SECTION 2.0

Project Description

The Huntington Beach Energy Project (HBEP) is a natural-gas-fired, combined-cycle, air-cooled, 939-megawatt (MW) electrical generating facility that will replace, and be constructed on the site of, the AES Huntington Beach Generating Station, an existing and operating power plant in Huntington Beach, California. HBEP will consist of two independently operating, three-on-one, combined-cycle gas turbine power blocks. Each power block will consist of three natural-gas-fired combustion turbine generators (CTG), three supplemental fired heat recovery steam generators (HRSG), one steam turbine generator (STG), an air-cooled condenser, and related ancillary equipment. Other equipment and facilities to be constructed and shared by both power blocks include natural gas compressors, water treatment facilities, emergency services, and administration and maintenance buildings. The Project will be constructed on 28.6 acres entirely within the footprint of the existing Huntington Beach Generating Station.

HBEP construction will require the removal of the existing Huntington Beach Generating Station Units 1, 2, and 5. Demolition of Unit 5, scheduled to occur between the fourth quarter of 2014 and the end of 2015, will provide the space for the construction of HBEP Block 1. Construction of Blocks 1 and 2 are each expected to take approximately 42 and 30 months, respectively, with Block 1 construction scheduled to occur from the first quarter of 2015 through the second quarter of 2018, and Block 2 construction scheduled to occur from the first quarter of 2018 through the second quarter of 2020. Removal/demolition of existing Huntington Beach Generating Station Units 1 and 2 is scheduled to occur from the fourth quarter of 2020 through the third quarter of 2022.

Existing Huntington Beach Generating Station Units 3 and 4 were licensed through the California Energy Commission (CEC; 00-AFC-13C) and demolition of these units is authorized under that license and will proceed irrespective of the HBEP. Therefore, demolition of existing Huntington Beach Generating Station Units 3 and 4 is not part of the HBEP project definition. However, to ensure a comprehensive review of potential project impacts, the demolition of existing Huntington Beach Generating Station Units 3 and 4 is included in the cumulative impact assessment. Removal/demolition of existing Huntington Beach Generating Station Units 3 and 4 will be in advance of the construction of HBEP Block 2.

HBEP will reuse existing onsite potable water, natural gas, stormwater, process wastewater, and sanitary pipelines and electrical transmission facilities. No offsite linear developments are proposed as part of the project. HBEP will continue to use potable water, provided by the City of Huntington Beach, for construction, operational process, and sanitary uses, but at substantially lower volumes than historically used by the existing generating units at the Huntington Beach Generating Station. The new generating units will use air-cooled condensers and will eliminate the use of ocean water for cooling, which is currently used for the existing Huntington Beach Generating Station units. During HBEP operation, stormwater and process wastewater will be discharged to a retention basin and then ultimately to the Pacific Ocean via an existing outfall. Sanitary wastewater will be conveyed to the Orange County Sanitation District via the existing City of Huntington Beach sewer connection. Two, 230-kilovolt (kV) transmission interconnections will connect both HBEP power blocks to the existing Southern California Edison (SCE) 230-kV switchyard that is located on a separate parcel within the existing Huntington Beach Generating Station site. See Section 3.0, Transmission System Engineering, for a discussion of the HBEP interconnection to the existing SCE 230-kV switchyard.

2.1 Facility Description, Design, and Operation

HBEP has been designed using commercially proven technology equipped with monitoring, protection, and safety systems to provide safe and reliable operation over a 30-year operating life. It will consist of two, three-on-one, combined-cycle gas turbine power blocks, with each power block consisting of three natural-gas-fired CTGs, three supplemental fired HRSGs, and one STG.

The two HBEP power blocks will include the following principal combined design elements:

- Six Mitsubishi Power Systems Americas (MPSA) 501DA CTGs with a nominal rating of 118 MW each.[1] The CTGs will be equipped with evaporative coolers on the inlet air system and dry low oxides of nitrogen (NO_x) combustors.
- Two MPSA single-cylinder, single flow, impulse, axial exhaust condensing STGs.
- Six HRSGs, which will be horizontal, single-pressure, and natural circulation. Each HRSG has a natural-gas-fired duct burner for supplemental firing in the HRSG inlet ductwork and an emission reduction system consisting of a selective catalytic reduction (SCR) unit to control NO_x stack emissions, and an oxidation catalyst to control carbon monoxide (CO) and volatile organic compounds (VOC) emissions in the outlet ductwork.
- Two air-cooled condensers and two closed-loop cooling fin fan coolers.
- Two 230-kV interconnections to the existing onsite SCE 230-kV switchyard (see Section 3.0, Transmission Systems Engineering).
- Direct connection with the existing onsite Southern California Gas Company (SoCalGas) natural gas 16-inch-diameter gas main (see Section 4.0, Natural Gas Supply).
- Connection to an existing onsite 8-inch-diameter potable water line.
- Connection to an existing City of Huntington Beach 4-inch-diameter combined sanitary and process forced main sewer line.

2.1.1 Site Arrangement and Layout

Primary access to the HBEP site will be provided via the existing Huntington Beach Generating Station entrance off Newland Street, just north of the intersection of the Pacific Coast Highway (Highway 1). Figure 2.1-1 shows the facility site plan and general arrangement. Figures 2.1-2a, 2.1-2b, and 2.1-2c show typical elevation views of the project.

The HBEP site is bounded to the west by a manufactured home / recreational vehicle park; to the north by an out-of-service tank farm that will become the site of the proposed Poseidon desalination plant (the tank farm is AES property which will be leased to Poseidon) and the Huntington Beach Channel (a facility operated by the Orange County Flood Control District); to the southeast by Huntington Beach Wetland Preserve / Magnolia Marsh wetlands and the Plains All American Tank Farm, and to the south and southwest by the Pacific Coast Highway, Huntington State Beach and the Pacific Ocean.

AES's Huntington Beach Generating Station currently has four operating generating units (Units 1, 2, 3 and 4). Existing Units 3 and 4 are currently operational; however, these units will be permanently retired from service by November 1, 2012. These four units were originally constructed in the late 1950s and 1960s by SCE, with major upgrades to Units 1 and 2 occurring in 1995 and upgrades to Units 3 and 4 in 2001. The existing Huntington Beach Generating Station has various ancillary facilities that will remain in use to support HBEP. These facilities include the administration/warehouse building, SoCalGas natural gas pipeline interconnection and metering station, City of Huntington Beach potable water connection, and the City of Huntington Beach sanitary sewer system.

The primary source of fire protection water for the project will be the same as for the existing generating station: it will be supplied via the existing connection to the City of Huntington Beach 8-inch potable water distribution system. The existing fire water distribution system, including two emergency diesel-fired fire water pumps, and process water distribution and storage systems will be re-used to the greatest extent possible, but with some modifications to the onsite conveyance systems to accommodate the newly constructed facilities.

[1] All facility capabilities for the site are based on historical ambient weather data from Santa Ana, California (John Wayne–Orange County airport). Nominal CTG only output at site ambient air temperature conditions.

2.1.1.1 Pipelines

The facility will use the following existing pipelines:

- Natural gas supply pipeline
- Potable water supply pipeline
- Wastewater discharge pipeline

2.1.1.1.1 Natural Gas Supply Pipeline

As discussed in Section 4.0, Natural Gas Supply, natural gas is delivered to the existing Huntington Beach Generating Station by SoCalGas via an existing 16-inch-diameter line to an existing gas metering station. As part of the HBEP, SoCalGas will construct a new metering station. The construction of the new gas metering station by SoCalGas is considered part of the overall HBEP and the potential environmental impacts associated with the construction of the new gas meter are included as part of the analysis of construction impacts in this AFC.

The natural gas will flow from the new SoCalGas metering station to a new gas pressure control station and gas scrubber/filtering equipment that will be constructed by the project owner as part of the HBEP. Natural gas will then be distributed onsite to the combustion turbine fuel gas compressors and subsequently the combustion turbines and directly to the duct burners.

2.1.1.1.2 Potable Water Supply Pipeline

Potable water to the HBEP site is supplied from an existing 8-inch pipeline from the City of Huntington Beach.

2.1.1.1.3 Wastewater Discharge Pipeline

Sanitary wastewater generated by HBEP will be discharged to the City of Huntington Beach existing sewer main that services the existing Huntington Beach Generating Station. HBEP process wastewater and site stormwater will be collected in an onsite retention basin and then discharged to an existing ocean outfall for the existing Huntington Beach Generating Station.

2.1.2 Overview of Demolition Activities

The existing Huntington Beach Generation Station's Units 1, 2, 3, 4, and 5 will be demolished while ensuring that a minimum generating capacity of at least 430 MW is maintained at the existing Huntington Beach Generating Station at all times. As noted previously, existing Huntington Beach Generating Station's Units 3 and 4 were licensed through the CEC (00-AFC-13C), and demolition of these units is authorized under that license and will proceed irrespective of the HBEP.

Construction of HBEP Blocks 1 and 2 will be coordinated with the operation and demolition of the existing Huntington Beach Generating Station's units. Initial demolition on the site will commence with demolition of the remaining portions of the existing and decommissioned peaker Unit 5 and the east fuel oil storage tank, which will provide space for construction of HBEP Block 1. The demolition of existing Huntington Beach Generating Station Units 3 and 4 will be in advance of the construction of HBEP Block 2, which will be constructed on the resulting free space. Units 1 and 2 will be demolished after construction of HBEP Block 2. Demolition activities are described in more detail in Section 2.2

2.1.3 Process Description

As discussed previously, HBEP Blocks 1 and 2 will consist of the following equipment: six Mitsubishi 501DA CTGs equipped with dry low-NO_x combustors to control NO_x and evaporative coolers for reducing inlet air temperatures; six HRSGs with natural-gas-fired duct burners, SCR systems for NO_x emissions control, and oxidation catalyst equipment to control CO and VOC emissions; two Mitsubishi single-casing, axial exhaust STGs; two air-cooled condensers; and associated support equipment.

The CTG exhaust gases of approximately 1,100°F will be used to generate steam in the HRSGs. The HRSGs will employ a single-pressure design. Steam from three HRSGs will be admitted to a single condensing STG. Each STG will produce approximately 151 MW (gross). The project's generating units are expected to have an overall annual availability of approximately 98.4 percent.

The heat balances for the project's modes of operation are shown in Figures 2.1-3a, 2.1-3b, and 2.1-3c for the site ambient air temperature conditions[2] with no evaporative cooling of the CTG inlet air or supplemental firing. The use of the evaporative coolers is not intended as power augmentation, but rather will be employed to mitigate CTG degradation (ambient and mechanical) to maintain the facility at or near the nominal generating capacity. The predicted net electrical output of the HBEP under these conditions is approximately 939 MW at a heat rate of approximately 7,427 British thermal units per kilowatt hour (Btu/kWh) on a lower heating value (LHV) basis. This corresponds with a thermal efficiency of approximately 46 percent on a LHV basis.

The combustion turbines and associated duct burner equipment will include the use of best available control technology (BACT) to limit emissions of criteria pollutants and hazardous air pollutants. NO_x will be controlled to 2.0 parts per million by volume, dry basis (ppmvd), corrected to 15 percent oxygen through the use of dry low-NO_x combustors and SCR. An oxidation catalyst will also be used to control CO emissions to 2.0 ppmvd at 15 percent oxygen and VOCs emissions to 1.0 ppmvd at 15 percent oxygen. BACT for particulate matter (with a diameter less than 10 and 2.5 microns [PM_{10} and $PM_{2.5}$]) and sulfur dioxide (SO_2) will be the exclusive use of natural gas with a sulfur content not to exceed 0.75 grains per 100 standard cubic feet of natural gas (gr/100 scf). Emissions of excess ammonia (ammonia slip) not used in the SCR process will be limited to 5.0 ppmvd at 15 percent oxygen.

2.1.4 Combined-cycle Process

CTG combustion air will flow through the inlet air filters, evaporative inlet air coolers, and associated air inlet ductwork before being compressed in the CTG compressor section and then entering the CTG combustion sections. Natural gas will be mixed with the compressed air prior to being introduced to the combustion sections and ignited. The hot combustion gases will expand through the power turbine section of the CTGs, causing them to rotate and drive the electric generators and CTG compressors. The hot combustion gases will exit the turbine sections and enter the HRSGs. The HRSGs will heat water (feed water), converting it into superheated high-pressure steam. High-pressure steam will be delivered to the high-pressure inlet section of the steam turbine. The high-pressure steam will expand as it passes through the STG, then will exit as low-pressure steam. The low-pressure steam will enter the air-cooled condenser, which will remove heat from the low-pressure steam (causing the steam to condense to water) and release the heat to the ambient air. The condensed water, or condensate, will be returned to the HRSG feed water system for reuse.

2.1.5 Major Generating Facility Components

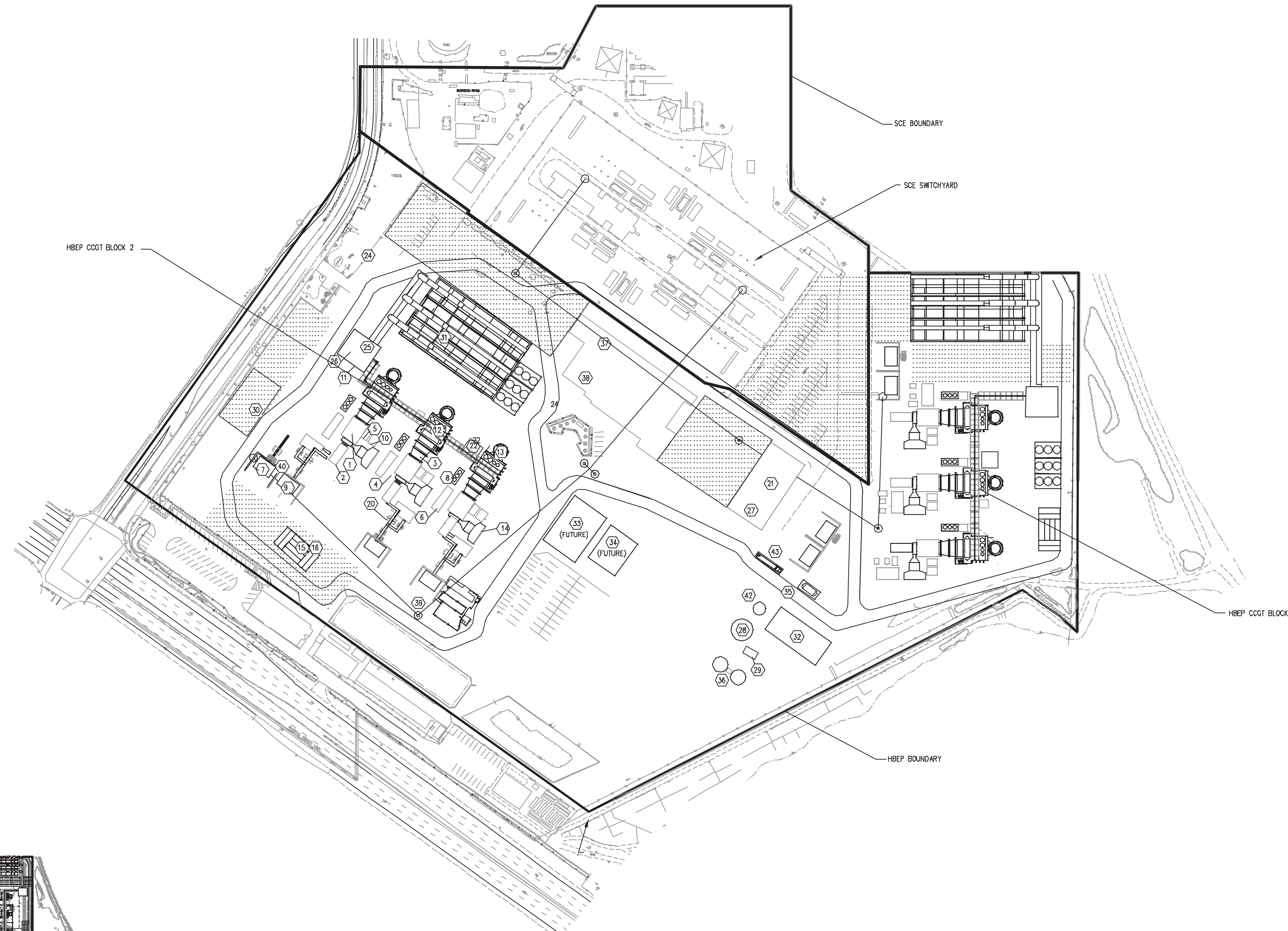
The following paragraphs describe the major components of the two HBEP power blocks.

2.1.5.1 Combustion Turbine Generators

Natural gas combustion in the MPSA 501DA CTGs will produce thermal energy, which is converted into mechanical energy required to drive the combustion turbine compressors and electrical generators. Each CTG system will contain supporting systems and associated auxiliary equipment.

The combustion turbine will drive a totally enclosed water to air Cooled (TEWAC) synchronous generator. Utilizing a TEWAC, the closed-loop fluid cooler will reject the generator's heat load. The fluid cooler's preliminary design accounts for the TEWAC's heat load.

