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Mr. Chris Perri
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March 14, 2016

Subject: Huntington Beach Energy Project (Facility ID 115389) Air Permit Application

Dear Mr. Perri,

AES Huntington Beach, LLC (AES) is submitting this letter as a means of informing the South Coast Air Quality Management District (SCAQMD) of recent changes to the Huntington Beach Energy Project's (HBEP) operating profile. The following items are attached to this letter and help convey these changes:

1) A revised HBEP Air Permit Application, which documents the HBEP's emissions, air quality and public health impacts, and regulatory compliance.
2) Two bound copies of the HBEP Air Permit Application with tracked changes.
3) Six bound copies of the HBEP Air Permit Application without tracked changes.
4) One CD containing an electronic copy of the HBEP Air Permit Application with and without tracked changes.
5) Six DVDs containing the modeling files associated with the HBEP Air Permit Application.

If you require further information, please do not hesitate contacting me at 669-800-1012 or Jerry Salamy at 916-286-0207.

Regards,

Elyse Jay Engel

Elyse Engel
Air Quality Task Lead
CH2M HILL Engineers, Inc.

Attachments

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Report

Revised Huntington Beach Energy Project Air Permit Application Documentation

Applicant

AES Huntington Beach, LLC

March 2016

Prepared by

CH2MHILL®

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SECTION 1

1 Background

The Huntington Beach Energy Project (HBEP) is a proposed 844-megawatt (MW) nominal power plant to be located at the existing site of the Huntington Beach Generating Station (HBGS), situated approximately 900 feet from the Pacific Ocean. The surrounding area is a mix of residential, wetland preserve, public beach, and industrial land uses, and is bordered by a manufactured home/recreation vehicle park on the west, Huntington Beach Channel and residential areas to the north and east, a tank farm to the north, the Huntington Beach Wetland Preserve/Magnolia Marsh wetlands on the southeast, and the Huntington Beach State Park and Pacific Ocean to the south and southwest. The entire parcel on which the HBGS is located, including the switchyard and tank farm, is approximately 106 acres, and the new plant will be constructed on about 28.6 of those acres. The nearest inhabitants to the proposed project site are in a residential area approximately 300 to 400 feet west of the site.

The current HBGS consists of two utility boilers. Boilers 1 and 2 are identical units, each rated at 215 MW output and 2,021 million British thermal units per hour (MMBtu/hr) heat input. The boilers are equipped with selective catalytic reduction (SCR) systems, and are fired exclusively on natural gas. The boilers were built in the 1950s. There are two 275-horsepower (hp) diesel-fueled emergency engines, which were installed in 2001 for fire control, a 30,000-gallon urea storage tank, and two urea-to-ammonia converters. The urea is used in the SCR systems, and is converted into ammonia before injection into the boiler exhaust with the use of the urea-ammonia converters. There is also an old peaker turbine (Unit 5) that has been shut down and no longer operates, as well as Boilers 3 and 4, which have also been shut down.

The current ownership of the equipment at the site is split between AES Huntington Beach, LLC (AES), which owns Boilers 1 and 2, the two emergency engines, and the urea storage tank, and Edison Mission Energy, LLC, which purchased Boilers 3 and 4 and permanently retired them in November 2012. AES is the operator for all the equipment onsite. Boilers 1 and 2, along with their SCR systems, urea storage tank, and urea-to-ammonia converters will be shut down concurrent with the combined-cycle power block coming online.

As part of this project, AES has also proposed to shut down Boiler 7, rated at 4,752.2 MMBtu/hr heat input and 480 MW output, at the AES Redondo Beach Generating Station. Therefore, the total generating capacity being retired as part of this project is 910 MW.

The proposed new facility will consist of two power blocks (one combined-cycle and one simple-cycle) capable of producing a nominal power output of 844 MW net. The combined-cycle power block will consist of two combustion turbine generators (CTG), two heat recovery steam generators (HRSG) without duct firing, one steam turbine generator (STG), a natural-gas-fired auxiliary boiler, and auxiliary equipment including an aqueous ammonia storage tank and an oil/water separator. The simple-cycle power block will consist of two CTGs and auxiliary equipment including an aqueous ammonia storage tank and an oil/water separator. AES, a wholly-owned subsidiary of AES Southland Corp., will be the facility owner and operator of the new plant.

The plant will be designed to supply power to the wholesale energy market through the existing substation, located adjacent and to the northeast of the property. Output will depend on market conditions and dispatch requirements. The plant’s expected availability is over 98 percent on an annual basis, with the actual capacity factor anticipated to be between 45 and 75 percent. AES expects the plant to be dispatched at peaking and intermediate loads on a regular basis. Therefore, the plant is designed to have the ability to start quickly – cold starts should be 60 minutes for the combined-cycle power block and 30 minutes for the simple-cycle power block – and can operate with only one turbine online at any given time.

The HBEP requires a significant revision to the existing Title V permit at the AES, Huntington Beach site (Facility ID# 115389). The new project is also subject to the oxides of nitrogen (NO_X) and oxides of sulfur (SO_X) Regional Clean Air Incentives Market (RECLAIM) and Prevention of Significant Deterioration (PSD) regulations for nitrogen dioxide (NO_2), carbon monoxide (CO), greenhouse gases (GHG), and particulate matter with an aerodynamic diameter less than or equal to 10 microns (PM_{10}).

Construction of the combined-cycle power block is scheduled to begin in the second quarter of 2017 and end in the second quarter of 2020. Construction of the simple-cycle power block is scheduled to begin in the second quarter of 2022 and end in the fourth quarter of 2023. Demolition of existing HBGS Unit 5 will make room for construction of the combined-cycle power block, and is scheduled to begin in the first quarter of 2016 and end in the second quarter of 2017. Similarly, demolition of existing HBGS Units 3 and 4 will make room for construction of the simple-cycle power block, and is scheduled to begin in the second quarter of 2020 and end in the second quarter of 2022. However, demolition of existing HBGS Units 3 and 4 is not considered part of the project. Existing HBGS Units 1 and 2 will be demolished following commercial operation of the simple-cycle power block, beginning in the first quarter of 2024 and ending in the fourth quarter of 2025.

SECTION 2

2 Process Description for Combustion Turbines

The gas turbine facility will consist of two combined-cycle and two simple-cycle combustion turbines. The combined-cycle power block will consist of two General Electric (GE) Frame 7FA.05 CTGs, each rated at 231.2 MW (International Organization for Standardization [ISO] gross) and equipped with dry low NO_X (DLN) burners, evaporative inlet air cooling, an SCR, and an oxidation catalyst, two HRSGs, and an STG rated at 230.9 MW (ISO gross). The combined-cycle power block will include a Rentech, model D-Type water tube auxiliary boiler rated at 71 MMBtu/hr, higher heating value (HHV) basis, with a single John Zink/Coen RMB low NO_X burner. The auxiliary boiler will also include an SCR and flue-gas recirculation emission controls. Other ancillary equipment includes an ammonia storage tank and an oil/water separator. The combined-cycle CTG exhaust stacks will be 150 feet tall and the auxiliary boiler exhaust stack will be 80 feet tall.

The simple-cycle power block will consist of two GE LMS 100PB CTGs, each rated at 100.8 MW (average ambient temperature gross) and equipped with DLN burners, evaporative inlet air-cooling, an SCR, and an oxidation catalyst, an ammonia storage tank, and an oil/water separator. The simple-cycle CTG exhaust stacks will be 80 feet tall.

Each power block is independently operated.

The system output will vary depending on the ambient air temperature condition, use of evaporative coolers, amount of auxiliary load, generator power factor, and other factors. At the site’s low temperature (maximum output case), the plant total output is restricted to 894.4 MW (693.6 MW for the combined-cycle CTGs and 200.8 MW for the simple-cycle CTGs). Table 2-1 presents the combined-cycle output on a per turbine basis. Table 2-2 presents the simple-cycle output on a per turbine basis.

TABLE 2-1
Combined-cycle Output Per Turbine

	ISO 59°F – 60% RH (Evaporative Cooling Off)	110°F – 8% RH (Evaporative Cooling On)	32°F – 87% RH (Evaporative Cooling Off)	66°F – 58% RH (Evaporative Cooling On)
Gas Turbine Heat Input, MMBtu/hr, HHV	2,240	2,123	2,273	2,248
Gas Turbine Gross Output [a], kW	231,197	215,890	236,140	232,073
Steam Turbine Gross Output [b], kW	115,470	96,702	110,675	114,838
Total Gross Power Output [c], kW	346,667	312,592	346,815	346,911
Net Power Output, kW	339,875	318,160	340,745	340,840
Net Plant Heat Rate, Btu/kWh, LHV	5,967	6,271	6,017	5,984
Net Plant Heat Rate, Btu/kWh, HHV	6,576	6,912	6,672	6,596

[a] On a per turbine basis.

[b] One-half of the total steam turbine output.

[c] Multiply by 2 to get the output per power block.

Notes:

°F = degrees Fahrenheit

Btu/kWh = British thermal unit(s) per kilowatt-hour

kW = kilowatt

LHV = lower heating value

RH = relative humidity

TABLE 2-2
Simple-cycle Output Per Turbine

	110°F – 8% RH (Evaporative Cooling On)	32°F – 87% RH (Evaporative Cooling Off)	66°F – 58% RH (Evaporative Cooling On)
Gas Turbine Heat Input, MMBtu/hr, HHV	737	880	885
Gas Turbine Gross Output, kW	77,501	100,393	100,814
Net Power Output, kW	76,041	98,934	99,355
Net Plant Heat Rate, Btu/kWh, LHV	8,726	8,012	8,027
Net Plant Heat Rate, Btu/kWh, HHV	9,686	8,894	8,910

There will be no new transmission lines or gas lines needed for the project. Each of the components is discussed in more detail below.

2.1 Combined-cycle Turbine Data

The combined-cycle power block will consist of two GE Frame 7FA.05 CTGs, each rated at 231.2 MW (ISO gross) and equipped with DLN burners, evaporative inlet air cooling, an SCR, and an oxidation catalyst, two HRSGs, and an STG rated at 230.9 MW (ISO gross). Each turbine will be equipped with inlet air filters and coolers. The turbines will combust natural gas exclusively. Total heat input for two turbines at nominal conditions is 4,496 MMBtu/hr, HHV basis, and fuel use at these conditions is approximately 4.28 million cubic feet per hour (MMcf/hr), based on a natural gas heat content of 1,050 British thermal unit(s) per cubic foot (Btu/cf). Pertinent turbine specifications are summarized in Table 2-3.

TABLE 2-3
Combined-cycle Turbine Data

Parameter	Specification
CT Manufacturer	General Electric
Model	Frame 7FA.05
Fuel Type	Natural gas
Maximum Power Output	236.14 MW (1 turbine @ 32°F, no duct firing)
Maximum Heat Input	2,273 MMBtu/hr, HHV (1 turbine @ 32°F)
Maximum Fuel Consumption	2.16 MMcf/hr, HHV (1 turbine @ 32°F, 1,050 Btu/cf)
Maximum Exhaust Flow	75.7 MMcf/hr, dry @ 15% O_2 (1 turbine @ 32°F)
NO_X Combustion Control	DLN 9 ppm
NO_X Post Combustion Control	SCR 2.0 ppm, 1-hour average
Ammonia Injection Rate per Turbine	242.0 lb/hr maximum
Steam Turbine Output	229.68 MW @ 65.8°F
Net Plant Heat Rate, LHV	5,967 Btu/kWh @ ISO
Net Plant Heat Rate, HHV	6,576 Btu/kWh @ ISO

Notes:

lb/hr = pound(s) per hour

O_2 = oxygen

ppm = part(s) per million

Each turbine will exhaust to an HRSG. The HRSGs are designed to convert heat from the exhaust gas to produce steam for use in the steam turbine. Exhaust gases enter the HRSG at approximately 1,100 degrees Fahrenheit (°F). The HRSGs and steam turbine both employ a triple pressure design. Feed water into the HRSG will be converted to high, intermediate, and low-pressure steam for use in the steam turbine. The steam exits the steam turbine as low-pressure steam, enters the air-cooled condenser, and is cooled and condensed back into water. Each HRSG will vent to a separate exhaust stack.

2.2 Simple-cycle Turbine Data

The simple-cycle power block will consist of two GE LMS 100PB CTGs, each rated at 100.8 MW (average ambient temperature gross) and equipped with DLN burners, evaporative inlet air-cooling, an SCR, and an oxidation catalyst. The turbines will combust natural gas exclusively. Total heat input for two turbines at nominal conditions is 1,770 MMBtu/hr, HHV basis, and fuel use at these conditions is approximately 1.69 MMcf/hr, based on a natural gas heat content of 1,050 Btu/cf. Pertinent turbine specifications are summarized in Table 2-4.

TABLE 2-4
Simple-cycle Turbine Data

Parameter	Specification
CT Manufacturer	General Electric
Model	LMS 100PB
Fuel Type	Natural gas
Maximum Power Output	100.8 MW (1 turbine @ 65.8°F, no duct firing)
Maximum Heat Input	885 MMBtu/hr, HHV (1 turbine @ 65.8°F)
Maximum Fuel Consumption	0.84 MMcf/hr, HHV (1 turbine @ 65.8°F, 1,050 Btu/cf)
Maximum Exhaust Flow	56.5 MMcf/hr, dry @ 15% O_2 (1 turbine @ 65.8°F)
NO_X Combustion Control	DLN 25 ppm
NO_X Post Combustion Control	SCR 2.5 ppm, 1-hour average
Ammonia Injection Rate per Turbine	180 lb/hr maximum
Net Plant Heat Rate, LHV	8,027 Btu/kWh @ 66°F
Net Plant Heat Rate, HHV	8,910 Btu/kWh @ 66°F

Each turbine will exhaust to an exhaust transition containing the air pollution control system and will vent to a separate exhaust stack.

2.3 Auxiliary Boiler

The combined-cycle power block will use steam supplied from the auxiliary boiler to reach its base load quickly while simultaneously reducing both startup time of the gas turbines and the associated emissions. The auxiliary boiler specifications are listed in Table 2-5.

TABLE 2-5
Auxiliary Boiler Specifications

Parameter	Specification
Boiler Manufacturer	Rentech
Maximum Heat Input	71 MMBtu/hr
Model No.	D-Type
Boiler Type	Water-tube
Fuel Type	Natural Gas

TABLE 2-5
Auxiliary Boiler Specifications

Parameter	Specification
Maximum Fuel Consumption	0.068 MMcf/hr
Maximum Exhaust Flow	29,473 acfm
Maximum Exhaust Temperature	318°F
NO_X Combustion Control	Low NO_X Burner
NO_X BACT Concentration at Stack Outlet	5 ppm @ 3% O_2 (post-SCR)
CO BACT Concentration at Stack Outlet	50 ppm @ 3% O_2 (post-SCR)

Notes:

acfm = actual cubic feet per minute

BACT = Best Available Control Technology

2.4 Air Pollution Control (APC) Equipment

APC equipment will be installed to control NO_X, CO, and volatile organic compounds (VOC) from the gas turbines. Each APC system will consist of the following: 1) DLN burner, 2) SCR, and 3) oxidation catalyst.

DLN Burners – Each CTG will include built-in pollution controls based on a dry combustion design (DLN burner) to reduce NO_X emissions. This control will reduce the combined-cycle CTG NO_X emissions to 9 part(s) per million by volume, dry basis (ppmvd) at 15 percent oxygen (O_2) and the simple-cycle CTG NO_X emissions to 25 ppmvd at 15 percent O_2. The DLN control will be fully operational when the turbine reaches a load of approximately 60 percent or more.

Oxidation Catalyst System – An oxidation catalyst will be installed in the HRSG section of the combined-cycle CTGs and the exhaust transition for the simple-cycle CTGs. The catalyst will be designed to reduce combined-cycle CTG exhaust gas CO to 2.0 ppmvd or less at 15 percent O_2 and VOC to 2.0 ppmvd at 15 percent O_2 and simple-cycle CTG exhaust gas CO to 4.0 ppmvd or less at 15 percent O_2 and VOC to 2.0 ppmvd at 15 percent O_2. Pertinent oxidation catalyst specifications are provided in Tables 2-6 and 2-7.

TABLE 2-6
Combined-cycle Oxidation Catalyst Data

Parameter	Specification
Manufacturer	BASF
Catalyst Type	Palladium in a honeycomb structure
Catalyst Volume	328.8 cf
Catalyst Area	1,879 ft^2
Reactor Dimensions	2.1” L X 26.17’ W X 71.8’ H (includes SCR catalyst housing)
Space Velocity	230,231 hr^{-1}
Area Velocity	40,287 ft/hr
CO Removal Efficiency	70 – 85%
Outlet CO	2.0 ppmvd @ 15% O_2
VOC Removal Efficiency	50 – 60%
Outlet VOC	2.0 ppmvd @ 15% O_2
Minimum Operating Temperature	570°F

Notes:

cf = cubic feet

ft^2 = square feet

ft/hr = feet per hour

TABLE 2-6
Combined-cycle Oxidation Catalyst Data

Parameter	Specification
H = height	
hr^{-1} = per hour	
L = length	
W = width	

TABLE 2-7
Simple-cycle Oxidation Catalyst Data

Parameter	Specification
Manufacturer	BASF Camet
Catalyst Type	Palladium in a honeycomb structure
Catalyst Volume	165.6 cf
Catalyst Area	794.8 ft^2
Reactor Dimensions	2.1’ L X 2.5” W X 2’ H
Space Velocity	139,539 hr^{-1}
Area Velocity	29,071 ft/hr
CO Removal Efficiency	90 – 96%
Outlet CO	4.0 ppmvd @ 15% O_2
VOC Removal Efficiency	50 – 60%
Outlet VOC	2.0 ppmvd at 15% O_2
Minimum Operating Temperature	500°F

SCR System – An SCR catalyst will be installed in the HRSG section of the combined-cycle CTGs, the exhaust transition for the simple-cycle CTGs, and the auxiliary boiler. The SCR system is expected to reduce NO_X emissions to 2.0 ppmvd at 15 percent O_2 on a 1-hour average for the combined-cycle CTGs, 2.5 ppmvd at 15 percent O_2 for the simple-cycle CTGs, and 5 ppmvd at 3 percent O_2 for the auxiliary boiler. The SCR catalyst will be located downstream of the CO catalyst, and will consist of a vanadium/titanium/tungsten type catalyst in a honeycomb structure. Aqueous ammonia (ammonium hydroxide at 19 percent concentration by weight) from the storage tank will be vaporized, diluted with air, and injected into the exhaust through an injection grid. The amount of ammonia injected will vary depending on NO_X reduction requirements, but will be approximately a 1-to-1 molar ratio of ammonia to NO_X. Tables 2-8 and 2-9 present the combined- and simple-cycle SCR system data.

TABLE 2-8
Combined-cycle SCR Catalyst Data

Parameter	Specification
Manufacturer	Cormetech
Catalyst Type	Titanium/Vanadium/Tungsten honeycomb
Catalyst Volume	2,761 cf
Catalyst Area	1,841 ft^2
Reactor Dimensions	18” L X 25.71’ W X 71.6’ H
Space Velocity	27,418 hr^{-1}
Area Velocity	41,119 ft/hr

TABLE 2-8
Combined-cycle SCR Catalyst Data

Parameter	Specification
Ammonia Injection Rate	242 lbm/hr
Ammonia Slip	5.0 ppm
Outlet NO_X	2.0 ppm @ 15% O_2
Guarantee	25,000 hours of operation, or 5 years
SCR/CO Catalyst Total Cost	$1 million
Operating Temperature Range	570°F – 692°F

Note:
lbm/hr = pound-mole per hour

TABLE 2-9
Simple-cycle SCR Catalyst Data

Parameter	Specification
Manufacturer	Cormetech CMHT
Catalyst Type	Titanium/Vanadium/Tungsten honeycomb
Catalyst Volume	621.96 cf
Catalyst Area	126.5 ft^2
Reactor Dimensions	11.5’ L X 4.92’ W X 11’ H (includes CO catalyst housing)
Space Velocity	37,147 hr^{-1}
Area Velocity	182,639 ft/hr
Ammonia Injection Rate	180 lbm/hr
Ammonia Slip	5.0 ppm
Outlet NO_X	2.5 ppm @ 15% O_2
Guarantee	24,000 hours of operation, or 3 years
SCR/CO Catalyst Total Cost	$1.1 million
Operating Temperature Range	500°F – 870°F

The SCR catalyst for the auxiliary boiler will be installed downstream of the low NO_X burner and will reduce the exhaust NO_X emissions from 9 ppmvd to 5 ppmvd at 3 percent O_2. The SCR catalyst will be manufactured by Babcock & Wilcox (B&W). The catalyst material will be vanadium based on a homogeneous honeycomb titanium support matrix. The catalyst model will be from the FM Series. The total catalyst volume is 46 cubic feet (cf). The catalyst dimensions will be 3 feet 8 inches high by 5 feet 5 inches wide by 7 feet 3 inches in length. The life cycle of the SCR modules is expected to be 3 years. The SCR warranty is 5 ppmvd ammonia slip at 3 percent O_2. The operating range for the SCR catalyst will be 415°F to 628°F. Table 2-10 is a summary of the specifications of the SCR catalyst for the auxiliary boiler.

TABLE 2-10
Auxiliary Boiler SCR Catalyst Data

Parameters	Specifications
Catalyst Manufacturer	B&W
Catalyst Description	Vanadium

TABLE 2-10
Auxiliary Boiler SCR Catalyst Data

Parameters	Specifications
Catalyst Model No.	FM Series
Catalyst Volume	46 cf
Catalyst Area	28 ft^2
Space Velocity	485 hr^{-1}
Area Velocity	47,800 ft/hr
Stack Outlet CO	50 ppmvd @ 3% O_2
Stack Outlet NO_X	5 ppmvd @ 3% O_2 (1-hour average)
Catalyst Life	3 years
Ammonia Injection Rate	19% aqueous ammonia, provided by the combined-cycle power block aqueous ammonia
Ammonia Source	Storage Tanks
Maximum Operating Temperature	628°F

2.5 Exhaust Stacks

Each combined-cycle CTG/HRSG will be equipped with an identical 20-foot-diameter, 150-foot-tall stack. Each simple-cycle CTG will be equipped with an identical 13.5-foot-diameter, 80-foot-tall stack. The stacks will contain sampling ports for exhaust gas testing. Table 2-11 contains stack data.

TABLE 2-11
Stack Data

Specification	Combined-cycle CTG	Simple-cycle CTG	Auxiliary Boiler
Stack Diameter (ft)	20	13.5	3
Stack Height (ft)	150	80	80
Stack Area (ft^2)	314.2	143.1	7.07
Exhaust Gas Temperature (°F)	194	853	318
Exhaust Gas Volume (MMcf/hr)	75.72 @ 32°F	56.29 @ 32°F	1.77
Exhaust Gas Velocity (ft/min)	4,017 @ 32°F	6,551 @ 32°F	4,170

Notes:
ft = foot
ft/min = feet per minute

2.6 Monitoring Systems

Each turbine will be equipped with continuous stack monitors for NO_X, CO, and O_2, along with a fuel meter. The auxiliary boiler will be equipped with a NO_X, O_2, and fuel meter. A data acquisition system is required to collect information from the analyzers and fuel meters to calculate exhaust flows and mass emissions of NO_X for transmission through the remote terminal unit (RTU). Other parameters which are required to be measured and recorded include the ammonia injection rate, exhaust temperature prior to the SCR catalyst, CTG output, and pressure drop across the SCR catalyst. A NO_X analyzer will be placed upstream of the SCR catalyst for fine tuning the ammonia injection rate and also for use in estimating ammonia slip.

2.7 Ammonia Storage Tanks

Each power block will include a separate ammonia storage tank. The combined-cycle power block and auxiliary boiler will use a 35,000-gallon tank (13 feet in diameter and 45 feet long horizontal tank) and the simple-cycle power block will use a 15,000-gallon tank (6 feet in diameter and 18 feet long horizontal tank) to store a 19 percent aqueous ammonia solution for use in the CTGs and auxiliary boiler SCRs. These tanks are horizontal pressure vessels with pressure relief valves (PRVs) set at 50 pressure square inch, gauge (psig). During loading, vapors from the tanks are vented back to the filling truck through the vapor return line. The tanks are designed so that, under normal operating conditions, the pressure will not exceed the PRV setting. Expected average combined-cycle and simple-cycle CTG ammonia use is about 32.3 and 24 gallons per hour per CTG, respectively (242 pound(s) per hour [lb/hr] for a combined-cycle CTG and 180 lb/hr for a simple-cycle CTG).

2.8 Cooling System

There are no cooling towers associated with the combined-cycle CTGs as they will be air-cooled. Exhaust steam from the STG will be condensed in an air-cooled condenser. The air-cooled condenser will utilize large fans to blow ambient air across finned tubes through which the low-pressure steam flows. 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. Steam generated by the auxiliary boiler will pass through the HRSGs and STG, and will be condensed in the air-cooled condenser. The simple-cycle CTGs generate no steam; therefore, steam condensing is not required.

2.9 Oil/Water Separator

There will be two new oil/water separators (OWS) installed, one to serve each power block. These OWS will collect potentially oily wastewater from equipment area wash downs and lubricant containing areas. The only potential oil contaminant is lubricating oil associated with the gas turbines and associated feed water pumps. Oil will be collected in the OWS and will be removed by vacuum truck before the oil collection section reaches its capacity.

SECTION 3

3 Emissions

Emissions from commissioning of the new gas turbines and operation of the new gas turbines and auxiliary boiler will consist of NO_x, CO, VOC, PM_{10}, particulate matter with an aerodynamic diameter less than or equal to 2.5 microns ($PM_{2.5}$), sulfur dioxide (SO_2), GHGs, and air toxics. The GHGs evaluated include carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), and sulfur hexafluoride (SF_6), as applicable. Carbon dioxide equivalent (CO_2e) emissions were also determined, using the following global warming potentials (GWPs) per Table A-1 of Title 40 Code of Federal Regulations (CFR) Part 98, Subpart A: 25 for CH_4, 298 for N_2O, and 22,800 for SF_6.

3.1 Commissioning

Commissioning is a one-time event which occurs following installation and just prior to bringing the equipment online for commercial operation. The commissioning emissions are based on the estimated duration of each commissioning event, emission control efficiencies expected for each event, and turbine operating rates. The commissioning phase for each combustion technology is described in more detail below. The detailed emission calculations for commissioning are provided in Appendix A, Tables 1 and 2.

3.1.1 Combined-cycle Turbines

The total duration of the combined-cycle power block commissioning period is expected to be up to 1,992 hours (996 hours per CTG). During the commissioning period, each GE Frame 7FA.05 will be operated for up to 216 hours without emission control systems in operation. The maximum hourly and event commissioning emission rates for the GE Frame 7FA.05s are presented in Table 3-1. Because commissioning is expected to be completed within 1,992 hours, annual impacts for the combined commissioning and operation of the combined-cycle power block were also evaluated since annual emissions during the commissioning year could be higher than those during a noncommissioning year. Therefore, the annual average emission rates associated with commissioning and operation of the GE Frame 7FA.05s are also presented in Table 3-1.

