, technical, and quality provisions for procurement specifications for plant systems, components, or services.
- **Manufacturer's Control and Surveillance.** Activities necessary to ensure that the manufacturers conform to the provisions of the procurement specifications.
- **Manufacturer Data Review.** Activities required to review manufacturers' drawings, data, instructions, procedures, plans, and other documents to ensure coordination of plant systems and components, and conformance to procurement specifications.
- **Receipt Inspection.** Inspection and review of product at the time of delivery to the construction site.

- Construction/Installation. Inspection and review of storage, installation, cleaning, and initial testing of systems or components at the facility.
- System/Component Testing. Actual operation of generating facility components in a system in a controlled manner to ensure that the performance of systems and components conform to specified requirements.

2.4.2.5.2 Quality Control Records

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

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

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

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

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

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

2.4.3 Thermal Efficiency

The maximum thermal efficiency that can be expected from a natural gas-fired simple-cycle plant using GE LM6000 combustion turbine units is approximately 40 percent on an HHV basis, and 55 to 56 percent on a lower heating value (LHV) basis. This level of efficiency is achieved when a facility is base-loaded at annual average ambient conditions. Other types of operations, particularly those at less than full gas turbine output, will result in lower efficiencies. The basis of MEP operations will be system dispatch within California's power generation and transmission system. It is expected that MEP will be primarily operated in load following or cycling service. The number of startup and shutdown cycles is expected to range between zero and a maximum of 300 per year per CTG.

Plant fuel consumption will depend on the operating profile of the power plant. It is estimated that the range of fuel consumed by the power plant will be from a minimum of

near zero British thermal units (Btu) per hour to a maximum of approximately 1,926 MMBtu per hour (HHV basis) at 100-percent load and average ambient conditions.

The net annual electrical production of MEP cannot be accurately forecasted at the present time due to uncertainties in the system load dispatching model and the associated policies. However, due to the efficiency of the plant, its operating characteristics will be as described previously. The maximum annual generation possible from the facility is estimated to be approximately 775 gigawatt hours per year, based on a permitted operating limitation of 4,000 hours per year per CTG.

2.5 Facility Closure

Facility closure can be temporary or permanent. Temporary closure is defined as a shutdown for a period exceeding the time required for normal maintenance, including closure for overhaul or replacement of the combustion turbines. Causes for temporary closure include a disruption in the supply of natural gas or damage to the plant from earthquake, fire, storm, or other natural acts. Permanent closure is defined as a cessation in operations with no intent to restart operations owing to plant age, damage to the plant beyond repair, economic conditions, or other reasons. Section 2.5.1 discusses temporary facility closure and Section 2.5.2 discusses permanent facility closure.

2.5.1 Temporary Closure

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

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

2.5.2 Permanent Closure

The planned life of the generation facility is 40 years. However, if the generation facility is still economically viable, it can be operated longer. It is also possible that the facility could become economically noncompetitive earlier than 40 years, forcing early decommissioning.

Whenever the facility is permanently closed, the closure procedure will follow a plan that will be developed as described below.

The removal of the facility from service, or decommissioning, may range from “mothballing” to the removal of all equipment and appurtenant facilities, depending on conditions at the time. Because the conditions that would affect the decommissioning decision are largely unknown at this time, these conditions would be presented to the CEC when more information is available and the timing for decommissioning is more imminent.

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

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

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

2.6 References

California Energy Commission (CEC), 2006. Errata to the Presiding Member’s Proposed Decision, Application for Certification for the Pastoria Energy Facility 160 MW Expansion (05-AFC-1). November 16