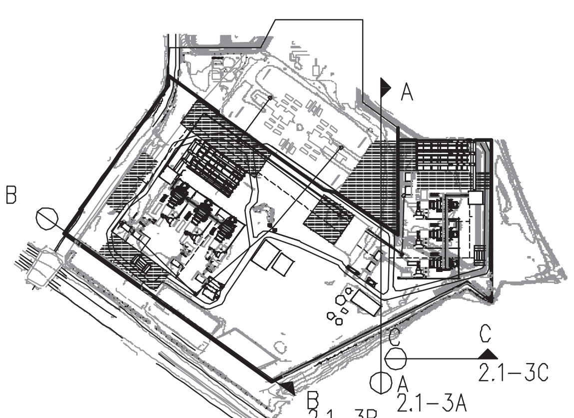
[2] Site average ambient temperature is 65.8°F (Dry Bulb) and 56.8°F (Wet Bulb) and relative humidity of 57%



EQUIPMENT LIST

NO.	DESCRIPTION	DIMENSIONS
1	COMBUSTION GAS TURBINE (CGT)	32'x89'x34'
2	CGT GENERATOR ENCLOUSURE	16'x39'x34'
3	CGT/HRSG TRANSITION DUCT	14'x32'x31'
4	CGT ENCLOSURE	41'x32'x25'
5	FUEL GAS SKID	20'x12'x15'
6	CGT CONTROL/LUBE OIL SKID	50'x14.5'
7	STG STEP UP TRANSFORMER	35'x23'x15'
8	TURBINE COOLING AIR SKID **	10'x8'
9	CGT STEP UP TRANSFORMER	35'x23'x9'
10	CO2 F/F (LP TANK)	15'x20'x15'
11	STG ENCLOSURE	59'x55'x40'
12	HEAT RECOVERY STEAM GENERATOR	77'x'44'x92'
13	STACK	18' DIA.
14	CGT AIR INTAKE SYSTEM	40'x17'x38'
15	CONTROL PACKAGE	40'x20'x15'
16	ELECTRICAL PACKAGE	40'x20'x15'
17	SFC. TRANSFORMER	11'x8'x10'
18	SEC. TRANSFORMER	11'x8'x10'
19	UNIT TRANSFORMER	9'x11'x9'
20	GENERATOR MAIN CIRCUIT BREAKER	28'x20'
21	FUEL GAS COMPRESSOR BLDG.	144'x75'x25'
22	BOILER FEEDPUMP ENCLOSURE	30'x30'x15'
23	CEMS	15'x15'x10'
24	BOP FIN FAN COOLER	86'x48'x15'
25	STEAM TURBINE GENERATOR	52' x 23'
26	STG CONTROL/LUBEOIL SKID	38' x 17'
27	FUEL GAS CONDITIONING SKID	71.5' x 34'
28	EXIST. SERVICE WTR. TANK (RESUE)	40' DIA.x48' S.S
29	EXIST.FIRE WATER PUMP ENCLOSURE	22'x30'x12'
30	RELOCATED GAS METERING STATION	108'x82'
31	ACC	209'x127'x104'
32	EXISTING RO/EDI BUILDING (REUSE)	113'x51'x30'
33	NEW CONTROL/ADMIN BUILDING	100'x72'x40'
34	NEW MAINT./WAREHOUSE BUILDING	72'x60'x35'
35	AMONIA TANK AND CONTAINMENT	18'x38'x14'
36	EXIST. DI WATER TANKS (2)(REUSE)	28' DIA.x32'S.S
37	EXIST.SHOPS & WAREHOUSE(REUSE)	214'x115'x17'
38	EXIST. ADMIN BUILDING (REUSE)	81'x57'x11'
39	TRANSMISSION STRUCTURE (TYP.)	135' TALL
40	TRANSFORMER WALL	53'x42'x30'
41	NOT USED	
42	EXIST. BRINE TANK (REUSE)	24' DIA.x22'
43	AMONIA UNLOADING	56'X12'

** = TCA HEIGHT FOR BLOCK 1 IS 24'
** = TCA HEIGHT FOR BLOCK 2 IS 12'
FENCE
MASONRY WALL
CONSTRUCTION LAYDOWN & STAGING



KEYMAP

FIGURE 2.1-1
General Arrangement/Site Plan
AES Huntington Beach Energy Project
Huntington Beach, California

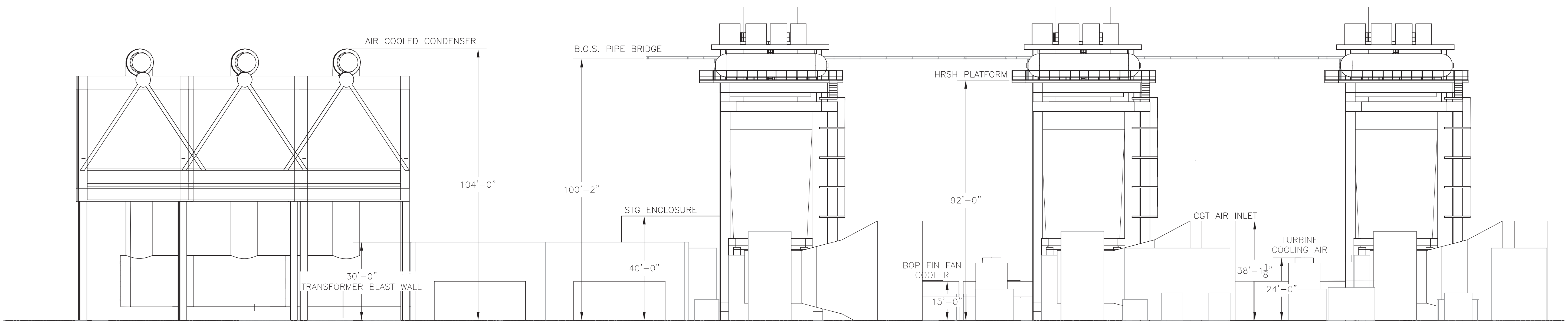


FIGURE 2.1-2a
East Elevation View
AES Huntington Beach Energy Project
Huntington Beach, California

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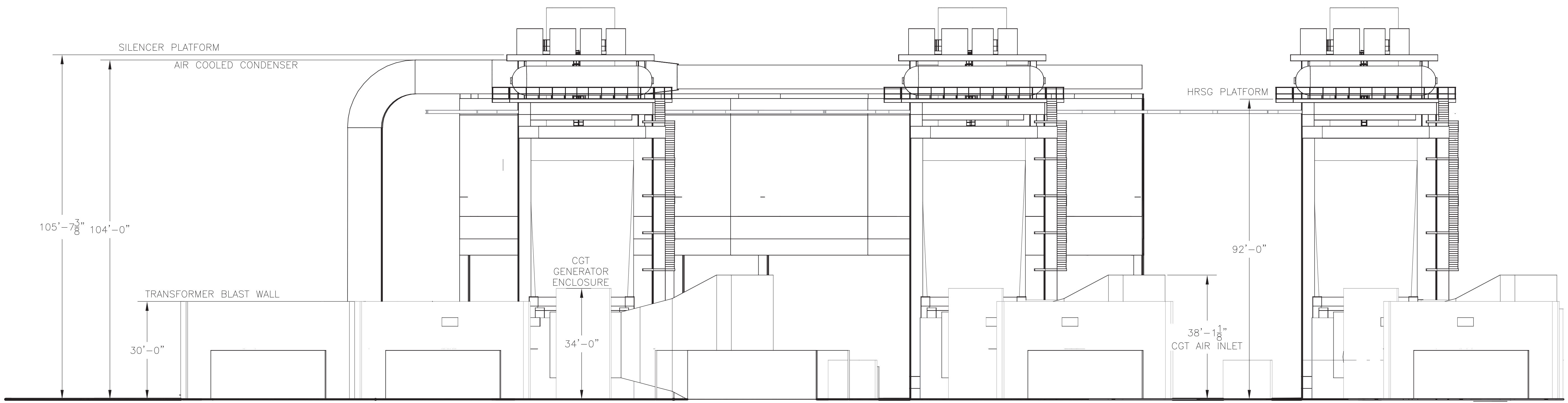

FIGURE 2.1-2b
North Elevation View
AES Huntington Beach Energy Project
Huntington Beach, California

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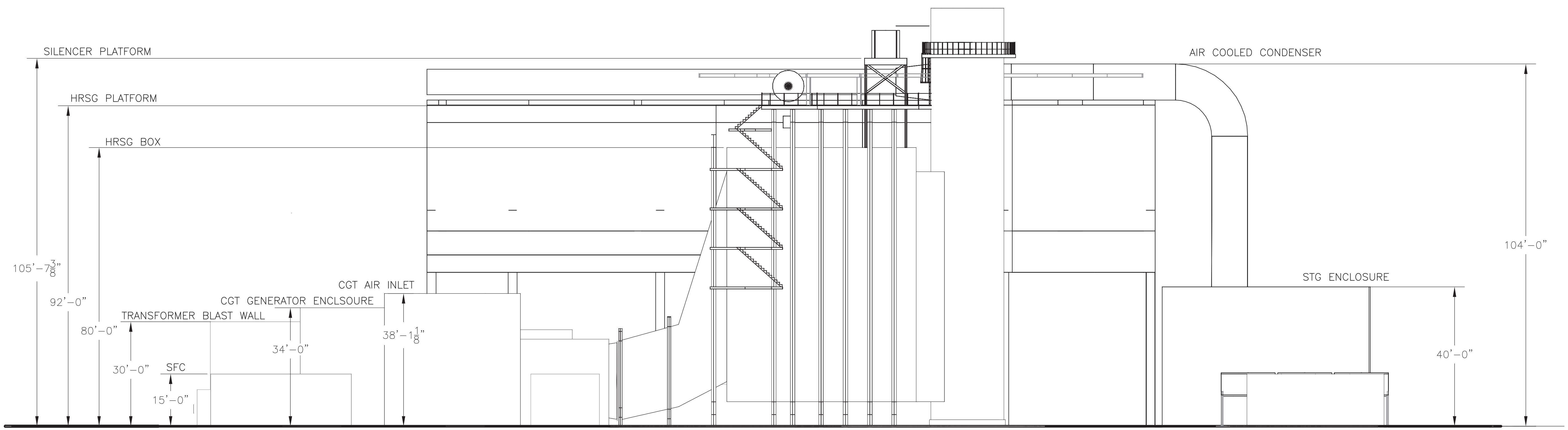

FIGURE 2.1-2c
South Elevation View
AES Huntington Beach Energy Project
Huntington Beach, California

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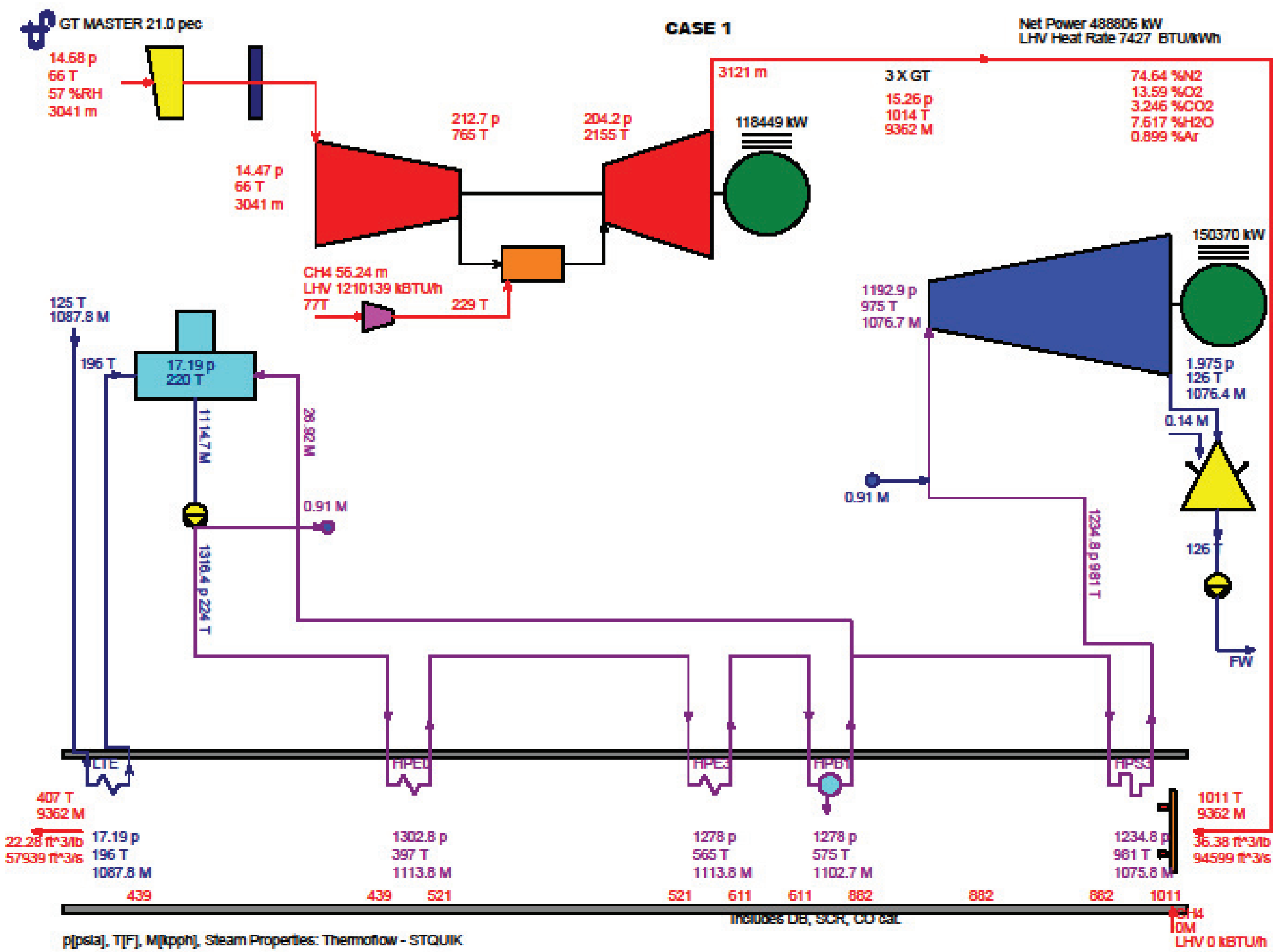
Case 1

Case 1 Heat Balance Number 1a Three Combustion Turbines Operating at Maximum Heat Input without Evaporative Cooling

Site Average Annual Temperature (SAAT), Dry Bulb 65.8 F, Wet Bulb 56.8 F, Relative Humidity 57%



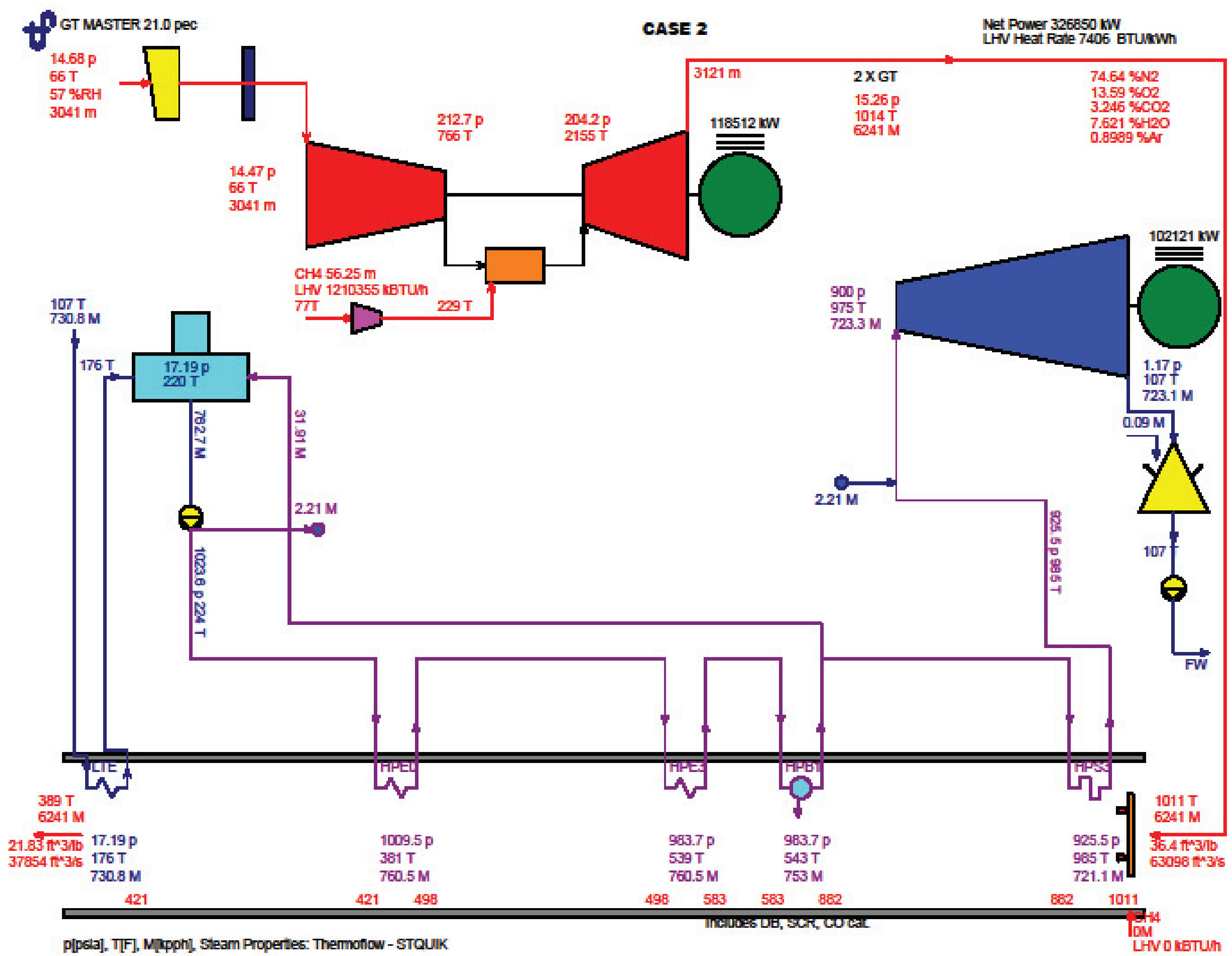
Case 1 Heat Balance Number 1a Three Combustion Turbines Operating at Maximum Heat Input without Evaporative Cooling
Site Average Annual Temperature (SAAT), Dry Bulb 65.8 F, Wet Bulb 56.8 F, Relative Humidity 57%

FIGURE 2.1-3a
Heat Balance
AES Huntington Beach Energy Project
Huntington Beach, California

Case 2

Case 2 Heat Balance Number 1b Two Combustion Turbines Operating at Maximum Heat Input without Evaporative Cooling

Site Average Annual Temperature (SAAT), Dry Bulb 65.8 F, Wet Bulb 56.8 F, Relative Humidity 57%



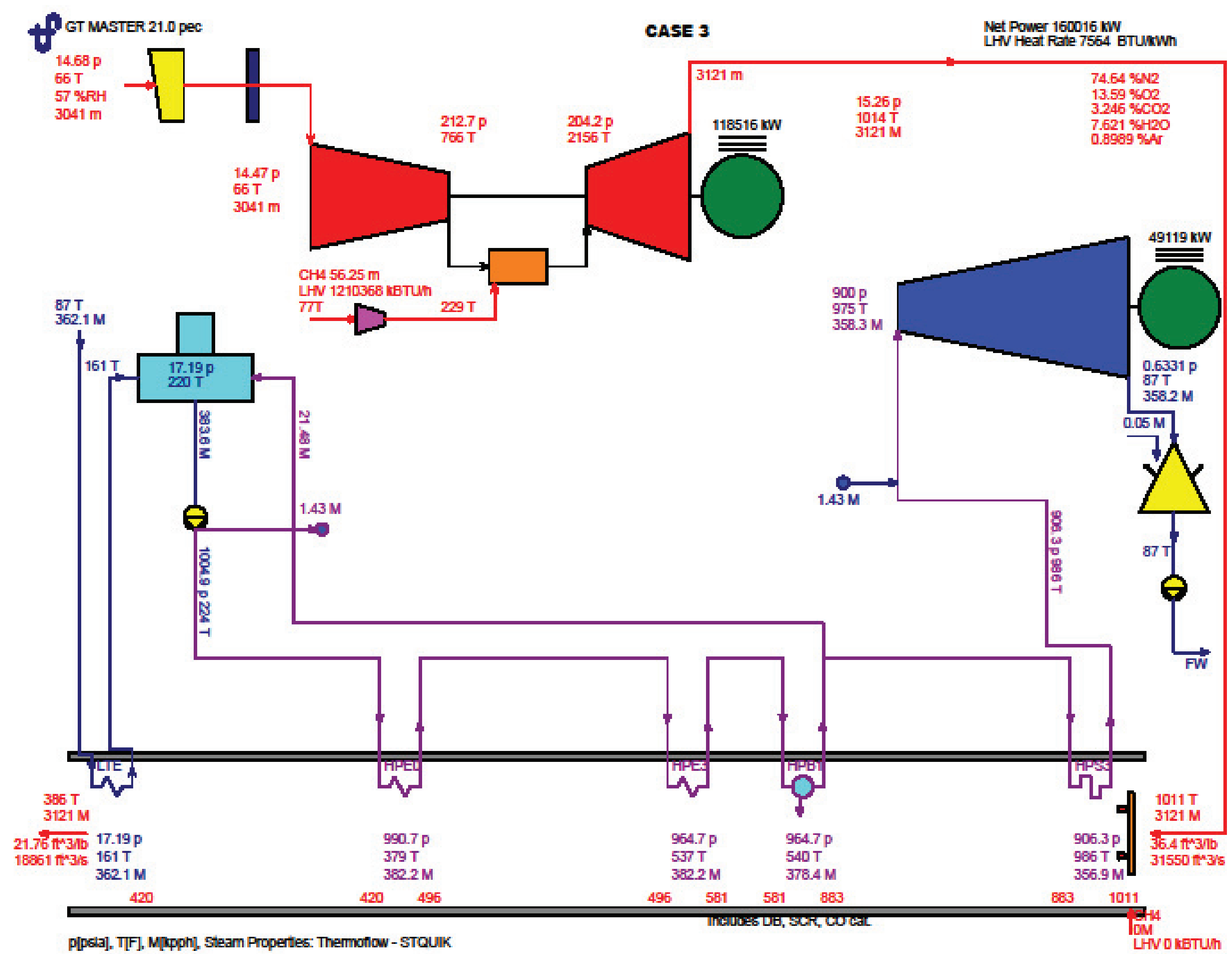
Case 2 Heat Balance Number 1b Two Combustion Turbines Operating at Maximum Heat Input without Evaporative Cooling
Site Average Annual Temperature (SAAT), Dry Bulb 65.8 F, Wet Bulb 56.8 F, Relative Humidity 57%

FIGURE 2.1-3b
Heat Balance
AES Huntington Beach Energy Project
Huntington Beach, California

Case 3

Case 3 Heat Balance Number 1c One Combustion Turbine Operating at Maximum Heat Input without Evaporative Cooling

Site Average Annual Temperature (SAAT), Dry Bulb 65.8 F, Wet Bulb 56.8 F, Relative Humidity 57%



Case 3 Heat Balance Number 1c One Combustion Turbine Operating at Maximum Heat Input without Evaporative Cooling
Site Average Annual Temperature (SAAT), Dry Bulb 65.8 F, Wet Bulb 56.8 F, Relative Humidity 57%

FIGURE 2.1-3c
Heat Balance
AES Huntington Beach Energy Project
Huntington Beach, California

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The CTGs will be equipped with the following systems and components:

- Inlet air filters, inlet silencers, and evaporative coolers
- Metal acoustical enclosure
- Lubrication oil system for the combustion turbine and the generator
- Dry low-NO_x combustion system
- Compressor wash system
- Fire detection and protection system (using carbon dioxide)
- Fuel gas system, including flow meter, strainer, and duplex filter
- Starter system
- Turbine controls
- TEWAC or direct air-cooled synchronous generators
- Generator controls, protection, excitation, power system stabilizer, and automatic generation control

The CTGs and accessory equipment will be contained in acoustical enclosures for noise reduction.