TABLE 3-1
GE Frame 7FA.05 Turbine Commissioning Emission Rates

Commissioning Emissions	VOC	CO	NO_X	SO_2	PM_{10}	$PM_{2.5}$
Short-Term Emission Rates						
Maximum Hourly, lb/hr (per turbine) [a]	270	1,900	130	4.86	8.50	8.50
Total Commissioning Period, tons (per 2x1 block) [b]	14.7	101	27.6	4.84	8.47	8.47
Annual Emission Rates						
Annual Average Hourly, lb/hr (per turbine) [c]	N/A	N/A	16.4	N/A	7.41	7.41
Total Commissioning/Operation Period, tons (per 2x1 block) [d]	N/A	N/A	143	N/A	64.9	64.9

[a] SO_2, PM_{10}, and $PM_{2.5}$ emissions are not emitted in amounts greater than normal operating rates.

[b] Total commissioning period SO_2, PM_{10}, and $PM_{2.5}$ emissions are based on the maximum emission rates at 32°F multiplied by the total number of commissioning hours.

[c] Annual average hourly emissions for evaluating annual impacts are based on the sum of total commissioning emissions and annual operation emissions per turbine, divided by 8,760.

[d] Total commissioning/operation period emissions are based on the total commissioning period emissions presented here and the annual average operation emission rates at 65.8°F and 100 percent load.

Note:

TABLE 3-1
GE Frame 7FA.05 Turbine Commissioning Emission Rates

Commissioning Emissions	VOC	CO	NO_X	SO_2	PM_{10}	$PM_{2.5}$

N/A = not applicable (i.e., no annual average ambient air quality standard exists for these pollutants; therefore, annual average emissions were not modeled)

3.1.2 Simple-cycle Turbines

The total duration of the simple-cycle power block commissioning period is expected to be up to 560 hours (280 hours per turbine). During the commissioning period, each GE LMS 100PB will be operated for up to 4 hours without emission control systems in operation. The maximum hourly and event commissioning emission rates for the GE LMS 100PBs are presented in Table 3-2. Because commissioning is expected to be completed within 560 hours, annual impacts for the combined commissioning and operation of the simple-cycle power block were also evaluated since annual emissions during the commissioning year could be higher than those during a noncommissioning year. Therefore, the annual average emission rates associated with commissioning and subsequent operation of the GE LMS 100PBs are also presented in Table 3-2.

TABLE 3-2
GE LMS 100PB Turbine Commissioning Emission Rates

Commissioning Emissions	VOC	CO	NO_X	SO_2	PM_{10}	$PM_{2.5}$
Short-Term Emission Rates						
Maximum Hourly, lb/hr (per turbine) [a]	5.08	244	40.1	1.64	6.24	6.24
Total Commissioning Period, tons (per 2-turbine block) [b]	0.84	25.4	5.72	0.46	1.75	1.75
Annual Emission Rates						
Annual Average Hourly, lb/hr (per turbine) [c]	N/A	N/A	3.10	N/A	1.63	1.63
Total Commissioning/Operation Period, tons (per 2-turbine block) [d]	N/A	N/A	27.1	N/A	14.2	14.2

[a] SO_2, PM_{10}, and $PM_{2.5}$ emissions are not emitted in amounts greater than normal operating rates.

[b] Total commissioning period SO_2, PM_{10}, and $PM_{2.5}$ emissions are based on the maximum emission rates at 65.8°F multiplied by the total number of commissioning hours.

[c] Annual average hourly emissions for evaluating annual impacts are based on the sum of total commissioning emissions and annual operation emissions per turbine, divided by 8,760.

[d] Total commissioning/operation period emissions are based on the total commissioning period emissions presented here and the annual average operation emission rates at 65.8°F and 100 percent load.

Note:

N/A = not applicable (i.e., no annual average ambient air quality standard exists for these pollutants; therefore, annual average emissions were not modeled)

3.1.3 Auxiliary Boiler

The auxiliary boiler commissioning process includes first burner light-off, conditioning, establishing the air/fuel ratio curve, and establishing the SCR ammonia injection curve. The auxiliary boiler commissioning will occur over 5 days and will require up to 6 fired hours per day. The auxiliary boiler commissioning emissions will be the same as the auxiliary boiler cold startup emissions, presented in Table 3-3 below. As the auxiliary boiler commissioning will not overlap with operation of any other HBEP emission source, an impacts analysis is not required.

TABLE 3-3
Auxiliary Boiler Commissioning Emissions

Startup	NO_X Pounds	CO Pounds	VOC Pounds
Daily Emissions	8.44	8.68	9.37
Total Commissioning Emissions	42.2	43.4	46.9

3.2 Operation

Emissions were calculated for three basic operational modes, as follows:

- Startup, which occurs each time the gas turbine or auxiliary boiler is started
- Normal operation
- Shutdown, which occurs each time the gas turbine is shut down

The detailed emission calculations for operation are provided in Appendix A, Tables 3 through 17.

3.2.1 Operating Schedule

AES has proposed the operating schedule for HBEP shown in Table 3-4 on a per turbine basis.

TABLE 3-4
Operating Schedule

	GE Frame 7FA.05		GE LMS 100PB	
Parameter	**Events**	**Hours**	**Events**	**Hours**
Annual Hours	--	6,100	--	1,750
Annual Cold Startup	80	80.0	0	--
Annual Warm Startup	88	44.0	0	--
Annual Hot Startup	332	166	350	175
Annual Shutdown	500	250	350	75.8
Total Annual Startup/ Shutdown Hours (per turbine)	--	540	--	251
Total Annual Operating Hours (per turbine)	--	6,640	--	2,001
Monthly Cold Startup	15	15.0	0	--
Monthly Warm Startup	12	6.00	0	--
Monthly Hot Startup	35	17.5	62	31.0
Monthly Shutdown	62	31.0	62	13.4
Total Monthly Startup/ Shutdown Hours (per turbine)	--	69.5	--	44.4
Monthly Operating Hours (per turbine)	--	675	--	700

The auxiliary boiler may operate 365 days per year with 24 cold starts, 48 warm starts, and 48 hot starts, and an annual fuel consumption of 189,155 million British thermal units (MMBtu). Monthly operation assumes 2 cold starts, 4 warm starts, 4 hot starts, and 16,055 MMBtu per month of fuel consumption.

3.2.2 Hourly Emissions

The maximum hourly emissions for normal operation, startups, and shutdowns are presented in Tables 3-5 through 3-8 for each combustion technology.

TABLE 3-5
Maximum Hourly Emissions for Normal Operation (1 Turbine)

	Emissions (lb/hr)			
Pollutant	**Uncontrolled GE Frame 7FA.05 [a]**	**Uncontrolled GE LMS 100PB [b]**	**Controlled GE Frame 7FA.05**	**Controlled GE LMS 100PB**
NO_X	59.3	82.9	16.5	8.29
CO	35.2	202	10.0	8.07
VOC	5.75	4.62	5.75	2.31
PM_{10}	9.0	6.24	8.50	6.24
SO_2	4.86	1.64	4.86	1.64
Ammonia	/////////	/////////	15.2	6.14

[a] Uncontrolled emission rates based on DLN without SCR, NO_X = 9 ppm and CO = 7.07 ppm.

[b] Uncontrolled emission rates based on DLN without SCR, NO_X = 25 ppm, CO = 100 ppm, and VOC = 4 ppm.

TABLE 3-6
Maximum Hourly and Total Emissions for Startups and Shutdowns (1 GE Frame 7FA.05 Turbine)

	Cold Start, 60 minutes		Warm Start, 30 minutes		Hot Start, 30 minutes		Shutdown, 30 minutes	
Pollutant	**lb/hr [a]**	**lb/event**	**lb/hr [a]**	**lb/event**	**lb/hr [a]**	**lb/event**	**lb/hr [a]**	**lb/event**
NO_X	61.0	61.0	25.2	17.0	25.2	17.0	18.2	10.0
CO	325	325	142	137	142	137	138	133
VOC	36.0	36.0	27.9	25.0	27.9	25.0	34.9	32.0
PM_{10}	8.50	8.50	8.50	4.25	8.50	4.25	8.50	4.25
SO_2	4.86	4.86	4.86	2.43	4.86	2.43	4.86	2.43

[a] The lb/hr numbers represent the highest hour during the event.

Note:

lb/event = pound(s) per event

TABLE 3-7
Maximum Hourly and Total Emissions for Startups and Shutdowns (1 GE LMS 100PB Turbine)

	Start, 30 minutes		Shutdown, 13 minutes	
Pollutant	**lb/hr [a]**	**lb/event**	**lb/hr [a]**	**lb/event**
NO_X	20.7	16.6	9.61	3.12
CO	19.4	15.4	34.4	28.1
VOC	3.96	2.80	4.87	3.06
PM_{10}	6.24	3.12	6.24	1.35
SO_2	1.64	0.82	1.64	0.36

[a] The lb/hr numbers represent the highest hour during the event.

TABLE 3-8
Maximum Hourly and Total Emissions for Startups (Auxiliary Boiler)

	Cold Start, 170 minutes		Warm Start, 85 minutes		Hot Start, 25 minutes	
Pollutant	**lb/hr [a]**	**lb/event**	**lb/hr [a]**	**lb/event**	**lb/hr [a]**	**lb/event**
NO_X	1.49	4.22	1.49	2.11	1.49	0.62
CO	1.53	4.34	1.53	2.17	1.53	0.64
VOC	1.65	4.69	1.65	2.34	1.65	0.69
PM_{10}	0.30	0.84	0.30	0.42	0.30	0.12
SO_2 [b]	0.084	0.24	0.084	0.12	0.084	0.035

[a] The lb/hr numbers represent the highest hour during the event.

[b] SO_2 emissions assume a maximum fuel sulfur level of 0.75 grain per 100 dry standard cubic feet.

3.2.3 Monthly and Daily Emissions

The monthly operating schedules for the combined-cycle and simple-cycle CTGs are presented in Tables 3-9 and 3-10, respectively.

TABLE 3-9
Monthly Operating Schedule (GE Frame 7FA.05 Turbine)

Parameter	Number	Hours
Monthly Cold Starts	15	15.0
Monthly Warm Starts	12	6.00
Monthly Hot Starts	35	17.5
Monthly Shutdowns	62	31.0
Total Monthly Startup and Shutdown Hours	N/A	69.5
Total Monthly Operating Hours (not including startups and shutdowns)	N/A	675

Note:

N/A = not applicable

TABLE 3-10
Monthly Operating Schedule (GE LMS 100PB Turbine)

Parameter	Number	Hours
Monthly Starts	62	31.0
Monthly Shutdowns	62	13.4
Total Monthly Startup and Shutdown Hours	N/A	44.4
Total Monthly Operating Hours (not including startups and shutdowns)	N/A	700

Note:

N/A = not applicable

The maximum monthly and average daily emissions are presented in Tables 3-11 and 3-12 for the combined-cycle and simple-cycle CTGs, respectively.

As shown in Table 3-11, daily emissions are calculated as the monthly emissions divided by 30, based on the monthly operating schedule in Table 3-9.

TABLE 3-11
Maximum Monthly and Average Daily Emissions (GE Frame 7FA.05 Turbine)

Pollutant	Maximum Monthly Emissions (lb/month)	Average Daily Emissions (lb/day)
NO_X	26,894	896
CO	52,652	1,755
VOC	15,149	505
SO_2	7,320	241
PM_{10}	12,648	422
$PM_{2.5}$	12,648	422

Note:

lb/month = pound(s) per month

As shown in Table 3-12, daily emissions are calculated as the monthly emissions divided by 30, based on the monthly operating schedule in Table 3-10.

TABLE 3-12
Maximum Monthly and Average Daily Emissions (GE LMS 100PB Turbine)

Pollutant	Maximum Monthly Emissions (lb/month)	Average Daily Emissions (lb/day)
NO_X	14,039	468
CO	16,689	556
VOC	3,961	132
SO_2	2,435	81.2
PM_{10}	9,288	310
$PM_{2.5}$	9,288	310

Table 3-13 summarizes the auxiliary boiler maximum hourly, daily, and annual emission estimates.

TABLE 3-13
Auxiliary Boiler Maximum Hourly, Daily, and Annual Emission Estimates

Period	NO_X	CO	VOC	SO_2 [a]	PM_{10}	$PM_{2.5}$	Fuel Use (MMBtu)
Hourly Emissions (lb/hr) [b]	0.42	2.83	0.47	0.14	0.51	0.51	70.8
Daily Emissions (lb/day) [c]	3.75	21.4	4.17	1.09	3.82	3.82	535
Monthly Emissions (lb/month) [d]	112	641	125	32.8	115	115	16,055
Annual Emissions (lb/year) [e]	1,328	7,547	1,476	137	1,351	1,351	189,155
Annual Emissions (tpy) [f]	0.66	3.77	0.74	0.069	0.68	0.68	--

[a] Hourly, daily, and monthly SO_2 emission rates assume a maximum fuel sulfur level of 0.75 grain per 100 dry standard cubic feet. Annual SO_2 emission rates assume an average fuel sulfur level of 0.25 grain per 100 dry standard cubic feet.

TABLE 3-13
Auxiliary Boiler Maximum Hourly, Daily, and Annual Emission Estimates

Period	NO_X	CO	VOC	SO_2 [a]	PM_{10}	$PM_{2.5}$	Fuel Use (MMBtu)

[b] Hourly emissions are based on the maximum hourly firing rate.

[c] Daily emissions are the monthly emissions averaged over 30 days.

[d] Monthly emissions assume two cold starts, four warm starts, four hot starts, and 16,055 MMBtu of fuel consumption per month.

[e] Annual emissions assume 24 cold starts, 48 warm starts, 48 hot starts, and 189,155 MMBtu of fuel consumption per year.

3.2.4 Annual Emissions

Table 3-14 summarizes the annual criteria pollutant emissions for each combustion technology.

TABLE 3-14
Annual Criteria Pollutant Emissions

	Annual Emissions per Unit (tpy)			Annual Emissions per Combustion Technology (tpy)*		
Pollutant	**GE Frame 7FA.05**	**GE LMS 100PB**	**Auxiliary Boiler**	**GE Frame 7FA.05**	**GE LMS 100PB**	**Auxiliary Boiler**
NO_X	57.9	10.7	0.66	116	21.4	0.66
CO	96.9	14.7	3.77	194	29.4	3.77
VOC	31.4	3.05	0.74	62.7	6.10	0.74
SO_2	5.32	0.55	0.069	10.6	1.09	0.069
PM_{10}	28.2	6.24	0.68	56.4	12.5	0.68
$PM_{2.5}$	28.2	6.24	0.68	56.4	12.5	0.68

*Accounts for 2 GE Frame 7FA.05 turbines, 2 GE LMS 100PB turbines, and one auxiliary boiler.

Table 3-15 summarizes the annual GHG emissions for the facility.

TABLE 3-15
Annual GHG Emissions

	CO_2	CH_4	N_2O	CO_2e [a]
HBEP, MT/yr	1,782,131	33.6	3.36	1,784,101

[a] Value includes SF_6 emissions associated with 10 circuit breakers with an assumed annual leak rate of 1 percent, as allowed by 17 California Code of Regulations 95350 – 95359.

Note:

MT/yr = metric ton(s) per year

Table 3-16 summarizes the hourly and annual toxic emissions for the combined-cycle CTGs.

TABLE 3-16
Combined-cycle: Summary of Operation Emissions – Air Toxics

	Emission Factors		Emissions (per Turbine)			Emissions (Facility Total)		
Compound	**lb/MMcf** [a]	**lb/MMBtu** [a]	**lb/hr** [b]	**lb/yr** [c]	**tpy**	**lb/hr**	**lb/yr**	**tpy**
Ammonia [d]	5 ppm	--	15.2	100,715	50.4	30.5	201,430	101
1,3-Butadiene	4.39E-04	4.18E-07	0.0010	6.24	0.0031	0.0019	12.5	0.0062

TABLE 3-16
Combined-cycle: Summary of Operation Emissions – Air Toxics

Compound	Emission Factors		Emissions (per Turbine)			Emissions (Facility Total)		
	lb/MMcf [a]	lb/MMBtu [a]	lb/hr [b]	lb/yr [c]	tpy	lb/hr	lb/yr	tpy
Acetaldehyde [e]	1.80E-01	1.71E-04	0.39	2,559	1.28	0.78	5,118	2.56
Acrolein [e]	3.69E-03	3.51E-06	0.0080	52.5	0.026	0.016	105	0.052
Benzene [e]	3.33E-03	3.17E-06	0.0072	47.3	0.024	0.014	94.7	0.047
Ethylbenzene	3.26E-02	3.10E-05	0.071	463	0.23	0.14	927	0.46
Formaldehyde [e]	3.67E-01	3.50E-04	0.79	5,218	2.61	1.59	10,435	5.22
Naphthalene	1.33E-03	1.27E-06	0.0029	18.9	0.0095	0.0058	37.8	0.019
PAHs [f]	9.18E-04	8.74E-07	0.0010	6.53	0.0033	0.0020	13.1	0.0065
Propylene Oxide	2.96E-02	2.82E-05	0.064	421	0.21	0.13	842	0.42
Toluene	1.33E-01	1.27E-04	0.29	1,891	0.95	0.58	3,782	1.89
Xylene	6.53E-02	6.22E-05	0.14	928	0.46	0.28	1,857	0.93
TOTAL HAPs				**11,612**	**5.81**		**23,223**	**11.6**
TOTAL TACs				**5,271**	**2.64**		**10,542**	**5.27**

[a] Provided by South Coast Air Quality Management District (SCAQMD) via e-mail correspondence on November 3, 2015, with the exception of ammonia. Units of lb/MMBtu calculated by dividing lb/MMcf by the gas heat content of 1,050 Btu/cf.

[b] Hourly per turbine emissions calculated by multiplying the emission factor by 2,273 MMBtu/hr, HHV.

[c] Annual per turbine emissions calculated by multiplying the emission factor by 2,248 MMBtu/hr, HHV and 6,640 hours/year.

[d] Based on the operating exhaust ammonia limit of 5 ppmvd @ 15% O_2 and an F-factor of 8,710.

[e] Emission factors account for the use of an oxidation catalyst, as provided by SCAQMD via e-mail correspondence on November 3, 2015.

[f] Per Section 3.1.4.3 of *AP-42* (U.S. Environmental Protection Agency [EPA], 2000), PAH emissions were assumed to be controlled up to 50% through the use of an oxidation catalyst.

Notes:

HAP	=	hazardous air pollutant
lb/MMBtu	=	pound(s) per million British thermal unit
lb/MMcf	=	pound(s) per million cubic foot
PAH	=	polycyclic aromatic hydrocarbon
TAC	=	toxic air contaminant

Table 3-17 summarizes the hourly and annual toxic emissions for the simple-cycle CTGs.

TABLE 3-17
Simple-cycle: Summary of Operation Emissions – Air Toxics

Compound	Emission Factors		Emissions (per Turbine)			Emissions (Facility Total)		
	lb/MMcf [a]	lb/MMBtu [a]	lb/hr [b]	lb/yr [c]	tpy	lb/hr	lb/yr	tpy
Ammonia [d]	5 ppm	--	6.14	12,277	6.14	12.3	24,553	12.3
1,3-Butadiene	4.39E-04	4.18E-07	0.00037	0.74	0.00037	0.00074	1.48	0.00074
Acetaldehyde [e]	1.80E-01	1.71E-04	0.15	304	0.15	0.30	607	0.30
Acrolein [e]	3.69E-03	3.51E-06	0.0031	6.22	0.0031	0.0062	12.4	0.0062
Benzene [e]	3.33E-03	3.17E-06	0.0028	5.62	0.0028	0.0056	11.2	0.0056
Ethylbenzene	3.26E-02	3.10E-05	0.027	55.0	0.027	0.055	110	0.055
Formaldehyde [e]	3.67E-01	3.50E-04	0.31	619	0.31	0.62	1,238	0.62
Naphthalene	1.33E-03	1.27E-06	0.0011	2.24	0.0011	0.0022	4.49	0.0022
PAHs [f]	9.18E-04	8.74E-07	0.00039	0.77	0.00039	0.00077	1.55	0.00077
Propylene Oxide	2.96E-02	2.82E-05	0.025	49.9	0.025	0.050	100	0.050
Toluene	1.33E-01	1.27E-04	0.11	224	0.11	0.22	449	0.22
Xylene	6.53E-02	6.22E-05	0.055	110	0.055	0.11	220	0.11
TOTAL HAPs				**1,378**	**0.69**		**2,756**	**1.38**
TOTAL TACs				**625**	**0.31**		**1,251**	**0.63**

[a] Provided by SCAQMD via e-mail correspondence on November 3, 2015, with the exception of ammonia. Units of lb/MMBtu calculated by dividing lb/MMcf by the gas heat content of 1,050 Btu/cf.

[b] Hourly per turbine emissions calculated by multiplying the emission factor by 885 MMBtu/hr, HHV.

[c] Annual per turbine emissions calculated by multiplying the emission factor by 885 MMBtu/hr, HHV and 2,001 hours/year.

[d] Based on the operating exhaust ammonia limit of 5 ppmvd @ 15% O_2 and an F-factor of 8,710.

[e] Emission factors account for the use of an oxidation catalyst, as provided by SCAQMD via e-mail correspondence on November 3, 2015.

[f] Per Section 3.1.4.3 of *AP-42* (EPA, 2000), PAH emissions were assumed to be controlled up to 50% through the use of an oxidation catalyst.

Table 3-18 summarizes the hourly and annual toxic emissions for the auxiliary boiler.

TABLE 3-18
Auxiliary Boiler: Summary of Operation Emissions – Air Toxics

Compound	Emission Factors		Emissions		
	lb/MMcf [a]	lb/MMBtu [a]	lb/hr [b]	lb/yr [c]	tpy
Ammonia [d]	5 ppm	2.24E-03	1.59E-01	4.09E+02	2.05E-01
Benzene	5.80E-03	5.52E-06	3.91E-04	1.04E+00	5.22E-04
Formaldehyde	1.23E-02	1.17E-05	8.29E-04	2.22E+00	1.11E-03
PAHs	1.00E-04	9.52E-08	6.74E-06	1.80E-02	9.01E-06
Naphthalene	3.00E-04	2.86E-07	2.02E-05	5.40E-02	2.70E-05
Acetaldehyde	3.10E-03	2.95E-06	2.09E-04	5.58E-01	2.79E-04

TABLE 3-18
Auxiliary Boiler: Summary of Operation Emissions – Air Toxics

Compound	Emission Factors		Emissions		
	lb/MMcf [a]	lb/MMBtu [a]	lb/hr [b]	lb/yr [c]	tpy
Acrolein	2.70E-03	2.57E-06	1.82E-04	4.86E-01	2.43E-04
Toluene	2.65E-02	2.52E-05	1.79E-03	4.77E+00	2.39E-03
Xylene	1.97E-02	1.88E-05	1.33E-03	3.55E+00	1.77E-03
Ethylbenzene	6.90E-03	6.57E-06	4.65E-04	1.24E+00	6.22E-04
Hexane	4.60E-03	4.38E-06	3.10E-04	8.29E-01	4.14E-04
TOTAL HAPs				**14.8**	**0.0074**
TOTAL TACs				**4.09**	**0.0020**

[a] Provided by SCAQMD via e-mail correspondence on November 3, 2015. Units of lb/MMBtu calculated by dividing lb/MMcf by the gas heat content of 1,050 Btu/cf.

[b] Hourly emissions calculated by multiplying the emission factor by 71 MMBtu/hr, HHV.

[c] Annual emissions calculated by multiplying the emission factor by 189,155 MMBtu/year, HHV, which accounts for two cold starts, four warm starts, and four hot starts per month.

[d] Based on the operating exhaust ammonia limit of 5 ppmvd @ 15% O_2 and an F-factor of 8,710.

SECTION 4

4 Air Quality Impacts Analysis

An air quality impacts analysis was conducted to compare worst-case ground-level impacts resulting from the HBEP with established state and federal ambient air quality standards and applicable South Coast Air Quality Management District (SCAQMD) significance criteria. The analysis was performed using the newest versions of AERMET (version 15181) and AERMOD (version 15181).[1] The stack parameters, emission rates, and results for each modeled scenario are described below, as related to commissioning and operation of the combined-cycle CTGs, simple-cycle CTGs, and auxiliary boiler.

4.1 Commissioning Impacts Analysis

For commissioning, a total of 6 scenarios were modeled, as listed below:

- Two GE Frame 7FA.05s at 10 percent load with auxiliary boiler operation
- Two GE Frame 7FA.05s at 40 percent load with auxiliary boiler operation
- Two GE Frame 7FA.05s at 80 percent load with auxiliary boiler operation
- Two GE LMS 100PBs at 5 percent load with operation of two GE Frame 7FA.05s and the auxiliary boiler
- Two GE LMS 100PBs at 75 percent load with operation of two GE Frame 7FA.05s and the auxiliary boiler
- Two GE LMS 100PBs at 100 percent load with operation of two GE Frame 7FA.05s and the auxiliary boiler

The stack parameters for each unit included in the modeled scenarios are presented in Appendix B, Table 1. Stack parameters presented include source coordinates, elevation, stack height, temperature, exit velocity, and stack diameter.

The short-term and annual emission rates (in gram(s) per second [g/s] and pound(s) per hour [lb/hr]) for each unit included in the modeled scenarios are presented in Appendix B, Table 2. These emission rates are the highest unabated emissions expected during commissioning. Only NO_2 and CO were modeled for the short-term averaging periods because SO_2, PM_{10}, and $PM_{2.5}$ are not emitted in amounts greater than normal operating rates. In other words, results for short-term SO_2, PM_{10}, and $PM_{2.5}$ were extracted from the operational modeling results, as discussed later within this response. Additionally, short-term modeling was only included for short-term NO_2 and CO for scenarios where the emission rates were not captured by another commissioning or operation scenario modeled. NO_2, PM_{10}, and $PM_{2.5}$ were modeled for annual averaging periods, and the emission rates account for operation following commissioning activities.

The building parameters included in the modeled scenarios are presented in Appendix B, Table 3. The building parameters for the three GE Frame 7FA.05 commissioning scenarios include the presence of existing HBGS Units 1, 2, 3, and 4 in addition to those of the GE Frame 7FA.05s. The building parameters for the three GE LMS 100PB commissioning scenarios include the presence of the two GE Frame 7FA.05s and existing HGBS Units 1 and 2, in addition to those of the GE LMS 100PBs.

The results for each modeled scenario are presented in Appendix B, Table 4. As with the emission rates, these results are sorted by short-term and annual averaging periods. As noted, impacts for the GE Frame 7FA.05 scenarios include operation of the auxiliary boiler; NO_2 was modeled using the plume volume molar ratio method (PVMRM). Impacts for the GE LMS 100PB scenarios include operation of the auxiliary boiler and two GE Frame 7FA.05s at the worst-case operating conditions, as discussed later within this response. These results were used to identify the maximum impacts provided below.

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[1] Note that use of the latest version of AERMET (version 15181) required reprocessing of the meteorological data, including the latest version of AERMINUTE (version 15272), per the methodology contained in Section 4.2.3 of the *Dispersion Modeling Protocol for the Amended Huntington Beach Energy Project*.

Table 4-1 presents the results of the GE Frame 7FA.05 commissioning impacts analysis. As indicated, the maximum predicted CO, NO_2, SO_2, annual PM_{10}, and $PM_{2.5}$ commissioning impacts combined with the background concentrations will be below the ambient air quality standards for each averaging period. For PM_{10}, the 24-hour background concentration exceeds the California Ambient Air Quality Standard (CAAQS) without adding the modeled concentration. As a result, the predicted impact combined with the background concentration would be greater than the CAAQS. However, the commissioning activity would be finite, and the Project Owner will limit the hours of operation required to complete commissioning activities. Additionally, HBEP emissions will be fully offset consistent with SCAQMD Rule 1303 through the SCAQMD internal offset bank under SCAQMD Rule 1304(a)(2). Therefore, impacts from GE Frame 7FA.05 commissioning will be less than significant.

TABLE 4-1
GE Frame 7FA.05 Commissioning Impacts Analysis – Maximum Modeled Impacts Compared to the Ambient Air Quality Standards

Pollutant	Averaging Time	Maximum Modeled Concentration, µg/m³	Background Concentration, µg/m³ [a]	Total Predicted Concentration, µg/m³	CAAQS, µg/m³	NAAQS, µg/m³
CO	1-hour	4,341	3,321	7,662	23,000	40,000
	8-hour	3,000	2,519	5,519	10,000	10,000
NO_2	1-hour (max) [b]	169	142	311	339	—
	Annual [c]	0.66	21.8	22.5	57	100
SO_2	1-hour (max)	5.99	20.2	26.2	655	—
	3-hour	5.13	20.2	25.3	—	1,300
	24-hour	1.74	5.20	6.94	105	—
PM_{10}	24-hour	5.64	51.0	56.6	50	150
	Annual	0.57	19.3	19.9	20	—
$PM_{2.5}$	24-hour (98th percentile) [d]	3.33	21.3	24.6	—	35
	Annual	0.57	8.60	9.17	12	12

[a] Background concentrations were the highest concentrations monitored during 2011 through 2013.

[b] The maximum 1-hour NO_2 concentration is based on AERMOD PVMRM output with an in-stack NO_2 to NO_X ratio of 0.5 and an out-of-stack NO_2 to NO_X ratio of 0.9 (EPA, 2011; California Air Pollution Control Officer's Association [CAPCOA], 2011). Hourly paired ozone data is from the SCAQMD Costa Mesa monitoring station.

[c] The maximum annual NO_2 concentration includes an ambient NO_2 ratio of 0.75 (EPA, 2005).

[d] The total predicted concentration for the federal 24-hour $PM_{2.5}$ standard is the 5-year average, high-8th-high modeled concentration combined with the 3-year average, 98th percentile background concentration.

Table 4-2 presents the results of the GE LMS 100PB commissioning impacts analysis. As indicated, the maximum predicted CO, NO_2, SO_2, annual PM_{10}, and $PM_{2.5}$ commissioning impacts combined with the background concentrations will be below the ambient air quality standards for each averaging period. For PM_{10}, the 24-hour background concentration exceeds the CAAQS without adding the modeled concentration. As a result, the predicted impact combined with the background concentration would be greater than the CAAQS. However, the commissioning activity would be finite, and the Project Owner will limit the hours of operation required to complete commissioning activities. Additionally, HBEP emissions will be fully offset consistent with SCAQMD Rule 1303 through the SCAQMD internal offset bank under SCAQMD Rule 1304(a)(2). Therefore, impacts from GE LMS 100PB commissioning will be less than significant.

TABLE 4-2
GE LMS 100PB Commissioning Impacts Analysis – Maximum Modeled Impacts Compared to the Ambient Air Quality Standards

Pollutant	Averaging Time	Maximum Modeled Concentration, µg/m³	Background Concentration, µg/m³ [a]	Total Predicted Concentration, µg/m³	CAAQS, µg/m³	NAAQS, µg/m³
CO	1-hour	527	3,321	3,848	23,000	40,000
	8-hour	131	2,519	2,650	10,000	10,000
NO_2 [b]	1-hour (max)	79.1	142	221	339	—
	Annual	0.51	21.8	22.3	57	100
SO_2	1-hour (max)	5.76	20.2	26.0	655	—
	3-hour	5.01	20.2	25.2	—	1,300
	24-hour	1.66	5.20	6.86	105	—
PM_{10}	24-hour	5.11	51.0	56.1	50	150
	Annual	0.52	19.3	19.8	20	—
$PM_{2.5}$	24-hour (98th percentile) [c]	3.04	21.3	24.3	—	35
	Annual	0.52	8.60	9.12	12	12

[a] Background concentrations were the highest concentrations monitored during 2011 through 2013.
[b] The maximum 1-hour and annual NO_2 concentrations include ambient NO_2 ratios of 0.80 (EPA, 2011) and 0.75 (EPA, 2005), respectively.

[c] The total predicted concentration for the federal 24-hour $PM_{2.5}$ standard is the 5-year average, high-8th-high modeled concentration combined with the 3-year average, 98th percentile background concentration.

The commissioning activities associated with installation of the auxiliary boiler will occur prior to first fire of the combined-cycle CTGs. Therefore, an independent assessment of the auxiliary boiler commissioning impacts was not performed. However, the auxiliary boiler emissions were included in each of the modeled commissioning scenarios as being in normal operation only.

4.2 Operation Impacts Analysis

To evaluate the worst-case air quality impacts, each technology was assessed at peak, average, and minimum load at low, average, and high ambient temperatures[2]. This assessment, referred to as a load analysis, included a total of 41 modeled scenarios, as listed below:

- Operation of two GE Frame 7FA.05s at 100 percent load, two GE LMS 100PBs at 100 percent load, and the auxiliary boiler at an ambient temperature of 32 degrees Fahrenheit (°F)
- Operation of two GE Frame 7FA.05s at 100 percent load, two GE LMS 100PBs at 75 percent load, and the auxiliary boiler at an ambient temperature of 32°F
- Operation of two GE Frame 7FA.05s at 100 percent load, two GE LMS 100PBs at 50 percent load, and the auxiliary boiler at an ambient temperature of 32°F
- Operation of two GE Frame 7FA.05s at 75 percent load, two GE LMS 100PBs at 100 percent load, and the auxiliary boiler at an ambient temperature of 32°F
- Operation of two GE Frame 7FA.05s at 75 percent load, two GE LMS 100PBs at 75 percent load, and the auxiliary boiler at an ambient temperature of 32°F
- Operation of two GE Frame 7FA.05s at 75 percent load, two GE LMS 100PBs at 50 percent load, and the auxiliary boiler at an ambient temperature of 32°F

[2] Load rates and ambient temperatures based on turbine performance data provided in Appendix A, Tables 3 and 7.

- Operation of two GE Frame 7FA.05s at 45 percent load, two GE LMS 100PBs at 100 percent load, and the auxiliary boiler at an ambient temperature of 32°F
- Operation of two GE Frame 7FA.05s at 45 percent load, two GE LMS 100PBs at 75 percent load, and the auxiliary boiler at an ambient temperature of 32°F
- Operation of two GE Frame 7FA.05s at 45 percent load, two GE LMS 100PBs at 50 percent load, and the auxiliary boiler at an ambient temperature of 32°F
- Operation of two GE Frame 7FA.05s at 100 percent load with evaporative cooling, two GE LMS 100PBs at 100 percent load with evaporative cooling, and the auxiliary boiler at an ambient temperature of 65.8°F
- Operation of two GE Frame 7FA.05s at 100 percent load with evaporative cooling, two GE LMS 100PBs at 100 percent load, and the auxiliary boiler at an ambient temperature of 65.8°F
- Operation of two GE Frame 7FA.05s at 100 percent load with evaporative cooling, two GE LMS 100PBs at 75 percent load, and the auxiliary boiler at an ambient temperature of 65.8°F
- Operation of two GE Frame 7FA.05s at 100 percent load with evaporative cooling, two GE LMS 100PBs at 50 percent load, and the auxiliary boiler at an ambient temperature of 65.8°F
- Operation of two GE Frame 7FA.05s at 100 percent load, two GE LMS 100PBs at 100 percent load with evaporative cooling, and the auxiliary boiler at an ambient temperature of 65.8°F
- Operation of two GE Frame 7FA.05s at 100 percent load, two GE LMS 100PBs at 100 percent load, and the auxiliary boiler at an ambient temperature of 65.8°F
- Operation of two GE Frame 7FA.05s at 100 percent load, two GE LMS 100PBs at 75 percent load, and the auxiliary boiler at an ambient temperature of 65.8°F
- Operation of two GE Frame 7FA.05s at 100 percent load, two GE LMS 100PBs at 50 percent load, and the auxiliary boiler at an ambient temperature of 65.8°F
- Operation of two GE Frame 7FA.05s at 75 percent load, two GE LMS 100PBs at 100 percent load with evaporative cooling, and the auxiliary boiler at an ambient temperature of 65.8°F
- Operation of two GE Frame 7FA.05s at 75 percent load, two GE LMS 100PBs at 100 percent load, and the auxiliary boiler at an ambient temperature of 65.8°F
- Operation of two GE Frame 7FA.05s at 75 percent load, two GE LMS 100PBs at 75 percent load, and the auxiliary boiler at an ambient temperature of 65.8°F
- Operation of two GE Frame 7FA.05s at 75 percent load, two GE LMS 100PBs at 50 percent load, and the auxiliary boiler at an ambient temperature of 65.8°F
- Operation of two GE Frame 7FA.05s at 44 percent load, two GE LMS 100PBs at 100 percent load with evaporative cooling, and the auxiliary boiler at an ambient temperature of 65.8°F
- Operation of two GE Frame 7FA.05s at 44 percent load, two GE LMS 100PBs at 100 percent load, and the auxiliary boiler at an ambient temperature of 65.8°F
- Operation of two GE Frame 7FA.05s at 44 percent load, two GE LMS 100PBs at 75 percent load, and the auxiliary boiler at an ambient temperature of 65.8°F
- Operation of two GE Frame 7FA.05s at 44 percent load, two GE LMS 100PBs at 50 percent load, and the auxiliary boiler at an ambient temperature of 65.8°F

- Operation of two GE Frame 7FA.05s at 100 percent load with evaporative cooling, two GE LMS 100PBs at 100 percent load with evaporative cooling, and the auxiliary boiler at an ambient temperature of 110°F
- Operation of two GE Frame 7FA.05s at 100 percent load with evaporative cooling, two GE LMS 100PBs at 100 percent load, and the auxiliary boiler at an ambient temperature of 110°F
- Operation of two GE Frame 7FA.05s at 100 percent load with evaporative cooling, two GE LMS 100PBs at 75 percent load, and the auxiliary boiler at an ambient temperature of 110°F
- Operation of two GE Frame 7FA.05s at 100 percent load with evaporative cooling, two GE LMS 100PBs at 50 percent load, and the auxiliary boiler at an ambient temperature of 110°F
- Operation of two GE Frame 7FA.05s at 100 percent load, two GE LMS 100PBs at 100 percent load with evaporative cooling, and the auxiliary boiler at an ambient temperature of 110°F
- Operation of two GE Frame 7FA.05s at 100 percent load, two GE LMS 100PBs at 100 percent load, and the auxiliary boiler at an ambient temperature of 110°F
- Operation of two GE Frame 7FA.05s at 100 percent load, two GE LMS 100PBs at 75 percent load, and the auxiliary boiler at an ambient temperature of 110°F
- Operation of two GE Frame 7FA.05s at 100 percent load, two GE LMS 100PBs at 50 percent load, and the auxiliary boiler at an ambient temperature of 110°F
- Operation of two GE Frame 7FA.05s at 75 percent load, two GE LMS 100PBs at 100 percent load with evaporative cooling, and the auxiliary boiler at an ambient temperature of 110°F
- Operation of two GE Frame 7FA.05s at 75 percent load, two GE LMS 100PBs at 100 percent load, and the auxiliary boiler at an ambient temperature of 110°F
- Operation of two GE Frame 7FA.05s at 75 percent load, two GE LMS 100PBs at 75 percent load, and the auxiliary boiler at an ambient temperature of 110°F
- Operation of two GE Frame 7FA.05s at 75 percent load, two GE LMS 100PBs at 50 percent load, and the auxiliary boiler at an ambient temperature of 110°F
- Operation of two GE Frame 7FA.05s at 48 percent load, two GE LMS 100PBs at 100 percent load with evaporative cooling, and the auxiliary boiler at an ambient temperature of 110°F
- Operation of two GE Frame 7FA.05s at 48 percent load, two GE LMS 100PBs at 100 percent load, and the auxiliary boiler at an ambient temperature of 110°F
- Operation of two GE Frame 7FA.05s at 48 percent load, two GE LMS 100PBs at 75 percent load, and the auxiliary boiler at an ambient temperature of 110°F
- Operation of two GE Frame 7FA.05s at 48 percent load, two GE LMS 100PBs at 50 percent load, and the auxiliary boiler at an ambient temperature of 110°F

The stack parameters for each unit included in the load analysis are presented in Appendix C, Table 1. Stack parameters presented include source coordinates, elevation, stack height, temperature, exit velocity, and stack diameter.

The short-term and annual emission rates (in g/s and lb/hr) for each unit included in the load analysis are presented in Appendix C, Table 2. As shown, only the exhaust scenarios with combustion turbines operating at an average annual ambient temperature of 65.8°F include annual emission rates. Generally, the emission rates are based on the following:

- Short-term SO_2 emission rates for the GE Frame 7FA.05s and GE LMS 100PBs are based on a maximum fuel sulfur content of 0.75 grain per 100 dry standard cubic feet of natural gas.

- Hourly CO and NO_2 emission rates for the GE Frame 7FA.05s are based on cold startup events.
- Hourly CO and NO_2 emission rates for the GE LMS 100PBs are based on one startup, one shutdown, and the balance of the hour at steady-state operation.
- 8-hour CO emission rates for the GE Frame 7FA.05s are based on two cold startups, two shutdowns, and the balance of the period at steady-state operation.
- 8-hour CO emission rates for the GE LMS 100PBs are based on two startups, two shutdowns, and the balance of the period at steady-state operation.
- Hourly emission rates for the auxiliary boiler are based on steady-state operation at 100 percent load.
- Annual emission rates for the GE Frame 7FA.05s are based on 80 cold startups, 88 warm startups, 332 hot startups, 500 shutdowns, and 6,100 hours of steady-state operation.
- Annual emission rates for the GE LMS 100PBs are based on 350 hot startups, 350 shutdowns, and 1,750 hours of steady-state operation.
- Annual emission rates for the auxiliary boiler are based on an annual heat input of 189,155 MMBtu, which accounts for 10 startups per month.

The building parameters included in the load analysis are presented in Appendix C, Table 3. The building parameters include the presence of existing HGBS Units 1 and 2 in addition to those of the GE Frame 7FA.05s and the GE LMS 100PBs.

The results for each scenario modeled through the load analysis are presented in Appendix C, Table 4. As with the emission rates, only the exhaust scenarios with CTGs operating at an average annual ambient temperature of 65.8°F include annual averaging period results. These results were used to identify the maximum impacts described below.

Table 4-3 presents the maximum HBEP operational impacts. As indicated, the maximum predicted CO, NO_2, SO_2, annual PM_{10}, and $PM_{2.5}$ operational impacts combined with the background concentrations will be below the ambient air quality standards for each averaging period. The 24-hour PM_{10} background concentration exceeds the CAAQS without adding the modeled concentration. As a result, the predicted impact combined with the background concentration will be greater than the CAAQS. However, HBEP emissions will be fully offset consistent with SCAQMD Rule 1303 through the SCAQMD internal offset bank under SCAQMD Rule 1304(a)(2). Therefore, impacts from operation will be less than significant.

TABLE 4-3
HBEP Operation Impacts Analysis – Maximum Modeled Impacts Compared to the Ambient Air Quality Standards

Pollutant	Averaging Time	Maximum Modeled Concentration, μg/m³	Background Concentration, μg/m³ [a]	Total Predicted Concentration, μg/m³	CAAQS, μg/m³	NAAQS, μg/m³
CO	1-hour	631	3,321	3,952	23,000	40,000
	8-hour	149	2,519	2,668	10,000	10,000
NO_2 [b]	1-hour (max)	94.5	142	237	339	—
	1-hour (98th percentile) [c]	—	—	126	—	188
	Annual	0.59	21.8	22.4	57	100
SO_2	1-hour (max)	5.76	20.2	26.0	655	—
	1-hour (99th percentile) [d]	4.86	8.80	13.7	—	196
	3-hour	5.01	20.2	25.2	—	1,300
	24-hour	1.66	5.20	6.86	105	365
PM_{10}	24-hour	5.11	51.0	56.1	50	150
	Annual	0.64	19.3	19.9	20	—
$PM_{2.5}$	24-hour (98th percentile) [e]	3.04	21.3	24.3	—	35
	Annual	0.64	8.60	9.24	12	12

TABLE 4-3
HBEP Operation Impacts Analysis – Maximum Modeled Impacts Compared to the Ambient Air Quality Standards

Pollutant	Averaging Time	Maximum Modeled Concentration, μg/m³	Background Concentration, μg/m³ [a]	Total Predicted Concentration, μg/m³	CAAQS, μg/m³	NAAQS, μg/m³

[a] Background concentrations were the highest concentrations monitored during 2011 through 2013.

[b] The maximum 1-hour and annual NO_2 concentrations include ambient NO_2 ratios of 0.80 (EPA, 2011) and 0.75 (EPA, 2005), respectively.

[c] The total predicted concentration for the federal 1-hour NO_2 standard is the 5-year average, high-8th-high modeled concentration paired with 98th percentile seasonal hour-of-day background concentrations for 2010 through 2012.

[d] The total predicted concentration for the federal 1-hour SO_2 standard is the 5-year average, high-4th-high modeled concentration combined with the 3-year average, 99th percentile background concentration.

[e] The total predicted concentration for the federal 24-hour $PM_{2.5}$ standard is the 5-year average, high-8th-high modeled concentration combined with the 3-year average, 98th percentile background concentration.

4.2.1 Rule 2005

To demonstrate compliance with SCAQMD Rule 2005, each combustion unit was modeled individually using the stack parameters, emission rates, and building parameters from Appendix C, Tables 1, 2, and 3, respectively. The particular operational scenario selected for each combustion unit was chosen based on the load analysis results. In other words, only the parameters from the operational scenarios leading to the worst-case 1-hour, 1-hour federal, and annual NO_2 impacts were used. The results for each modeled scenario are presented in Appendix C, Table 5. These results were used to identify the maximum impacts described below.

The maximum modeled NO_2 concentrations are presented in Table 4-4 and are compared to the SCAQMD Rule 2005 significance threshold. Although each combustion emission unit was modeled, the results presented in Table 4-4 are only for the emission unit causing the highest modeled concentrations, in this case one combined-cycle CTG. The maximum modeled NO_2 concentrations were also added to representative background concentrations and compared to the state and federal ambient air quality standards for NO_2. Although the NO_2 concentrations per emission unit are greater than the SCAQMD Rule 2005 1-hour threshold, they are less than the ambient air quality standards and will be fully offset through the surrender of NO_X Regional Clean Air Incentives Market (RECLAIM) trading credits (RTCs). Therefore, the predicted NO_2 impacts from operation will be less than significant compared to SCAQMD Rule 2005.

TABLE 4-4
Rule 2005 Air Quality Thresholds and Standards Applicable to the HBEP (per emission unit)

Pollutant/Averaging Time	Maximum Modeled Concentration, μg/m³ [a]	Significant Threshold, μg/m³ [b]	Background Concentration, μg/m³ [c]	Total Predicted Concentration, μg/m³	CAAQS, μg/m³	NAAQS, μg/m³
NO_2 (1-hour)	60.3	20	142	202	339	—
NO_2 (Federal 1-hour)	62.0	N/A	98.2	160	—	188
NO_2 (Annual)	0.28	1.0	21.8	22.1	57	100

[a] The maximum 1-hour and annual NO_2 concentrations include ambient NO_2 ratios of 0.80 (EPA, 2011) and 0.75 (EPA, 2005), respectively.

[b] Allowable change in air quality concentration per emission unit per SCAQMD Rule 2005, Appendix A.

[c] Background concentrations were the highest concentrations monitored during 2011 through 2013.

4.2.2 Regulation XVII (Prevention of Significant Deterioration [PSD])

To demonstrate compliance with SCAQMD Regulation XVII, operation of the HBEP was modeled using the stack parameters, emission rates, and building parameters from Appendix C, Tables 1, 2, and 3, respectively. As with the Rule 2005 assessment, the particular operational scenario selected for each combustion unit was chosen based on the load analysis results. In other words, only the parameters from the operational scenarios leading to the worst-case 1-hour and annual NO_2, 1-hour and 8-hour CO, and 24-hour and annual PM_{10} impacts were used. However, for 24-hour PM_{10}, the scenario contributing the maximum impact had both GE Frame 7FA.05s operating at 44 percent load for 24 hours per day. Because this is an unlikely scenario, refined modeling was performed assuming one GE Frame 7FA.05 would operate 24 hours per day at 44 percent load and one GE Frame 7FA.05 would operate 20 hours per day at 44 percent load and 4 hours per day at 75 percent load. The results are presented in Appendix C, Table 6 and were used to identify the maximum impacts described below.

As shown in Table 4-5, the maximum predicted 1-hour CO, 8-hour CO, annual NO_2, 24-hour PM_{10}, and annual PM_{10} impacts from operation of the HBEP are below the Class II significance impact levels (SILs), Class II PSD Increment Standards, and significant monitoring concentrations. Therefore, additional analysis of 1-hour CO, 8-hour CO, annual NO_2, 24-hour PM_{10}, and annual PM_{10} impacts is not required. However, the maximum predicted 1-hour NO_2 impacts from operation of the HBEP exceed the Class II SIL, with a radius of impact with predicted concentrations greater than 7.52 micrograms per cubic meter ($\mu g/m^3$) of 3.8 kilometers (km). Therefore, the cumulative impacts of the HBEP and competing sources were assessed for all receptors where the HBEP impacts alone exceeded the 1-hour NO_2 SIL, as described below.

TABLE 4-5
HBEP Predicted Impacts Compared to the PSD Air Quality Impact Standards

Pollutant/Averaging Time	Maximum Modeled Concentration, $\mu g/m^3$	Significant Impact Level, $\mu g/m^3$	PSD Class II Increment Standard, $\mu g/m^3$	Significant Monitoring Concentration, $\mu g/m^3$
CO (1-hour)	631	2,000	N/A	N/A
CO (8-hour)	149	500	N/A	575
NO_2 (1-hour) [a]	94.5	7.52 [c]	N/A	N/A
NO_2 (Annual) [a]	0.59	1.0	25	14
PM_{10} (24-hour) [b]	4.97	5.0	30	10
PM_{10} (Annual)	0.64	1.0	17	N/A

[a] The maximum 1-hour and annual NO_2 concentrations include ambient NO_2 ratios of 0.80 (EPA, 2011) and 0.75 (EPA, 2005), respectively.

[b] The 24-hour PM_{10} concentration is based on one GE Frame 7FA.05 turbine operating 24 hours per day at 44 percent load and one GE Frame 7FA.05 turbine operating 20 hours per day at 44 percent load and 4 hours per day at 75 percent load.

[c] The SIL for 1-hour NO_2 is based on SCAQMD correspondence.

Note:

N/A = not applicable (i.e., no standard)

To assess the cumulative impacts of the HBEP and competing sources, operation of the HBEP was modeled with concurrent operation of the competing sources listed below, which were approved by the SCAQMD on October 8, 2013[3]:

- HBGS Units 1 and 2
- Orange County Sanitation – Fountain Valley
- Orange County Sanitation – Huntington Beach
- Beta Offshore
- Shipping Lanes

The stack parameters for each unit included in the competing source assessment are presented in Appendix C, Table 7. Stack parameters presented include source coordinates, elevation, stack height, temperature,

[3] Source parameters and emissions rates for all competing sources, with the exception of HBGS, were provided by SCAQMD.

exit velocity, and stack diameter for point sources and elevation, release height, and horizontal and vertical dimensions for volume sources. The 1-hour NO_2 emission rates (in g/s and lb/hr) for each unit included in the competing source assessment are presented in Appendix C, Table 8. Note that the stack parameters and emission rates used for the HBEP were selected based on the load analysis results. In other words, only the parameters from the operational scenarios leading to the worst-case federal 1-hour NO_2 impacts were used. The building parameters were taken from Appendix C, Table 3. The competing source assessment results are presented in Appendix C, Table 9 and were used to identify the maximum impacts described below.

The receptor grid used in the competing source assessment modeling, shown in Figure 4-1, includes only those receptors in which the worst-case HBEP 1-hour NO_2 impacts exceeded the SIL. In other words, only those receptors where the five-year average of modeled impacts exceed the SIL were included.

Table 4-6 presents a summary of the predicted cumulative 1-hour NO_2 impacts from operation of the HBEP and competing sources, as well as a comparison to the National Ambient Air Quality Standard (NAAQS). As shown, the predicted HBEP cumulative impacts, including a representative background NO_2 concentration, are below the NAAQS. Therefore, operation of the HBEP will not cause or contribute to a violation of the NAAQS.

TABLE 4-6
HBEP and Competing Source Predicted 1-hour NO_2 Impacts Compared to the NAAQS

Pollutant	Averaging Time	Total Predicted Concentration, $\mu g/m^3$ [a]	NAAQS, $\mu g/m^3$
NO_2	1-hour	144	188

[a] The total predicted concentration for the federal 1-hour NO_2 standard is the 5-year average, high-8th-high modeled concentration paired with 98th percentile seasonal hour-of-day background concentrations for 2010 through 2012.

To assess potential impacts to Class I areas, operation of the HBEP was modeled using the stack parameters, emission rates, and building parameters from Appendix C, Tables 1, 2, and 3, respectively. As with the Rule 2005 assessment, the particular operational scenario selected for each combustion unit was chosen based on the load analysis results. In other words, only the parameters from the operational scenarios leading to the worst-case annual NO_2 and 24-hour and annual PM_{10} impacts were used. The results are presented in Appendix C, Table 10 and were used to identify the maximum impacts described below.

Table 4-7 presents a summary of the predicted annual NO_2, 24-hour PM_{10}, and annual PM_{10} impacts and a comparison to the PSD Class I Increment Standards. The predicted impacts from operation of the HBEP are below the SILs. Therefore, the HBEP would have a negligible impact at the more distant Class I areas.