2.1.5.2 Heat Recovery Steam Generators

The HRSGs will transfer heat from the exhaust gases of the CTGs to the feed water to produce high-pressure steam. The HRSGs will be single-pressure, natural circulation units equipped with inlet and outlet ductwork, insulation, lagging, and separate exhaust stacks.

Major heat transfer components of each HRSG will include the low-temperature economizer (LTE)/feed water heater, high-pressure economizers, high-pressure evaporator, high-pressure drum, and high-pressure superheater sections. The LTE will receive condensate from the condenser hot well via the condensate pumps. The LTE will be the final heat transfer section to receive heat from the combustion gases before they will be exhausted to the atmosphere.

Condensate will be pumped through the LTE and into a deaerator. The boiler feed water pumps will remove feed water from the DA and pump it to the high-pressure portions of the HRSG. The feed water will pass through multiple high-pressure economizers, then to the high-pressure steam drum. The saturated water will then flow from the steam drum to the inlet of the high-pressure evaporator, where saturated steam will form in the tubes through the transfer of heat energy from the CTG exhaust gas. The high-pressure saturated liquid/vapor mixture will then be returned to the steam drum, where moisture separators will separate the high-pressure saturated liquid from the steam vapor. The saturated water will be returned to the high-pressure evaporator, while the steam will pass to the high-pressure super heater inlet. The high-pressure super heater will produce high-pressure steam through the transfer of heat energy from the CTG exhaust gas. The superheated high-pressure steam will flow to the inlet of the high-pressure section of the STG. An attemperator will be provided upstream of the final high-pressure super heater to control the steam temperature entering the STG.

The technology for HBEP Blocks 1 and 2 will be configured and deployed as a multi-stage generating (MSG) asset designed to generate power across a wide range of capacities with a superior and relatively constant heat rate. The power blocks will be composed of multiple generators, often termed “embedded generating units,” whereby combinations of embedded generating units comprise the full operational capability for each power block, from minimum to maximum generating capacity. Each power block will have the ability to generate power from 110 MW to 470 MW while maintaining a relatively consistent heat rate. Each individual CTG can only operate within a 70 to 100 percent load range, so the maximum output of one MSG state will not fully overlap the minimum output of the next MSG state. This will result in a nominal “dead band” of generating capacity across the operating range of the power block; however, these dead bands between operating states can be minimized or eliminated with supplemental firing through the use of duct burners. One 450 MMBTU/hr high heat value natural-gas-fired duct burner will be installed in the inlet ductwork of each HRSG and will be used to increase the flue gas temperature entering the HRSG from 1,100°F to a maximum of 1,500°F. This increase in heat energy into the flue gas temperature will increase the high-pressure steam flow to the STG, providing additional generating capacity and thus minimizing or eliminating the dead band.

The HRSG will be sized for the maximum heat input of three combustion turbines operating at 100 percent load in new and clean condition. As the turbines age, a loss of efficiency of one or two percent will occur over time. This loss of efficiency and subsequent loss of heat input into the steam cycle can be recovered with supplemental firing. Limited supplemental firing, at less than the rated capacity of a single duct burner, could be employed when three CTGs are operating at 100 percent load to make up for the lost generating capacity. Due to the steam cycle size, supplemental firing of the HRSGs at the full rated capacity of the duct burners could only be deployed when no more than two gas turbines are operating.

The HRSGs are equipped with two emission control systems located in the HRSG evaporator region. The first system is an oxidation catalyst to control CO and VOC emissions. The second is an SCR emission control system that uses 19 percent aqueous ammonia in the presence of a catalyst to reduce the NO_x concentration in the exhaust gases. Ammonia is injected into the exhaust gas stream through a grid of nozzles located upstream of the SCR catalyst module. The subsequent chemical reaction will reduce almost all of the NO_x to nitrogen and water, leaving only 2.0 parts per million of NO_x in the exhaust stream. Both catalysts begin removing their respective emissions at a flue gas temperature of approximately 500°F.

2.1.5.3 Steam Turbine System

The steam turbine system will consist of a condensing steam turbine, gland steam system, lubricating oil system, hydraulic control system, and steam admission/induction valves. The STGs will be MPSA single-casing, single-flow, impulse axial exhaust condensing turbines for outdoor installation.

The steam turbine will drive a TEWAC synchronous generator. The closed-loop cooling system’s design accounts for the TEWAC’s heat load and will reject the generator’s heat through the cooling fluid cooler. Steam from the HRSG high-pressure superheaters will enter the steam turbine through the inlet steam system. The steam will expand through the turbine blades, driving the generator. On exiting the turbine, the steam will flow into the air-cooled condenser. A bypass valve, vent, and noise attenuator will be installed on the main steam line to release steam to the atmosphere in the event of a system upset condition.

2.1.6 Major Electrical Equipment and Systems

The bulk of the electric power produced by HBEP Blocks 1 and 2 will be transmitted to the electrical grid through 230-kV generation tie lines connecting each power block to the existing onsite SCE 230-kV switchyard (see Section 3.0, Transmission System Engineering, for a discussion of the HBEP interconnection to the existing SCE 230-kV switchyard). A small amount of electric power will be used onsite to power auxiliary equipment such as gas compressors, pumps and fans, control systems, and general facility loads including lighting, heating, and air conditioning. A station battery system will also be used to provide direct current (DC) voltage as backup power for control systems and other critical uses. Transmission and auxiliary uses are discussed in the following subsections.

2.1.6.1 Alternating Current (AC) Power—Transmission

Power will be generated by the six CTGs and the two STGs at 13.8 kV and stepped up by eight fan-cooled generator step-up (GSU) transformers to 230 kV for transmission to the grid. Auxiliary power will be fed from the 13.8-kV bus of two CTGs through separate station unit service transformers, which will step the power down to 4.16 kV. Each CTG will have a 13.8-kV generator circuit breaker, located on the generator output, to isolate and synchronize the CTG to the grid during startup. Surge arresters will be provided at the high-voltage bushings to protect the transformers from surges on the 230-kV system caused by lightning strikes or other system disturbances. The transformers will be set on concrete pads within berms designed to contain transformer oil in the event of a leak or spill. The high-voltage side of the GSU transformers will be connected to SCE switchyard circuit breakers and associated equipment with the SCE high-voltage transmission system. Section 3.0, Transmission System Engineering, presents additional information regarding the electrical transmission system. Figure 2.1-4 is a one-line diagram of the facility’s electrical system.

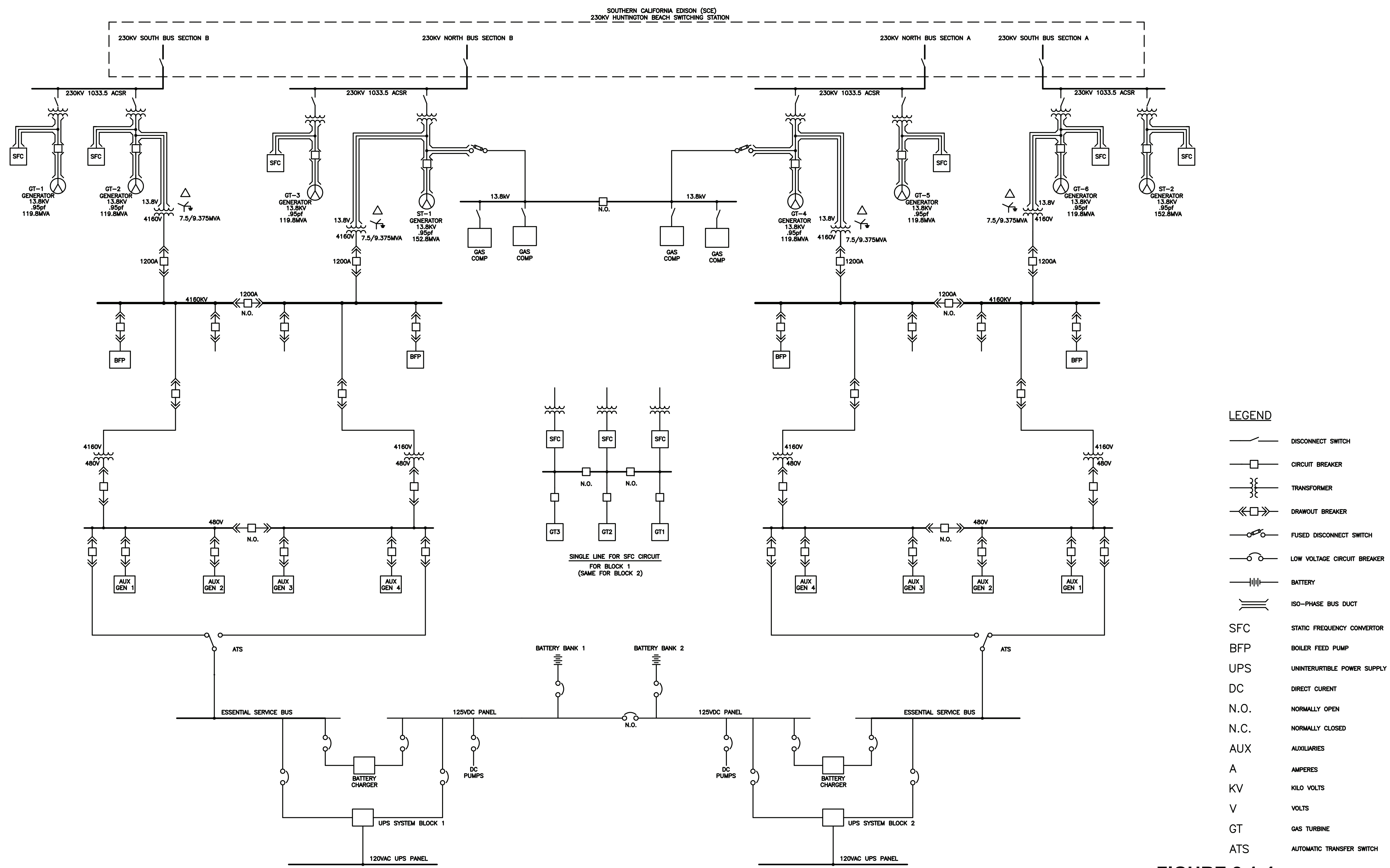

FIGURE 2.1-4
One-line Diagram
AES Huntington Beach Energy Project
Huntington Beach, California

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2.1.6.2 AC Power—Distribution to Auxiliaries

Auxiliary power for Blocks 1 and 2 will be supplied at 4.16-kV and 480 volts AC by a double-ended 4.16-kV switchgear lineup and a double-ended 480-volt load center substation arrangement. Within each power block, two 13.8-kV/4.16-kV station unit service transformers will supply primary power to the switchgear and then subsequently to large motor loads, and to the 4.16-kV side of the 4.16-kV/480-volt load center transformers. The high-voltage side of the station unit service transformers will be connected to a tap on the 13.8-kV isolated phase bus duct which connects the generator to the respective GSU transformer low voltage (secondary) winding. The 4.16-kV switchgear lineup will supply power to the large motor loads and to the load center transformers for 480-volt power distribution. The 4.16-kV switchgear will have circuit breakers for the main incoming feeds and for power distribution. The combustion turbine starting system and the generator excitation system will be powered through a respective transformer which will be connected through taps on the 13.8kV isolated phase bus.

Each load center transformer will supply 480-volt, three-phase power to the CTG and balance-of-plant 480-volt motor control centers (MCCs).

The MCCs will provide power through feeder breakers to the various 480-volt motor loads, and other low-voltage plant loads, including 480-volt power distribution panels, and lower voltage lighting and distribution panel transformers. Power for the AC power supply (240-volt/120-volt) system will be provided by the 480-volt MCCs and 480-volt power panels. Dry-type transformers will transform 480-volt power to 240/120-volt power.

The fuel gas compressors will receive their power at 13.8 kV via a separate auxiliary connection which will be tied to the 13.8kV bus duct between the generator output breakers and the GSU low voltage connection.

2.1.6.3 Essential Services Bus

A 480-volt AC bus will provide power to essential loads, which will include but will not be limited to ventilation, critical lighting, and a charger to the 125-volt DC power supply system. Each of the two HBEP power blocks will have an essential services bus.

2.1.6.4 125-volt DC Power Supply System

Each power block will have a 125-volt DC power supply system consisting of one battery bank, a battery charger, and one or more distribution panels. The panels will supply DC pumps, circuit breaker line power and an uninterruptible power supply (UPS) system. The two combined-cycle, gas turbine block DC buses will be connected with a tie breaker. Each CTG and the plant switchyard will be provided with its own separate battery systems, chargers, and panel boards.

Under normal operating conditions, the essential services buses provide 480-volt, three-phase AC power to the battery chargers and continuously charge the battery banks while supplying power to the DC loads.

Under abnormal or emergency conditions, when power from the essential services bus 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 essential services bus. 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 24 hours.

2.1.6.5 Uninterruptible Power Supply System

The HBEP power blocks will each have a critical service 120-volt AC, single-phase, 60-hertz bus. It will be powered with a UPS to supply AC power to instrumentation and loads, which will include but not be limited to distributed control system (DCS) operator stations, DCS controllers, the continuous emissions monitoring system, and protection and safety systems.

A UPS inverter will supply 120-volt AC single-phase power to the UPS panel boards that supply critical AC loads. The UPS inverter will be fed from the station 125-volt DC power supply system and alternatively from the essential services bus trough a transformer. The UPS system will consist of one full-capacity inverter, a static transfer switch, a manual bypass switch, an alternate source transformer, and one or more panel boards.

The normal source of power to the system will be from the 125-volt DC power supply system through the inverter to the UPS panel board. A solid-state static transfer switch will continuously monitor 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.

2.1.6.6 Alternate Power Source

The HBEP will not utilize an alternate power source.

2.1.7 Fuel System

The CTGs will only combust natural gas. The natural gas requirement during operation at SAAT conditions is approximately 7,261 MMBtu/hr (LHV basis, total for six CTGs).

Natural gas will be delivered to the site via the existing SoCalGas high-pressure natural gas pipeline located onsite at the existing Huntington Beach Generating Station on the west side of the facility near Newland Street. The high-pressure natural gas pipeline is a 16-inch-diameter line that operates at a nominal 145 pounds per square inch (psi). At the existing Huntington Beach Generating Station, the natural gas will flow through a flow-metering station, a gas pressure control station, gas compression equipment, and gas scrubber/filtering equipment housed in a separate building to attenuate noise, prior to entering the HBEP CTGs. The 145 psi natural gas will also flow to the duct burner skid without requiring gas compression, but it will require some level of scrubbing and filtration. The natural gas for the building heating systems will flow through the flow-metering station and gas pressure control station, but will not require compression, filtering, or heating.

2.1.8 Plant Cooling Systems

The steam turbine cycle heat rejection system will consist of an air-cooled condenser, which will eliminate the need for ocean water for power plant cooling, which is the system currently used at the existing Huntington Beach Generating Station. The heat rejection system will receive exhaust steam from the low-pressure section of the steam turbine and condense it to water (condensate) for reuse. The condenser will be designed to operate at a pressure of approximately 3 pounds per square inch (PSI) absolute. It will transfer approximately 1,080 MMBtu/hr to the ambient air as a result of condensing steam at these operating conditions.

Balance of plant systems will be cooled by a common plant closed-loop fluid cooler utilizing water. CTG, STG, gas compressors, and other balance of plant auxiliary equipment requiring cooling will be integrated into the closed-loop cooling water system.

2.1.9 Water Supply and Use

Figures 2.1-5a and 2.1-5b provide the water balances for HBEP representing two operating conditions. Figure 2.1-5a represents operation under site monthly maximum average ambient temperature (SMMAAT) conditions[3] with the CTGs at 100 percent load with CTG inlet air evaporative cooling operating. Figure 2.1-5b represents operation at site peak summer ambient temperature (SPSAT)[4] conditions with the CTGs operating at 100 percent load with CTG inlet evaporative cooling operating.

HBEP will use water provided by the City of Huntington Beach for process and potable uses. HBEP will access this water through an existing 8-inch-diameter potable water line serving the existing Huntington Beach Generating Station.

[3] SMMAAT is 85°F (dry bulb) and 69.7°F (wet bulb) and 45.75 percent relative humidity

[4] SPSAT conditions of 110°F dry bulb and 7 percent relative humidity.