TABLE 4-7
HBEP Predicted Impacts Compared to the Class I SIL and PSD Class I Increment Standards

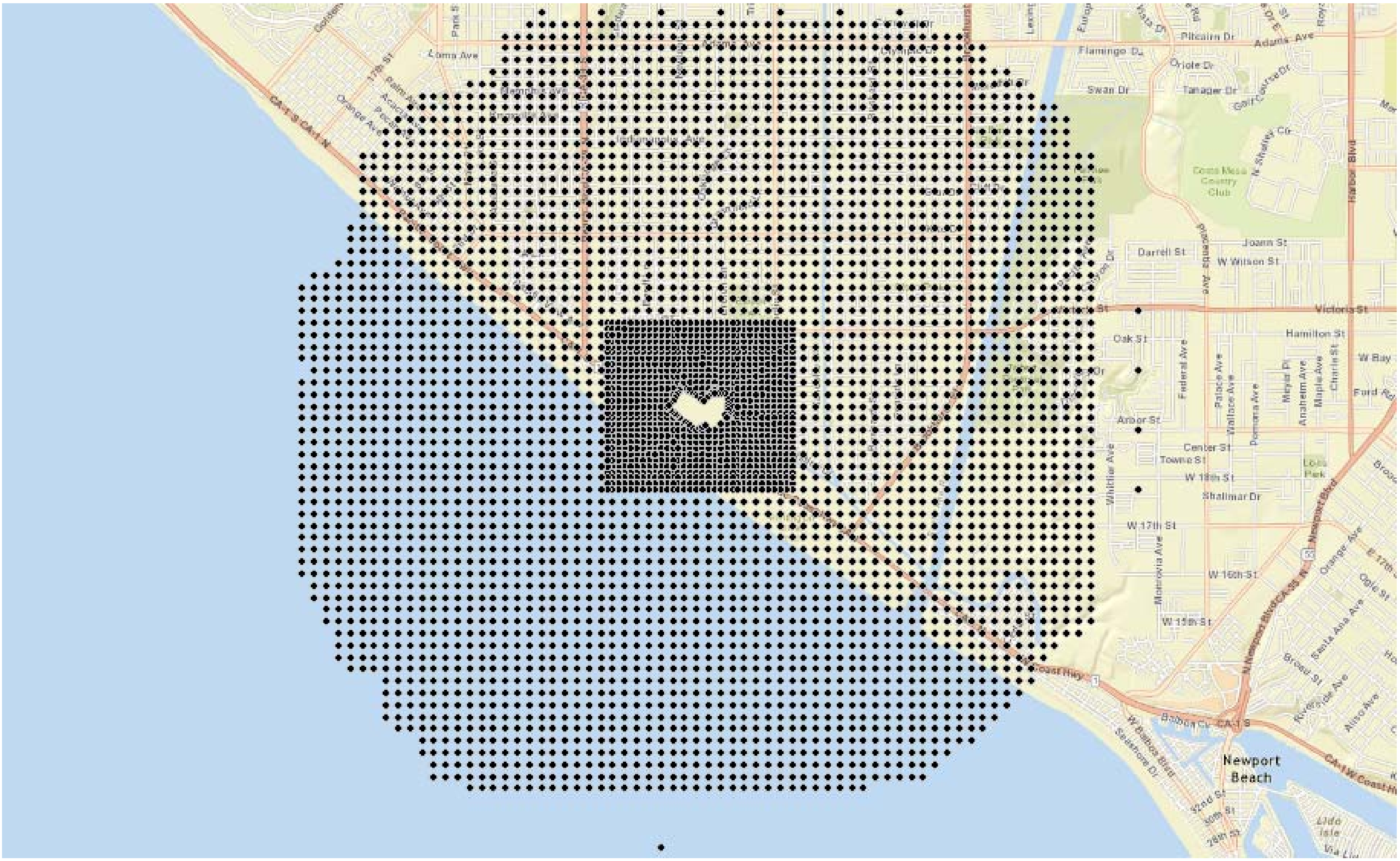
Pollutant/Averaging Time	Maximum Modeled Concentration at 50 km, $\mu g/m^3$	Significant Impact Level, $\mu g/m^3$	PSD Class I Increment Standard, $\mu g/m^3$
NO_2 (Annual) [a]	0.0057	0.1	2.5
PM_{10} (24-hour)	0.042	0.3	2.0
PM_{10} (Annual)	0.0057	0.2	1.0

[a] The annual NO_2 concentration includes an ambient NO_2 ratio of 0.75 (EPA, 2005).

4.2.3 Class II Visibility

A visibility analysis for Class II areas within 50 km of the HBEP was performed using the VISCREEN plume modeling program per the procedures outlined in the *Workbook for Plume Visual Impact Screening and Analysis* (U.S. Environmental Protection Agency [EPA], 1992), as described in Section 6.1.1 of the *Dispersion Modeling Protocol for the Amended Huntington Beach Energy Project*. Please note that Level I and Level II assessments were conducted using criterion for Class I areas, as no criteria exist for Class II areas. Therefore,

Huntington Beach Energy Project
Figure 4-1
Competing Source Receptor Grid
March 2016



the visibility assessment was conducted using overly conservative assumptions for Class II areas. However, even using the conservative approach, the modeled results from the visual assessment demonstrate that the HBEP would not adversely affect visibility at nearby Class II areas.

Table 4-8 summarizes the VISCREEN Level I modeled results for each Class II area evaluated, with the exception of Huntington Beach State Park (HB State Park), which was evaluated separately and is described in the following subsection. As shown, the maximum modeled values for color difference and contrast are presented for inside the area analyzed, regardless of the VISCREEN modeled lines of sight for the observer.

TABLE 4-8
HBEP Level I VISCREEN Results

Class II Area	Minimum Distance (km)	Maximum Distance (km)	Variable	Sky	Terrain	Criteria [a]
Crystal Cove State Park	12.5	18.4	Color Difference	**2.510**	**5.419**	2
			Contrast	0.03	0.029	0.05
Water Canyon National Park	33.6	42.9	Color Difference	1.11	1.658	2
			Contrast	0.013	0.014	0.05
Chino Hills State Park	35.8	41.6	Color Difference	0.912	1.525	2
			Contrast	0.011	0.014	0.05
San Mateo Canyon Wilderness Area	44.3	57.6	Color Difference	0.703	1.113	2
			Contrast	0.008	0.011	0.05

Bold values exceed the Class I significant impact criterion.

[a] Levels of concern for Class I areas were used because no specific requirements or criteria exist for assessing Class II visibility impacts (Federal Land Managers [FLM], 2010).

As shown in Table 4-8, the Level I assessment results demonstrate that the HBEP would be below the significance criterion for both color difference and contrast at Water Canyon National Park, Chino Hills State Park, and San Mateo Wilderness Area. The Level I assessment did, however, exceed the criterion for color difference at Crystal Cove State Park and, therefore, required a Level II assessment. The Level II assessment results are summarized in Table 4-9.

TABLE 4-9
HBEP Level II VISCREEN Results

Class II Area	Minimum Distance (km)	Maximum Distance (km)	Wind Speed (m/s) [a]	Stability [a]	Variable	Sky	Terrain	Criteria [b]
Crystal Cove State Park	12.5	18.4	3	D	Color Difference	0.265	0.644	2
					Contrast	0.003	0.003	0.05

Bold values exceed the Class I significant impact criterion.

[a] The Joint Frequency Distribution table used to calculate the wind speed and stability for the Level II assessment is presented in Appendix D, Table 1.

[b] Levels of concern for Class I areas were used because no specific requirements or criteria exist for assessing Class II visibility impacts (FLM, 2010).

Note:

m/s = meter(s) per second

As shown in Table 4-9, the Level II assessment results for Crystal Cove State Park are below the conservative Class I area criterion for both color difference and contrast; therefore, the HBEP would not adversely affect visibility at nearby Class II areas.

Huntington Beach State Park. The HB State Park Class II area is a small swath of land which extends along the California Coast for 3.4 km, located directly west of the HBEP. The HB State Park is bordered to the west by the Pacific Ocean and bordered to the east by California State Highway 1. On average, the width of the HB State Park is about 160 meters (m), with a range of widths between 130 m to 230 m. A plume blight analysis using VISCREEN would evaluate the change in background contrast and color affecting an observer looking through the center of a plume. The viewer's background *within* the limited area of interest can be defined as either an object (mountain side or building) or sky. A viewer standing on the border of the HB State Park looking across the beach or up the beach would not have any terrain or building to observe *within* the HB State Park. Therefore, the only feature *within* the HB State Park that would be observable is the sky. Areas outside of the HB State Park have not been identified and, therefore, were not evaluated.

The HB State Park is open between the hours of 6:00 am and 10:00 pm.[4] Therefore, the frequency of atmospheric stability class and winds blowing from the HBEP across the HB State Park were determined for times when the HB State Park would be open. Table 4-10 provides a breakdown of the frequency of atmospheric stability class and winds blowing across the HB State Park toward the sectors of 120 degrees to 305 degrees from true north, based on the National Weather Service (NWS) John Wayne Airport meteorological data used throughout the air quality impacts analysis.

TABLE 4-10
Frequency and Stability of Winds Blowing from the HBEP Toward HB State Park Between 6 am and 10 pm

Stability	Count [a]	Average Wind Speed (m/s)	Frequency (%) [b]
F	868	1.6	2.0
E	720	2.0	1.6
D	1,081	3.3	2.5
C	554	2.5	1.3
B	316	1.8	0.7
A	14	1.8	0.0

[a] The count of hours is based on the 5-year AERMET meteorological dataset.

[b] The frequency is based on a total of 43,824 hours in the 5-year AERMET meteorological dataset.

Air dispersion modeling categorizes the effects of atmospheric turbulence and wind speed into six different atmospheric stability classes, A through F. Of these, A is the most unstable and F is the most stable. A plume is most likely to remain cohesive in E or F stability conditions and least likely to remain cohesive in A or B stability conditions; however, due to the close proximity of the HBEP to the HB State Park, the A or B stability conditions may not have the distance or time to disperse the plume downwind of the HBEP exhaust stacks. Hours associated with the E and F atmospheric stability classes would, by definition, never occur during daylight hours.[5] Therefore, none of the Table 4-10 values associated with E or F stability conditions would have an effect on visibility at the HB State Park as those conditions would not occur during the daytime hour assessment period.

A VISCREEN Class II visibility analysis of the remaining atmospheric stability classes (A through D) and corresponding wind speeds identified in Table 4-10 was conducted. The procedures outlined in the *Workbook for Plume Visual Impact Screening and Analysis* (EPA, 1992) were followed to conduct the analysis. Based on the frequency of winds blowing across the HB State Park from the HBEP and the modeled impacts, as presented in Table 4-11, an observer looking across the HB State Park would have the sky

[4] Please refer to http://www.parks.ca.gov/?page_id=643 for details.

[5] D.B. Turner, *Workbook of Atmospheric Dispersion Estimates*, at page 6 (1969).

background Class I thresholds exceeded for either contrast or color difference during hours associated with stability classes A, B, C, and D. On average, this corresponds to 4.5 percent of the time or 395 hours[6] per year when the sky background would be obstructed compared to the extremely conservative Class I area thresholds.

TABLE 4-11
HBEP VISCREEN Analysis Results for HB State Park

Stability	VISCREEN Results (Contrast/Color Difference) [a]
D	0.098/7.659
C	0.076/5.976
B	0.182/10.162
A	0.14/7.889

[a] Class I criteria of |0.05| for contrast and 2.0 for color difference.

[b] Results presented are equivalent for either a Level I or Level II assessment. The Joint Frequency Distribution table used to calculate the wind speed and stability for the Level II assessment is presented in Appendix D, Table 2.

As noted above, this analysis is extremely conservative and only evaluates the HBEP's plume impacts on color difference and contrast in comparison to the more restrictive, and not necessarily appropriate, Class I area thresholds. Also, the VISCREEN model only allows for one source or exhaust stack to be evaluated. Therefore, in order to assess all 5 HBEP exhaust stacks, it was assumed that emissions from all 5 exhaust stacks are emitted from a single exhaust stack, which overestimates the HBEP's visibility impacts. Additionally, this analysis conservatively used the annual average background visual range at the HB State Park, when visual impacts associated with inland emission sources or regional haze may have a greater negative impact on the background visual range than the HBEP. Specifically, fires on the beach within the specified fire pits may have a greater negative impact on visibility at the HB State Park compared to the HBEP. This analysis also conservatively does not discount present natural weather conditions, such as fog or rain, where the background would be naturally obscured and a plume from the HBEP would not be perceptible.

Therefore, based on the limited and infrequent number of perceptibility impacts compared to the conservative Class I criteria identified using the VISCREEN model, the HBEP would not cause an adverse impairment to perceptibility at the HB State Park.

4.2.4 Fumigation

To assess both inversion break-up and shoreline fumigation impacts, modeling was performed using the stack parameters and emission rates from Appendix C, Tables 1 and 2, respectively. As with the Rule 2005 assessment, the particular operational scenario selected for each combustion unit modeled was chosen based on the load analysis results. In other words, only the parameters from the operational scenarios leading to the worst-case 1-hour NO_2, 1-hour, 3-hour, and 24-hour SO_2, 1-hour and 8-hour CO, and 24-hour PM_{10} impacts were used. The effects of fumigation on the maximum modeled impacts were evaluated using AERSCREEN (version 15181). Tables 4-12 and 4-13 present the potential HBEP operational inversion break-up and shoreline fumigation impacts, respectively. As indicated in Table 4-12, the inversion break-up fumigation CO, NO_2, SO_2, and PM_{10} concentrations combined with the background concentrations do not exceed the CAAQS or NAAQS, as applicable. Therefore, inversion break-up fumigation impacts of CO, NO_2, SO_2, and PM_{10} would be less than significant. As indicated in Table 4-13, this is the same result for shoreline

[6] Cumulative frequency of stability classes A, B, C, and D multiplied by 8,760 hours per year.

fumigation impacts. Details of the inversion break-up and shoreline fumigation modeling are presented in Appendix E.

TABLE 4-12
HBEP Operation Impacts Analysis – Inversion Break-up Fumigation Impacts Analysis Results Compared to the Ambient Air Quality Standards

Pollutant	Averaging Time	AERSCREEN Fumigation Result, $\mu g/m^3$	Background Concentration, $\mu g/m^3$ [a]	Total Predicted Concentration, $\mu g/m^3$	CAAQS, $\mu g/m^3$	NAAQS, $\mu g/m^3$
NO_2 [b]	1-hour (max)	85.3	142	227	339	—
SO_2	1-hour (max)	5.92	20.2	26.1	655	—
	3-hour	5.78	20.2	26.0	—	1,300
	24-hour	3.18	5.20	8.38	105	—
CO	1-hour	529	3,321	3,850	23,000	40,000
	8-hour	178	2,519	2,697	10,000	10,000
PM_{10}	24-hour	10.6	51.0	61.6	N/A	150

[a] Background concentrations were the highest concentrations monitored during 2011 through 2013.

[b] The 1-hour NO_2 concentration includes an ambient NO_2 ratio of 0.80 (EPA, 2011).

Note:

N/A = not applicable (i.e., area is designated nonattainment such that a comparison to the standard is not required)

TABLE 4-13
HBEP Operation Impacts Analysis – Shoreline Fumigation Impacts Analysis Results Compared to the Ambient Air Quality Standards

Pollutant	Averaging Time	AERSCREEN Fumigation Result, $\mu g/m^3$	Background Concentration, $\mu g/m^3$ [a]	Total Predicted Concentration, $\mu g/m^3$	CAAQS, $\mu g/m^3$	NAAQS, $\mu g/m^3$
NO_2 [b]	1-hour (max)	47.2	142	189	339	—
SO_2	1-hour (max)	3.52	20.2	23.7	655	—
	3-hour	3.55	20.2	23.8	—	1,300
	24-hour	2.13	5.20	7.33	105	—
CO	1-hour	125	3,321	3,446	23,000	40,000
	8-hour	37.6	2,519	2,557	10,000	10,000
PM_{10}	24-hour	10.5	51.0	61.5	N/A	150

[a] Background concentrations were the highest concentrations monitored during 2011 through 2013.

[b] The 1-hour NO_2 concentration includes an ambient NO_2 ratio of 0.80 (EPA, 2011).

Note:

N/A = not applicable (i.e., area is designated nonattainment such that a comparison to the standard is not required)

SECTION 5

5 Public Health Impacts Analysis

A health risk assessment (HRA) was conducted to assess the potential public health impacts and exposure associated with airborne emissions from routine operation of the HBEP. As applicable, the HRA results were also compared to the limits for excess cancer risk, cancer burden, and noncancer chronic and acute hazard indices contained within SCAQMD Rule 1401.

The air toxics emissions for the GE Frame 7FA.05s, GE LMS 100PBs, and auxiliary boiler were calculated consistent with the emission factors presented in Section 3.4 and a natural gas heat content of 1,050 Btu/cf. These emission rates were used to conduct an HRA for routine operation of the HBEP, the results of which are discussed below.

The *Hotspots Analysis Reporting Program Version 2* was used to perform the HRA, based on model inputs similar to those used for the criteria pollutant modeling, with the following SCAQMD-specific triggers:

- Mandatory minimum pathways and homegrown pathways were selected to evaluate cancer risk and chronic hazard index at the Point of Maximum Impact (PMI), Maximum Exposed Individual Resident (MEIR), and sensitive receptor
- Worker pathways (inhalation, dermal, and soil) were selected to evaluate cancer risk and chronic hazard index at the Maximum Exposed Individual Worker (MEIW)
- The Draft Risk Management Policy (RMP) Derived method was used to calculate cancer risk at the PMI, MEIR, and sensitive receptor, consistent with SCAQMD guidance (SCAQMD, 2015); the Office of Environmental Health Hazard Assessment (OEHHA) Derived method was used for all remaining scenarios

A summary of the excess cancer risk and chronic and acute hazard indices at the PMI, as well as the maximum predicted public health impacts for worker, residential, and sensitive receptors, has been included in Tables 5-1 and 5-2. The results in Table 5-1 represent a comparison of the total predicted HBEP impact to the SCAQMD's California Environmental Quality Act (CEQA) significance thresholds, while the results in Table 5-2 represent the predicted risk for each individual emission unit in accordance with SCAQMD Rule 1401.

As shown in Table 5-1, predicted impacts for the HBEP are below the significance thresholds of 10 in 1 million for excess cancer risk and chronic and acute hazard index of 1.0. Therefore, the predicted health risks associated with the HBEP will bne less than significant.

TABLE 5-1
Operational Health Risk Assessment Summary: Facility [a]

Risk [b]	Receptor Number	Receptor Coordinates (UTM, m) Easting	Receptor Coordinates (UTM, m) Northing	Value
Cancer Risk at the PMI (per million) [c]	681	409700	3723500	4.26
Cancer Risk at the MEIR (per million) [c]	815	410000	3723700	2.68
Cancer Risk at a Sensitive Receptor (per million) [c]	12905	409969.5	3724223	1.49
Cancer Risk at the MEIW (per million) [d]	681	409700	3723500	0.15
Chronic Hazard Index at the PMI	681	409700	3723500	0.011
Chronic Hazard Index at the MEIR	815	410000	3723700	0.0068
Chronic Hazard Index at a Sensitive Receptor	12905	409969.5	3724223	0.0038
Chronic Hazard Index at the MEIW	681	409700	3723500	0.011

TABLE 5-1
Operational Health Risk Assessment Summary: Facility [a]

Risk [b]	Receptor Number	Receptor Coordinates (UTM, m)		Value
		Easting	Northing	
Acute Hazard Index at the PMI	552	409600	3723300	0.056
Acute Hazard Index at the MEIR	719	410000	3723550	0.019
Acute Hazard Index at a Sensitive Receptor	12902	410027.1	3723140	0.013
Acute Hazard Index at the MEIW	552	409600	3723300	0.056

[a] The results in Table 5-1 represent the combined predicted risk for all five combustion units operating simultaneously.

[b] A facility with an excess cancer risk less than 10 in 1 million individuals is considered to be less than significant. A chronic or acute hazard index less than 1.0 for the facility is considered to be a less-than-significant health risk.

[c] Cancer risk values are based on the Draft RMP methodology.

[d] Cancer risk values are based on the OEHHA Derived methodology.

Note:

UTM = Universal Transverse Mercator

As shown in Table 5-2, the GE Frame 7FA.05s exceed the incremental increase in cancer risk threshold of 1 in 1 million; therefore, best available control technology for toxics (T-BACT) will be required for these units. The GE LMS 100PBs and auxiliary boiler do not trigger the regulatory requirement for T-BACT as their predicted impacts are below the incremental increase in cancer risk threshold of 1 in 1 million. Although not required in all cases, the emission control technologies included in the HBEP for all emission sources are considered to be T-BACT. All sources have predicted impacts below the chronic and acute hazard index of 1.0, resulting in less-than-significant impacts with controls.

It should be noted that the maximum impacts reported in Table 5-1 represent the maximum predicted impacts at one receptor from all sources combined. In contrast, the maximum impacts reported for each individual source in Table 5-2 may occur at different receptors. Therefore, the HBEP totals in Table 5-2 are not directly additive and should not be directly compared to the results presented in Table 5-1.

Because the predicted cancer risk, per individual unit, is greater than 1 in 1 million, the cancer burden was calculated for each census block receptor consistent with SCAQMD guidance (SCAQMD, 2015). The cancer burden for the HBEP was estimated at 8.8×10^{-9}, which is well below the significance threshold of 0.5. Therefore, the HBEP will not significantly increase cancer burden in the vicinity of the site.

TABLE 5-2
Operational Health Risk Assessment Summary: Individual Units [a]

Risk [b]	GE Frame 7FA.05-01	GE Frame 7FA.05-02	GE LMS 100PB-01	GE LMS 100PB-02	Auxiliary Boiler
Cancer Risk at the PMI (per million) [c]	1.71	2.38	0.086	0.086	0.18
Cancer Risk at the MEIR (per million) [c]	1.20	1.36	0.059	0.054	0.026
Cancer Risk at a Sensitive Receptor (per million) [c]	0.66	0.74	0.046	0.046	0.0048
Cancer Risk at the MEIW (per million) [d]	0.062	0.086	0.0031	0.0031	0.0054
Chronic Hazard Index at the PMI	0.0043	0.0060	0.00022	0.00022	0.00056
Chronic Hazard Index at the MEIR	0.0030	0.0035	0.00015	0.00014	0.000080
Chronic Hazard Index at a Sensitive Receptor	0.0017	0.0019	0.00012	0.00012	0.000015
Chronic Hazard Index at the MEIW	0.0043	0.0060	0.00022	0.00022	0.00056
Acute Hazard Index at the PMI	0.022	0.032	0.0017	0.0017	0.0011
Acute Hazard Index at the MEIR	0.0080	0.0090	0.0012	0.0012	0.00036
Acute Hazard Index at a Sensitive Receptor	0.0047	0.0065	0.00066	0.00070	0.00033
Acute Hazard Index at the MEIW	0.022	0.032	0.0017	0.0017	0.0011

[a] The results in Table 5-2 represent the predicted excess risk for each individual emission unit in accordance with SCAQMD Rule 1401.

[b] A source with an excess cancer risk less than 1 in 1 million individuals is considered to be less than significant. A source with an excess cancer risk less than 10 in 1 million is considered less than significant if T-BACT is installed. A chronic or acute hazard index less than 1.0 for each source is considered to be a less-than-significant health risk.

[c] Cancer risk values are based on the Draft RMP Derived methodology.

[d] Cancer risk values are based on the OEHHA Derived methodology.

SECTION 6

6 Regulatory Evaluation

6.1 Laws, Ordinances, Regulations, and Standards

The Clean Air Act (CAA), implemented by the EPA, requires major new and modified stationary sources of air pollution to obtain a construction permit prior to commencing construction through a program known as the federal New Source Review (NSR) program. The requirements of the NSR program are dependent on whether the air quality in the area where the new source (or modified source) is being located attains the NAAQS. The program that applies in areas that are in attainment of the NAAQS is the PSD. The program that applies to areas where the air does not meet the NAAQS (termed nonattainment areas) is the nonattainment NSR.

EPA implements the NSR program through regional offices. Arizona, California, Hawaii, Nevada, and specific Pacific trust territories are administrated out of the EPA Region IX office in San Francisco. EPA typically delegates its NSR, Title V, and Title IV authority to local air quality agencies that have sufficient regulatory structure to implement these programs consistent with requirements of the CAA and implementing regulations. The SCAQMD has been delegated several of these programs, including the authority to administer the PSD program.

The California Air Resources Board (ARB) was established by the state legislature in 1967 with the purpose of attaining and maintaining healthy air quality, conducting research into causes and solutions to air pollution, and addressing the impacts that motor vehicles have on air quality. To this end, ARB implements the following programs:

- Establish and enforce motor vehicle emission standards, including fuel standards.
- Monitor, evaluate, and set health-based air quality standards.
- Conduct research to solve air pollution problems.
- Establish TAC control measures.
- Oversee and assist local air quality districts.

Air pollution control districts were established based on meteorological and topographical factors. The districts were established to enforce air pollution regulations for the purpose of attaining and maintaining all state and federal ambient air quality standards. The districts regulate air emissions by issuing air permits to stationary sources of air pollution in compliance with approved regulatory programs. Each district promulgates rules and regulations specific to air quality issues within its jurisdiction. The air emissions sources regulated by each district vary. The types of air pollution sources that might be regulated include manufacturers, power plants, refineries, gasoline service stations, and auto body shops.

The applicable laws, ordinances, regulations, and standards (LORS) and compliance with these requirements are discussed in more detail in the following sections.

6.2 Federal LORS

EPA promulgates and enforces federal air quality regulations, with Region IX administering the federal air programs in California. The federal CAA provides the legal authority to regulate air pollution from stationary sources. The applicable federal regulations are summarized in Table 6-1, along with the agency responsible for administration of the regulation.