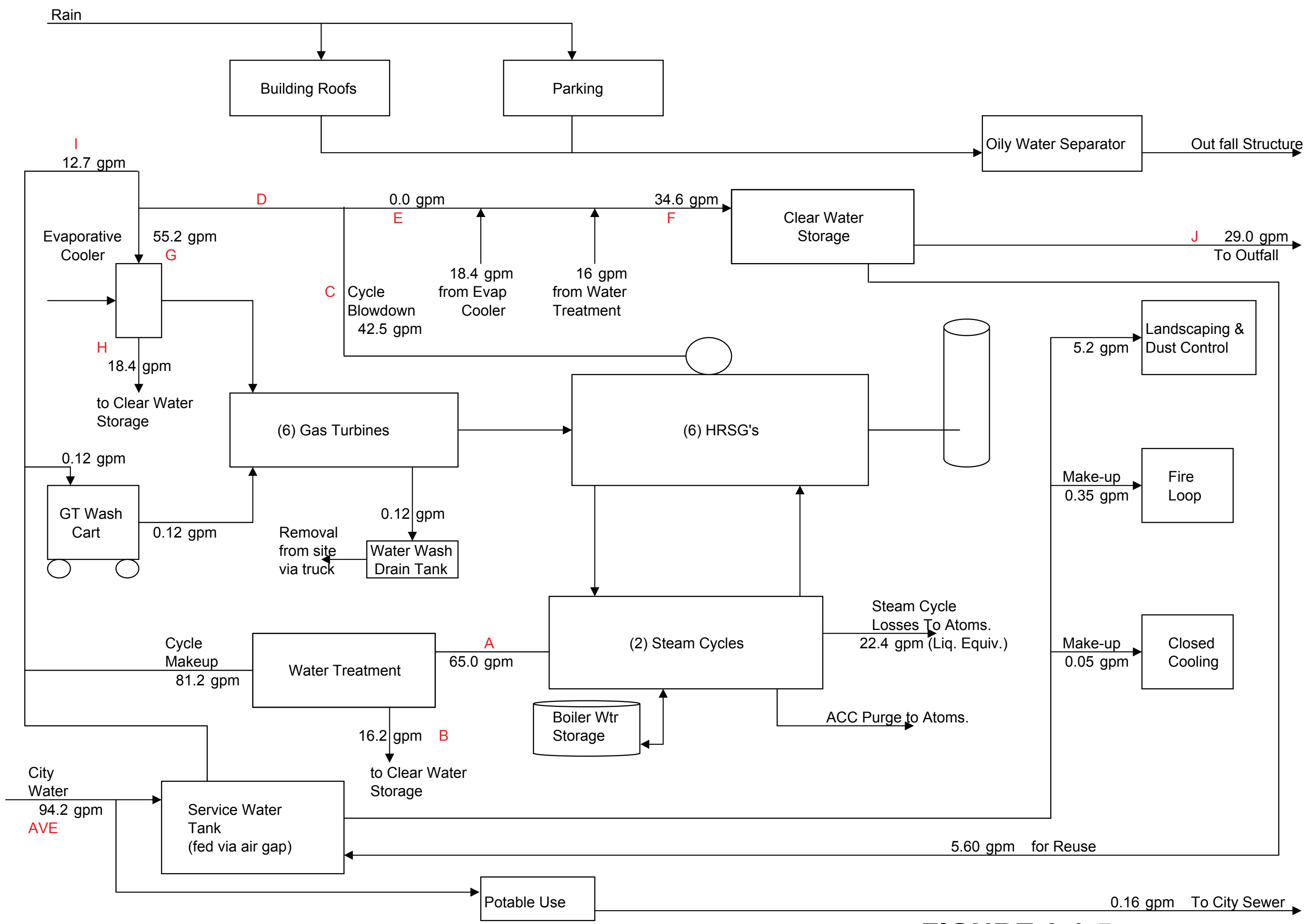


FIGURE 2.1-5a
Average Monthly Temperature Water Balance (SMMAAT)

AES Huntington Beach Energy Project

Huntington Beach, California

CH2MHILL

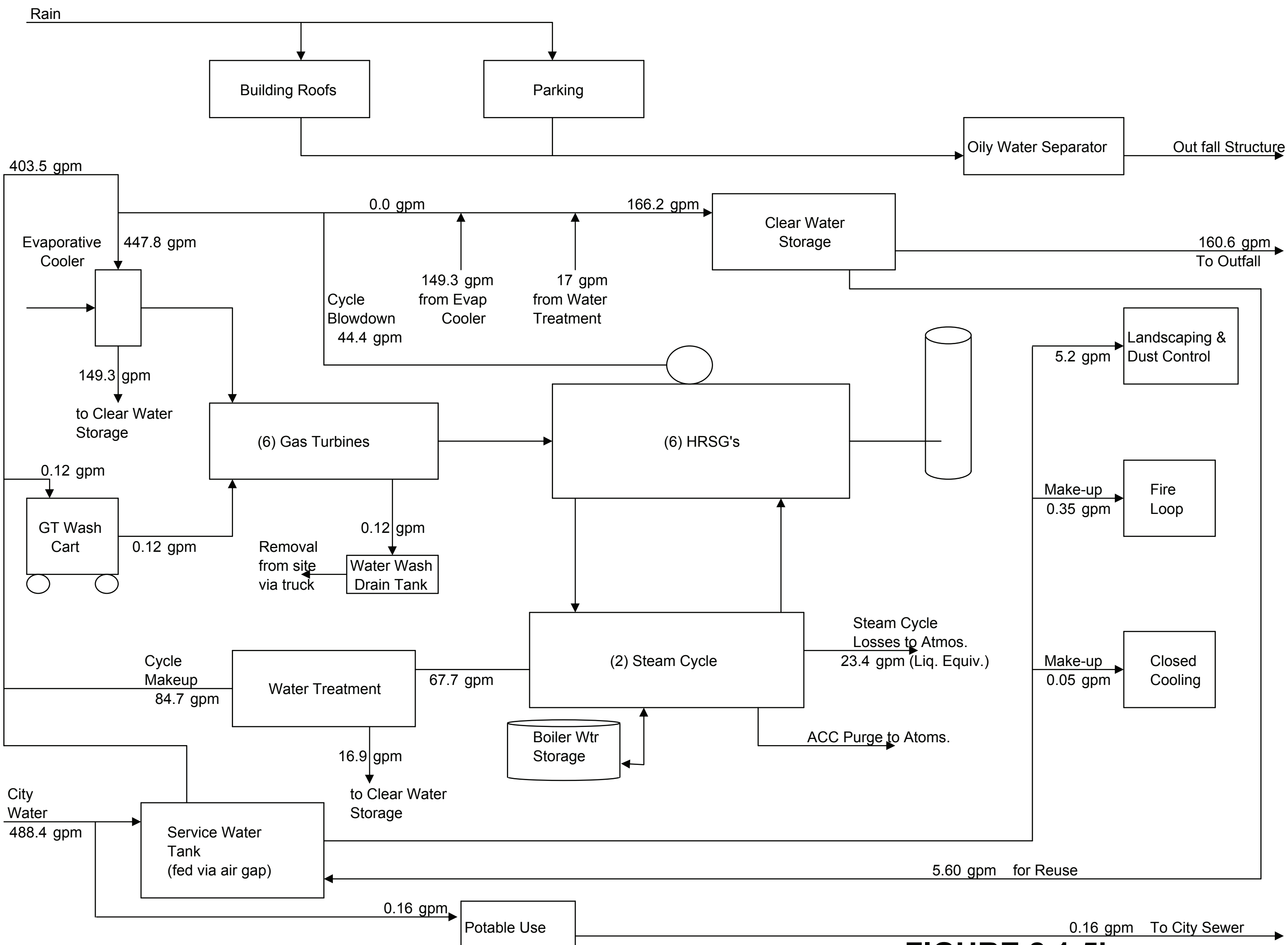


FIGURE 2.1-5b
Peak Temperature Water Balance (SPSAT)
AES Huntington Beach Energy Project
Huntington Beach, California

2.1.9.1 Water Requirements

The maximum theoretical water needs for the HBEP combined-cycle units while operating at a their maximum annual consumption rate (HBEP operating for 6,665 hours per year) and peak consumption rate (six CTGs at 100 percent load with inlet air evaporative cooling operating) in terms of water demand were developed using the following two sets of temperature conditions.

- For the site SMMAAT[5] conditions, the station maximum water use will be approximately 94 gallons per minute (gpm) or approximately 115 acre-feet per year (Table 2.1-1).
- For the SPSAT peak conditions, station maximum water use will be approximately 190 gpm.

The water requirements for the HBEP power blocks operating at a SMMAAT maximum consumption rate will be substantially less than the actual historical water consumption of the existing Huntington Beach Generating Station's units. Based on water volumes from 2004 through 2011, the existing Huntington Beach Generating Station has historically used approximately 290 acre-feet per year while operating at only 15 percent of its maximum capacity. The City of Huntington Beach supplies the process and potable water for the existing Huntington Beach Generating Station's units.

HBEP makeup water will be fed directly from the City's existing potable water service through metering equipment and into the 442,500 gal service water/fire water storage tank. Water from the fire/service water tank will be used as plant service water, irrigation water, makeup to the combustion turbine inlet air evaporative coolers, and raw feed to the steam cycle makeup water treatment system. The fire/service water storage tank will provide approximately 35 hours of operational storage and 2 hours of fire protection storage in the event of a disruption in the supply.

TABLE 2.1-1
Estimated Daily and Annual Water Use for HBEP Operations

Water Use	Average Daily Use Rate (gpm)	Maximum Daily Use Rate (gpm)	Average Annual Use* (acre-feet per year)
Potable water	94	190	115

*Assumes 6,665 hours of operation, at the average maximum daily temp.

2.1.9.2 Wastewater Requirements

The HBEP wastewater requirements while operating at a theoretical maximum operating hours and peak conditions (six CTGs at 100 percent load with inlet air evaporative cooling operating) in terms of water discharge were developed using two sets of temperature conditions. They are:

- For the site monthly maximum average ambient temperature conditions, discharge to the existing outfall will be approximately 29 gpm or approximately 11.6 million gallons per year.
- For the site peak summer ambient temperature conditions, discharge to the existing outfall will be approximately 61 gpm (Table 2.1-2).

TABLE 2.1-2
Estimated Daily and Annual Wastewater Discharge for HBEP Operations

Wastewater Use	Average Daily Discharge Rate (gpm)	Maximum Daily Discharge Rate (gpm)	Average Annual Use* (million gallons per year)
Wastewater to outfall	29	61	11.6

*Assumes 6,665 hours of operation at the average daily maximum temp.

[5] SMMAAT is Site Max Median Annual Ave Temp: This is the annual average of the median max daily temp, corresponding to 85 deg Db and 70 deg wet bulb, which is where the station expects to need evaporative cooling on a regular basis.

Actual annual discharge volumes to the existing ocean outfall are expected to be substantially less than represented here and will depend on the actual operating profile and annual service factor of the HBEP in any given year.

Sanitary wastewater discharge from the HBEP will be to the existing 4-inch sewer line that connects to the existing City of Huntington Beach sewer line located in the north corner of the site near Newland Road.

2.1.9.3 Water and Wastewater Treatment

Makeup water for the HBEP power blocks steam cycle will have contaminants removed (demineralized) by passing the service water through a reverse osmosis system followed by an continuous electrodeionization (CEDI) process. The various water streams are:

- The demineralized water will be sent to two 144,000 gallon storage tanks. It will provide approximately 75 hours of storage at the average daily use rate shown in Table 2.1-1 conditions. Demineralized water is used for feedwater makeup for the steam cycle and for combustion turbine wash water.
- The reject water stream from the reverse osmosis system will be discharged to a holding tank for reuse onsite such as equipment wash down, fire water loop, and closed-loop cooling. The unused portion will ultimately be discharged to the existing outfall. The re-used portion will flow to the service water tank for storage and reuse.
- Feedwater makeup water will be fed to the condensate receiver.
- Blowdown (condensate removed from the HRSGs to reduce water contaminants) will be discharged to an atmospheric flash tank, where the flash steam will be vented to the atmosphere and the condensate will be cooled prior to transfer to a holding tank for reuse. The unused portion will ultimately be discharged to the existing outfall. The re-used portion will flow to the service water tank for storage and reuse.
- Wastewater from combustion turbine water washes will be collected in combustion turbine drain tanks and then trucked offsite for disposal. Service water will be used for makeup to the combustion turbine evaporative coolers, equipment washdown, and other miscellaneous plant uses.
- Blowdown from the combustion turbine evaporative coolers will be discharged to the plant process drain system and stored for reuse onsite. The unused portion will be discharged to the outfall. The reused portion will flow to the service water tank for storage and reuse.
- Wastewater from process areas that could potentially include oil or other lubricants will be directed to an oil-water separator for removal of accumulated oil that may result from equipment leakage or small spills and large particulate matter that may be present from equipment washdowns. The oil free storm water from the process areas and from the pavement areas will be collected in the retention basins and will be discharged to the existing ocean outfall. The residual oil containing sludge will be collected via vacuum truck and disposed appropriately by a licensed transporter.

2.1.9.4 Air-cooled Condenser System

Exhaust steam from the STGs will be condensed in two air-cooled condensers. The use of an air-cooled condenser will eliminate the significant water demand required for condensing STG exhaust steam in a conventional surface condenser/cooling tower arrangement. To condense steam in an air-cooled condenser, large fans will blow ambient air across finned tubes through which the low-pressure steam flows. The low-pressure steam will cool until it reaches the temperature at which it is condenses back into water (condensate). The condensate collects in a receiver located under the air-cooled condenser. Condensate pumps will then return the condensate from the receiver back to the HRSGs for reuse.

2.1.9.5 Closed-loop Cooling Fluid Cooler

A closed-loop cooling system will provide cooling water for various plant equipment such as the CTG and STG generator coolers, gas compressors, CTG and STG lubrication oil coolers, and HRSG feedwater pumps. The primary means of heat rejection for this closed-loop system will be an air-cooled heat exchanger. The air-cooled heat exchanger will use large fans to blow ambient air across finned tubes through which the closed-loop cooling water will flow. The air-cooled heat exchanger will consume no water.

2.1.10 Emission Control and Monitoring

Air emissions from the combustion of natural gas in the CTGs and duct burners in the HRSGs will be controlled using state-of-the-art systems. To ensure that the systems perform correctly, continuous emission monitoring will be performed on the stack exhaust flow rate, temperature, oxygen, NO_x and CO levels, as well as on the natural gas heat input, generator output, and ammonia injection rate into the pollution control system. Section 5.1, Air Quality, includes additional information on emission control and monitoring.

2.1.10.1 NO_x Emission Control

The existing and operational Units 1–4 at the Huntington Beach Generation Station use a urea-to-ammonia conversion system that supplies ammonia to the SCR units for NO_x control. In this process, solid urea pellets react with heat and water to form a composite gas of carbon dioxide, ammonia and residual water vapor at low pressure. This system has proven to have poor reliability and slow response times, produces an inconsistent concentration of ammonia, and requires a steam supply to fuel the urea-to-ammonia reactor.

The HBEP power blocks are designed to be fast-start and fast-ramp units that will require an immediate and varying supply of ammonia at precise concentrations for emissions control. In its current state, the existing Huntington Beach Generating Station urea-to-ammonia system is incompatible with the HBEP due to its inability to accommodate fast starts and rapid load changes. Therefore, the HBEP generating units will be supported by a new 19 percent aqueous ammonia storage tank and ammonia injection grid to supply ammonia to the HBEP SCR system, and the urea-to-ammonia conversion system will be removed.

SCR will be used to control NO_x concentrations in the exhaust gas emitted to the atmosphere to 2.0 ppmvd from the HRSG stacks. The SCR process will use ammonia from the 19 percent aqueous ammonia tank. Ammonia slip, or the concentration of unreacted ammonia in the exiting exhaust gas, will be limited to 5.0 ppmvd from the HRSG stacks. The SCR equipment will include a mixing chamber, catalyst modules, ammonia storage system, ammonia vaporization and injection system, and monitoring equipment and sensors. HBEP will make use of an ammonia delivery system, which will consist of a single 24,000-gallon ammonia tank, a spill containment basin, and a refilling station with a spill containment basin and sump.

2.1.10.2 Carbon Monoxide and Volatile Organic Compounds

An oxidizing catalytic converter will be used to reduce the CO concentration in the exhaust gas emitted to the atmosphere from the HRSG stacks to 2.0 ppmvd and VOCS to 1.0 ppmvd.

2.1.10.3 Particulate Emission Control

Particulate emissions will be controlled by the use of best combustion practices and sole use of inherently low sulfur natural gas. A high-efficiency CTG inlet air filtration system will remove particulates in the ambient air prior to entering the CTG processes.

2.1.10.4 Continuous Emission Monitoring

Continuous emission monitors will sample, analyze, and record fuel gas flow rate, NO_x and CO concentration levels, and percentage of oxygen in the exhaust gas from each of the six HRSG stacks. This system will generate reports of emission data in accordance with permit requirements and will send alarm signals to the plant supervisory control system when emissions approach or exceed pre-selected limits.

2.1.11 Waste Management

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

2.1.11.1 Stormwater Collection, Treatment, and Disposal

Stormwater that falls within process equipment containment areas will be collected and discharged to the existing Huntington Beach Generating Station's process drain system, which consists of oil/water separation sumps and two retention basins. Stormwater that falls within the of paved areas of the plant area and outside the process equipment containment areas will be routed to the retention basin. A small portion of stormwater may fall outside of the process containment and pavement areas and will either percolate directly into the soil or drain over the surface into the retention basins to assist with the removal of suspended solids. The oil-free stormwater from the process areas and from the pavement areas collected in the retention basins will be discharged through the existing ocean outfall. The residual oil-containing sludge will be collected via vacuum truck and disposed of as hazardous waste. The water balance diagrams, Figures 2.1-5a and 2.1-5b, show the expected wastewater streams. Table 2.1-2 shows the flow rates for HBEP for the annual average and maximum conditions, respectively.

2.1.11.2 Plant Drains and Oil/Water Separator

General HBEP 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 to the process drain collection system. Drains that potentially could contain oil or grease will first be routed through an oil/water separator. Wastewater streams that are unlikely to contain oil and grease, including CTG inlet air evaporative cooler blowdown, HRSG blowdown, blowdown from the auxiliary cooling system evaporative fluid cooler, and reverse osmosis reject will bypass the oil/water separator. Miscellaneous wastewaters, including those from combustion turbine water washes and from some water treatment membrane-based system's cleaning operations, will be collected in holding tanks or sumps and will be trucked offsite for disposal at an approved wastewater disposal facility.

2.1.11.3 Sanitary Wastewater

Sanitary wastewater from sinks, toilets, showers, dishwashers, and other sanitary facilities will be discharged to the facility's sanitary sewer collector system as it is today. Effluent from the oil/water separator will be combined with other process wastewater and sanitary wastewater and then pumped via a wastewater lift station to an existing 4-inch City of Huntington Beach sanitary sewer line located in the north corner of the Site near Newland Street. The water balance diagrams, Figures 2.1-5a and 2.1-5b, show the expected wastewater streams. Table 2.1-2 shows the flow rates for HBGS for the annual average and maximum conditions, respectively.

2.1.11.4 Solid Wastes

HBEP will produce maintenance and plant wastes typical of 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. Solid wastes will be trucked offsite for recycling or disposal (see Section 5.14).

2.1.11.5 Hazardous Wastes

Several methods will be used to properly manage and dispose of hazardous wastes generated by the HBEP. 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 in turbine wash waters. These wastes, which are subject to high metal concentrations, will be temporarily stored onsite in portable tanks or sumps, and disposed of offsite in accordance with applicable regulatory requirements.

2.1.12 Management of Hazardous Materials

A variety of chemicals will be stored and used during construction and operation of the HBEP. 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 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. Containment areas subject to rainfall will be provided additional containment volume sufficient to contain the rainfall from a 25-year, 24-hour storm event. Drain piping for reactive chemicals will be trapped and isolated from other drains to eliminate noxious or toxic vapors.

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.

The ammonia tank containment structure will be designed and installed that specifically limits the amount of ammonia vapor evolved in the event of a tank failure.

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

2.1.13 Fire Protection

The existing fire protection system at the existing Huntington Beach Generating Station will be modified to meet all LORS for the HBEP while reusing existing equipment to the maximum extent possible. Existing fire pumps, storage tanks and piping will remain in service as part of the newly modified fire protection system. The system design will protect personnel and limit property loss and plant downtime in the event of a fire. The primary source of fire protection water will be supplied via the existing Huntington Beach Generating Station's connection to the City of Huntington Beach's 8-inch potable water distribution system. The secondary source of fire protection water will be supplied from an existing 442,500 gallon onsite fire/service water storage tank, which will be reconfigured in accordance with National Fire Protection Association (NFPA) guidelines to provide 2 hours of protection for the onsite worst-case single fire.

Fire protection water from the City connection and onsite fire/service water storage tank will be provided to a dedicated underground fire loop piping system. The fire hydrants and the fixed suppression systems will be supplied from the fire-water loop. Fire water pressure in the fire-water loop will be maintained with a jockey pump. Fixed fire suppression systems will be installed at determined fire risk areas. Sprinkler systems also will be installed in the administration/maintenance building as required by NFPA and local code requirements. The CTG units will be protected by a carbon dioxide fire protection system. Hand-held fire extinguishers of the appropriate size and rating will be located in accordance with NFPA 10 throughout the facility. Two existing emergency diesel fire water pumps currently installed at the Huntington Beach Generating Station will remain in service for the HBEP.

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

2.1.14 Plant Auxiliaries

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

2.1.14.1 Lighting

HBEP will be operational (though not necessarily generating power) 24 hours per day, 7 days per week and would require night lighting for safety and security. The lighting system will provide illumination for operation under normal conditions, for safety under emergency conditions, and for manual operations during a power outage. The system will also provide 120-volt convenience outlets for portable lamps and tools.

To reduce offsite lighting impacts, lighting for HBEP will be restricted to areas required for safety and operation. Exterior lights will be hooded and will be directed onsite to minimize glare and light spill off of the site. Low-pressure sodium lamps and fixtures of a non-glare type will be specified. In addition, switched lighting circuits will be provided for areas where lighting is not required for normal operation or safety to allow these areas to remain dark at most times and to minimize the amount of lighting potentially visible offsite.

2.1.14.2 Grounding

The electrical system is susceptible to ground faults, lightning, and switching surges that result in high voltage that constitutes a hazard to personnel and electrical equipment. The station grounding system provides an adequate path to permit the dissipation of current created by these events.