TABLE 6-1
Applicable Federal Laws, Ordinances, Regulations, and Standards for Protection of Air Quality

LORS	Purpose	Regulating Agency	Applicability/Compliance Strategy
Title 40 CFR Part 50	Establishes ambient air quality standards for criteria pollutants.	EPA Region IX	The Project Owner conducted a dispersion modeling analysis to determine if the HBEP would exceed the state or federal ambient air quality standards. Dispersion modeling indicates the HBEP will not exceed the state or federal ambient air quality standards for the attainment pollutants during normal operations. Nonattainment pollutant emissions will be mitigated consistent with the SCAQMD's State Implementation Plan-Approved NSR program.
Title 40 CFR Part 51, NSR (SCAQMD Regulation XIII)	Requires pre-construction review and permitting of new or modified stationary sources of air pollution to allow industrial growth without interfering with the attainment and maintenance of ambient air quality standards.	SCAQMD with EPA Region IX Oversight	Requires NSR facility permitting for construction or modification of specified stationary sources. NSR applies to pollutants for which ambient concentration levels are higher than NAAQS. The NSR requirements are implemented at the local level with EPA oversight (SCAQMD Regulation XIII). A Permit to Construct (PTC) and Permit to Operate (PTO) application will be obtained from SCAQMD prior to HBEP construction. As a result, the compliance requirements of 40 CFR 51 will be met.
Title 40 CFR Part 52, PSD	The PSD program allows new sources of air pollution to be constructed, or existing sources to be modified in areas classified as attainment, while preserving the existing ambient air quality levels, protecting public health and welfare, and protecting Class I Areas (e.g., national parks and wilderness areas).	SCAQMD with EPA Region IX Oversight	The PSD requirements apply on a pollutant-specific basis to any project that is a new major stationary source or a major modification to an existing major stationary source. SCAQMD classifies an unlisted source (which is not in the specified 28 source categories) that emits or has the potential to emit 250 tpy of any pollutant regulated by the CAA as a major stationary source. For listed sources, the threshold is 100 tpy. NO_x, VOC, or SO_2 emissions from a modified major source are subject to PSD if the cumulative emission increases for either pollutant exceeds 40 tpy. In addition, a modification at a non-major source is subject to PSD if the modification itself would be considered a major source. In May 2010, EPA issued the GHG permitting rule officially known as the "Prevention of Significant Deterioration and Title V Greenhouse Gas Tailoring Rule" (GHG Tailoring Rule), in which EPA defined six GHG pollutants (collectively combined and measured as CO_2e) as NSR-regulated pollutants. Under the GHG Tailoring Rule, new projects that emit GHG pollutants above certain threshold levels would be subject to PSD permitting beginning in July 2011. However, in July 2014, the U.S. Supreme Court ruled that EPA could not regulate GHG emissions alone. As a result, new sources with a GHG PTE equal to or greater than 100,000 tpy of CO_2e are no longer required to obtain a PSD permit specifically for GHG emissions. If the new source would require a PSD permit as a result of criteria pollutant PTE, a BACT analysis to evaluate GHG emissions control would still be required. The HBEP is a natural-gas-fired, combined-cycle and simple-cycle, air-cooled electrical generating facility and would be considered one of the 28 source categories. Therefore, the emission rates were compared to the 100 tpy threshold. As shown in Table 3-14, the emission increase in CO and NO_x would exceed the 100 tpy threshold per pollutant. Therefore, the HBEP would be subject to PSD analysis requirements for CO and NO_x. Since the HBEP exceeds the PSD thresholds for several criteria pollutants, a BACT analysis for GHG emissions control is required.

TABLE 6-1
Applicable Federal Laws, Ordinances, Regulations, and Standards for Protection of Air Quality

LORS	Purpose	Regulating Agency	Applicability/Compliance Strategy
			A PSD application was submitted to the SCAQMD and EPA, which included a BACT analysis for GHG emissions control.
Title 40 CFR Part 60, Subpart KKKK (SCAQMD Regulation IX)	Establishes national standards of performance for new or modified facilities in specific source categories.	SCAQMD with EPA Region IX Oversight	40 CFR 60 Subpart KKKK – NO_x Emission Limits for New Stationary Combustion Turbines applies to all new combustion turbines that commence construction, modification, or reconstruction after February 18, 2005. The Rule requires natural-gas-fired turbines with a heat input greater than 850 MMBtu/hr to meet an NO_x emission limit of 15 ppm at 15 percent O_2, and an SO_2 limit of 0.060 lb/MMBtu. Alternatively, a fuel sulfur limit of 500 part(s) per million by weight (ppmw) could be met. Stationary combustion turbines regulated under this subpart would be exempt from the requirements of Subpart GG. The proposed combined-cycle and simple-cycle CTGs will use DLN burners with SCR systems and pipeline-quality natural gas and will comply with both the NO_x and SO_2 limits. The NO_x and SO_2 emissions from the combined-cycle CTGs will be 2 ppm at 15 percent O_2 and 0.0022 lb/MMBtu, respectively. The NO_x and SO_2 emissions from the simple-cycle CTGs will be 2.5 ppm at 15 percent O_2 and 0.0018 lb/MMBtu, respectively. The certified NO_x Continuous Emission Monitoring System (CEMS) will ensure compliance with the standard. Records of natural gas use and fuel sulfur content will ensure compliance with the SO_2 limit.
Title 40 CFR Part 60, Subpart Dc (SCAQMD Regulation IX)	Establishes national standards of performance for new or modified facilities in specific source categories.	SCAQMD with EPA Region IX Oversight	40 CFR 60 Subpart Dc – Standards of Performance for Small Industrial-Commercial-Institutional Steam Generating Units applies to steam generating units with design heat input rates between 10 and 100 MMBtu/hr that were installed after June 9, 1989. Because the HBEP's auxiliary boiler will be fired exclusively on natural gas, the Project Owner will only be required to maintain monthly fuel consumption records for a minimum of two years.
Title 40 CFR Part 60, Subpart TTTT	Establishes a new source performance standard for electrical generating facilities.	SCAQMD with EPA Region IX Oversight	EPA promulgated New Source Performance Standard Subpart TTTT, which includes two potentially applicable GHG emission limits for newly constructed combustion turbines. A newly constructed or reconstructed stationary combustion turbine that supplies more than its design efficiency times its potential electric output as net-electric sales on a 3-year rolling average basis and combusts more than 90 percent natural gas on a heat input basis on a 12-operating-month rolling average basis must meet a limit of 450 kilograms (kg) of CO_2 per MWh of gross energy output (1,000 lb CO_2/MWh), or 470 kg of CO_2 per MWh of net energy output (1,030 lb CO_2/MWh). A newly constructed or reconstructed stationary combustion turbine that supplies its design efficiency times its potential electric output or less as net-electric sales on a 3-year rolling average basis and combusts more than 90 percent natural gas on a heat input basis on a 12-operating-month rolling average basis must meet a limit of 50 kg CO_2 per gigajoule (GJ) of heat input (120 lb CO_2/MMBtu). The applicable emission standard depends on whether a combustion turbine sells more electricity than its potential electrical output, which is calculated by multiplying the design

TABLE 6-1
Applicable Federal Laws, Ordinances, Regulations, and Standards for Protection of Air Quality

LORS	Purpose	Regulating Agency	Applicability/Compliance Strategy
			efficiency and the potential electrical output, and combusts more than 90 percent natural gas. Assuming the combined-cycle power block will generate more electricity than the potential electrical output, the HBEP will need to comply with the 1,000 lb CO_2/MWh emission limit. The HBEP is exclusively fueled by natural gas with a combined-cycle power block design efficiency of approximately 56 percent. The HBEP's combined-cycle GHG efficiency is estimated at 947 lb CO_2/MWh-Net, assuming an 8 percent performance degradation, which complies with Subpart TTTT's emission limit of 1,000 lb CO_2/MWh. See Appendix A, Table 18 for details. The HBEP simple-cycle power block design efficiency is 41 percent and the potential HBEP simple-cycle power block's electrical output threshold is 718,320 MWh-Net (based on the design efficiency of 41 percent and the net electrical output of 200 MW for 8,760 hours per year). The HBEP simple-cycle power block's potential annual net electric sales are 400,200 MWh-Net, assuming 200 MWs-Net of generation and 2,001 hours per year of operation (1,750 operating hours plus 175 startup and 76 shutdown hours). Since the annual net electric sales are less than the electric output threshold, the HBEP simple-cycle power block must comply with Subpart TTTT emission limit of 50 kg CO_2 per GJ of heat input (120 lb CO_2/MMBtu). As a natural-gas fired facility, the HBEP is expected to emit CO_2 at a rate of 117 lb CO_2/MMBtu, thereby complying with the applicable emission limit in Subpart TTTT. See Appendix A, Table 19 for details.
Title 40 CFR Part 63	Establishes national emission standards to limit emissions of HAPs or air pollutants identified by EPA as causing or contributing to the adverse health effects of air pollution but for which NAAQS have not been established from facilities in specific categories.	SCAQMD with EPA Region IX Oversight	40 CFR 63—National Emission Standards for Hazardous Air Pollutants (NESHAP) for Source Categories establishes emission standards to limit emissions of HAPs from specific source categories for Major HAP sources. Sources subject to 40 CFR 63 requirements must either use the maximum achievable control technology (MACT), be exempted under 40 CFR 63, or comply with published emission limitations. The potential NESHAP applicable to the HBEP is Subpart YYYY, which sets a formaldehyde emission limit or an operational limit of 91 part(s) per billion by volume (ppbv) for turbines. Note that Subpart JJJJJJ is not applicable to the HBEP because the auxiliary boiler will be fired exclusively with natural gas. Projects would be subject to the 40 CFR 63 requirements if the HAP PTE is greater than or equal to 25 tpy for combined HAPs and 10 tpy for individual HAPs. The HBEP is not expected to exceed these thresholds and is not subject to NESHAPs.
Title 40 CFR Part 64 (Compliance Assurance Monitoring [CAM] Rule)	Establishes onsite monitoring requirements for emission control systems.	SCAQMD with EPA Region IX Oversight	40 CFR 64—CAM requires facilities to monitor the operation and maintenance of emissions control systems and report any control system malfunctions to the appropriate regulatory agency. If an emission control system is not working properly, the CAM Rule also requires a facility to take action to correct the control system malfunction. The CAM Rule applies to emissions units with uncontrolled PTE levels greater than applicable major source thresholds. Emission control systems governed by Title V operating permits requiring continuous compliance determination methods are generally compliant with the CAM Rule. The HBEP's CTGs will have emission control systems for NO_x and CO (SCR and oxidation catalyst); the HBEP's auxiliary boiler will have emission control systems for NO_x (SCR). However, emissions of NO_x and CO from the CTGs and NO_x from the auxiliary boiler would be directly

TABLE 6-1
Applicable Federal Laws, Ordinances, Regulations, and Standards for Protection of Air Quality

LORS	Purpose	Regulating Agency	Applicability/Compliance Strategy
			measured by CEMS. Therefore, the HBEP is exempt from the CAM provisions based on the exemption in 40 CFR 64.2(b)(vi) and SCAQMD Regulation XX for NO_x.
Title 40 CFR Part 70 (SCAQMD Regulation XXX)	CAA Title V Operating Permit Program	SCAQMD with EPA Region IX Oversight	40 CFR 70—Operating Permits Program requires the issuance of operating permits that identify all applicable federal performance, operating, monitoring, recordkeeping, and reporting requirements. The requirements of 40 CFR 70 apply to facilities that are subject to New Source Performance Standards (NSPS) requirements and are implemented at the local level through SCAQMD Regulation XXX. According to Regulation XXX, Rule 3001, a facility would be required to submit a Title V application if the facility has a PTE greater than 10 tpy of NO_x or VOC, 100 tpy of SO_2, 50 tpy of CO, or 70 tpy of PM_{10} or the HAP PTE is greater than or equal to 25 tpy for combined HAPs and 10 tpy for individual HAPs. The HBEP will exceed the Title V thresholds listed in SCAQMD Rule 3001. As a result, the HBEP submitted an application to modify the existing Title V permit.
Title 40 CFR Part 72 (SCAQMD Regulation XXXI)	CAA Acid Rain Program	SCAQMD with EPA Region IX Oversight	40 CFR 72—Acid Rain Program establishes emission standards for SO_2 and NO_x emissions from electric generating units through the use of market incentives, requires sources to monitor and report acid gas emissions, and requires the acquisition of SO_2 allowances sufficient to offset SO_2 emissions on an annual basis. An acid rain facility, such as the HBEP, must also obtain an acid rain permit as mandated by Title IV of the CAA. A permit application must be submitted to SCAQMD at least 24 months before operation of the new units commences. The application must present all relevant sources at the facility, a compliance plan for each unit, applicable standards, and estimated commencement date of operation. The necessary Title IV applications will be submitted as part of the permitting process.

6.3 State LORS

ARB's primary responsibilities are to develop, adopt, implement, and enforce the state's motor vehicle pollution control program; to administer and coordinate the state's air pollution research program; to adopt and update, as necessary, the CAAQS; to review the operations of the local air pollution control districts; and to review and coordinate preparation of the State Implementation Plan for achievement of the NAAQS.

The California Health and Safety Code, Section 41700 prohibits the discharge from a facility of air pollutants that cause injury, detriment, nuisance, or annoyance to the public, that endanger the comfort, repose, health, or safety of the public, or that damage business or property.

In August 2006, the California legislature passed Assembly Bill (AB) 32, the California Global Warming Solutions Act of 2006. AB 32 requires California resource agencies to establish a comprehensive program of regulatory and market mechanisms to achieve reductions in GHG. The HBEP will be subject to AB 32, and will be required to comply with all final rules, regulations, emissions limitations, emission reduction measures, or market-based compliance mechanisms adopted under AB 32. ARB promulgated a Cap and Trade regulation to limit GHG emissions and to develop a market-based compliance mechanism for the creation, sale, and use of GHG allowances.

In addition to AB 32, Senate Bill 1368 (Perata, Chapter 598, Statutes of 2006) was signed into law on September 29, 2006. The law limits long-term investments in base load generation by the state's utilities to power plants that meet an emissions performance standard (EPS) jointly established by the California Energy Commission (CEC) and the California Public Utilities Commission (CPUC). In response, the CEC has designed regulations that establish a standard for base load generation owned by, or under long-term contract to, publicly owned utilities of 1,100 pound(s) CO_2 per megawatt-hour (lb CO_2/MWh). Base load generation is defined as electricity generation from a power plant that is designed and intended to provide electricity at an annualized plant capacity factor of at least 60 percent. The permitted capacity factor for the HBEP will be approximately 50 percent. The HBEP combined-cycle combustion turbines are subject to the EPS and, with a GHG efficiency of 877 lb CO_2/MWh (including start-ups, shutdowns, and non-baseload operation), clearly comply. The HBEP simple-cycle combustion turbines will not have a capacity factor of at least 60 percent and the EPS is not applicable. See Appendix A, Tables 18 and 19 for details.

The state has promulgated numerous laws and regulations at the state level (Toxic Air Contaminants and Air Toxic Hot Spots) which are effectuated at the local level by the air districts. A discussion of these state and local LORS is presented in Tables 6-2 and 6-3, respectively.

TABLE 6-2
Applicable State Laws, Ordinances, Regulations, and Standards for the Protection of Air Quality

LORS	Purpose	Regulating Agency	Applicability/Compliance Strategy
California Health & Safety Code, Section 41700	Prohibits emissions in quantities that adversely affect public health, other businesses, or property.	SCAQMD with ARB Oversight	The CEC Conditions of Certification and the air quality management district PTC processes are developed to ensure that no adverse public health effects or public nuisances result from operation of the HBEP.
California Assembly Bill 32 – Global Warming Solutions Act of 2006 (AB 32)	The purpose is to reduce carbon emissions within the state by approximately 25 percent by the year 2020.	SCAQMD with ARB Oversight	Requires ARB to develop regulations to limit and reduce GHG emissions.
California Code of Regulations, Title 17, Article 5	Establishes GHG limitations, reporting requirements, and a Cap and Trade offsetting program.	ARB	ARB has promulgated a Cap and Trade regulation that limits or caps GHG emissions and requires subject facilities to acquire GHG allowances. HBEP GHG emissions have been estimated and the Project Owner will report emissions and acquire allowances and offsets consistent with these regulations.
California Senate Bill 1368 – Emissions Performance Standards (SB 1368)	The law limits long-term investments in base load generation by the state's utilities to power plants that meet an EPS jointly established by the CEC and CPUC.	CEC with ARB Oversight	CEC has designed regulations that establish a standard for base load generation owned by, or under long-term contract to, publicly owned utilities of 1,100 lb CO_2/MWh. The HBEP combined-cycle turbines will comply with the EPS and will emit 877 lb CO_2/MWh (including start-ups, shutdowns, and non-baseload operation). The HBEP simple-cycle turbines do not have a capacity factor of at least 60 percent and are not subject to the EPS.

6.4 Local LORS

When the state’s air pollution statutes were reorganized in the mid-1960s, local districts were required to be established in each county of the state. There are three different types of districts: county, regional, and unified. In addition, special air quality management districts, with more comprehensive authority over non-vehicular sources as well as transportation and other regional planning responsibilities, have been established by the Legislature for several regions in California, including SCAQMD. Air quality management districts have principal responsibility for developing plans for meeting the NAAQS and CAAQS; for developing control measures for non-vehicular sources of air pollution necessary to achieve and maintain both state and federal air quality standards; for implementing permit programs established for the construction, modification, and operation of sources of air pollution; and for enforcing air pollution statutes and regulations governing non-vehicular sources.

SCAQMD plans define the proposed strategies, including stationary source control measures and NSR rules, whose implementation will attain the CAAQS. The relevant stationary source control measures and NSR requirements are presented in Table 6-3.

TABLE 6-3
Applicable Local Laws, Ordinances, Regulations, Standards, and Permits for Protection of Air Quality

LORS	Purpose	Regulating Agency	Applicability/Compliance Assessment
SCAQMD Rule 201	Establishes an orderly procedure for the review of new and modified sources of air pollution through the issuance of permits.	SCAQMD	Rule 201 specifies that any facility installing nonexempt equipment that causes or controls the emission of air pollutants must first obtain a PTC from the SCAQMD. SCAQMD has three separate preconstruction review programs for new or modified sources of criteria pollutant emissions: Regulation XIII (NSR), Regulation XVII (PSD), and Rule 2005 (NSR for RECLAIM). Section 4.2 included an assessment of the air quality impacts in accordance with Regulation XIII, Regulation XVII, and Rule 2005. The completed SCAQMD PTC application forms were previously submitted.
SCAQMD Rule 201.1	Incorporates the permit conditions in federally issued PTCs.	SCAQMD	A person constructing and/or operating equipment or an agricultural permit unit, pursuant to a PTC issued by the EPA, shall construct the equipment or agricultural permit unit in accordance with the conditions set forth in that permit, and shall operate the equipment or agricultural permit unit at all times in accordance with such conditions. A federal PSD permit will be obtained for the HBEP. The Project Owner will comply with the permit conditions established in the PSD permit.
SCAQMD Rule 212	Establishes standards for approving permits and issuing public notice.	SCAQMD	Rule 212 requires public notification if a. Any new or modified permit unit, source under Regulation XX, or equipment under Regulation XXX that may emit air contaminants is located within 1,000 feet from the outer boundary of a school; or b. Any new or modified facility which has onsite emission increases exceeding any of the daily maximums specified in subdivision (g) of this rule; or c. Any new or modified permit unit, source under Regulation XX, or equipment under Regulation XXX with increases in emissions of TACs, for which the Executive Officer has made a determination that a person may be exposed to a maximum incremental cancer risk (MICR) is greater than 1 in 1 million (1×10^{-6}), due to a project's proposed construction, modification, or relocation for facilities with more than one permitted equipment unless the applicant can show the total facility-wide MICR is below 10 in 1 million (10×10^{-6}). The HBEP will be greater than 1,000 feet from the outer boundary of a school and the predicted total facility-wide MICR is less than 10 in 1 million. However, the onsite emissions will exceed the daily maximums listed in subdivision (g) of this Rule. Therefore, a public notice consistent with the requirements outlined in Rule 212 will be issued. The process for public notification and comment will include all of the applicable provisions of 40 CFR 51.161(b) and 40 CFR 124.10.
SCAQMD Rule 218	Establishes requirements for a CEMS.	SCAQMD	The owner or operator of any equipment subject to this Rule shall provide, properly install, operate, and maintain in calibration and good working order a certified CEMS to measure the concentration and/or emission rates, as applicable, of air contaminants and diluent gases, flow rates, and other required parameters. Each CTG and the auxiliary boiler will be equipped with a CEMS. These units will comply with all applicable requirements of Rule 218, Regulation XX (NO_x RECLAIM), and Title IV (Acid Rain – 40 CFR 75).
SCAQMD Rule 401	Establishes limits for visible emissions from stationary sources.	SCAQMD	Rule 401 prohibits visible emissions as dark as or darker than Ringlemann No. 1 for periods greater than 3 minutes in any hour. Natural gas will be the only fuel fired in the natural gas turbines and auxiliary boiler. Therefore, the HBEP will not create visible emissions as dark as or darker than Ringlemann No. 1.
SCAQMD Rule 402	Prohibits the discharge from a facility of air pollutants that cause injury, detriment, nuisance, or annoyance to the public, or that damage businesses or property.	SCAQMD	A person shall not discharge from any source whatsoever such quantities of air contaminants or other material which cause injury, detriment, nuisance, or annoyance to any considerable number of persons or to the public; or which endanger the comfort, repose, health or safety of any such persons or the public; or which cause, or have a natural tendency to cause, injury or damage to businesses or property. The CEC Conditions of Certification and the SCAQMD PTC process are designed to ensure that the operation of the HBEP will not cause a public nuisance.
SCAQMD Rule 403	Establishes requirements to reduce the amount of particulate matter (PM) entrained in the ambient air as a result of man-made fugitive dust sources.	SCAQMD	Rule 403 requires the implementation of best available control measures to minimize fugitive dust emissions and prohibits visible dust emissions beyond the property line, a 50 $\mu g/m^3$ incremental increase in PM_{10} concentrations across a facility as measured by upwind and downwind concentrations, and track-out of bulk material onto public, paved roadways. The HBEP will implement best available control measures as part of the Stormwater Pollution Prevention Plan to minimize fugitive dust emissions during construction and operation.
SCAQMD Rule 404	Establishes limits for PM emission concentrations.	SCAQMD	A person shall not discharge into the atmosphere from any source PM in excess of the concentration at standard conditions listed in Rule 404. However, per Rule 404.c, this Rule does not apply to emissions resulting from the combustion of liquid or gaseous fuels in steam generators or gas turbines. Because the CTGs and auxiliary boiler will combust natural gas only, Rule 404 is not applicable.
SCAQMD Rule 405	Establishes limits for PM mass emission rates.	SCAQMD	Emission rate limits are based upon the process weight (fuel burned) per hour. Natural gas will be the only fuel fired in the natural gas turbines and auxiliary boiler. Therefore, the HBEP will comply with the Rule 405 PM emission limits.
SCAQMD Rule 407	Establishes limits for CO and SO_x emissions from stationary sources.	SCAQMD	Rule 407 prohibits CO and SO_x emissions in excess of 2,000 and 500 ppm, respectively, from any source. The CO emissions from the combined-cycle CTGs, simple-cycle CTGs, and auxiliary boiler will be less than 2 ppm, 4 ppm, and 50 ppm, respectively. Therefore, the HBEP meets the CO limit. In addition, equipment that complies with the requirements of Rule 431.1 is exempt from the SO_x limit. Since the facility will comply with Rule 431.1, the SO_x provisions of Rule 407 are not applicable.

TABLE 6-3
Applicable Local Laws, Ordinances, Regulations, Standards, and Permits for Protection of Air Quality

LORS	Purpose	Regulating Agency	Applicability/Compliance Assessment
SCAQMD Rule 409	Establishes limits for PM emissions from fuel combustion sources.	SCAQMD	Rule 409 prohibits PM emissions in excess of 0.1 grain per cubic foot (gr/cf) of gas at 12 percent CO_2 at standard conditions. Natural gas will be the only fuel fired in the natural gas turbines and auxiliary boiler. Therefore, the HBEP will comply with the Rule 409 PM emission limits.
SCAQMD Rule 431.1	Establishes limits for the sulfur content of gaseous fuels to reduce SO_x emissions from stationary combustion sources.	SCAQMD	Rule 431.1 limits the sulfur content of natural gas calculated as hydrogen sulfide (H_2S) to be less than 16 part(s) per million by volume (ppmv). The sulfur content of the natural gas will be less than 0.75 grain of sulfur per 100 dry standard cubic feet of natural gas or 12.6 ppmv. Therefore, the HBEP will comply with the Rule 431.1 requirement.
SCAQMD Rule 474	Establishes limits for emissions of NO_x from stationary combustion sources.	SCAQMD	Per Rule 2001, NO_x RECLAIM facilities are exempt from the provisions of Rule 474. Since the HBEP will be a NO_x RECLAIM facility, Rule 474 is not applicable.
SCAQMD Rule 475	Establishes limits for combustion contaminant (PM) emissions from subject equipment.	SCAQMD	Rule 475 prohibits PM emissions that exceed both 11 lb/hr (per emission unit) and 0.01 gr/cf at 3 percent O_2. The combined-cycle CTGs' PM emission rate will be 8.50 lb/hr and less than 0.01 gr/cf. Similarly, the simple-cycle CTGs' PM emission rate will be 6.24 lb/hr and less than 0.01 gr/cf.
SCAQMD Rule 476	Establishes limits for NO_x and PM emissions from steam generating equipment with a maximum heat input rating exceeding 50 MMBtu/hr.	SCAQMD	Per Rule 2001, NO_x RECLAIM facilities are exempt from the NO_x requirements for this rule. Therefore, only the PM provisions of this rule will apply. The combined-cycle CTGs' PM emission rate will be 8.50 lb/hr and less than 0.01 gr/cf. Similarly, the simple-cycle CTGs' PM emission rate will be 6.24 lb/hr and less than 0.01 gr/cf.
SCAQMD Rule 53	Establishes limits for emissions of sulfur compounds (SO_x) from stationary sources in Orange County.	SCAQMD	A person shall not discharge into the atmosphere sulfur compounds, which would exist as a liquid or gas at standard conditions, exceeding in concentration at the point of discharge 500 ppmv, calculated as SO_2. The use of low sulfur natural gas will result in SO_2 concentrations significantly less than 500 pppmv.
SCAQMD Regulation IX, Permits (40 CFR 60)	Establishes national standards of performance for new or modified facilities in specific source categories.	SCAQMD with EPA Region IX Oversight	See 40 CFR 60 (Table 6-1) to review applicability and the compliance assessment.
SCAQMD Regulation X, Permits (40 CFR 63)	Establishes national emission standards to limit emissions of HAPs or air pollutants identified by EPA as causing or contributing to the adverse health effects of air pollution but for which NAAQS have not been established from facilities in specific categories.	SCAQMD with EPA Region IX Oversight	See 40 CFR 63 (Table 6-1) to review applicability and the compliance assessment.
SCAQMD Rule 1134	Establishes limits for emissions of NO_x from stationary gas turbines.	SCAQMD	Per Rule 2001, NO_x RECLAIM facilities are exempt from the provisions of Rule 1134. Therefore, Rule 1134 is not applicable to the HBEP.
SCAQMD Rule 1135	Establishes limits for emissions of NO_x from electricity generating systems.	SCAQMD	Per Rule 2001, NO_x RECLAIM facilities are exempt from the provisions of Rule 1135. Therefore, Rule 1135 is not applicable to the HBEP.
SCAQMD Rule 1146	Establishes limits for emissions of NO_x from industrial, institutional, and commercial boilers, steam generators, and process heaters.	SCAQMD	Per Rule 2001, NO_x RECLAIM facilities are exempt from the provisions of Rule 1146. Therefore, Rule 1146 is not applicable to the HBEP.

TABLE 6-3
Applicable Local Laws, Ordinances, Regulations, Standards, and Permits for Protection of Air Quality

LORS	Purpose	Regulating Agency	Applicability/Compliance Assessment
SCAQMD Rule XIII, Permits (NSR)	Provides for the review of new and modified sources and provide mechanisms, including the use of BACT and emission offsets, by which authorities to construct such sources may be granted for non-RECLAIM pollutants.	SCAQMD	Rule 1303(a) – BACT: BACT shall be applied to any new or modified source which results in an emission increase of any nonattainment air contaminant, any ozone depleting compound, or ammonia. The BACT requirements of Rule 1303 apply regardless of any modeling or offset exemption in Rule 1304. Therefore, a complete top-down BACT analysis was conducted for emissions of CO, VOC, SO_2, PM_{10}, $PM_{2.5}$, and GHG. A BACT analysis for NO_x was conducted as part of compliance with Rule 2005. The BACT analysis was submitted previously. Rule 1303(b)(1) – Modeling: As part of the NSR permit approval process, an air quality dispersion analysis must be conducted using a mass emissions-based analysis contained in the Rule or an approved dispersion model to evaluate impacts of increased criteria pollutant emissions from any new or modified facility on ambient air quality. The Project Owner conducted air dispersion modeling to demonstrate that the auxiliary boiler will not cause a violation, or make significantly worse an existing violation, of any state or federal ambient air quality standard. The CTGs are exempt from modeling requirements per Rule 1304, with the exception of Regulation XX pollutants. Rule 1303(b)(2) – Offsets: Unless exempt from offsets requirements pursuant to Rule 1304, emission increases shall be offset by either Emission Reduction Credits approved pursuant to Rule 1309, or by allocations from the Priority Reserve in accordance with the provisions of Rule 1309.1, or allocations from the Offset Budget in accordance with the provisions of Rule 1309.2. Offset ratios shall be 1.2-to-1.0 for Emission Reduction Credits and 1.0-to-1.0 for allocations from the Priority Reserve, except for facilities not located in the South Coast Air Basin, where the offset ratio for Emission Reduction Credits only shall be 1.2-to-1.0 for VOC, NO_x, SO_x and PM_{10} and 1.0-to-1.0 for CO. The Project Owner will provide sufficient VOC and PM_{10} Emission Reduction Credits to offset project emissions for those sources not covered by the Rule 1304(a)(2) exemption at a 1.2-to-1.0 ratio; NO_x and SO_2 emissions will be addressed through Regulation XX. The CTGs are exempt from offset requirements per Rule 1304, with the exception of Regulation XX pollutants. Rule 1303(b)(3) – Sensitive Zone Requirements: Unless credits are obtained from the Priority Reserve, facilities located in the South Coast Air Basin are subject to the Sensitive Zone requirements specified in California Health & Safety Code Section 40410.5. The HBEP is located in Zone 1. Therefore, the Project Owner will obtain Emission Reduction Credits from Zone 1 only to offset emissions from the auxiliary boiler. The CTGs are exempt from offset requirements per Rule 1304, with the exception of Regulation XX pollutants. Rule 1303(b)(4) – Facility-wide Compliance: The HBEP will comply with all applicable rules and regulations of the SCAQMD. Rule 1303(b)(5)(A) – Alternative Analysis: Conduct an analysis of alternative sites, sizes, production processes, and environmental control techniques for such proposed source and demonstrate that the benefits of the proposed project outweigh the environmental and social costs associated with that project. Rule 1303(b)(5)(B) – Statewide Compliance: Demonstrate prior to the issuance of a PTC that all major stationary sources, as defined in the jurisdiction where the facilities are located, that are owned or operated by such person (or by any entity controlling, controlled by, or under common control with such person) in the State of California are subject to emission limitations and are in compliance or on a schedule for compliance with all applicable emission limitations and standards under the CAA. The Project Owner has certified in SCAQMD Form 400-A that all major sources under its ownership or control in the State of California are in compliance with all federal, state, and local air quality rules and regulations. Rule 1303(b)(5)(C) – Protection of Visibility: Conduct a modeling analysis for plume visibility in accordance with the procedures specified in Appendix B if the net emission increase from the new or modified source exceeds 15 tpy of PM_{10} or 40 tpy of NO_x; and the location of the source, relative to the closest boundary of a specified federal Class I area, is within 28 km. Emissions of PM_{10} and NO_x will exceed the emissions thresholds but the distance to the nearest Class I area is approximately 70 km. Therefore, a visibility analysis is not required. Rule 1303(b)(5)(D) – Compliance through CEQA: Because the CEC certification process is similar to the CEQA process, the applicable CEQA requirements have been addressed. Rule 1304.1 – Electrical Generating Fee for Use of Offset Exemption: Requires the payment of fees to generate air quality improvements within the project area consistent with SCAQMD's approved Air Quality Management Plan.

TABLE 6-3
Applicable Local Laws, Ordinances, Regulations, Standards, and Permits for Protection of Air Quality

LORS	Purpose	Regulating Agency	Applicability/Compliance Assessment
SCAQMD Rule 1325, Permits (Federal $PM_{2.5}$ NSR)	Provides for the review of new and modified sources and mechanisms, including the use of lowest achievable emissions rate (LAER) and emission offsets, by which authorities to construct such sources may be granted for $PM_{2.5}$.	SCAQMD	The Executive Officer shall deny the permit for a new major polluting facility; or major modification to a major polluting facility; or any modification to an existing facility that would constitute a major polluting facility in and of itself (i.e., the PTE is 100 tpy or more of $PM_{2.5}$ or its precursors), unless each of the following requirements is met: (A) LAER is employed for the new or relocated source or for the actual modification to an existing source; and (B) Emission increases shall be offset at a ratio of 1.1-to-1.0 for $PM_{2.5}$ and at the ratio required in Regulation XIII or Rule 2005 for NO_x and SO_2, as applicable; and (C) Certification is provided by the owner/operator that all major sources, as defined in the jurisdiction where the facilities are located, that are owned or operated by such person (or by any entity controlling, controlled by, or under common control with such person) in the State of California are subject to emission limitations and are in compliance or on a schedule for compliance with all applicable emission limitations and standards under the CAA; and (D) An analysis is conducted of alternative sites, sizes, production processes, and environmental control techniques for such proposed source and demonstration made that the benefits of the proposed project outweigh the environmental and social costs associated with that project. The HBEP will not exceed the 100-tpy threshold for $PM_{2.5}$ (or $PM_{2.5}$ precursors on a per-pollutant basis). Therefore, Rule 1325 is not applicable.
SCAQMD Rule 1401, Permits (Toxics NSR)	Provides for the review of new and modified sources of TAC emissions to evaluate potential public exposure and health risk, to mitigate potentially significant health risks resulting from these exposures, and to provide net health risk benefits by improving the level of control when existing sources are modified or replaced.	SCAQMD	T-BACT shall be applied to any new or modified source of TACs where the source risk is a cancer risk greater than 1 in 1 million (1×10^{-6}), a chronic hazard index greater than 1.0, or an acute hazard index greater than 1.0. The predicted MICR at the MEIR and MEIW for the HBEP are 2.68 and 0.15 in one million, respectively. The maximum predicted chronic and acute hazard indices for the HBEP are 0.011 and 0.056, respectively. These values are below the PTC or PTO facility thresholds for cancer risk of 10 in 1 million and the chronic and acute hazard index of 1.0. The predicted MICR at the MEIR and MEIW are 1.36 and 0.086, respectively, for an individual combined-cycle CTG; 0.059 and 0.0031, respectively, for an individual simple-cycle CTG; and 0.026 and 0.0054, respectively, for the auxiliary boiler. Although the combined-cycle CTG cancer risks exceed the individual unit threshold of 1 in 1 million, the HBEP will employ emission controls considered to be T-BACT. Therefore, the HBEP will comply with Rule 1401.
SCAQMD Rule 1403, Permits (Asbestos Removal)	Specifies work practice requirements to limit asbestos emissions from building demolition and renovation activities, including the removal and associated disturbance of asbestos-containing materials.	SCAQMD	The Project Owner will comply with the requirements outlined in Rule 1403 prior to and during the removal of asbestos-containing materials.
SCAQMD Regulation XVII, Permits (PSD)	Allows new sources of air pollution to be constructed, or existing sources to be modified in areas classified as attainment, while preserving the existing ambient air quality levels, protecting public health and welfare, and protecting Class I Areas (e.g., national parks and wilderness areas).	SCAQMD with EPA Region IX Oversight	See 40 CFR 52 (Table 6-1) to review applicability and the compliance assessment.

TABLE 6-3
Applicable Local Laws, Ordinances, Regulations, Standards, and Permits for Protection of Air Quality

LORS	Purpose	Regulating Agency	Applicability/Compliance Assessment
SCAQMD Regulation XX, Permits (NO_x RECLAIM)	Provides for the review of new and modified sources and provides mechanisms, including the use of BACT and emission offsets, by which authorities to construct such sources may be granted for RECLAIM pollutants.	SCAQMD	Rule 2005(b)(1)(A) – BACT: BACT shall be applied to any new or modified source which results in an emission increase of any nonattainment air contaminant, any ozone depleting compound, or ammonia. A complete top-down BACT analysis was conducted for NO_X, CO, VOC, SO_2, PM_{10}, $PM_{2.5}$, and GHG and was previously submitted. Rule 2005(b)(1)(B) – Modeling: As part of the NSR permit approval process, an air quality dispersion analysis must be conducted for NO_x using a mass emissions-based analysis contained in the rule or an approved dispersion model, to evaluate impacts of increased NO_x emissions from any new or modified facility on ambient air quality. An air quality dispersion analysis was conducted for NO_x using the AERMOD dispersion model. Rule 2005(b)(2) – Offsets: NO_x emission increases shall be offset using RECLAIM trading credits at a ratio of 1.0-to-1.0. The HBEP will participate in the NO_x and SO_2 RECLAIM program and will secure the necessary RTCs. Rule 2005(e) – Trading Zone Requirements: Any increase in an annual allocation to a level greater than the facility's starting plus non-tradable allocations, and all emissions from a new or relocated facility, must be fully offset by obtaining RTCs originated in one of the two trading zones. A facility in Zone 1 may only obtain RTCs from Zone 1. A facility in Zone 2 may obtain RTCs from either Zone 1 or 2, or both. The HBEP is located in Zone 1. Therefore, the Project Owner will obtain RTCs from Zone 1 only. Rule 2005(g)(1) – Statewide Compliance: Demonstrate, prior to the issuance of a PTC, that all major stationary sources, as defined in the jurisdiction where the facilities are located, that are owned or operated by such person (or by any entity controlling, controlled by, or under common control with such person) in the State of California are subject to emission limitations and are in compliance or on a schedule for compliance with all applicable emission limitations and standards under the CAA. The Project Owner has certified in SCAQMD Form 400-A that all major sources under its ownership or control in the State of California are in compliance with all federal, state, and local air quality rules and regulations. Rule 2005(g)(2) – Alternative Analysis: Conduct an analysis of alternative sites, sizes, production processes, and environmental control techniques for such proposed source and demonstrate that the benefits of the proposed project outweigh the environmental and social costs associated with that project. The Project Owner has conducted a comparative evaluation of alternative sites as part of the Petition to Amend (PTA) process and has concluded that the benefits of providing grid reliability and increased employment in the surrounding area will outweigh the environmental and social costs incurred in the construction and operation of the proposed facility. Rule 2005(g)(3) – Compliance through CEQA: Because the CEC certification process is similar to the CEQA process, the applicable CEQA requirements have been addressed. Rule 2005(g)(4) – Protection of Visibility: Conduct a modeling analysis for plume visibility in accordance with the procedures specified in Appendix B if the net emission increase from the new or modified source exceeds 40 tpy of NO_x; and the location of the source, relative to the closest boundary of a specified federal Class I area, is within 28 km. Emissions of NO_x will exceed the emissions thresholds; however, the distance to the nearest Class I area is approximately 70 km. Therefore, a visibility analysis is not required. Rule 2005(h) – Public Notice: The applicant shall provide public notice, if required, pursuant to Rule 212 The Project Owner will comply with the requirements for Public Notice outlined in Rule 212. Rule 2005(i) – Rule 1401 Compliance: All new or modified sources shall comply with the requirements of Rule 1401. The Project Owner will comply with the requirements of Rule 1401 as demonstrated in Section 5. Rule 2005(j) – Compliance with State and Federal NSR: The HBEP will comply with all applicable rules and regulations of the SCAQMD.
SCAQMD Regulation XXX, Permits (Title V)	Implements the operating permit requirements of Title V of the CAA as amended in 1990.	SCAQMD with EPA Region IX Oversight	See 40 CFR 70 (Table 6-1) to review applicability and the compliance assessment.
SCAQMD Rule 3008, Title V Permits (PTE Limitations)	Exempts low-emitting facilities with actual emissions below a specific threshold from federal Title V permit requirements by limiting the facility's PTE.	SCAQMD	This Rule shall apply to any facility that would, if it did not comply with the limitations set forth in either paragraphs (d)(1) or (d)(2) of Rule 3008, have the PTE air contaminants equal to or in excess of the thresholds specified in Table 2, subdivision (b) of Rule 3001 – Applicability, or, for GHGs, 100,000 or more tpy of CO_2e. The HBEP will exceed the Title V thresholds listed in Rule 3001. As a result, the Project Owner submitted an application to modify the existing Title V permit.
SCAQMD Regulation XXXI, Permits (Acid Rain)	Incorporates by reference the provisions of 40 CFR 72 for purposes of implementing an acid rain program that meets the requirements of Title IV of the CAA.	SCAQMD with EPA Region IX Oversight	See 40 CFR 72 (Table 6-1) to review applicability and the compliance assessment.

SECTION 7

7 References

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Appendix A
Air Emissions Estimates—Operation

Huntington Beach Energy Project
Appendix A, Table 1
Summary of Commissioning Emission Estimates: Combined-Cycle Turbines
March 2016

				Unabated Emission Rate (lbs/hr)			Total Unabated Emissions (lbs)			Reduction (%)			Abated Emission Rate (lbs/hr)			Abated Emission Rate (g/s)			Total Abated Emissions (lbs)				
Activity	Duration (hr)	CTG Load (%)	Heat Input (MMBtu/hr, HHV)	NO_X	CO	VOC	NO_X	CO	VOC	NO_X (SCR)	CO (OxCat)	VOC (OxCat)	NO_X	CO	VOC	NO_X	CO	VOC	NO_X	CO	VOC	SO_2 [2]	$PM_{10/2.5}$ [2]
CTG Testing (Full Speed No Load, FSNL)	48	10	721	130	1,900	270	6,240	91,200	12,960	0%	0%	0%	***130***	***1,900***	270	***16.4***	***239***	34.0	6,240	91,200	12,960	233	408
Steam Blows [1]	120	40	1,333	68.3	32.4	3.00	8,190	3,888	360	0%	0%	0%	***68.3***	32.4	3.00	***8.60***	4.08	0.38	8,190	3,888	360	583	1,020
Set Unit HRSG & Steam Safety Valves	12	40	1,333	68.3	32.4	3.00	819	389	36.0	0%	0%	0%	68.3	32.4	3.00	8.60	4.08	0.38	819	389	36	58.3	102
Steam Blows - Restoration																							
DLN Emissions Tuning	12	50	1,422	47.3	23.8	2.00	567	285	24.0	0%	0%	0%	47.3	23.8	2.00	5.95	2.99	0.25	567	285	24	58.3	102
Emissions Tuning	12	60	1,566	52.5	24.8	2.00	630	298	24.0	0%	0%	0%	52.5	24.8	2.00	6.62	3.13	0.25	630	298	24	58.3	102
Emissions Tuning	12	80	1,924	63.0	29.2	2.50	756	350	30.0	0%	0%	0%	***63.0***	29.2	2.50	***7.94***	3.67	0.32	756	350	30	58.3	102
Restart CTGs and run HRSG in Bypass Mode. STG Bypass Valve Tuning. HRSG Blow Down and Drum Tuning																							
Verify STG on Turning Gear; Establish Vacum in ACC Ext Bypass Blowdown to ACC (combined blows) commence tuning on ACC Controls; Finalize Bypass Valve Tuning. ACC cleaning	168	80	1,924	63.0	29.2	2.50	10,584	4,899	420	78%	78%	35%	13.9	6.42	1.63	1.75	0.81	0.20	2,328	1,078	273	816	1,428
CT Base Load Testing/Tuning	24	100	2,282	73.5	34.6	3.00	1,764	829	72.0	78%	78%	35%	16.2	7.60	1.95	2.04	0.96	0.25	388	182	47	117	204
Load Test STG / Combine Cycle (2X1) Tuning	48	50	1,422	47.3	23.8	2.00	2,268	1,140	96.0	78%	78%	35%	10.4	5.23	1.30	1.31	0.66	0.16	499	251	62	233	408
STG Load Test/Combined Cycle Tuning	96	80	1,924	63.0	29.2	2.50	6,048	2,799	240	78%	78%	35%	13.9	6.42	1.63	1.75	0.81	0.20	1,331	616	156	467	816
RATA / Pre-performance Testing/Source Testing	84	80	1,924	63.0	29.2	2.50	5,292	2,449	210	78%	78%	35%	13.9	6.42	1.63	1.75	0.81	0.20	1,164	539	137	408	714
Source Testing & Drift Test Day 1	24	50	1,422	47.3	23.8	2.00	1,134	570	48.0	78%	78%	35%	10.4	5.23	1.30	1.31	0.66	0.16	249	125	31	117	204
Source Testing & Drift Test Day 2	24	50	1,422	47.3	23.8	2.00	1,134	570	48.0	78%	78%	35%	10.4	5.23	1.30	1.31	0.66	0.16	249	125	31	117	204
Source Testing & Drift Test Day 3	24	50	1,422	47.3	23.8	2.00	1,134	570	48.0	78%	78%	35%	10.4	5.23	1.30	1.31	0.66	0.16	249	125	31	117	204
Source Testing & Drift Test Day 4	24	50	1,422	47.3	23.8	2.00	1,134	570	48.0	78%	78%	35%	10.4	5.23	1.30	1.31	0.66	0.16	249	125	31	117	204
Source Testing & Drift Test Day 5	24	50	1,422	47.3	23.8	2.00	1,134	570	48.0	78%	78%	35%	10.4	5.23	1.30	1.31	0.66	0.16	249	125	31	117	204
Source Testing & Drift Test Day 6	24	50	1,422	47.3	23.8	2.00	1,134	570	48.0	78%	78%	35%	10.4	5.23	1.30	1.31	0.66	0.16	249	125	31	117	204
Source Testing & Drift Test Day 7	24	50	1,422	47.3	23.8	2.00	1,134	570	48.0	78%	78%	35%	10.4	5.23	1.30	1.31	0.66	0.16	249	125	31	117	204
Performance Testing	132	100	2,282	73.5	34.6	3.00	9,702	4,562	396	78%	78%	35%	16.2	7.60	1.95	2.04	0.96	0.25	2,134	1,004	257	642	1,122
CALISO Certification & Testing / PPA Testing	60	75	2,282	60.9	28.1	2.50	3,654	1,685	150	78%	78%	35%	13.4	6.18	1.63	1.69	0.78	0.20	804	371	98	292	510
Total for One CTG	**996**						**64,452**	**118,766**	**15,354**										**27,597**	**101,328**	**14,682**	**4,841**	**8,466**
Total for Two CTGs (One 2x1 Block)	**1,992**						**128,904**	**237,532**	**30,708**										**55,194**	**202,656**	**29,364**	**9,681**	**16,932**

Notes:

Information added consistent with data provided 1/22/2016

1. Part Load removal efficiencies for NO_X, VOC, and CO require validation from HRSG and catalyst supplier.

2. SO_2 and $PM_{10/2.5}$ emissions during commissioning are expected to be no greater than full load operations. Therefore, emissions were calculated using the maximum hourly emission rates for normal operation, as summarized below.

Maximum Emission Rates	lbs/hr
SO_2	4.86
$PM_{10/2.5}$	8.50

Huntington Beach Energy Project
Appendix A, Table 2
Summary of Commissioning Emission Estimates: Simple-Cycle Turbines
March 2016

				Unabated Emission Rate (lbs/hr)			Total Unabated Emissions (lbs)			Reduction (%)			Abated Emission Rate (lbs/hr)			Abated Emission Rate (g/s)			Total Abated Emissions (lbs)				
Activity	**Duration (hr)**	**CTG Load (%)**	**Heat Input (MMBtu/hr, HHV)**	**NO_x**	**CO**	**VOC**	**NO_x**	**CO**	**VOC**	**NO_x (SCR)**	**CO (OxCat)**	**VOC (OxCat)**	**NO_x**	**CO**	**VOC**	**NO_x**	**CO**	**VOC**	**NO_x**	**CO**	**VOC**	**SO_2 [2]**	**$PM_{10/2.5}$ [2]**
Unit 1 Testing (Full Speed No Load, FSNL)	4	5	194	40.1	244.0	5.1	160.2	976.0	20.3	0%	0%	0%	***40.1***	***244.0***	5.1	***5.05***	***30.7***	0.64	160.2	976.0	20.3	6.6	25.0
Unit 1 DLN Emissions Tuning [1]	12	100	880	82.0	360.0	4.6	984.0	4,320.0	54.7	75%	75%	33%	20.5	***90.0***	3.1	2.58	***11.3***	0.38	246.0	1,080.0	36.7	19.7	74.9
Unit 1 Emissions Tuning [1]	12	75	645	66.0	289.8	4.0	792.0	3,477.6	48.0	75%	75%	33%	16.5	***72.5***	2.7	2.08	***9.13***	0.34	198.0	869.4	32.2	19.7	74.9
Unit 1 Base Load Testing	12	75	645	66.0	289.8	1.7	792.0	3,477.6	20.5	75%	75%	33%	16.5	72.5	1.1	2.08	9.13	0.14	198.0	869.4	13.7	19.7	74.9
No Operation																							
Install Temporary Emissions Test Equipment																							
Refire Unit 1	12	100	880	82.0	360.0	4.6	984.0	4,320.0	54.7	75%	75%	33%	20.5	90.0	3.1	2.58	11.3	0.38	246.0	1,080.0	36.7	19.7	74.9
Unit 1 Source Testing & Drift Test Day 1-5; RATA / Pre-performance Testing / Part 60/75 Certification and Source Testing	168	100	880	82.0	360.0	4.6	13,776.0	60,480.0	766.1	75%	75%	33%	20.5	90.0	3.1	2.58	11.3	0.38	3,444.0	15,120.0	513.3	275.5	1,048.3
Unit 1 Water Wash & Performance Preparation	24	100	880	82.0	360.0	4.6	1,968.0	8,640.0	109.4	75%	75%	33%	20.5	90.0	3.1	2.58	11.3	0.38	492.0	2,160.0	73.3	39.4	149.8
Unit 1 Performance Testing	24	100	880	82.0	360.0	4.6	1,968.0	8,640.0	109.4	75%	75%	33%	20.5	90.0	3.1	2.58	11.3	0.38	492.0	2,160.0	73.3	39.4	149.8
Install Temporary Emissions Test Equipment																							
Unit 1 CALISO Certification	12	100	880	82.0	360.0	4.6	984.0	4,320.0	54.7	75%	75%	33%	20.5	90.0	3.1	2.58	11.3	0.38	246.0	1,080.0	36.7	19.7	74.9
Total for One CTG	**280**						**22,408**	**98,651**	**1,238**										**5,722**	**25,395**	**836**	**459**	**1,747**
Total for Two CTGs	**560**						**44,816**	**197,302**	**2,476**										**11,444**	**50,790**	**1,672**	**918**	**3,494**

Notes:
Information added consistent with data provided 1/22/2016
1. After commissioning, tuning is expected to occur twice a year.
2. SO_2 and $PM_{10/2.5}$ emissions during commissioning are expected to be no greater than full load operations. Therefore, emissions were calculated using the maximum hourly emission rates for normal operation, as summarized below.