The station grounding grid will be designed for adequate capacity to dissipate the ground fault current from the ground grid under the most severe conditions in areas of high ground fault current concentration. The grid spacing will maintain safe voltage gradients. Bare conductors will be installed below grade in a grid pattern. Each junction of the grid will be bonded together by an exothermic weld. Ground resistivity readings will be used to determine the necessary numbers of ground rods and grid spacing to ensure safe step and touch potentials under severe fault conditions. Grounding conductors will be brought from the ground grid to connect to building steel and non-energized metallic parts of electrical equipment.

2.1.14.3 Distributed Control System

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

The DCS will provide the following functions:

- Coordinate control of the STG, CTGs, HRSGs, and other systems
- Control the balance-of-plant systems in response to plant demands
- Monitor controlled plant equipment and process parameters and deliver this information to plant operators
- Provide control displays (printed logs, LCD video monitors) for signals generated within the system or received from input/output
- Provide consolidated plant process status information through displays presented in a timely and meaningful manner
- Provide alarms for out-of-limit parameters or parameter trends, display on alarm video monitor(s), and record on an alarm log printer
- Provide storage and retrieval of historical data

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

- PC-based operator consoles with LCD video monitors
- Input/output cabinets
- Historical data unit
- Printers
- Data links to the combustion turbine and steam turbine control systems

The DCS will have a functionally distributed architecture allowing integration of balance-of-plant equipment that may be controlled locally via a programmable logic controller. The DCS will interface with the CTG and STG control systems 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. This also will allow critical control and safety systems to have redundancy of controls and a UPS. As part of the quality control program, daily operator logs will be available for review to determine the status of the operating equipment.

2.1.14.4 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 may be provided.

2.1.14.5 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. The instrument air system will provide the source of air for the service air system. Each service air header will include a backpressure regulating valve to maintain a minimum instrument air system pressure, regardless of service air use. For purposes of reliability, each power block will have two 100-percent-capacity air compressors located near the power block. This will reduce flow losses and minimize the risk of air loss due to line leaks or damage. The service air and instrument air system will feed from the same compressors, but the service air system will be segregated by a back pressure control valve that will close in the event of excessive pressure loss in the service air system.

2.1.14.6 Instrument Air

The instrument air system will provide dry air to pneumatic operators and devices. 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.

2.1.15 Interconnection to the Electrical Grid

Each HBEP power block will be connected to separate two-winding, three-phase, GSU transformers. Two new single-circuit overhead transmission lines will be installed on the HBEP site to connect each power block's GSU transformers to the existing SCE 230-kV switchyard. The SCE switchyard will contain 230-kV circuit breaker and air break disconnect switches to interconnect the new HBEP units to the SCE 230-kV transmission system. Refer to Section 3.0, Transmission System Engineering, for additional information on the switchyard and generation tie lines.

2.2 Demolition Activities

Demolition of certain existing Huntington Beach Generating Station support structures and equipment will be completed to facilitate construction and operation of the HBEP. Construction of the HBEP will require the removal of existing Huntington Beach Generating Station Units 1, 2, and 5. The demolition of Unit 5, scheduled to occur between the fourth quarter of 2014 and the end of 2015, provides the space for the construction of HBEP Block 1. Construction of Blocks 1 and 2 is expected to take approximately 42 and 30 months respectively, with Block 1 construction scheduled to occur between the first quarter of 2015 through the second quarter of 2018, and Block 2 construction scheduled to occur between the first quarter of 2018 through second quarter of 2020. Removal/demolition of existing Huntington Beach Generating Station Units 1 and 2 is scheduled to occur between the fourth quarter of 2020 through the third quarter of 2022.

Existing Huntington Beach Generating Station Units 3 and 4 were licensed through the CEC (00-AFC-13C) and demolition of these units is authorized under that license and will proceed irrespective of the HBEP. Therefore, demolition of existing Huntington Beach Generating Station Units 3 and 4 is not part of the HBEP project definition. However, to ensure a comprehensive review of potential project impacts, the demolition of existing Huntington Beach Generating Station Units 3 and 4 is included in the cumulative impact assessment. Removal/demolition of existing Huntington Beach Generating Station Units 3 and 4 will be in advance of the construction of HBEP Block 2.

Initial demolition activities to support HBEP construction and operation include the demolition of the remaining portions of the decommissioned existing Huntington Beach Generating Station's Unit 5 peaker and the removal of the east fuel oil tank and JP4 storage tank. These initial activities will include demolition of the foundations, building, small auxiliary mechanical and electrical equipment associated with the Unit 5 peaker, and removal of the fuel storage tanks per the requirements of a Department of Toxic Substances Control Removal Action. These demolition activities will occur in conjunction with the initial site preparation construction activities for HBEP Block 1 that include reshaping the tank's associated berm and establishing final grades and roads.

Final demolition activities include the demolition of existing Huntington Beach Generating Station's Units 1 and 2 and their ancillary mechanical and electrical equipment except for the existing reverse osmosis/electro-deionization building as well as the service water and deionized water tanks.

2.2.1 Demolition Manpower

A typical crew size has been assumed for this discussion. Manpower loads will vary depending on the specific activities being performed. Various skill sets will be required for equipment operation, truck driving, asbestos and lead abatement, dismantling of structures, health and safety monitoring, sampling, general housekeeping, etc. It is anticipated that the maximum number of demolition personnel during any specific demolition activity will be approximately 50, with an overall average demolition workforce of 40 personnel. Professional labor for the demolition will include project management, construction management, planning and permitting specialists, health and safety specialist, quality assurance / quality control engineers, project controls engineers, accounting and procurement specialists, and administrative specialists. See Appendix 5.10B for the manpower requirements for demolition.

2.2.2 Demolition Equipment

Equipment anticipated to be used for the demolition of the existing Huntington Beach Generating Station include the following; however, the actual equipment may vary depending on the selected demolition contractor:

- 35-ton and 75-ton rubber-tired cranes.
- Excavators with shear attachments
- Backhoes
- Paving breaker attachments for the excavators or backhoes
- Front-end loaders
- 10-wheeled dump trucks for transporting materials
- Truck tractor driven end-dumps for transporting wastes to appropriate disposal facilities
- Fork lifts
- Compactors
- Bulldozers
- Various support vehicles such water trucks (dust control), fueling/service vehicles, and pickup trucks

During peak demolition activities at the site, an estimated maximum of 15 tractor-trailer units will leave the site each day to transport waste and debris offsite for salvage, recycling or disposal. See Appendix 2A for a list of the equipment requirements for demolition.

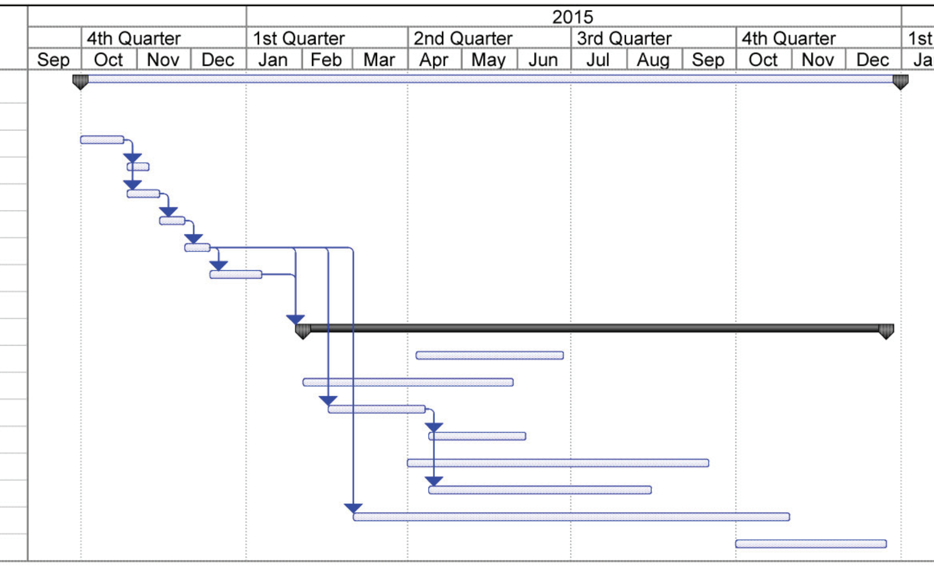
2.2.3 Demolition Schedule

Table 2.2-1 lists HBEP major schedule milestones, including demolition start dates. Figure 2.2.1 provides the demolition schedule for the existing Huntington Beach Generating Station's Unit 5 Peaker and Tank Area. Figure 2.2-2 provides the schedule for the separately licensed cumulative demolition of existing Huntington Beach Generating Station's Units 3 and 4. Figure 2.2-3 provides the demolition schedule for existing Huntington Beach Generating Station's Units 1 and 2.

HUNTINGTON BEACH ENERGY PROJECT
PEAKER AND TANK AREA DEMOLITION

Fri 1/27/12

ID		Task Name	Duration	Start	Finish	Predecessors
1		**DEMOLITION - PEAKER AND TANK AREA DEMO**	**327 days?**	**Wed 10/1/14**	**Thu 12/31/15**	
2						
3		PERMITS	18 days?	Wed 10/1/14	Fri 10/24/14	
4		INSTALL TEMPORARY ROADS	10 days	Mon 10/27/14	Fri 11/7/14	3
5		COORDINATE CONTRACTOR AND LAYDOWN AREAS	14 days	Mon 10/27/14	Thu 11/13/14	3
6		SET UP GENERATION / POWER SUPPLY & WATER	10 days	Fri 11/14/14	Thu 11/27/14	5
7		LEAD ITEMS / SUPPLIES / MISC. EQUIP.	10 days	Fri 11/28/14	Thu 12/11/14	6
8		ESTABLISH SITE OFFICES	21 days	Fri 12/12/14	Fri 1/9/15	7
9						
10		**PEAKER AND TANK AREA REMOVAL**	**233 days?**	**Mon 2/2/15**	**Wed 12/23/15**	**7,8**
11		DISMANTLE PEAKER / SALVAGE / SCRAP	60 days	Mon 4/6/15	Fri 6/26/15	
12		DEMO TANK AND MISC. EQUIPMENT	85 days	Mon 2/2/15	Fri 5/29/15	
13		REMOVE U.G. MECHANICAL	40 days	Mon 2/16/15	Fri 4/10/15	7
14		REMOVE U.G. ELECTRICAL	40 days	Mon 4/13/15	Fri 6/5/15	13
15		REMOVE BALANCE OF PLANT EQUIPMENT	120 days	Wed 4/1/15	Tue 9/15/15	
16		REMOVE / RESHAPE TANK BERM	90 days	Mon 4/13/15	Fri 8/14/15	13
17		REMOVE EXIST CONCRETE STRUCTURES	175 days?	Mon 3/2/15	Fri 10/30/15	7
18		ESTABLISH FINAL GRADES AND ROADS	60 days?	Thu 10/1/15	Wed 12/23/15	



Project: DEMO SCH PEAKER AND TA
Date: Fri 1/27/12

Task | Progress | Summary | External Tasks | Deadline
Split | Milestone | Project Summary | External Milestone

FIGURE 2.2-1
Demolition Schedule for HBGS Unit 5 Peaker and Tank Area
AES Huntington Beach Energy Project
Huntington Beach, California

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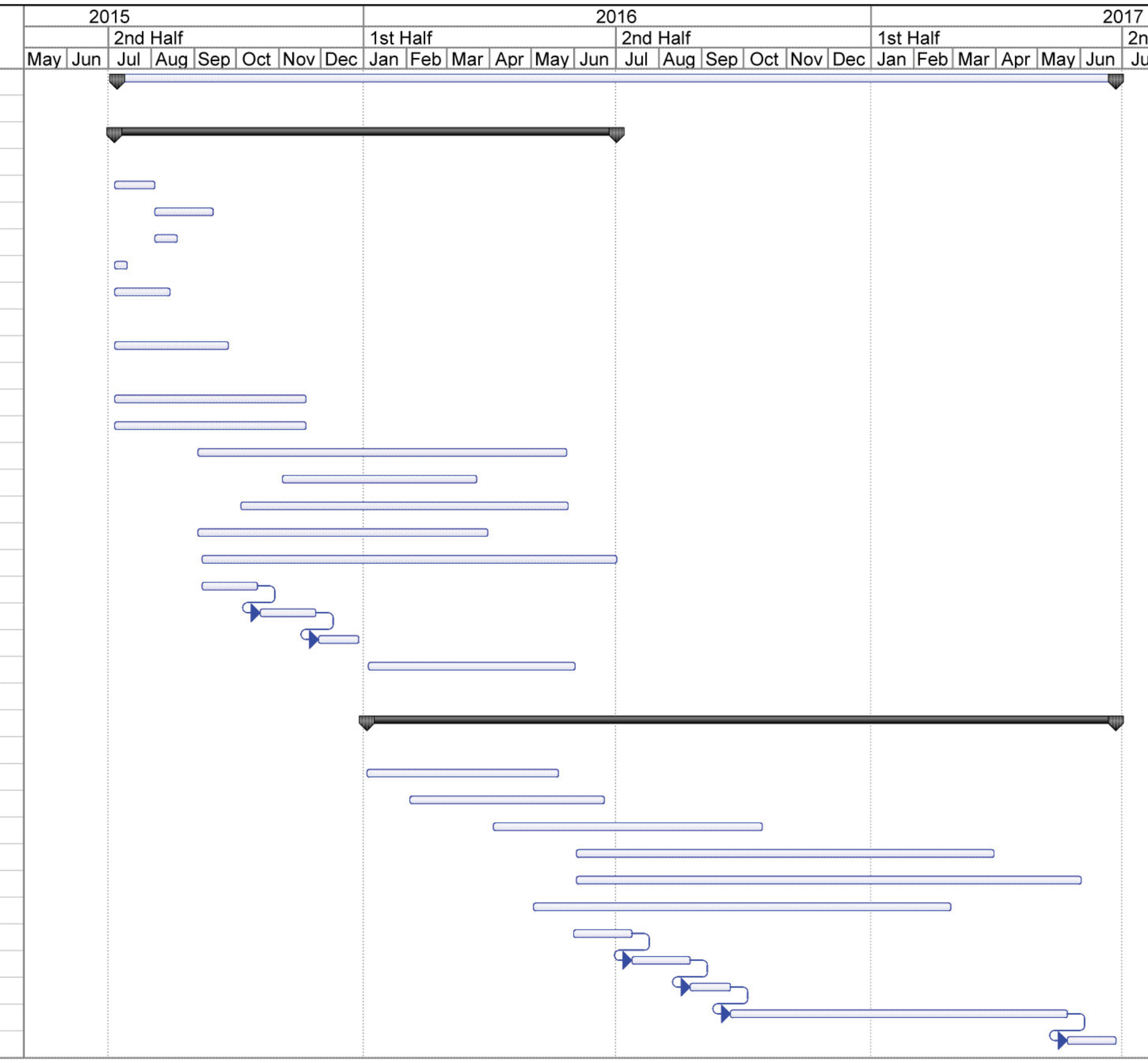
HUNTINGTON BEACH ENERGY PROJECT

DEMOLITION - UNITS 3 & 4

Tue 3/13/12

ID		Task Name	Duration	Start	Finish	Predecessors
1		**DEMO UNITS 3 & 4**	**514 days?**	**Wed 7/8/15**	**Mon 6/26/17**	
2						
3		**DISMANTLE UNIT 4**	**260 days?**	**Mon 7/6/15**	**Fri 7/1/16**	
4						
5		PERMITS	21 days	Mon 7/6/15	Mon 8/3/15	
6		COORDINATE EQUIPMENT AND LAYDOWN AREA	30 days	Tue 8/4/15	Mon 9/14/15	
7		SET UP GENERATION / POWER SUPPLY	12 days	Tue 8/4/15	Wed 8/19/15	
8		LEAD ITEMS / SUPPLIES	7 days	Mon 7/6/15	Tue 7/14/15	
9		ESTABLISH SAFETY PROGRAM	30 days	Mon 7/6/15	Fri 8/14/15	
10						
11		IMPLEMENT ASBESTOS ABATEMENT PROGRAM	60 days	Mon 7/6/15	Fri 9/25/15	
12						
13		REMOVE PIPING INSULATION - ASBESTOS	100 days	Mon 7/6/15	Fri 11/20/15	
14		DISMANTLE UNIT 4 PIPING AND EQUIPMENT	100 days	Mon 7/6/15	Fri 11/20/15	
15		REMOVE INSULATION FROM BOILER - ASBESTOS	190 days	Fri 9/4/15	Thu 5/26/16	
16		DISMANTLE UNIT 4 BOILER	100 days?	Wed 11/4/15	Tue 3/22/16	
17		DEMO HOT AND COLD DUCTWORK	170 days	Mon 10/5/15	Fri 5/27/16	
18		REMOVE EQUIPMENT - ALL FLOORS	149 days	Fri 9/4/15	Wed 3/30/16	
19		DISMANTLE / SALVAGE TURBINE BUILDING	215 days?	Mon 9/7/15	Fri 7/1/16	
20		REMOVE UNIT 4 STM TURBINE	30 days	Mon 9/7/15	Fri 10/16/15	
21		REMOVE UNIT 4 STM TURB GENERATOR	30 days	Mon 10/19/15	Fri 11/27/15	20
22		REMOVE UNIT 4 TRANSFORMERS	21 days	Mon 11/30/15	Mon 12/28/15	21
23		REMOVE UNIT 4 ANCILLARY ITEMS	107 days?	Tue 1/5/16	Wed 6/1/16	
24						
25		**DISMANTLE UNIT 3**	**386 days?**	**Mon 1/4/16**	**Mon 6/26/17**	
26						
27		REMOVE PIPING INSULATION - ASBESTOS	100 days	Mon 1/4/16	Fri 5/20/16	
28		DISMANTLE UNIT 3 PIPING AND EQUIPMENT	100 days	Thu 2/4/16	Wed 6/22/16	
29		REMOVE INSULATION FROM BOILER - ASBESTOS	140 days	Mon 4/4/16	Fri 10/14/16	
30		DISMANTLE UNIT 3 BOILER	215 days?	Fri 6/3/16	Thu 3/30/17	
31		DEMO HOT AND COLD DUCTWORK	260 days	Fri 6/3/16	Thu 6/1/17	
32		DISMANTLE / SALVAGE TURBINE BUILDING	215 days	Tue 5/3/16	Mon 2/27/17	
33		REMOVE UNIT 3 STM TURBINE	30 days	Wed 6/1/16	Tue 7/12/16	
34		REMOVE UNIT 3 STM TURB GENERATOR	30 days	Wed 7/13/16	Tue 8/23/16	33
35		REMOVE UNIT 3 TRANSFORMERS	21 days	Wed 8/24/16	Wed 9/21/16	34
36		REMOVE UNIT 3 ANCILLARY ITEMS	173 days?	Thu 9/22/16	Mon 5/22/17	35
37		REMOVE STACK	25 days	Tue 5/23/17	Mon 6/26/17	36



Project: DEMO UNITS 3 AND 4
Date: Tue 3/13/12

Task | Split | Milestone | Summary | Project Summary | External Tasks | External Milestone | Progress | Deadline

FIGURE 2.2-2
Demolition Schedule for HBGS Units 3 and 4
AES Huntington Beach Energy Project
Huntington Beach, California