Maximum Emission Rates	**lbs/hr**
SO_2	1.64
$PM_{10/2.5}$	6.24

Huntington Beach Energy Project
Appendix A, Table 3
Combined Cycle: GE 7FA.05 Performance Data
March 2016

Huntington Beach 2x1 7FA.05 Emissions Data

Case Number	1	2	3	4	5	6	7	8	9	10	11
CTG Model	7FA.05	7FA.05	7FA.05	7FA.05	7FA.05	7FA.05	7FA.05	7FA.05	7FA.05	7FA.05	7FA.05
CTG Fuel Type	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG
CTG Load (as % of emissions compliant load range)	max	average	min	max	max	average	min	max	max	average	min
CTG Inlet Air Cooling	Off	Off	Off	On	Off	Off	Off	On	Off	Off	Off
Fuel Sulfur Content (grains/100 standard cubic feet)	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75
Ambient Conditions	Low	Low	Low	Average	Average	Average	Average	High	High	High	High
Ambient Temperature, F	32	32	32	65.8	65.8	65.8	65.8	110	110	110	110
Ambient Relative Humidity, %	87%	87%	87%	58%	58%	58%	58%	8%	8%	8%	8%
Atmospheric Pressure, psia	14.68	14.68	14.68	14.68	14.68	14.68	14.68	14.68	14.68	14.68	14.68
Combustion Turbine Performance											
CTG Inlet Air Conditioning Effectiveness, % (ONE CTG)	N/A	N/A	N/A	90%	N/A	N/A	N/A	90%	N/A	N/A	N/A
Inlet Loss, in. H_2O	3.95	3.95	3.95	3.95	3.95	3.95	3.95	3.95	3.95	3.95	3.95
Exhaust Loss, in. H_2O	15.2	9.9	6.6	15.0	15.0	9.3	6.1	14.5	11.8	7.7	6.2
CTG Load Level (percent of Base Load)	BASE	75%	45%	BASE	BASE	75%	44%	BASE	BASE	75%	48%
Gross CTG Output, kW (ONE CTG)	236,140	177,105	105,791	232,073	227,061	170,296	100,815	215,890	190,222	142,667	90,926
Gross CTG Heat Rate, Btu/kWh (LHV) (ONE CTG)	8,683	9,128	11,742	8,789	8,865	9,179	11,662	8,921	9,065	9,710	12,245
Gross CTG Heat Rate, Btu/kWh (HHV) (ONE CTG)	9,628	10,061	12,942	9,687	9,771	10,117	12,854	9,833	9,991	10,702	13,496
Net CTG Output, kW (ONE CTG)	235,402	176,367	105,053	231,335	226,323	169,558	100,077	215,152	189,484	141,929	90,188
Net CTG Heat Rate, Btu/kWh (LHV) (ONE CTG)	8,710	9,166	11,825	8,817	8,894	9,219	11,748	8,952	9,100	9,761	12,345
Net CTG Heat Rate, Btu/kWh (HHV) (ONE CTG)	9,658	10,103	13,033	9,718	9,803	10,161	12,949	9,866	10,030	10,758	13,607
CTG Heat Input, MMBtu/h (LHV) (ONE CTG)	2,050	1,617	1,242	2,040	2,013	1,563	1,176	1,926	1,724	1,385	1,113
CTG Heat Input, MMBtu/h (HHV) (ONE CTG)	2,273	1,782	1,369	2,248	2,219	1,723	1,296	2,123	1,901	1,527	1,227
CTG Exhaust Flow, 10^3 lb/h (ONE CTG)	4,360	3,523	2,803	4,302	4,307	3,381	2,705	4,268	3,797	3,042	2,719
CTG Exhaust Temperature, F (ONE CTG)	1,109	1,117	1,215	1,141	1,141	1,152	1,215	1,112	1,167	1,209	1,215
Gross 2x1 Combined Cycle, kW	693,629	529,542	354,818	693,822	683,688	518,034	342,069	625,183	559,852	428,984	302,758
Net 2x1 Combined Cycle, kW	681,490	520,275	348,609	681,680	671,723	508,968	336,083	614,242	550,055	421,477	297,460
Gross STG Output, kW	221,349	175,332	143,236	229,676	229,566	177,442	140,439	193,403	179,408	143,650	120,906
GT Exaust Composition % Weight (ONE CTG)											
O_2	13.82%	14.04%	14.35%	13.60%	13.77%	13.87%	14.41%	13.97%	14.11%	14.09%	14.99%
CO_2	6.11%	5.96%	5.76%	6.16%	6.07%	6.00%	5.65%	5.86%	5.90%	5.91%	5.32%
H_2O	5.20%	5.09%	4.92%	5.87%	5.62%	5.57%	5.28%	5.97%	5.15%	5.16%	4.68%
N_2	73.51%	73.55%	73.61%	73.02%	73.18%	73.20%	73.31%	72.86%	73.49%	73.48%	73.66%
Ar	1.25%	1.25%	1.25%	1.24%	1.24%	1.24%	1.24%	1.24%	1.25%	1.25%	1.25%
Fuel Sulfur Content (grains/100 standard cubic feet)	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75
Catalyst Inlet Exhaust Analysis - % Mole Basis - Wet (ONE CTG/HRSG TRAIN)											
Ar	0.89%	0.89%	0.89%	0.88%	0.88%	0.88%	0.88%	0.88%	0.89%	0.89%	0.89%
CO_2	3.95%	3.85%	3.72%	3.96%	3.91%	3.87%	3.64%	3.77%	3.81%	3.82%	3.44%
H_2O	8.21%	8.03%	7.78%	9.23%	8.85%	8.77%	8.33%	9.37%	8.12%	8.14%	7.40%
N_2	74.62%	74.69%	74.80%	73.84%	74.10%	74.13%	74.30%	73.58%	74.59%	74.58%	74.88%
O_2	12.28%	12.48%	12.77%	12.04%	12.21%	12.30%	12.79%	12.35%	12.54%	12.52%	13.34%
Ave Mol Wt (based on % mol)	28.44	28.45	28.46	28.33	28.36	28.37	28.40	28.29	28.43	28.43	28.48
Total	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
SO_2, lb/hr (after SO_2 oxidation)	4.86	3.83	2.94	4.83	4.77	3.70	2.79	4.56	4.09	3.28	2.64
SO_3, lb/hr (after SO_2 oxidation)	4.86	3.83	2.94	4.83	4.77	3.70	2.79	4.56	4.09	3.28	2.64
Stack Exit Temperature, F	216	178	170	213	215	175	170	221	223	198	184
Stack Diameter, ft (estimated)	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
Stack Flow, 10^3 lb/h	4,360	3,523	2,803	4,302	4,307	3,381	2,705	4,268	3,797	3,042	2,719
Stack Flow, 10^3 acfm	1261.9	961.9	755.3	1244.4	1248.0	921.4	730.7	1250.8	1110.5	857.1	748.6
Stack Exit Velocity, ft/s	66.95	51.03	40.07	66.02	66.21	48.88	38.76	66.36	58.91	45.47	39.71
NO_X (Catalyst Inlet), ppmvd (dry, 15% O_2)	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0
CO (Catalyst Inlet), ppmvd (dry, 15% O_2)	7.07	7.25	7.53	6.96	7.08	7.16	7.65	7.31	7.33	7.31	8.18
VOC (Catalyst Inlet), ppmvd (dry, 15% O_2)	1.10	1.13	1.17	1.08	1.10	1.11	1.19	1.14	1.14	1.14	1.27
Stack NO_X Emissions with the Effects of Selective Catalytic Reduction (SCR) (ONE CTG/HRSG TRAIN)											
NO_X, ppmvd (dry, 15% O2)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
NO_X, ppmvd (dry)	2.91	2.85	2.75	3.00	2.94	2.91	2.74	2.89	2.83	2.83	2.56
NO_X, ppmvw (wet)	2.69	2.63	2.55	2.74	2.70	2.67	2.53	2.64	2.62	2.62	2.38
NO_X, lb/h as NO_2	16.48	12.99	9.98	16.39	16.17	12.56	9.45	15.48	13.86	11.13	8.95
NO_X, lb/MMBtu (LHV) as NO_2	0.0080	0.0080	0.0080	0.0080	0.0080	0.0080	0.0080	0.0080	0.0080	0.0080	0.0080
NO_X, lb/MMBtu (HHV) as NO_2	0.0072	0.0073	0.0073	0.0073	0.0073	0.0073	0.0073	0.0073	0.0073	0.0073	0.0073
SCR NH_3 slip, ppmvd (dry, 15% O_2)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
SCR NH_3 slip, lb/h	15.2	12.0	9.2	15.2	15.0	11.6	8.7	14.3	12.8	10.3	8.3
Ammonia Use, lb/h	43.00	33.90	26.05	42.77	42.21	32.78	24.66	40.39	36.16	29.05	23.35
Stack CO Emissions with the Effects of Catalytic Reduction (CO Catalyst) (ONE CTG / HRSG TRAIN)											
CO, ppmvd (dry, 15% O_2)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
CO, ppmvd (dry)	2.91	2.85	2.75	3.00	2.94	2.91	2.74	2.89	2.83	2.83	2.56
CO, ppmvw (wet)	2.69	2.63	2.55	2.74	2.70	2.67	2.53	2.64	2.62	2.62	2.38
CO, lb/h	10.03	7.91	6.08	9.98	9.85	7.65	5.75	9.42	8.44	6.78	5.45
CO, lb/MMBtu (LHV)	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049
CO, lb/MMBtu (HHV)	0.0044	0.0044	0.0044	0.0044	0.0044	0.0044	0.0044	0.0044	0.0044	0.0044	0.0044

Huntington Beach Energy Project
Appendix A, Table 3
Combined Cycle: GE 7FA.05 Performance Data
March 2016

Huntington Beach 2x1 7FA.05 Emissions Data

Case Number	1	2	3	4	5	6	7	8	9	10	11
Stack SO_2 Emissions (ONE CTG / HRSG TRAIN)											
Assumed SO_2 oxidation rate in CO Catalyst for SO_3 calculation, vol%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Assumed SO_2 oxidation rate in SCR for SO_3 calculation, vol%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
SO_2, ppmvd (dry, 15% O_2)	0.37	0.37	0.37	0.36	0.37	0.37	0.37	0.36	0.37	0.37	0.37
SO_2, ppmvd (dry)	0.54	0.52	0.51	0.55	0.54	0.54	0.50	0.53	0.52	0.52	0.47
SO_2, ppmvw (wet)	0.49	0.48	0.47	0.49	0.49	0.49	0.46	0.48	0.48	0.48	0.43
SO_2, lb/h	4.86	3.84	2.95	4.81	4.78	3.72	2.79	4.60	4.16	3.33	2.67
SO_2, lb/MMBtu (LHV)	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024
SO_2, lb/MMBtu (HHV)	0.0021	0.0022	0.0022	0.0021	0.0022	0.0022	0.0022	0.0022	0.0022	0.0022	0.0022
Stack VOC Emissions with the Effects of Catalytic Reduction (CO Catalyst) (ONE CTG / HRSG TRAIN)											
VOC, ppmvd (dry, 15% O_2)	0.5	0.6	0.6	0.5	0.6	0.6	0.6	0.6	0.6	0.6	0.6
VOC, ppmvd (dry)	0.80	0.80	0.81	0.81	0.81	0.81	0.82	0.82	0.81	0.81	0.81
VOC, ppmvw (wet)	0.74	0.74	0.75	0.74	0.74	0.75	0.75	0.75	0.75	0.75	0.76
VOC, lb/h as CH_4 (VOC corrected to 2 ppmvd @ 15% O_2)	5.75	4.53	3.48	5.72	5.64	4.38	3.29	5.40	4.83	3.88	3.12
VOC, lb/MMBtu (LHV)	0.0028	0.0028	0.0028	0.0028	0.0028	0.0028	0.0028	0.0028	0.0028	0.0028	0.0028
VOC, lb/MMBtu (HHV)	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
PM_{10} from the GT and Duct Burner											
PM_{10} Emissions - Front and Back Half Catch											
PM_{10}, lb/h (from the CTG)	6.70	6.70	6.70	6.70	6.70	6.70	6.70	6.70	6.70	6.70	6.70
PM_{10}, lb/h (from the Burner)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PM_{10}, lb/h (total from CTG and Burner)	6.70	6.70	6.70	6.70	6.70	6.70	6.70	6.70	6.70	6.70	6.70
PM_{10} with the Effects of SO_2 Oxidation [includes $(NH_4)_2$-(SO_4)] (ONE CTG / HRSG TRAIN)											
PM_{10} Emissions - Front and Back Half Catch											
PM_{10}, lb/h (incl. Ammonium Sulfate, assuming 100% conversion from SO_3)	8.50	8.50	8.50	8.50	8.50	8.50	8.50	8.50	8.50	8.50	8.50
PM_{10}, lb/MMBtu (LHV)	0.0041	0.0053	0.0068	0.0042	0.0042	0.0054	0.0072	0.0044	0.0049	0.0061	0.0076
PM_{10}, lb/MMBtu (HHV)	0.0037	0.0048	0.0062	0.0038	0.0038	0.0049	0.0066	0.0040	0.0045	0.0056	0.0069
$PM_{2.5}$ with the Effects of SO_2 Oxidation [includes $(NH_4)_2$-(SO_4)] (ONE CTG / HRSG TRAIN)											
$PM_{2.5}$ Emissions - Front and Back Half Catch											
$PM_{2.5}$, lb/h	8.50	8.50	8.50	8.50	8.50	8.50	8.50	8.50	8.50	8.50	8.50
$PM_{2.5}$, lb/MMBtu (LHV)	0.0041	0.0053	0.0068	0.0042	0.0042	0.0054	0.0072	0.0044	0.0049	0.0061	0.0076
$PM_{2.5}$, lb/MMBtu (HHV)	0.0037	0.0048	0.0062	0.0038	0.0038	0.0049	0.0066	0.0040	0.0045	0.0056	0.0069
Total Effects of SO_2 Oxidation (ONE CTG / HRSG TRAIN)											
Total SO_2 to SO_3 conversion rate for SO_3 calculation, %vol	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Total Amount of SO_2 converted to SO_3 for SO_3 calculation, lb/h	4.86	3.83	2.94	4.83	4.77	3.70	2.79	4.56	4.09	3.28	2.64
Maximum Stack Ammonium Sulfate [$(NH_4)_2$-(SO_4)] (assuming 100% conversion from SO_3), lb/h	10.02	7.90	6.07	9.97	9.84	7.64	5.75	9.41	8.43	6.77	5.44
Maximum Stack H_2SO_4 (assuming 100% conversion from SO_3 to H_2SO_4), lb/h	7.44	5.87	4.51	7.40	7.30	5.67	4.27	6.99	6.26	5.03	4.04

Notes:

1. Dry air composition is as follows:
   N_2: 78.1%
   O_2: 21.0%
   Ar: 0.9%
   CO_2: 0.03%
2. Estimated emissions based on GE performance runs provided by AES on 12/23/14, 'AES_EXTERNAL_12_22_2014_Huntington Beach.xlsx'.
3. As the CTG performance and emissions information utilized does not reflect guaranteed values currently offered by GE, it is recommended that additional and suitable margin be applied to the values to account for differences between expected and guaratneed CTG emissions values.
4. Ammonium sulfates created downstream of the SCR are included in front half particulates and front and back half particulates. It is assumed that 100% SO_3 is converted to ammonium sulfates in order to account for "worst case" particulate emissions.
5. CO catalyst VOC destruction rate of 50% is assumed.
6. Sulfur content in fuel gas is assumed to be 0.75 grains/100 SCF.
7. As OEM project specific information is not available, an SO_2 to SO_3 conversion rate of 100% is assumed. Use of a high conversion rate is recommended for purposes of establishing permit limitations and emissions levels to provide additional margin.
8. Ammonia use is calculated with 19% aqueous ammonia and factors in ammonia slip.
9. Information presented is not reflective of emissions control equipment guaranteed performance levels as this information is not presently available. Engineer reserves the ability to adjust information to reflect guaranteed and OEM specific information when available.
10. Information presented is intended to reflect a conservative approach to estimated stack emissions; however, no additional margin has been applied to the emissions rates.
11. Steam turbine and combined cycle performance information presented is preliminary and for information purposes only. Information is subject to change based on equipment supplier feedback and equipment selection.
12. No margin has been included in the information provided. It is recommended that additional margin be added for the purposes of establishing permit limitations.
13. $PM_{10/2.5}$ emission rate of 9.0 lb/hr provided by AES.

Huntington Beach Energy Project
Appendix A, Table 4
Combined Cycle: Summary of Start-Up and Shutdown Emission Estimates
March 2016

Hot/Warm Start Emissions

Temperature and Pollutant		Startup	Duration (min)	Catalyst Inlet (lbs/hr)	Inlet Over Duration (lbs)	Design Reduction (%)	Transient Reduction (%)	Net Reduction (%)	Total Outlet (lbs)	Emissions per Event (lbs)
Event Time (min)										30
20°F	NO_X	T0-T10	10	64	11	80	40	32	7	
	NO_X	T10-T20	10	95	16	80	90	72	4	
	NO_X	T20-T30	10	75	13	80	100	80	3	
	NO_X Total	**Total Startup**	**30**						**14**	**17**
	CO	T0-T10	10	738	123	80	75	60	49	
	CO	T10-T20	10	1,351	225	80	90	72	63	
	CO	T20-T30	10	59	10	80	100	80	2	
	CO Total	**Total Startup**	**30**						**114**	**137**
	VOC	T0-T10	10	84	14	50	75	38	9	
	VOC	T10-T20	10	127	21	50	90	45	12	
	VOC	T20-T30	10	5.3	0.9	50	100	50	0.4	
	VOC Total	**Total Startup**	**30**						**21**	**25**
59°F	NO_X	T0-T10	10	63	11	80	40	32	7	
	NO_X	T10-T20	10	86	14	80	90	72	4	
	NO_X	T20-T30	10	68	11	80	100	80	2	
	NO_X Total	**Total Startup**	**30**						**13**	**16**
	CO	T0-T10	10	646	108	80	75	60	43	
	CO	T10-T20	10	1,183	197	80	90	72	55	
	CO	T20-T30	10	52	9	80	100	80	2	
	CO Total	**Total Startup**	**30**						**100**	**120**
	VOC	T0-T10	10	79	13	45	75	34	9	
	VOC	T10-T20	10	118	20	45	90	41	12	
	VOC	T20-T30	10	5	0.8	45	100	45	0.5	
	VOC Total	**Total Startup**	**30**						**22**	**25**
100°F	NO_X	T0-T10	10	62	10	80	40	32	7	
	NO_X	T10-T20	10	75	13	80	90	72	4	
	NO_X	T20-T30	10	62	10	80	100	80	2	
	NO_X Total	**Total Startup**	**30**						**13**	**15**
	CO	T0-T10	10	501	83	80	75	60	33	
	CO	T10-T20	10	917	153	80	90	72	43	
	CO	T20-T30	10	40	7	80	100	80	1	
	CO Total	**Total Startup**	**30**						**77**	**93**
	VOC	T0-T10	10	57	9	45	75	34	6	
	VOC	T10-T20	10	85	14	45	90	41	8	
	VOC	T20-T30	10	4	1	45	100	45	0.3	
	VOC Total	**Total Startup**	**30**						**14**	**18**

Notes:
1. Data includes a 20% margin.

Huntington Beach Energy Project
Appendix A, Table 4
Combined Cycle: Summary of Start-Up and Shutdown Emission Estimates
March 2016

Cold Start Emissions

Temperature and Pollutant		Startup	Duration (min)	Catalyst Inlet (lbs/hr)	Inlet Over Duration (lbs)	Design Reduction (%)	Transient Reduction (%)	Net Reduction (%)	Total Outlet (lbs)	Emissions per Event (lbs)
Event Time (min)										60
20°F	NO_X	T0-T10	10	64	11	80	0	0	11	
	NO_X	T10-T20	10	95	16	80	0	0	16	
	NO_X	T20-T30	10	75	13	80	0	0	13	
	NO_X	T30-T40	10	75	13	80	70	56	6	
	NO_X	T40-T50	10	75	13	80	85	68	4	
	NO_X	T50-T60	10	75	13	80	100	80	3	
	NO_X Total	**Total Startup**	**60**						**53**	**61**
	CO	T0-T10	10	738	123	80	30	24	93	
	CO	T10-T20	10	1,351	225	80	35	28	162	
	CO	T20-T30	10	59	10	80	50	40	6	
	CO	T30-T40	10	59	10	80	75	60	4	
	CO	T40-T50	10	59	10	80	90	72	3	
	CO	T50-T60	10	59	10	80	100	80	2	
	CO Total	**Total Startup**	**60**						**270**	**325**
	VOC	T0-T10	10	84	14	50	30	15	12	
	VOC	T10-T20	10	127	21	50	35	18	17	
	VOC	T20-T30	10	5	0.8	50	50	25	0.6	
	VOC	T30-T40	10	5	0.8	50	75	38	0.5	
	VOC	T40-T50	10	5	0.8	50	90	45	0.4	
	VOC	T50-T60	10	5	0.8	50	100	50	0.4	
	VOC Total	**Total Startup**	**60**						**31**	**36**
59°F	NO_X	T0-T10	10	63	11	80	0	0	11	
	NO_X	T10-T20	10	86	14	80	0	0	14	
	NO_X	T20-T30	10	68	11	80	0	0	11	
	NO_X	T30-T40	10	68	11	80	70	56	5	
	NO_X	T40-T50	10	68	11	80	85	68	4	
	NO_X	T50-T60	10	68	11	80	100	80	2	
	NO_X Total	**Total Startup**	**60**						**47**	**57**
	CO	T0-T10	10	646	108	80	30	24	82	
	CO	T10-T20	10	1,183	197	80	35	28	142	
	CO	T20-T30	10	52	9	80	50	40	5	
	CO	T30-T40	10	52	9	80	75	60	3	
	CO	T40-T50	10	52	9	80	90	72	2	
	CO	T50-T60	10	52	9	80	100	80	2	
	CO Total	**Total Startup**	**60**						**236**	**287**
	VOC	T0-T10	10	79	13	50	30	15	11	
	VOC	T10-T20	10	118	20	50	35	18	16	
	VOC	T20-T30	10	5	0.8	50	50	25	0.6	
	VOC	T30-T40	10	5	0.8	50	75	38	0.5	
	VOC	T40-T50	10	5	0.8	50	90	45	0.5	
	VOC	T50-T60	10	5	0.8	50	100	50	0.4	
	VOC Total	**Total Startup**	**60**						**29**	**36**
100°F	NO_X	T0-T10	10	62.4	10.4	80	0	0	10	
	NO_X	T10-T20	10	75	12.5	80	0	0	13	
	NO_X	T20-T30	10	62	10.3	80	0	0	10	
	NO_X	T30-T40	10	62	10.3	80	70	56	5	
	NO_X	T40-T50	10	62	10.3	80	85	68	3	
	NO_X	T50-T60	10	62	10.3	80	100	80	2	
	NO_X Total	**Total Startup**	**60**						**43**	**53**
	CO	T0-T10	10	500.7	85.5	80	30	24	63	
	CO	T10-T20	10	916.8	152.8	80	35	28	110	
	CO	T20-T30	10	40	6.7	80	50	40	4	
	CO	T30-T40	10	40	6.7	80	75	60	3	
	CO	T40-T50	10	40	6.7	80	90	72	2	
	CO	T50-T60	10	40	6.7	80	100	80	1	
	CO Total	**Total Startup**	**60**						**183**	**220**
	VOC	T0-T10	10	56.6	9.4	50	30	15	8	
	VOC	T10-T20	10	84.9	14.2	50	35	18	12	
	VOC	T20-T30	10	3.5	0.6	50	50	25	0.4	
	VOC	T30-T40	10	3.5	0.6	50	75	38	0.4	
	VOC	T40-T50	10	3.5	0.6	50	90	45	0.3	
	VOC	T50-T60	10	3.5	0.6	50	100	50	0.3	
	VOC Total	**Total Startup**	**60**						**21**	**25**

Notes:
1. Data includes a 20% margin.

Huntington Beach Energy Project
Appendix A, Table 4
Combined Cycle: Summary of Start-Up and Shutdown Emission Estimates
March 2016

Shutdown Emissions

Temperature and Pollutant		Shutdown	Duration (min)	Catalyst Inlet (lbs/hr)	Inlet Over Duration (lbs)	Design Reduction (%)	Transient Reduction (%)	Net Reduction (%)	Total Outlet (lbs)	Emissions per Event (lbs)
Event Time (min)										30
20°F	NO_X	T0-T10	10	53	9	80	100	80	2	
	NO_X	T10-T20	10	17	3	80	100	80	0.6	
	NO_X	T20-T30	10	100	17	80	80	64	6	
	NO_X Total	**Total Shutdown**	**30**						**9**	**10**
	CO	T0-T10	10	1,531	255	80	100	80	51	
	CO	T10-T20	10	1,092	182	80	100	80	36	
	CO	T20-T30	10	439	73	80	85	68	23	
	CO Total	**Total Shutdown**	**30**						110	**133**
	VOC	T0-T10	10	128	21	50	100	50	11	
	VOC	T10-T20	10	168	28	50	100	50	14	
	VOC	T20-T30	10	21	3	50	85	43	2	
	VOC Total	**Total Shutdown**	**30**						**27**	**32**
59°F	NO_X	T0-T10	10	44	7	80	100	80	1	
	NO_X	T10-T20	10	16	3	80	100	80	0.5	
	NO_X	T20-T30	10	92	15	80	80	64	6	
	NO_X Total	**Total Shutdown**	**30**						**8**	**9**
	CO	T0-T10	10	1,229	205	80	100	80	41	
	CO	T10-T20	10	1,057	176	80	100	80	35	
	CO	T20-T30	10	430	72	80	85	68	23	
	CO Total	**Total Shutdown**	**30**						**99**	**119**
	VOC	T0-T10	10	81	13	45	100	45	7	
	VOC	T10-T20	10	162	27	45	100	45	15	
	VOC	T20-T30	10	19	3	45	85	38	2	
	VOC Total	**Total Shutdown**	**30**						**24**	**29**
100°F	NO_X	T0-T10	10	30	5	80	100	80	1	
	NO_X	T10-T20	10	18	3	80	100	80	0.6	
	NO_X	T20-T30	10	85	14	80	80	64	5	
	NO_X Total	**Total Shutdown**	**30**						**7**	**8**
	CO	T0-T10	10	758	126	80	100	80	25	
	CO	T10-T20	10	1,014	169	80	100	80	34	
	CO	T20-T30	10	408	68	80	85	68	22	
	CO Total	**Total Shutdown**	**30**						**81**	**97**
	VOC	T0-T10	10	49	8	45	100	45	5	
	VOC	T10-T20	10	148	25	45	100	45	14	
	VOC	T20-T30	10	18	3	45	85	38	2	
	VOC Total	**Total Shutdown**	**30**						**21**	**24**

Notes:
1. Data includes a 20% margin.

Huntington Beach Energy Project
Appendix A, Table 5
Combined Cycle: Summary of Operation Emissions – Criteria Pollutants
March 2016

Scenario	1	2	3	4	5	6	7	8	9	10	11
Ambient Temperature (°F)	32	32	32	65.8	65.8	65.8	65.8	110	110	110	110
Relative Humidity (%)	87%	87%	87%	58%	58%	58%	58%	8%	8%	8%	8%
Load (%)	max	average	min	max	max	average	min	max	max	average	min
Fuel Input (MMBtu/hr HHV)	2,273	1,782	1,369	2,248	2,219	1,723	1,296	2,123	1,901	1,527	1,227
NO_x Emissions											
per turbine (lbs/hr) [a]	16.5	13.0	10.0	16.4	16.2	12.6	9.45	15.5	13.9	11.1	8.95
per turbine (lbs/day) [b]	488	415	352	476	472	396	330	447	413	356	310
per turbine (lbs/month) [c]	13,447	11,096	9,067	13,220	13,075	10,637	8,538	12,435	11,342	9,504	8,031
all turbines (lbs/month) [c]	26,894	22,192	18,134	26,440	26,149	21,274	17,075	24,870	22,684	19,009	16,062
per turbine (lbs/year) [d]	-	-	-	115,757	114,444	92,400	73,412	-	-	-	-
per turbine (tpy) [d]	-	-	-	57.9	57.2	46.2	36.7	-	-	-	-
all turbines (tpy) [d]	-	-	-	116	114	92.4	73.4	-	-	-	-
CO Emissions											
per turbine (lbs/hr) [a]	10.0	7.91	6.08	9.98	9.85	7.65	5.75	9.42	8.44	6.78	5.45
per turbine (lbs/day) [b]	1,127	1,082	1,044	1,022	1,019	973	933	832	811	776	748
per turbine (lbs/month) [c]	26,326	24,895	23,659	24,054	23,965	22,481	21,203	20,041	19,375	18,257	17,359
all turbines (lbs/month) [c]	52,652	49,790	47,319	48,108	47,931	44,963	42,406	40,082	38,751	36,513	34,719
per turbine (lbs/year) [d]	-	-	-	193,732	192,933	179,511	167,950	-	-	-	-
per turbine (tpy) [d]	-	-	-	96.9	96.5	89.8	84.0	-	-	-	-
all turbines (tpy) [d]	-	-	-	194	193	180	168	-	-	-	-
VOC Emissions											
per turbine (lbs/hr) [a]	5.75	4.53	3.48	5.72	5.64	4.38	3.29	5.40	4.83	3.88	3.12
per turbine (lbs/day) [b]	257	231	209	250	248	222	199	211	199	180	164
per turbine (lbs/month) [c]	7,574	6,754	6,047	7,368	7,317	6,467	5,735	6,349	5,968	5,327	4,814
all turbines (lbs/month) [c]	15,149	13,509	12,094	14,736	14,635	12,935	11,470	12,698	11,936	10,655	9,627
per turbine (lbs/year) [d]	-	-	-	62,744	62,286	54,599	47,977	-	-	-	-
per turbine (tpy) [d]	-	-	-	31.4	31.1	27.3	24.0	-	-	-	-
all turbines (tpy) [d]	-	-	-	62.7	62.3	54.6	48.0	-	-	-	-
SO_2 Emissions [e]											
per turbine (lbs/hr) [a]	4.86	3.84	2.95	4.81	4.78	3.72	2.79	4.60	4.16	3.33	2.67
per turbine (lbs/day) [b]	117	92.1	70.8	115	115	89.2	67.0	110	100	79.8	64.1
per turbine (lbs/month) [c]	3,615	2,855	2,195	3,577	3,560	2,765	2,078	3,424	3,093	2,474	1,986
all turbines (lbs/month) [c]	7,230	5,709	4,390	7,154	7,120	5,531	4,157	6,849	6,185	4,949	3,971
per turbine (lbs/year) [d]	-	-	-	10,641	10,590	8,227	6,183	-	-	-	-
per turbine (tpy) [d]	-	-	-	5.32	5.30	4.11	3.09	-	-	-	-
all turbines (tpy) [d]	-	-	-	10.6	10.6	8.23	6.18	-	-	-	-
PM Emissions											
per turbine (lbs/hr) [a]	8.50	8.50	8.50	8.50	8.50	8.50	8.50	8.50	8.50	8.50	8.50
per turbine (lbs/day) [b]	204	204	204	204	204	204	204	204	204	204	204
per turbine (lbs/month) [c]	6,324	6,324	6,324	6,324	6,324	6,324	6,324	6,324	6,324	6,324	6,324
all turbines (lbs/month) [c]	12,648	12,648	12,648	12,648	12,648	12,648	12,648	12,648	12,648	12,648	12,648
per turbine (lbs/year) [d]	-	-	-	56,440	56,440	56,440	56,440	-	-	-	-
per turbine (tpy) [d]	-	-	-	28.2	28.2	28.2	28.2	-	-	-	-
all turbines (tpy) [d]	-	-	-	56.4	56.4	56.4	56.4	-	-	-	-

Notes:

[a] The hourly emission rates are for the turbine in normal operation only (i.e., excludes startup or shutdown emissions).