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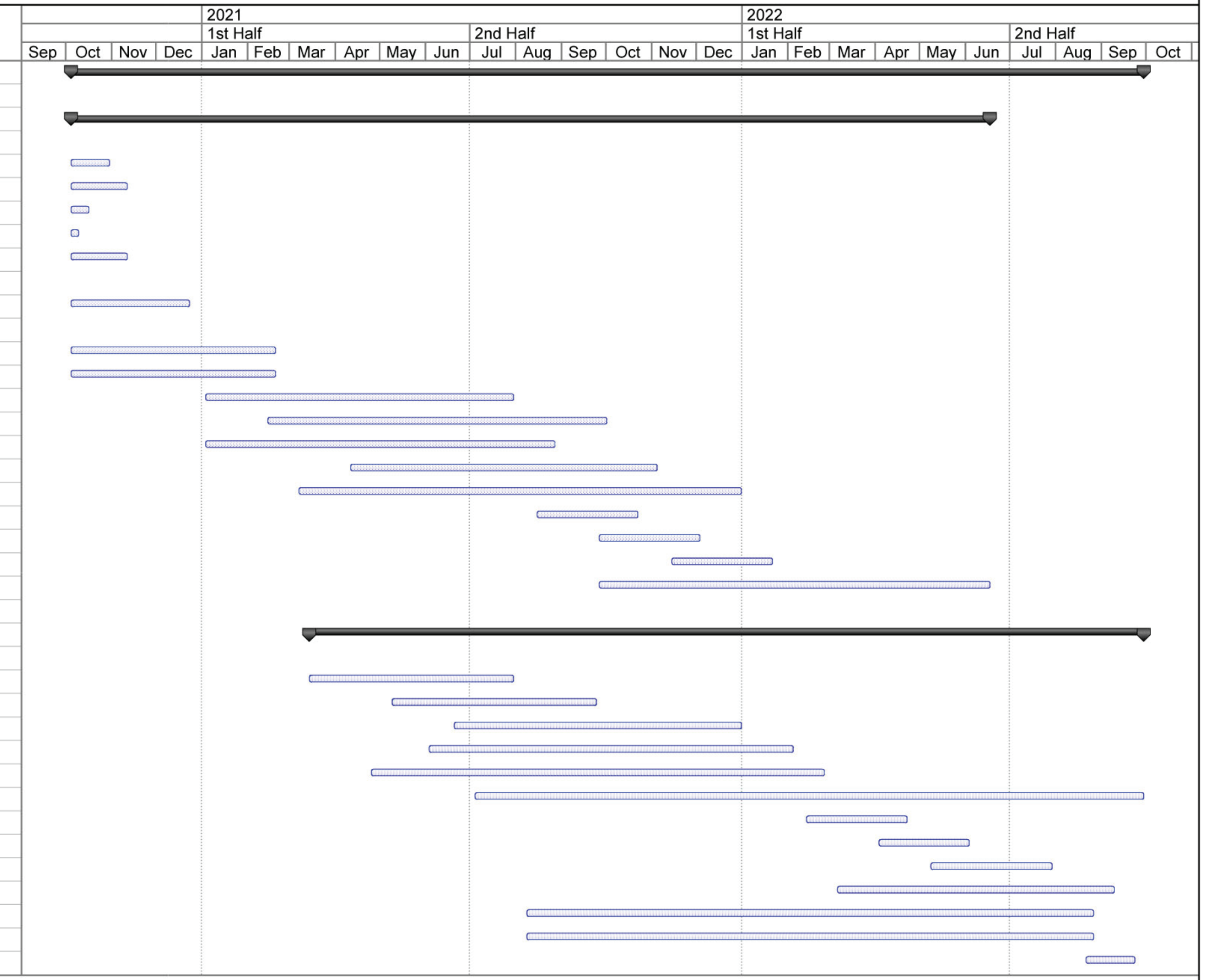
HUNTINGTON BEACH ENERGY PROJECT
DEMOLITION - UNITS 1 & 2

Tue 3/13/12

ID		Task Name	Duration	Start	Finish	Predecessors
1		**DEMO UNITS 1 & 2**	**519 days?**	**Mon 10/5/20**	**Thu 9/29/22**	
2						
3		**DISMANTLE UNIT 2**	**445 days?**	**Mon 10/5/20**	**Fri 6/17/22**	
4						
5		PERMITS	20 days	Mon 10/5/20	Fri 10/30/20	
6		COORDINATE EQUIPMENT AND LAYDOWN AREA	28 days	Mon 10/5/20	Wed 11/11/20	
7		SET UP GENERATION / POWER SUPPLY	10 days	Mon 10/5/20	Fri 10/16/20	
8		LEAD ITEMS / SUPPLIES	5 days	Mon 10/5/20	Fri 10/9/20	
9		ESTABLISH SAFETY PROGRAM	28 days	Mon 10/5/20	Wed 11/11/20	
10						
11		IMPLEMENT ASBESTOS ABATEMENT PROGRAM	58 days	Mon 10/5/20	Wed 12/23/20	
12						
13		REMOVE PIPING INSULATION - ASBESTOS	100 days	Mon 10/5/20	Fri 2/19/21	
14		DISMANTLE UNIT 2 PIPING AND EQUIPMENT	100 days	Mon 10/5/20	Fri 2/19/21	
15		REMOVE INSULATION FROM BOILER - ASBESTOS	150 days	Mon 1/4/21	Fri 7/30/21	
16		DISMANTLE UNIT 2 BOILER	165 days?	Mon 2/15/21	Fri 10/1/21	
17		DEMO HOT AND COLD DUCTWORK	170 days	Mon 1/4/21	Fri 8/27/21	
18		REMOVE EQUIPMENT - ALL FLOORS	149 days	Mon 4/12/21	Thu 11/4/21	
19		DISMANTLE / SALVAGE TURBINE BUILDING	215 days?	Mon 3/8/21	Fri 12/31/21	
20		REMOVE UNIT 2 STM TURBINE	50 days	Mon 8/16/21	Fri 10/22/21	
21		REMOVE UNIT 2 STM TURB GENERATOR	50 days	Mon 9/27/21	Fri 12/3/21	
22		REMOVE UNIT 2 TRANSFORMERS	50 days	Mon 11/15/21	Fri 1/21/22	
23		REMOVE UNIT 2 ANCILLARY ITEMS	190 days?	Mon 9/27/21	Fri 6/17/22	
24						
25		**DISMANTLE UNIT 1**	**404 days?**	**Mon 3/15/21**	**Thu 9/29/22**	
26						
27		REMOVE PIPING INSULATION - ASBESTOS	100 days	Mon 3/15/21	Fri 7/30/21	
28		DISMANTLE UNIT 1 PIPING AND EQUIPMENT	100 days	Mon 5/10/21	Fri 9/24/21	
29		REMOVE INSULATION FROM BOILER - ASBESTOS	140 days	Mon 6/21/21	Fri 12/31/21	
30		DISMANTLE UNIT 1 BOILER	176 days?	Fri 6/4/21	Fri 2/4/22	
31		DEMO HOT AND COLD DUCTWORK	220 days	Mon 4/26/21	Fri 2/25/22	
32		DISMANTLE / SALVAGE TURBINE BUILDING	324 days	Mon 7/5/21	Thu 9/29/22	
33		REMOVE UNIT 1 STM TURBINE	50 days	Mon 2/14/22	Fri 4/22/22	
34		REMOVE UNIT 1 STM TURB GENERATOR	45 days	Mon 4/4/22	Fri 6/3/22	
35		REMOVE UNIT 1 TRANSFORMERS	60 days	Mon 5/9/22	Fri 7/29/22	
36		REMOVE UNIT 1 ANCILLARY ITEMS	135 days?	Mon 3/7/22	Fri 9/9/22	
37		CONSTRUCT BLDG 33 CONTROL / ADMIN	275 days?	Mon 8/9/21	Fri 8/26/22	
38		CONSTRUCT BLDG 34 MAINT / WAREHOUSE	275 days?	Mon 8/9/21	Fri 8/26/22	
39		REMOVE STACK	25 days	Mon 8/22/22	Fri 9/23/22	



Project DEMO UNIT 1 & 2 SCHEDULE
Date: Tue 3/13/12

Task | Split | Milestone | Summary | Project Summary | External Tasks | External Milestone | Progress | Deadline

FIGURE 2.2-3
Demolition Schedule for HBGS Units 1 and 2
AES Huntington Beach Energy Project
Huntington Beach, California

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It is anticipated that demolition activities will be conducted during a normal 10 hour day and 6 day a week schedule utilizing a single shift. However, during critical demolition activities, it may be necessary to work longer shifts and additional days. These additional hours can be managed by crew rotations.

TABLE 2.2-1
HBEP Major Milestones

Activity	Date
Initiate Demolition of Unit 5 Peaker and East Oil Tank	Fourth Quarter 2014
Begin Construction of Block 1	First Quarter 2015
Commercial Operation of Block 1	Third Quarter 2018
Initiate Demolition of Units 3 and 4	Second Quarter 2015
Begin Construction of Block 2	First Quarter 2018
Commercial Operation of Block 2	Second Quarter 2020
Initiate Demolition of Units 1 and 2	Fourth Quarter 2020

2.3 Project Construction

Construction of HBEP Block 1 from final engineering design and planning to commercial operation date (COD) is anticipated to require approximately 42 months. Actual onsite physical construction from site preparation to completion of all mechanical, electrical, and balance of plant equipment is expected to take 30 months. The COD for Block 1 is scheduled for the third quarter of 2018. Major construction and power block commissioning milestones for Block 1 are shown in Figure 2.3-1. The construction and power block commissioning of HBEP Block 2 from site preparation to COD is anticipated to require approximately 27 months. The COD for Block 2 is scheduled for the second quarter of 2020. Major milestones for Block 2 are shown in Figure 2.3-2 The construction and commissioning schedule for HBEP Block 2 is shorter than the construction schedule for Block 1 because it is anticipated that much of the foundation of HBGS Units 3 and 4 will be remediated and reused during construction of Block 2, and that several in-place mechanical and electrical equipment and infrastructure (including gas compression, duct banks, water treatment) for Block 1 will be expanded to accommodate Block 2. New administration, control, and warehouse facilities are scheduled to be constructed starting in the third quarter of 2021 and finishing in the third quarter of 2022.

2.3.1 Construction Schedule and Workforce

The construction plan is based on a single 10-hour shift/ 6 days per week. Overtime and additional shift work may be used to maintain or enhance the construction schedule. Construction will most typically take place between the hours of 6 a.m. and 6 p.m., Monday through Saturday; however, additional hours may be necessary to maintain schedule or to complete critical construction activities (such as large concrete pours). During the commissioning and startup phase of each of the power blocks, the schedule will be based on a single shift, 10-hour / 6-day work week; however, during this time, some activities may continue 24 hours per day, 7 days per week.

An estimated peak of 230 craft and professional personnel is anticipated in the first quarter of 2017 for Block 1, and an estimated peak of 236 craft and professional personnel is anticipated in the second quarter of 2021 for Block 2. Appendix 5.10B provides the projected construction craft manpower by month.

2.3.2 Construction Plans

An Engineer-Procurement-Construction (EPC) contractor will be selected for the engineering, procurement, and construction of the facility. Subcontractors will be selected by the EPC.

2.3.2.1 Mobilization

The EPC contractor will mobilize after full notice to proceed. Initial site work will include site grading and stormwater control. A rock aggregate will be used for temporary roads, laydown, work areas, and onsite construction parking areas.

2.3.2.2 Construction Office Facilities

The existing Huntington Beach Generating Station administration building, and the existing shops and warehouse building will be used as shared offices for operations staff as well as construction offices for owner, contractor, and subcontractor personnel.

The construction of HBEP will require both onsite and offsite parking for construction workers. Construction worker parking for the construction HBEP and the demolition of the existing units at Huntington Beach Generating Stations is provided by a combination of onsite parking and offsite parking. A maximum of 330 parking spaces will be required during construction and demolition activities. As shown on Figure 2.3-3, offsite construction/demolition parking options include:

- Approximately 1.5 acres onsite at the Huntington Beach Generating Station (approximately 130 parking stalls)
- Approximately 3 acres of existing paved/graveled parking located adjacent to the HBEP across Newland Street (approximately 300 parking stalls)
- Approximately 2.5 acres of existing paved parking located at the corner of Pacific Coast Highway and Beach Boulevard (approximately 215 parking stalls)
- 225 parking stalls at the City of Huntington Beach shore parking west of the project site
- Approximately 1.9 acres at the Plains All American Tank Farm located on Magnolia Street (approximately 170 parking stalls)

Construction workers will arrive at the onsite or offsite construction parking areas in private vehicles using various routes to the access the sites. Shuttles will be used transport construction workers to and from the project site from offsite parking areas. Figure 5.12-4 in Section 5.12, Traffic and Transportation, shows the shuttle routes to and from each of the potential offsite construction worker parking areas to the HBEP site. In combination with the onsite construction parking area, the offsite parking areas being considered will provide adequate parking for construction workers and visitors during construction of HBEP.

2.3.2.3 Construction Laydown and Storage

Approximately 22 acres of construction laydown will be required, with approximately 6 acres at the Huntington Beach Generating Station used for a combination of laydown and construction parking, and 16 acres at the AES Alamitos Generating Station (AGS) used for construction laydown (component storage only/no assembly of components at AGS). During HBEP construction, the large components will be hauled from the construction laydown area at the AGS site to the HBEP site on an as-needed basis.

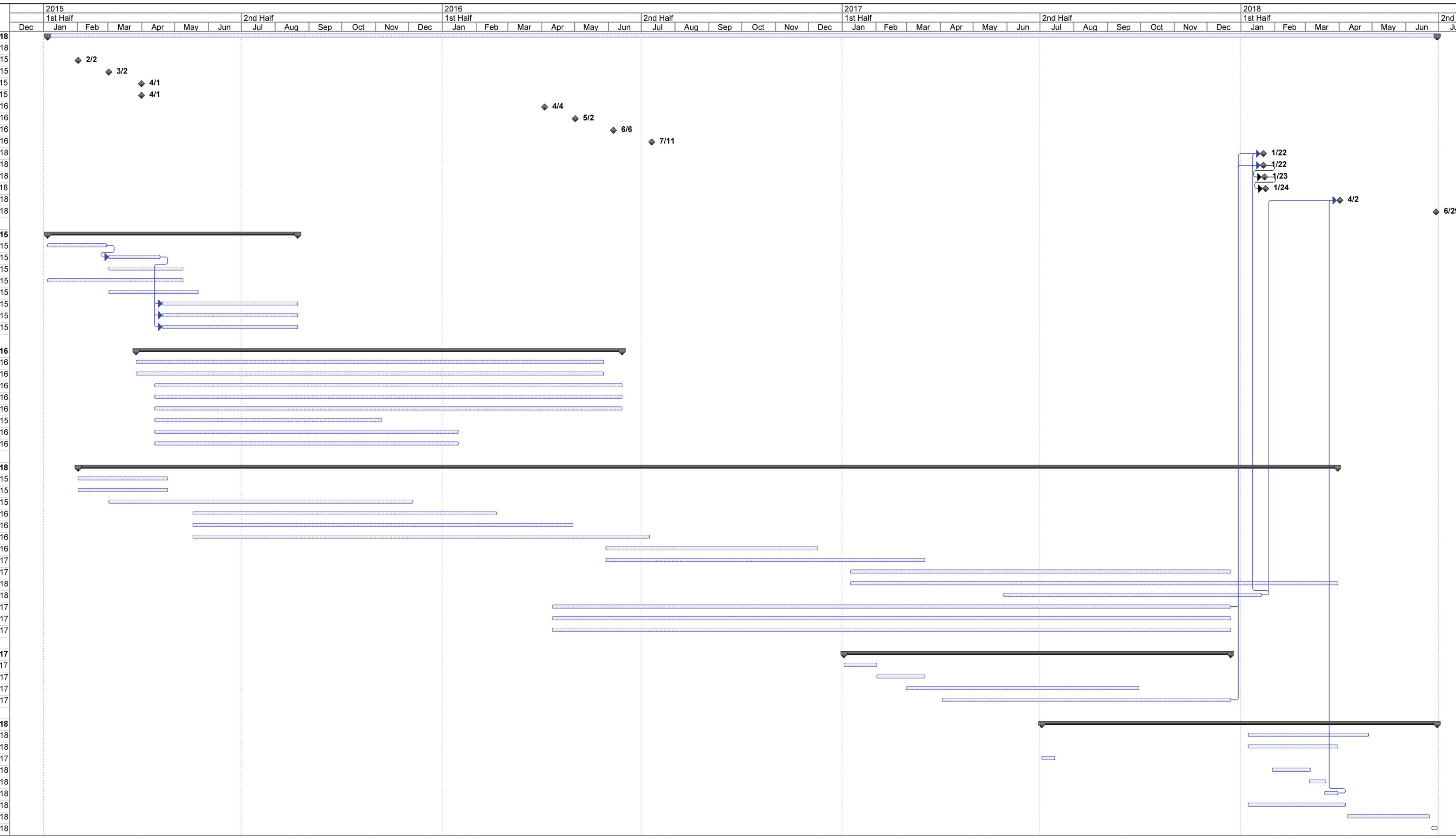
Construction access will be generally from Newland Road via Pacific Coast Highway. Large or heavy equipment, such as the turbines, generators, GSU transformers, and HRSG modules will be delivered to site by heavy haul truck/trailer following specific requirements of “heavy/oversize load” permits from appropriate agencies (Caltrans, City of Huntington Beach, and/or County of Orange). Large and heavy components of the generating units (e.g., turbines, HRSG components and other large components) will arrive by ship or rail at the Port of Long Beach. From the Port of Long Beach, the large components of the generating units will be hauled directly to the HBEP site for immediate installation. In the event heavy equipment arrives but cannot be transported and transferred directly into its final position at the HBEP, it will be hauled to the AGS site (located 13 miles northwest of HBGS) to a designated laydown area using a specific heavy haul route (see Figure 5.12-3). See Section 5.12, Transportation and Traffic, for information on the heavy haul route from the Port of Long Beach to the construction laydown area at the AGS site, and from the AGS site to the HBEP site. When the components stored at the offsite laydown area are ready for installation at HBEP, they will be hauled to project site using the specific heavy haul route.

HUNTINGTON BEACH ENERGY PROJECT

CCGT BLOCK 1 CONSTRUCTION

Fri 1/27/12

ID	Task Name	Duration	Start	Finish
1	**Block 1 Construction**	**910 days?**	**Mon 1/5/15**	**Fri 6/29/18**
2	**Key Milestones**	909 days	Mon 1/5/15	Thu 6/28/18
3	EPC Limited Notice to Proceed	1 day?	Mon 2/2/15	Mon 2/2/15
4	Receive Permits	1 day?	Mon 3/2/15	Mon 3/2/15
5	Full Notice to Proceed	1 day?	Wed 4/1/15	Wed 4/1/15
6	Commence Site Mobilization - EPC	1 day?	Wed 4/1/15	Wed 4/1/15
7	Receive GTG #1	1 day?	Mon 4/4/16	Mon 4/4/16
8	Receive GTG #2	1 day?	Mon 5/2/16	Mon 5/2/16
9	Receive GTG #3	1 day?	Mon 6/6/16	Mon 6/6/16
10	Receive Stm Turbine Generator	1 day?	Mon 7/11/16	Mon 7/11/16
11	Mechanical Completion	1 day?	Mon 1/22/18	Mon 1/22/18
12	First Fire GTG #1	1 day?	Mon 1/22/18	Mon 1/22/18
13	First Fire GTG #2	1 day?	Tue 1/23/18	Tue 1/23/18
14	First Fire GTG #3	1 day?	Wed 1/24/18	Wed 1/24/18
15	1st Synchronization Stm Turbine Gen	1 day?	Mon 4/2/18	Mon 4/2/18
16	Commercial Operation	1 day?	Fri 6/29/18	Fri 6/29/18
17				
18	**Engineering**	**165 days?**	**Mon 1/5/15**	**Fri 8/21/15**
19	Detailed Geotechnical Studies	40 days?	Mon 1/5/15	Fri 2/27/15
20	Gen Arrgmt's, Grading, Drainage	35 days?	Mon 3/2/15	Fri 4/17/15
21	Foundations Design	50 days?	Mon 3/2/15	Fri 5/8/15
22	Major Equipment Specs	90 days	Mon 1/5/15	Fri 5/8/15
23	Building / Structurs Design	60 days	Mon 3/2/15	Fri 5/22/15
24	Mechanical Design	90 days	Mon 4/20/15	Fri 8/21/15
25	Electrical Design	90 days	Mon 4/20/15	Fri 8/21/15
26	I&C Design	90 days	Mon 4/20/15	Fri 8/21/15
27				
28	**Purchase / Fabrication**	**317 days?**	**Fri 3/27/15**	**Mon 6/13/16**
29	CGT's	306 days?	Fri 3/27/15	Fri 5/27/16
30	GTG's	306 days?	Fri 3/27/15	Fri 5/27/16
31	Stm Turbine	306 days?	Mon 4/13/15	Mon 6/13/16
32	ST GEN	306 days?	Mon 4/13/15	Mon 6/13/16
33	Condensers	306 days?	Mon 4/13/15	Mon 6/13/16
34	HRSG's	150 days	Mon 4/13/15	Fri 11/6/15
35	Transformers	200 days	Mon 4/13/15	Fri 1/15/16
36	Balance of Plant	200 days	Mon 4/13/15	Fri 1/15/16
37				
38	**Construction**	**825 days?**	**Mon 2/2/15**	**Fri 3/30/18**
39	Owner's Mobilization	60 days	Mon 2/2/15	Fri 4/24/15
40	Mobilize and Site Prep	60 days	Mon 2/2/15	Fri 4/24/15
41	Foundations	200 days	Mon 3/2/15	Fri 12/4/15
42	UG Mechanical	200 days	Mon 5/18/15	Fri 2/19/16
43	UG Electrical	250 days	Mon 5/18/15	Fri 4/29/16
44	Steel Structures	300 days	Mon 5/18/15	Fri 7/8/16
45	Erect CGT's	140 days?	Mon 5/30/16	Fri 12/9/16
46	Erect GTG's	210 days?	Mon 5/30/16	Fri 3/17/17
47	Erect Stm Turbine and Condenser	250 days?	Mon 1/9/17	Fri 12/22/17
48	Erect HRSG's	320 days?	Mon 1/9/17	Fri 3/30/18
49	Erect GT Stacks	170 days?	Mon 5/29/17	Fri 1/19/18
50	Above Ground Mechanical	445 days	Mon 4/11/16	Fri 12/22/17
51	Above Ground Electrical	445 days?	Mon 4/11/16	Fri 12/22/17
52	Erect Balance of Plant Equipment	445 days	Mon 4/11/16	Fri 12/22/17
53				
54	**Gas Interconnection**	**254 days?**	**Tue 1/3/17**	**Fri 12/22/17**
55	Design	22 days?	Tue 1/3/17	Wed 2/1/17
56	Procurement / Fabrication	32 days?	Thu 2/2/17	Fri 3/17/17
57	Construction	153 days?	Wed 3/1/17	Fri 9/29/17
58	Commissioning	190 days?	Mon 4/3/17	Fri 12/22/17
59				
60	**Commissioning**	**260 days?**	**Mon 7/3/17**	**Fri 6/29/18**
61	Electrical and I&C Checkout	80 days?	Mon 1/8/18	Fri 4/27/18
62	Hydros and Flushes	60 days?	Mon 1/8/18	Fri 3/30/18
63	Establish Backfeed	10 days	Mon 7/3/17	Fri 7/14/17
64	Water supply / Return Systems Available	25 days?	Tue 1/30/18	Mon 3/5/18
65	Clean Steam Cycle	11 days?	Mon 3/5/18	Mon 3/19/18
66	Stm Turbine / Gen Commisioning	10 days?	Mon 3/19/18	Fri 3/30/18
67	Combined Cycle Commisioning	65 days?	Mon 1/8/18	Fri 4/6/18
68	Performance & Emissions Testing	55 days?	Mon 4/9/18	Fri 6/22/18
69	Commercial Operation	5 days?	Mon 6/25/18	Fri 6/29/18



Project: Block 1 Constr Sched 122811
Date: Fri 1/27/12

Task | Split | Progress | Milestone ◆ | Summary | Project Summary | External Tasks | External Milestone ◆ | Deadline ⇩

FIGURE 2.3-1
HBEP Block 1
Construction Schedule
AES Huntington Beach Energy Project
Huntington Beach, California

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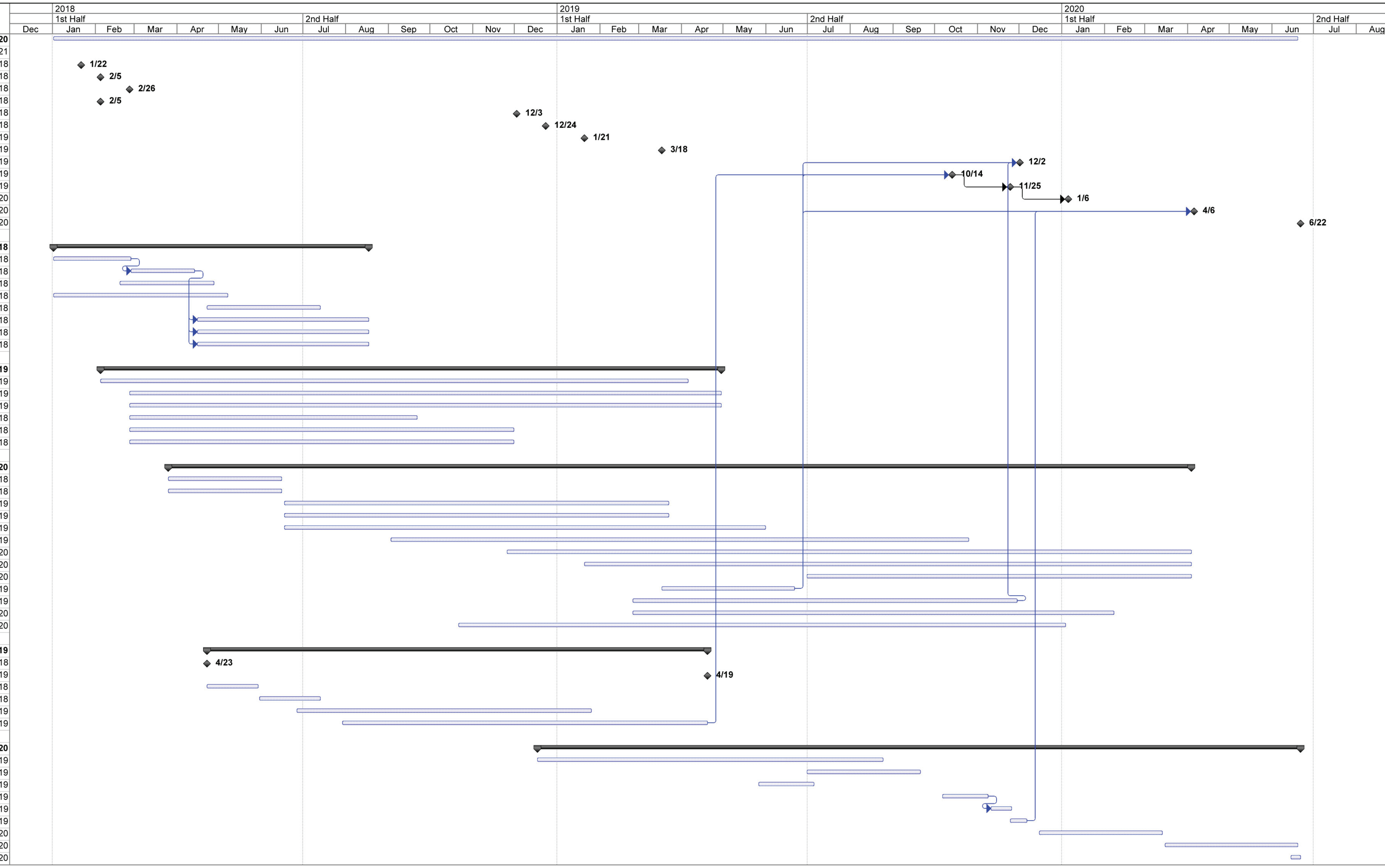
HUNTINGTON BEACH ENERGY PROJECT
CCGT BLOCK 2 CONSTRUCTION

Tue 3/13/12

ID	Task Name	Duration	Start	Finish
1	**EPC, 3 on 1, 3GTG's / 1 Stm Turbine**	**644 days?**	**Tue 1/2/18**	**Fri 6/19/20**
2	**Key Milesstones**	909 days	Tue 1/2/18	Fri 6/25/21
3	EPC Limited Notice to Proceed	1 day?	Mon 1/22/18	Mon 1/22/18
4	Receive Permits	1 day?	Mon 2/5/18	Mon 2/5/18
5	Full Notice to Proceed	1 day?	Mon 2/26/18	Mon 2/26/18
6	Commence Site Mobilization - EPC	1 day?	Mon 2/5/18	Mon 2/5/18
7	Receive GTG #4	1 day?	Mon 12/3/18	Mon 12/3/18
8	Receive GTG #5	1 day?	Mon 12/24/18	Mon 12/24/18
9	Receive GTG #6	1 day?	Mon 1/21/19	Mon 1/21/19
10	Receive Stm Turbine Generator	1 day?	Mon 3/18/19	Mon 3/18/19
11	Mechanical Completion	1 day?	Mon 12/2/19	Mon 12/2/19
12	First Fire GTG #4	1 day?	Mon 10/14/19	Mon 10/14/19
13	First Fire GTG #5	1 day?	Mon 11/25/19	Mon 11/25/19
14	First Fire GTG #6	1 day?	Mon 1/6/20	Mon 1/6/20
15	1st Synchronization Stm Turbine Gen	1 day?	Mon 4/6/20	Mon 4/6/20
16	Commercial Operation	1 day	Mon 6/22/20	Mon 6/22/20
17				
18	**Engineering**	**164 days?**	**Tue 1/2/18**	**Fri 8/17/18**
19	Detailed Geotechnical Studies	40 days?	Tue 1/2/18	Mon 2/26/18
20	Gen Arrgmt's, Grading, Drainage	34 days?	Tue 2/27/18	Fri 4/13/18
21	Foundations Design	50 days?	Mon 2/19/18	Fri 4/27/18
22	Major Equipment Specs	90 days	Tue 1/2/18	Mon 5/7/18
23	Building / Structurs Design	60 days	Mon 4/23/18	Fri 7/13/18
24	Mechanical Design	90 days	Mon 4/16/18	Fri 8/17/18
25	Electrical Design	90 days	Mon 4/16/18	Fri 8/17/18
26	I&C Design	90 days	Mon 4/16/18	Fri 8/17/18
27				
28	**Purchase / Fabrication**	**321 days?**	**Mon 2/5/18**	**Mon 4/29/19**
29	GTG's	305 days?	Mon 2/5/18	Fri 4/5/19
30	Stm Turbine	306 days?	Mon 2/26/18	Mon 4/29/19
31	Condensers	306 days?	Mon 2/26/18	Mon 4/29/19
32	HRSG's	150 days	Mon 2/26/18	Fri 9/21/18
33	Transformers	200 days	Mon 2/26/18	Fri 11/30/18
34	Balance of Plant	200 days	Mon 2/26/18	Fri 11/30/18
35				
36	**Construction**	**530 days?**	**Mon 3/26/18**	**Fri 4/3/20**
37	Owner's Mobilization	60 days	Mon 3/26/18	Fri 6/15/18
38	Mobilize and Site Prep	60 days	Mon 3/26/18	Fri 6/15/18
39	Foundations	200 days	Mon 6/18/18	Fri 3/22/19
40	UG Mechanical	200 days	Mon 6/18/18	Fri 3/22/19
41	UG Electrical	250 days	Mon 6/18/18	Fri 5/31/19
42	Steel Structures	300 days	Mon 9/3/18	Fri 10/25/19
43	Erect GTG's	355 days?	Mon 11/26/18	Fri 4/3/20
44	Erect Stm Turbine and Condenser	315 days?	Mon 1/21/19	Fri 4/3/20
45	Erect HRSG's	200 days?	Mon 7/1/19	Fri 4/3/20
46	Erect GT Stacks	70 days?	Mon 3/18/19	Fri 6/21/19
47	Above Ground Mechanical	200 days	Mon 2/25/19	Fri 11/29/19
48	Above round Electrical	250 days?	Mon 2/25/19	Fri 2/7/20
49	Erect Balance of Plant Equipment	315 days	Mon 10/22/18	Fri 1/3/20
50				
51	**Gas Interconnection**	**260 days?**	**Mon 4/23/18**	**Fri 4/19/19**
52	Gas Interconnection	0 days?	Mon 4/23/18	Mon 4/23/18
53	Gas Interconnection	0 days?	Fri 4/19/19	Fri 4/19/19
54	Design	27 days?	Mon 4/23/18	Tue 5/29/18
55	Procurement / Fabrication	32 days?	Thu 5/31/18	Fri 7/13/18
56	Construction	153 days?	Wed 6/27/18	Fri 1/25/19
57	Commissioning	190 days?	Mon 7/30/18	Fri 4/19/19
58				
59	**Commissioning**	**394 days?**	**Tue 12/18/18**	**Sun 6/21/20**
60	Electrical and I&C Checkout	179 days?	Tue 12/18/18	Sat 8/24/19
61	Hydros and Flushes	60 days?	Mon 7/1/19	Fri 9/20/19
62	Establish Backfeed	30 days?	Mon 5/27/19	Fri 7/5/19
63	Water supply / Return Systems Available	25 days?	Mon 10/7/19	Fri 11/8/19
64	Clean Steam Cycle	11 days?	Mon 11/11/19	Mon 11/25/19
65	Stm Turbine / Gen Commissioning	10 days?	Mon 11/25/19	Fri 12/6/19
66	Combined Cycle Commisioning	65 days?	Mon 12/16/19	Fri 3/13/20
67	Performance & Emissions Testing	70 days?	Mon 3/16/20	Fri 6/19/20
68	Commercial Operation	5 days	Mon 6/15/20	Sun 6/21/20



Project: HBEP Block 2 Const Sched
Date: Tue 3/13/12

Task | Split | Milestone | Summary | Project Summary | External Tasks | External Milestone | Progress | Deadline

FIGURE 2.3-2
HBEP Block 2
Construction Schedule
AES Huntington Beach Energy Project
Huntington Beach, California

CH2MHILL.

Legend

- AES Huntington Beach Generating Station
- AES Huntington Beach Energy Project
- Onsite Construction Parking
- Offsite Construction Parking

FIGURE 2.3-3
HBEP Construction Parking Areas
AES Huntington Beach Energy Project
Huntington Beach, California

CH2MHILL

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Onsite construction laydown will be within existing site boundaries, primarily on the land around the existing Units 3 and 4. These areas include the parking lot and the open areas directly adjacent to the Units 3 and 4. Construction access will be generally from Newland Street. Large or heavy equipment, such as the turbines, generators, GSU transformers, and HRSG modules, will be delivered to the site by heavy haul truck/trailer following specific requirements of any permits that are required.

2.3.2.4 Emergency Facilities

Emergency services will be coordinated with the local fire agencies (Huntington Beach Fire Department), the Hunting Beach Police Department, and local hospitals. An urgent care facility will be contacted to arrange for non-emergency physician referrals. First aid kits will be provided around the site and will be regularly maintained. At least one person trained in first aid will be part of the construction crew.

In addition, the EPC will have a Construction Safety Supervisor. Construction foremen and supervisors will be have first aid and CPR training, and will be trained in the use of a portable automatic external defibrillator, which will be available onsite at all times during construction.

Fire extinguishers will be located throughout the site at strategic locations at all times during construction.

2.3.2.5 Construction Utilities

During construction, existing, onsite utility lines will be used for the construction offices, laydown area, and the project site.

Temporary construction power will be obtained from SCE. Area lighting will be provided and strategically located for safety and security.

Construction water will be potable water from the City of Huntington Beach potable water supply system that is connected to the existing Huntington Beach Generating Station. Average daily use of potable water is expected to be approximately 18,000 gallons. During the 60-day commissioning period, when activities such as hydrostatic testing, cleaning and flushing, and steam blows of the HRSGs and steam cycles will be conducted, average water usage is estimated at 24,000 gallons per day with a maximum daily use of 130,000 gallons. Hydrostatic test water and cleaning water will be tested and disposed in accordance with applicable LORS.

Portable toilets will be provided throughout the site.

2.3.2.6 Site Services

The following site services will be provided by the EPC contractor:

- Environmental health and safety training
- Site security
- Site first aid
- Construction testing (e.g., nondestructive examination (NDE), hydrostatic testing)
- Fire protection including 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

2.3.2.7 Construction Materials and Equipment

Construction equipment will be at the project site from shortly after an EPC contractor is selected through commissioning and startup of the each of the power blocks. The type of equipment on site will coincide with the erection work being performed. Appendix 2A lists the equipment anticipated to be used on the project site. Materials such as concrete, pipe, wire and cable, fuels, reinforcing steel, and small tools and consumables will be delivered to the site by truck. Some of the heavy equipment items will be transported by rail then heavy haul truck. Rail deliveries will be offloaded in the Vanco Rail Siding area and transported by truck to the site. Appendix 2B shows the anticipated number of truck deliveries to the project site. Truck deliveries of construction materials and equipment will generally occur on weekdays between 6:00 a.m. and 6:00 p.m. The delivery of fill material required to build Block 1 is expected to occur over a 9-month period during the demolition of Unit 5. Six trucks per day are expected during the 9-month period and these could be delivered to the project site during the 10-hour work day, 6 days per week period. For Block 2, delivery of fill material is expected to occur during the last 4 months of the demolition of existing Huntington Beach Generating Station's Units 3 and 4 and over a 4-month period at the beginning of the Block 2 construction schedule. Three trucks per day are expected to be delivered during the 8-month period. Site access will be controlled for personnel and vehicles.

There will be an average and peak workforce of approximately 200 and 300, respectively, of craft people, supervisory, support, and construction management personnel onsite during demolition and construction (see Appendix 5.10B).

2.3.2.8 Construction Noise

Typically, noisy construction will be scheduled to occur between 6:00 a.m. and 6:00 p.m. Monday through Saturday. Additional hours may be necessary to make up schedule deficiencies or to complete critical construction activities (for example, 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. See Section 5.7, Noise, for a discussion and analysis of construction and demolition noise.

2.3.2.9 Construction Lighting

Lighting will be required to facilitate HBEP night construction and commissioning activities. Construction lighting will, to the extent feasible and consistent with worker safety codes, be directed toward the center of the construction site and shielded to prevent light from straying offsite. Task-specific construction/commissioning lighting will be used to the extent practical while complying with worker safety regulations. Typically, construction will be scheduled to occur between 6:00 a.m. and 6:00 p.m., Monday through Saturday. Additional hours may be necessary to make up schedule deficiencies or to complete critical construction activities (for example, pouring concrete at night during hot weather, working around time-critical shutdowns and constraints). During some construction periods and during the commissioning/startup phase of the project, some activities will continue 24 hours per day, 7 days per week. During periods when nighttime construction/commissioning activities take place, illumination that meets state and federal worker safety regulations will be required. To the extent possible, the nighttime construction/commissioning lighting will be erected pointing toward the center of the site where activities are occurring and will be shielded. Task-specific lighting will be used to the extent practical while complying with worker safety regulations. Despite these measures, there may be limited times during the construction/commissioning period when the project site may appear as a brightly lit area as seen in close views and from distant hillside residential areas.

2.4 Facility Operations

HBEP will be capable of being dispatched throughout the year and will have annual availability of 98.4 percent for each power block. It will be possible for plant availability to exceed 99 percent for a given 12-month period.

HBEP will employ a staff of 33, including plant operators, supervisors, administrative personnel, mechanics, engineers, chemists, and electricians (Table 2.4-1), in three rotating shifts. The facility will be capable of operating 24 hours per day, 7 days per week.

HBEP is designed as a multi-stage generator, to serve both peak and intermediate loads with the added capabilities of rapid startup, low turndown capability (ability to turn down to a low load), and steep ramp rates, (30 percent per minute when operating above minimum gas turbine turndown capacity). Because the combined-cycle configuration will be more efficient than many of the existing gas-fired steam generation facilities in southern California and will provide much needed flexible operating characteristics for integrating renewable energy into the electrical grid and providing fast response load following service, the HBEP is expected to have an annual capacity factor of between 35 and 50 percent. Because HBEP will be dispatched as an as-needed generating asset for meeting peak energy demands, load-following service, or local area reliability needs, the annual service factor (percent of time generating power regardless of load rate) for HBEP is expected to be considerably higher than the annual capacity factor. The expected operating profile of the HBEP will see the facility dispatched at intermediate and minimum loads more often than at full load which makes the design of the HBEP multi-stage generating (MSG) assets the best available technology in terms of thermal efficiency, greenhouse gas emissions, and criteria pollutant emissions. The actual capacity factor for HBEP in any month or year will depend on weather-related customer demand, load growth, renewable energy supplies, generating unit retirements and replacements, the level of generating unit and transmission outages, and other factors. The exact operational profile of the HBEP will ultimately depend on electrical grid needs at the time and dispatch decisions made by the offtaker or load serving entity contracted with AES to buy and distribute the power generated and the California Independent System Operator (CAISO).

TABLE 2.4-1
Typical Plant Operation Workforce

Classification	Number
Plant Manager	1
Operations Leader	1
Maintenance Leader	1
Environmental Engineer	1
Maintenance Planner	1
Power Plant Operators	20
Controls Specialty	5
Mechanic	2
Admin	1
Total	**33**

HBEP will be operated in one or all of the following modes:

- **Maximum or Base Load**. HBEP will be operated at maximum continuous output for as many hours per year as dispatched by the load serving entity. Maximum (base load) output is defined as Mode 1a based on the operation of three CTGs.
- **General Leveling**. HBEP will be available at contractual capacity but operated at less than maximum available output at low load times of the day. The output of each unit will therefore be adjusted periodically, either by schedule or automatic generation control, to employ the fast ramp capabilities to meet whatever load requested by the offtaker or necessary by CAISO.
- **Turndown**. One (Mode 1b) or two (Mode 1c) of the CTGs/HRSGs would be shut down and the other(s) would be operating at full load or in general leveling mode. If the shutdown unit is not undergoing maintenance, it will in most cases be available to the power purchaser and the CAISO as non-spinning reserve. This mode of operation can be expected to occur during average- to low-load hours (off-peak hours, weekends).
- **Full Shutdown**. This would occur when required as dictated by electrical system needs, economic conditions, equipment malfunction, fuel supply interruption, transmission line disconnect, or scheduled maintenance of equipment common to all units.

As California's renewable energy portfolio continues to grow, operating in either load following or partial shutdown mode will become more and more common, thus placing an increased importance upon the rapid startup, high turndown, steep ramp rate, and superior heat rate of the MSGs employed at the HBEP.

In the unlikely event of a situation that causes a longer-term cessation of operations, security of the facilities will be maintained on a 24-hour basis, and the CEC will be notified. Depending on the length of shutdown, a contingency plan for the temporary cessation of operations may be implemented. Such a 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 2.8, Facility Closure).

2.5 Engineering

In accordance with CEC regulations, this section, together with the engineering appendixes and Section 4.0, Natural Gas Supply, presents information concerning the design and engineering of HBEP. The LORS applicable to the 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.

Details on the following design criteria are included in Appendix 2C:

- Civil Engineering Design Criteria
- Structural Engineering Design Criteria
- Mechanical Engineering Design Criteria
- Electrical Engineering Design Criteria
- Control Engineering Design Criteria
- Chemical Engineering Design Criteria
- Geological and Foundation Engineering Design Criteria

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

- **Power Generation**—See Section 2.1.4, Combined-cycle Process; Section 2.1.5.1, Combustion Turbine Generators; and Section 2.1.5.3, Steam Turbine System. Also see Appendix 2C and Sections 2.1.5 through 2.1.15, which describe the various plant auxiliaries.
- **Heat Dissipation**—See Appendix 2C.
- **Cooling Water Supply System**—See Section 2.1.9, Water Supply and Use.
- **Air Emission Control System**—See Section 2.1.10, Emission Control and Monitoring, and Section 5.1, Air Quality.
- **Waste Disposal System**—See Section 2.1.11, Waste Management, and Section 5.14, Waste Management.
- **Noise Abatement System**—See Section 5.7, Noise.
- **Switchyards/Transformer Systems**—See Section 2.1.6, Major Electrical Equipment and Systems; Section 2.1.14.2, Grounding; Section 2.1.6.1, AC Power—Transmission; Section 2.1.15, Interconnection to Electrical Grid; Section 3.0, Transmission System Engineering; and Appendix 2C.

2.5.1 Facility Safety Design

HBEP 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.

2.5.2 Natural Hazards

The principal natural hazards associated with the HBEP site are earthquakes, floods, and tsunami. The site is located in a seismically active area, as is most of southern California, and the potential for strong ground motion in the project area is considered significant during the design life of the proposed structures. Structures will be designed to meet the seismic requirements of California Code of Regulations Title 24 and the California Building Code. Section 5.4, Geologic Hazards and Resources, discusses the geological hazards of the area and site, and includes a review of potential geologic hazards, seismic ground motions, and the potential for soil liquefaction caused by ground shaking. Appendix 2C includes the structural seismic design criteria for the buildings and equipment. According to the Federal Emergency Management Agency, the site is within the 100-year floodplain. Section 5.15, Water Resources, includes additional information on the potential for flooding.

2.5.3 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 2C contains the design practices and codes applicable to safety design for the project. Compliance with these requirements will minimize project effects on public and employee safety.

2.5.3.1 Fire Protection Systems

The project will rely on onsite fire protection systems and local fire protection services. 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 CTGs and certain accessory equipment compartments from fire. The system will have fire detection sensors in all protected compartments. Actuating one sensor will provide a high-temperature alarm on the CTG control panel. Actuating a second sensor will trip the CTG, 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.

Sprinkler and Deluge Systems. These systems protect STG equipment, buildings, and large transformers and specific electrical equipment rooms. The STG pedestal area will be protected by an automatic dry pipe sprinkler system. The STG lubrication oil reservoir will be protected by dry pilot sprinklers, and the STG bearing areas will be protected with pre-action sprinkler systems. Buildings will generally be protected by automatic wet-type sprinkler systems. Large transformers (GSU and auxiliary transformers) will be protected by automatic water spray (deluge) systems. Electrical equipment and battery rooms will be protected with pre-action sprinkler systems.

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/warehouse/maintenance building, water treatment building, and other structures will be equipped with 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 Huntington Beach Fire Department for assistance. The Hazardous Materials Business Plan (see Section 5.5, Hazardous Materials Handling) for the plant will include all information necessary to allow firefighting and other emergency response agencies to plan and implement safe responses to fires, spills, and other emergencies.

2.5.3.2 Personnel Safety Program

HBEP 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 Health and Safety.

2.6 Facility Reliability

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

2.6.1 Facility Availability

HBEP is designed to operate between approximately 12 and 100 percent of base load to support dispatch service in response to customer demands for electricity. HBEP is designed for an operating life of 30 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 status of plant components.

The percent of time that a combined-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 combined-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 the HBEP is estimated to be approximately 98 percent. The EAF 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.

2.6.2 Redundancy of Critical Components

The following subsections identify equipment redundancy as it applies to HBEP availability. Specifically, redundancy in the combined-cycle power block and in the balance-of-plant systems that serve it is described. The combined-cycle power block will be served by the following balance-of-plant systems: fuel supply system, DCS, boiler feed water system, condensate system, demineralized water system, power cycle makeup and storage, steam condensing system, closed-cycle cooling water system, and compressed air system. Major equipment redundancy is summarized in Table 2.6-1.

2.6.2.1 Combined-cycle Power Block

Each HBEP block consists of three separate CTG/HRSG power generation trains that operate in parallel within the combined-cycle power block. Each train will be powered by a CTG. Each CTG will provide approximately 20 to 34 percent of the total combined-cycle power block output (assuming all three trains operating). The heat input from the exhaust gas from each CTG will be used in the steam generation system to produce steam. Thermal energy in the steam from the steam generation system will be converted to mechanical energy and then to electrical energy in the STG subsystem. The expanded steam from the STG will be condensed and recycled to the feed water system. Power from the STG subsystem will contribute approximately 33 to 44 percent of the total unfired combined-cycle power block output (assuming both CTG/HRSG trains operating). Major equipment redundancies are listed in Table 2.6-1.

TABLE 2.6-1
Major Equipment Redundancy

Description	Number Per CCGT Block	Note
Combined-Cycle CTGs and HRSGs	3 – 33% trains	Steam turbine bypass system allows both CTG/HRSG trains to operate at base load with the steam turbine out of service
Natural Gas Fired Duct Burners	3 – One per HRSG	Two duct burners are needed to provide part load operation to minimize MSG dead bands between stages. Duct burners will not be used for augmenting maximum power output.
STG	1 – 100%	See note above pertaining to CTGs and HRSGs
HRSG Feedwater Pumps	3–50% per Block	—
Condensate Pumps	3 – 50%	—
Air-Cooled Condenser	1 – 100%	Condenser must be in operation for plant to operate, however, it will include approximately 30 cells; thus there is a level of redundancy in fans, gearboxes, and motors.
Auxiliary Cooling Water Pumps	2 – 100%	—

TABLE 2.6-1
Major Equipment Redundancy

Description	Number Per CCGT Block	Note
Closed-loop Cooling Fluid Cooler (Auxiliary Cooling Water)	1 – 100%	—
Air Compressors	2 – 100%	—
Fuel Gas Compressors per Block	3 – 100%	There will be a total of 5 electrically driven gas compressors with 100% block flow rate capacity. Two gas compressors are expected to operate at 50% Block flow rate with one 100% block flow rate available at all times.
Reverse Osmosis Units	1 – 100%	For two 100% reverse osmosis units at the site.
CEDI Water Polishers	100% spare capacity	—
Condensate Polishers	2 X 100%	Mixed Bed – bottles to be generated offsite

2.6.2.2 CTG Subsystems

The HBEP CTG subsystems will include the combustion turbine, inlet air filtration, cooling/heating system, turbine and generator lubrication oil systems, starting system, fuel system, generator and excitation systems, and turbine control and instrumentation. The combustion turbine will produce thermal energy through the combustion of natural gas. The thermal energy will be converted into mechanical energy through rotation of the combustion turbine, which drives the compressor and generator. Exhaust gas from the combustion turbine will be used to produce steam in the associated HRSG. The generator excitation system will be a solid-state static system. Combustion turbine control and instrumentation (interfaced with the DCS) will cover the turbine governing system, the protective system, and the sequence logic.

2.6.2.3 HRSG Subsystems

The HBEP steam generation system will consist of the HRSG and blowdown systems. The HRSG system will provide for the transfer of heat from the exhaust gas of a combustion turbine for the production of steam. This heat transfer will produce steam at the pressures and temperatures required by the steam turbine. The HRSG system will consist of ductwork, duct burner, heat transfer sections, an SCR system, and an oxidation catalyst module, as well as safety and auto relief valves and processing of continuous and intermittent blowdown drains.

2.6.2.4 Steam Turbine Generator Subsystems

The HBEP steam turbine will convert the thermal energy to mechanical energy to drive the STG shaft to make electrical energy in the generator. The basic subsystems will include the steam turbine and auxiliary systems, turbine and generator lubrication oil systems, generator/exciter system, and turbine control and instrumentation.

2.6.2.5 Plant Distributed Control System

The HBEP DCS will be a redundant microprocessor-based system and will have a functionally distributed architecture comprising a group of similar redundant processing units; these units will be linked to a group of operator consoles and an engineer work station by redundant data highways. Each processor will be programmed to perform specific dedicated tasks for control information, data acquisition, annunciation, and historical purposes. Because they will be redundant, no single processor failure can cause or prevent a unit trip.

The DCS will interface with the control systems furnished by the CTG, STG, HRSG, and fuel gas compressor suppliers 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 enough redundancy to preclude a single device failure from significantly affecting overall plant control and operation. Consideration will be given to the action performed by the control and safety devices in the event of control circuit failure. Controls and controlled devices will move to the safest operating condition upon failure.

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

2.6.2.6 HRSG Feedwater System

The HRSG feed water system will transfer feed water from the low-pressure steam drum to the high-pressure sections of the HRSGs. The system will consist of three, 50-percent-capacity pumps for supplying each power block of three HRSGs. Each pump will be multistage, horizontal, and motor-driven and will include regulating control valves, minimum flow recirculation control, and other associated pipes and valves. The low-pressure system will receive feedwater directly from the low-pressure economizer using the pressure supplied by the condensate pumps.

2.6.2.7 Condensate System

The condensate system will provide a flow path from the condensate receiver to the HRSG low-pressure economizers. The condensate system will include three, 50-percent-capacity, multistage, vertical, motor-driven condensate pumps.

2.6.2.8 Power Cycle Makeup Water Treatment System

The cycle makeup will include two, 100-percent-capacity trains of two-pass reverse osmosis equipment followed by an electro-deionization system with two 100-percent-capacity trains.

2.6.2.9 Power Cycle Water Makeup and Storage

The power cycle water makeup and storage subsystem provides demineralized water storage and pumping capabilities to supply high-purity water for system cycle makeup, CTG water wash, and chemical cleaning operations. The major components of the system are a single demineralized water storage tank and two 100-percent-capacity, horizontal, centrifugal, cycle makeup water pumps.

2.6.2.10 Compressed Air System

The compressed air system will be designed to supply service and instrument air for the facility. Dry, oil-free instrument air will be provided for pneumatic operators and devices throughout the plant. Compressed service air will be provided to appropriate areas of the plant as utility stations consisting of a ball valve and quick disconnect fittings.

The instrument air system will be given demand priority over the service air system. A backpressure control valve will cut off the air supply to the service air header so as to maintain the minimum required instrument air pressure.

Two, 100-percent-capacity, oil free, rotary screw package air compressors will supply compressed air to the service and instrument air systems. Two, 100-percent-capacity, heat-less desiccant air dyers will be provided to dry the service and instrument air.

2.6.3 Fuel Availability

Fuel will be delivered via an existing SoCalGas 16-inch-diameter low pressure gas main immediately adjacent to the project site (see Section 4.0 Natural Gas Supply). SoCalGas has confirmed that its system has sufficient capacity to supply the HBEP at this location. A will serve letter is included in Appendix 4A.

2.6.4 Water Availability

HBEP will use, on average, 115 acre-feet per year of potable water provided by the City of Huntington Beach for power plant cooling and process water, fire protection, and potable uses.

The availability of water to meet the needs of the HBEP is discussed in more detail in Section 5.15, Water Resources. A will-serve letter from the City of Huntington Beach is included in Appendix 5.15A.

2.6.5 Sewer and Wastewater Treatment Availability

HBEP will discharge, on average, 11.6 million gallons per year of wastewater, consisting of process and sanitary wastewater, with process water being discharge to the outfall and sanitary wastewater discharged to the City of Huntington Beach sewer system.

The availability of wastewater collection and treatment capacity to meet the needs of the HBEP is discussed in more detail in Section 5.15, Water Resources. A sewer service will-serve letter from the City of Huntington Beach is included in Appendix 5.15B

2.6.6 Project Quality Control

The HBEP quality control program 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 generating 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.

2.6.6.1 Project Stages

For quality assurance planning purposes, HBEP activities have been divided into the following stages that apply to specific periods during the project:

- **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.
- **Plant Operation.** As the project progresses, the design, procurement, fabrication, erection, and checkout of each generating facility system will progress through the stages defined above.

2.6.6.2 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 the 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 the HBEP to control operation and maintenance quality. A specific program for this project will be defined and implemented during initial plant startup.

2.7 Thermal Efficiency

The maximum gross thermal efficiency that can be expected from the configuration specified for HBEP is approximately 46 percent on a lower heating value basis. This level of efficiency is achieved when the facility is base-loaded. Other types of operations, particularly those at less than full gas turbine output, will result in lower efficiencies. However, the HBEP design achieves a very high level of efficiency across a wide range of generating capacity. The basis of HBEP operations will be system dispatch within California's power generation and transmission system. It is expected that the HBEP will be primarily operated in load-following or cycling service. The number of startup and shutdown cycles is expected to range between 50 and 650 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 BTUs per hour to a maximum of approximately 7,261 MMBtu/hr (LHV basis) at minimum ambient conditions.

The net annual electrical production of the HBEP cannot be accurately forecasted at this time because of uncertainties in the system load dispatching model and the associated uncertainties in load forecasts. However, because of the efficiency of the plant with operating characteristics as described above, it is expected to have a gross plant capacity factor between 35 and 50 percent. The maximum annual generation possible from the facility is estimated to be approximately 8,003 gigawatt hours per year (based on an annual average facility base load rating of 939 MW, 98.4 percent availability and 6,665 hours per year).

2.7.1 Operating Modes, Energy Consumption and Generation

The following information on projected operating modes has been estimated based on a market analysis of electricity demand beyond 2020, which does not reflect maximum potential operating profile of the HBEP. Projected operating hours, fuel consumption and energy production are provided as the best estimate of future conditions but may be more or less in any given operating year depending on market conditions.

- **Mode 1a; Stage 3**. Output and heat rate are based on the operation of three CTGs operating at maximum output (with no Evaporative Cooling). Figure 2.1-4a a presents a heat and mass balance for this operating mode.
- **Generation Leveling**. HBEP will be available at contractual capacity but operated at less than maximum available output (Mode 1a) at low load times of the day. The output of each unit will therefore be adjusted periodically, either by schedule or automatic generation control, to employ the fast ramp capabilities to meet whatever load requested by the offtaker or necessary by the CAISO.
- **Turndown**. Periodically, CTG's may be removed from service for maintenance or for expanded range of generation leveling operation. The Turndown modes provide output based on one (Mode 1b) or two (mode 1c) of the CTGs/HRSGs are removed from service but the remaining units would be operating at full load or in Generation Leveling mode. If the shutdown unit is not undergoing maintenance, it will in most cases be available to the power purchaser and the CAISO as non-spinning reserve. This mode of operation can be expected to occur during average- to low-load hours (off-peak hours, weekends).

  Mode 1b; Stage 2. Output and heat rate are based on operation of two CTGs at maximum output with no Evaporative Cooling. Figure 2.1-4b a presents a heat and mass balance for this operating mode.

  Mode 1c; Stage 1. Output and heat rate are based on operation of one CTG at maximum output with no Evaporative Cooling. Figure 2.1-4c a presents a heat and mass balance for this operating mode.

  Note: The power island(s) can be started directly into any service mode above.
- **Full Shutdown.** This would occur when required as dictated by electrical system needs, economic conditions, equipment malfunction, fuel supply interruption, transmission line disconnect, or scheduled maintenance of equipment common to all units.

Table 2.7-1 presents the annual heat input, annual energy production, and operating profile for the operating modes presented above. The annual heat input and energy production data presented includes start up and shutdown cycles.

TABLE 2.7-1
HBEP Fuel Consumption, Energy Production, and Operating Hours

Operating Mode	Annual Heat Input MMBtu[a]	Annual Total Energy Production in Net Gigawatts[b]	Number of Turbines Operating per Block[c]	Hours per Year per Turbine per Block[c]
1a- Stage 3	5,113,906.80	689.4	3	2455
1b- Stage 2	7,783,620.70	1050.1	2	1725
1c- Stage 1	304,009.60	40.1	1	125

[a] Includes Start/Shutdown fuel consumption and is not effected by Cold, Warm or Hot Start cycle.
[b] Includes Start/Shutdown cycle electricity production.
[c] Projected annual operating hours under design condition.

2.8 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 CTGs. 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 because of plant age, damage to the plant beyond repair, economic conditions, or other reasons. The following sections discuss temporary and permanent facility closure.

2.8.1 Temporary Closure

For a temporary facility closure, where there is no release of hazardous materials, security of the facilities will be maintained on a 24-hour basis, and the CEC and other responsible agencies will be notified. 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.

2.8.2 Permanent Closure

The planned life of HBEP is 30 years. However, if the HBEP were still economically viable, it could be operated longer. It is also possible that the facility could become economically noncompetitive in less than 30 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 would be submitted to the CEC for approval prior to decommissioning. The plan would address 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. If possible, unused chemicals will be sold 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 decommissioning activities.