[b] The daily emission rates include the number of daily starts and stops per the PPA (2 cold starts and 2 shutdowns per day).

[c] The monthly emission rates assume 31 days and include 15 cold starts, 12 warm starts, 35 hot starts, and 62 shutdowns per month.

[d] The annual emission rate assumes 6,100 hours of operation, 80 cold starts, 88 warm starts, 332 hot starts, and 500 shutdowns per year.

[e] Hourly, daily, and monthly SO_2 emissions assume a peak fuel sulfur content of 0.75 gr/100 cf, while annual SO_2 emissions assume an annual average fuel sulfur content of 0.25 gr/100 cf.

Revisions made consistent with proposed operating profile

Huntington Beach Energy Project
Appendix A, Table 6
Combined Cycle: Summary of Operation Emissions – Air Toxics
March 2016

Assumptions:

Maximum Heat Input Case:	Base load operation	
Total Operations (per turbine - includes startup and shutdown hours):	6,640	hrs/yr
Gas Heat Content:	1,050	MMBtu/MMscf
Maximum Hourly Heat Input (per turbine):	2,273	MMBtu/hr (HHV)
Average Annual Heat Input (per turbine):	2,248	MMBtu/hr (HHV)
Number of Turbines:	2	

Proposed Project	Emission Factors		Emissions (per Turbine)			Emissions (Facility Total)		
Compound	lb/MMcf [a]	lb/MMBtu [a]	lbs/hr	lbs/yr	tpy	lbs/hr	lbs/yr	tpy
Ammonia [b]	5 ppm	-	15.2	100,715	50.4	30.5	201,430	101
1,3-Butadiene	4.39E-04	4.18E-07	0.0010	6.24	0.0031	0.0019	12.5	0.0062
Acetaldehyde [c]	1.80E-01	1.71E-04	0.39	2,559	1.28	0.78	5,118	2.56
Acrolein [c]	3.69E-03	3.51E-06	0.0080	52.5	0.026	0.016	105	0.052
Benzene [c]	3.33E-03	3.17E-06	0.0072	47.3	0.024	0.014	94.7	0.047
Ethylbenzene	3.26E-02	3.10E-05	0.071	463	0.23	0.14	927	0.46
Formaldehyde [c]	3.67E-01	3.50E-04	0.79	5,218	2.61	1.59	10,435	5.22
Naphthalene	1.33E-03	1.27E-06	0.0029	18.9	0.0095	0.0058	37.8	0.019
PAHs [d]	9.18E-04	8.74E-07	0.0010	6.53	0.0033	0.0020	13.1	0.0065
Propylene Oxide	2.96E-02	2.82E-05	0.064	421	0.21	0.13	842	0.42
Toluene	1.33E-01	1.27E-04	0.29	1,891	0.95	0.58	3,782	1.89
Xylene	6.53E-02	6.22E-05	0.14	928	0.46	0.28	1,857	0.93
TOTAL HAPs				**11,612**	**5.81**		**23,223**	**11.6**
TOTAL TACs				**5,271**	**2.64**		**10,542**	**5.27**

Notes:

[a] Provided by SCAQMD via e-mail correspondence on 11/3/2015, with the exception of ammonia. Units of lb/MMBtu calculated by dividing lb/MMscf by the gas heat content.

[b] Based on the operating exhaust NH_3 limit of 5 ppmv @ 15% O_2 and an F-factor of 8,710.

[c] Emission factors account for the use of an oxidation catalyst, as provided by SCAQMD via e-mail correspondence on 11/3/2015.

[d] Per Section 3.1.4.3 of *AP-42* (EPA, 2000), PAH emissions were assumed to be controlled up to 50% through the use of an oxidation catalyst.

Revisions made consistent with proposed operating profile

Huntington Beach Energy Project
Appendix A, Table 7
Simple Cycle: LMS 100PB Performance Data
March 2016

Huntington Beach LMS100 PB Emissions Data

Case Number	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
GE Case Number	111	112	113	114	115	116	117	126	127	128	129
CTG Model	LMS100PB	LMS100PB	LMS100PB	LMS100PB	LMS100PB	LMS100PB	LMS100PB	LMS100PB	LMS100PB	LMS100PB	LMS100PB
CTG Fuel Type	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG
CTG Load Level (percent of Base Load)	100	75	50	100	100	75	50	100	100	75	50
CTG Inlet Air Cooling	Off	Off	Off	On	Off	Off	off	On	Off	Off	Off
Ambient Conditions	Low	Low	Low	Average	Average	Average	Average	High	High	High	High
Ambient Temperature, F	32	32	32	65.8	65.8	65.8	65.8	110	110	110	110
Ambient Relative Humidity, %	86.72	86.72	86.72	58.32	58.32	58.32	58.32	7.95	7.95	7.95	7.95
Atmospheric Pressure, psia	14.68	14.68	14.68	14.68	14.68	14.68	14.68	14.68	14.68	14.68	14.68
Combustion Turbine Performance											
Inlet Loss, in. H_2O	5	5	5	5	5	5	5	5	5	5	5
Exhaust Loss, in. H_2O	10	10	10	10	10	10	10	10	10	10	10
Gross CTG Output, kW (ONE CTG)	100,393	75,069	49,715	100,814	98,827	73,908	48,935	77,501	66,189	49,388	32,564
Gross CTG Heat Rate, Btu/kWh (LHV) (ONE CTG)	7,896	8,588	10,026	7,911	7,955	8,627	10,084	8,562	8,950	9,976	11,938
Gross CTG Heat Rate, Btu/kWh (HHV) (ONE CTG)	8,765	9,533	11,129	8,781	8,830	9,576	11,193	9,504	9,935	11,073	13,251
Net CTG Output, kW (ONE CTG)	98,934	73,610	48,256	99,355	97,368	72,448	47,476	76,041	64,730	47,929	31,105
Net CTG Heat Rate, Btu/kWh (LHV) (ONE CTG)	8,012	8,759	10,329	8,027	8,074	8,801	10,394	8,726	9,152	10,279	12,498
Net CTG Heat Rate, Btu/kWh (HHV) (ONE CTG)	8,894	9,722	11,465	8,910	8,962	9,769	11,537	9,686	10,158	11,410	13,873
CTG Heat Input, MMBtu/h (LHV) (ONE CTG)	793	645	498	798	786	638	493	664	592	493	389
CTG Heat Input, MMBtu/h (HHV) (ONE CTG)	880	716	553	885	873	708	548	737	658	547	432
CTG Exhaust Flow, 10^3 lb/h (ONE CTG)	1,754	1,479	1,162	1,746	1,724	1,463	1,151	1,473	1,329	1,128	901
CTG Exhaust Temperature, F (ONE CTG)	789	816	887	794	798	817	887	848	883	925	997
2 LMS100 PB Gross Kw	200,786	150,139	99,430	201,628	197,654	147,815	97,871	155,001	132,378	98,777	65,129
Gross Heat Rate, CTG (LHV)	7,896	8,588	10,026	7,911	7,955	8,627	10,084	8,562	8,950	9,976	11,938
Gross Heat Rate, 2 CTGs (LHV)	7,896	8,588	10,026	7,911	7,955	8,627	10,084	8,562	8,950	9,976	11,938
Aux Load and Transformer Losses	8,036	7,090	6,153	8,063	7,990	7,046	6,122	7,203	6,757	6,122	5,468
Net KW's for 2 LMS100 PB	192,750	143,048	93,277	193,565	189,664	140,770	91,749	147,798	125,621	92,654	59,661
Net Plant Heat Rate (all 2 LMS100 PB) (LHV)	8,225	9,014	10,687	8,241	8,290	9,059	10,757	8,979	9,431	10,635	13,032
Net Plant Heat Rate (all 2 LMS100 PB) (HHV)	9,130	10,006	11,863	9,147	9,202	10,056	11,940	9,967	10,469	11,805	14,466
CTG Exaust Composition % Weight - Wet (ONE CTG)											
O_2	14.23	14.55	14.68	14.00	14.05	14.44	14.58	14.05	14.33	14.50	14.61
CO_2	5.85	5.64	5.55	5.91	5.90	5.64	5.55	5.82	5.77	5.65	5.58
H_2O	4.98	4.82	4.75	5.64	5.47	5.26	5.19	5.90	5.02	4.93	4.87
N_2	73.65	73.71	73.74	73.18	73.30	73.38	73.40	72.95	73.60	73.63	73.65
Ar	1.26	1.26	1.26	1.25	1.25	1.25	1.25	1.24	1.25	1.26	1.26
Catalyst Inlet Exhaust Analysis - % Mole Basis - Wet (ONE CTG/HRSG TRAIN)											
Ar	0.89	0.90	0.90	0.88	0.89	0.89	0.89	0.88	0.89	0.89	0.89
CO_2	3.78	3.65	3.59	3.80	3.80	3.64	3.58	3.74	3.73	3.65	3.61
H_2O	7.87	7.61	7.50	8.87	8.61	8.29	8.17	9.27	7.93	7.78	7.70
N_2	74.77	74.88	74.92	74.01	74.21	74.34	74.39	73.66	74.69	74.75	74.78
O_2	12.65	12.94	13.06	12.39	12.45	12.81	12.94	12.42	12.73	12.89	12.99
Ave Mol Wt (based on % mol)	28.43	28.44	28.45	28.32	28.35	28.37	28.38	28.27	28.42	28.42	28.43
Stack Exit Temperature, F	789	816	887	794	798	817	887	848	883	925	997
Stack Diameter, ft (estimated)	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50
Stack Flow, 10^3 lb/h	1754	1479	1162	1746	1724	1463	1151	1473	1329	1128	901
Stack Flow, 10^3 acfm	938.19	807.64	669.81	941.44	930.92	801.79	665.26	829.75	764.69	669.05	562.16
Stack Exit Velocity, ft/s	109.18	94.01	77.96	108.66	108.40	93.34	77.45	96.61	89.04	77.90	65.46
NO_X (Catalyst Inlet), ppmvd (dry, 15% O_2)	25	25	25	25	25	25	25	25	25	25	25
CO (Catalyst Inlet), ppmvd (dry, 15% O_2)	100	100	125	100	100	100	125	100	100	100	125
VOC (Catalyst Inlet), ppmvd (dry, 15% O_2)	4	4	4	4	4	4	4	4	4	4	4
Estimated Maximum Emissions (at CTG Exhaust) x (GE Data, One CTG)											
NO_X, ppmvd (15% O_2)	25	25	25	25	25	25	25	25	25	25	25
NO_X as NO_2, lb/hr	82.37	66.99	51.79	82.88	81.69	66.25	51.27	68.95	61.55	51.19	40.39
CO, ppmvd (15% O_2)	100	100	125	100	100	100	125	100	100	100	125
CO, lb/hr	200.59	163.15	157.66	201.83	198.95	161.35	156.09	167.91	149.91	124.67	122.97
VOC, ppmvd (15% O_2)	4	4	4	4	4	4	4	4	4	4	4

Huntington Beach Energy Project
Appendix A, Table 7
Simple Cycle: LMS 100PB Performance Data
March 2016

Huntington Beach LMS100 PB Emissions Data

Case Number	1	2	3	4	5	6	7	8	9	10	11
VOC, lb/hr	4.60	3.74	2.89	4.62	4.56	3.70	2.86	3.85	3.43	2.86	2.25
Fuel Sulfur Content, gr/100 scf	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75
PM_{10}, lb/hr	4.33	0.00	0.00	4.33	4.33	0.00	0.00	4.33	4.33	0.00	0.00
SO_2, lb/hr	1.63	1.32	1.02	1.64	1.61	1.31	1.01	1.36	1.22	1.01	0.80
SO_3, lb/hr	0.11	0.09	0.07	0.11	0.11	0.09	0.07	0.09	0.08	0.07	0.05
Estimated Maximum Emissions (at Stack) x (GE Data, One CTG)											
NO_X, ppmvd (15% O_2)	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
NO_X as NO_2, lb/hr	8.24	6.70	5.18	8.29	8.17	6.63	5.13	6.89	6.16	5.12	4.04
CO, ppmvd (15% O_2)	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
CO, lb/hr	8.02	6.53	5.05	8.07	7.96	6.45	4.99	6.72	6.00	4.99	3.93
VOC, ppmvd (15% O_2)	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
VOC, lb/hr	2.30	1.87	1.44	2.31	2.28	1.85	1.43	1.92	1.72	1.43	1.13
NH_3, ppmvd (15% O_2)	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
NH_3, lb/hr	6.10	4.96	3.83	6.14	6.05	4.91	3.80	5.10	4.56	3.79	2.99
PM_{10}, lb/hr	6.24	6.24	6.24	6.24	6.24	6.24	6.24	6.24	6.24	6.24	6.24
Sulfur, Stack Ammonium Sulfate and PM Calculations with 0.75 grain/100 scf Sulfur - PEC Calculation (One CTG)											
Fuel Sulfur Content, gr/100 scf	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75
Fuel Molecular Weight, lbm/lbmol	16.73	16.73	16.73	16.73	16.73	16.73	16.73	16.73	16.73	16.73	16.73
Fuel Flow, lb/hr	38,341	31,185	24,109	38,579	38,026	30,842	23,868	32,096	28,655	23,831	18,804
SCFM Fuel (LHV)	14,496	11,790	9,115	14,586	14,377	11,660	9,024	12,135	10,834	9,010	7,109
Elemental Sulfur Molar Weight	32.06	32.06	32.06	32.06	32.06	32.06	32.06	32.06	32.06	32.06	32.06
SO_2 Molar Weight	64.06	64.06	64.06	64.06	64.06	64.06	64.06	64.06	64.06	64.06	64.06
SO_3 Molar Weight	80.06	80.06	80.06	80.06	80.06	80.06	80.06	80.06	80.06	80.06	80.06
Ammonium Sulfate Molar Weight	132.14	132.14	132.14	132.14	132.14	132.14	132.14	132.14	132.14	132.14	132.14
H_2SO_4 Molar Weight	98.08	98.08	98.08	98.08	98.08	98.08	98.08	98.08	98.08	98.08	98.08
Elemental Sulfur in Fuel, lb/hr	0.93	0.76	0.59	0.94	0.92	0.75	0.58	0.78	0.70	0.58	0.46
Moles of Sulfur in Fuel, lbmol/hr	0.03	0.02	0.02	0.03	0.03	0.02	0.02	0.02	0.02	0.02	0.01
% Sulfur Oxidized to SO_2, assumed	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%
% Sulfur Oxidized to SO_3, assumed	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%
Conservative SO_2 Calculation at CTG Exhaust, 90% oxidation assumption, lb/hr	1.68	1.36	1.05	1.69	1.66	1.35	1.04	1.40	1.25	1.04	0.82
Conservative SO_3 Calculation at CTG Exhaust, 10% oxidation assumption, lb/hr	0.23	0.19	0.15	0.23	0.23	0.19	0.14	0.19	0.17	0.14	0.11
SO_2 Moles at Calayst Inlet	0.03	0.02	0.02	0.03	0.03	0.02	0.02	0.02	0.02	0.02	0.01
Assumed SO_2 oxidation rate in CO Catalyst for SO_3 calculation, vol%	43%	43%	43%	43%	43%	43%	43%	43%	43%	43%	43%
Assumed SO_2 oxidation rate in SCR for SO_3 calculation, vol%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
SO_3, lb/hr created in CO Catalyst	0.905	0.74	0.57	0.91	0.90	0.73	0.56	0.76	0.68	0.56	0.44
SO_3, lb/hr created in SCR Catalyst	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
SO_3, lb/hr from Catalysts	0.92	0.75	0.58	0.92	0.91	0.74	0.57	0.77	0.69	0.57	0.45
Total SO_3, lb/hr (Catalysts plus initial fuel SO_3)	1.149	0.93	0.72	1.16	1.14	0.92	0.72	0.96	0.86	0.71	0.56
Maximum Stack Ammonium Sulfate [$(NH_4)_2$-(SO_4)] (assuming 100% conversion from SO_3), lb/h	1.90	1.54	1.19	1.91	1.88	1.53	1.18	1.59	1.42	1.18	0.93
Maximum Stack H_2SO_4 (assuming 100% conversion from SO_3 to H_2SO_4), lb/h	1.41	1.15	0.89	1.42	1.40	1.13	0.88	1.18	1.05	0.88	0.69
Total PM_{10} at Stack, lb/h per 1 LMS100 PB	6.23	1.54	1.19	6.24	6.21	1.53	1.18	5.92	5.75	1.18	0.93
Catalyst Ammonia Usage - PEC Calculation (One CTG)											
Total Catalyst NO_X Removal, lb/hr	74.13	60.29	46.61	74.59	73.52	59.63	46.15	62.05	55.40	46.07	36.35
NO_X Removal Efficiency, %	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
NO_X Molar Weight	46	46	46	46	46	46	46	46	46	46	46
NH_3 Molar Weight	17	17	17	17	17	17	17	17	17	17	17
NH_3 required for NO_X Removal, lb/hr	27.40	22.28	17.23	27.57	27.17	22.04	17.05	22.93	20.47	17.03	13.44
NH_3 Slip (assumed to be NH_3 in Stack), lb/hr	6.10	4.96	3.83	6.14	6.05	4.91	3.80	5.10	4.56	3.79	2.99
Total Ammonia Usage	33.49	27.24	21.06	33.70	33.22	26.94	20.85	28.04	25.03	20.82	16.43
19% Aqueous Ammonia Solution, lb NH_3/ft^3	11	11	11	11	11	11	11	11	11	11	11
Total Aqueous Ammonia Usage, gph per 1 LMS100 PB	22.78	18.52	14.32	22.92	22.59	18.32	14.18	19.07	17.02	14.16	11.17
19% Aqueous Ammonia Usage, lb/hr per CTG	176.51	143.56	110.99	177.61	175.07	141.98	109.88	147.76	131.91	109.71	86.56
THE BELOW IS FROM GE PERFORMANCE AND EMISSIONS 2.10.15											
Exh Wght % Wet (NOT FOR USE IN ENVIRONMENTAL PERMITS)											
AR	1.26	1.26	1.26	1.25	1.25	1.25	1.25	1.24	1.25	1.26	1.26

Huntington Beach Energy Project
Appendix A, Table 7
Simple Cycle: LMS 100PB Performance Data
March 2016

Huntington Beach LMS100 PB Emissions Data

Case Number	1	2	3	4	5	6	7	8	9	10	11
N_2	73.65	73.71	73.74	73.18	73.30	73.38	73.40	72.95	73.60	73.63	73.65
O_2	14.23	14.55	14.68	14.00	14.05	14.44	14.58	14.05	14.33	14.50	14.61
CO_2	5.85	5.64	5.55	5.91	5.90	5.64	5.55	5.82	5.77	5.65	5.58
H_2O	4.98	4.82	4.75	5.64	5.47	5.26	5.19	5.90	5.02	4.93	4.87
SO_2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CO	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
HC	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
NO_X	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Exh Mole % Dry (NOT FOR USE IN ENVIRONMENTAL PERMITS)											
AR	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
N_2	81.16	81.05	81.00	81.22	81.21	81.06	81.01	81.18	81.12	81.06	81.02
O_2	13.73	14.00	14.12	13.60	13.62	13.97	14.09	13.68	13.83	13.98	14.07
CO_2	4.10	3.95	3.88	4.17	4.16	3.97	3.90	4.13	4.05	3.96	3.91
H_2O	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SO_2	0.00	0.02	0.02	0.00	0.00	0.02	0.02	0.02	0.00	0.02	0.02
CO	0.02	0.01	0.01	0.02	0.02	0.01	0.01	0.01	0.02	0.01	0.01
HC	0.01	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.01	0.00	0.00
NO_X	0.00	0.00	0.00	0.00	0.00	0.00	0.00	----------	0.00	----------	----------
Exh Mole % Wet (NOT FOR USE IN ENVIRONMENTAL PERMITS)											
AR	0.89	0.90	0.90	0.88	0.89	0.89	0.89	0.88	0.89	0.89	0.89
N_2	74.77	74.88	74.92	74.01	74.21	74.34	74.39	73.66	74.69	74.75	74.78
O_2	12.65	12.94	13.06	12.39	12.45	12.81	12.94	12.42	12.73	12.89	12.99
CO_2	3.78	3.65	3.59	3.80	3.80	3.64	3.58	3.74	3.73	3.65	3.61
H_2O	7.87	7.61	7.50	8.87	8.61	8.29	8.17	9.27	7.93	7.78	7.70
SO_2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CO	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
HC	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
NO_X	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Huntington Beach Energy Project
Appendix A, Table 8
Simple Cycle: Summary of Start-Up and Shutdown Emission Estimates
March 2016

Startup Emissions

Pollutant	Startup	Duration (min)	Catalyst Inlet (lbs/hr)	Inlet Over Duration (lbs)	Design Reduction (%)	Transient Reduction (%)	Net Reduction (%)	Total Outlet (lbs)	Emissions per Event (lbs)
NO_X	T0-T10 [1, 2]	10		4.94	90%	0%	0%	04.94	
NO_X	T10-T20 [3]	10	82.0	13.7	90%	50%	45%	07.52	
NO_X	T20-T30 [3]	10	82.0	13.7	90%	100%	90%	01.37	
NO_X	**Total Startup**	**30**						**13.82**	**16.6**
CO	T0-T10 [1, 2]	10		31.67	96.0%	83.3%	80%	6.34	
CO	T10-T20 [4]	10	485.0	80.8	96.0%	100.0%	96%	3.25	
CO	T20-T30 [4]	10	485.0	80.8	96.0%	100.0%	96%	3.25	
CO	**Total Startup**	**30**						**12.84**	**15.4**
VOC	T0-T10 [1, 2]	10		1	50%	83.3%	42%	0.58	
VOC	T10-T20 [5]	10	10.5	1.75	50%	100%	50%	0.88	
VOC	T20-T30 [5]	10	10.5	1.75	50%	100%	50%	0.88	
VOC	**Total Startup**	**30**						**2.33**	**2.80**

Notes:

1. First fire occurs 4 minutes after initiation of the "10 Minute Start" timeline.
2. For the 10 Minute Start, emissions are per GE LMS 100 PB Estimated GT 10 Minute Startup Emissions at GT Exhasut Flange, dated 02-12-15.
3. For T10 through T30, NO_X emissions (lbs/hr) are based on Case 104 of GE-provided AES Southland (LMS 100 PB Perf & Emissions) New Fuel 02.10.15 Cust Copy R1:
   - -No NO_X reduction occurs until catalyst is up to temperature and ammonia is injected, hence no reduction during the T0 to T10 timeframe.
   - -It is assumed that the NO_X reduction commences at minute 15 and that design reduction occurs 50% of the time.
   - -Emissions per event include a 20% engineers' margin.
4. CO emissions (lbs/hr) are based on a spike factor of 485 lbs/hr for 20 minutes:
   - -During the T0 to T10 timeline, the exhaust is >700°F at T5 (1 minute after ignition); therefore, the Transient % of Design is calculated based on 5 minutes out of 6 (hence 83.3%).
   - -Emissions per event include a 20% engineers' margin.
5. VOC emissions (lbs/hr) are based on a spike factor of 10.5 lbs/hr for 20 minutes:
   - -During the T0 to T10 timeline, the exhaust is >700°F at T5 (1 minute after ignition); therefore, the Transient % of Design is calculated based on 5 minutes out of 6 (hence 83.3%).
   - -Emissions per event include a 20% engineers' margin.

Shutdown Emissions

Pollutant	Shutdown	Duration (min)	Inlet (lbs)	Transient (% of Design)	Design Reduction (%)	Transient Reduction (%)	Net Reduction (%)	Emissions per Event (lbs)
NO_X	0-13 minutes*	13.0	5.67	100%	90.0%	50.0%	45.00%	3.12
CO	0-13 minutes*	13.0	54.01	100%	96.0%	50.0%	48.00%	28.1
VOC	0-13 minutes*	13.0	4.08	100%	50%	50.0%	25.00%	3.06

Notes:

Emissions are per GE LMS 100 PB Est Shutdown Emissions GT Exh, dated 01-06-15.

It is conservatively assumed that the catalyst efficiency will be 50% during shutdown.

Huntington Beach Energy Project
Appendix A, Table 9
Simple Cycle: Summary of Operation Emissions – Criteria Pollutants
March 2016

Scenario	1	2	3	4	5	6	7	8	9	10	11
Ambient Temperature (°F)	32	32	32	65.8	65.8	65.8	65.8	110	110	110	110
Relative Humidity (%)	86.72	86.72	86.72	58.32	58.32	58.32	58.32	7.95	7.95	7.95	7.95
Load (%)	100	75	50	100	100	75	50	100	100	75	50
Fuel Input (MMBtu/hr HHV)	880	716	553	885	873	708	548	737	658	547	432
NO_X Emissions											
per turbine (lbs/hr) [a]	8.24	6.70	5.18	8.29	8.17	6.63	5.13	6.89	6.16	5.12	4.04
per turbine (lbs/day) [b]	225	191	156	226	224	189	155	195	178	155	131
per turbine (lbs/month) [c]	6,984	5,908	4,845	7,020	6,937	5,857	4,809	6,045	5,528	4,803	4,048
all turbines (lbs/month) [c]	13,968	11,817	9,690	14,039	13,873	11,713	9,617	12,090	11,056	9,606	8,095
per turbine (lbs/year) [d]	-	-	-	21,401	21,193	18,492	15,870	-	-	-	-
per turbine (tpy) [d]	-	-	-	10.7	10.6	9.25	7.94	-	-	-	-
all turbines (tpy) [d]	-	-	-	21.4	21.2	18.5	15.9	-	-	-	-
CO Emissions											
per turbine (lbs/hr) [a]	8.02	6.53	5.05	8.07	7.96	6.45	4.99	6.72	6.00	4.99	3.93
per turbine (lbs/day) [b]	268	234	201	269	267	233	200	239	222	200	176
per turbine (lbs/month) [c]	8,310	7,262	6,226	8,344	8,264	7,212	6,191	7,395	6,891	6,185	5,449
all turbines (lbs/month) [c]	16,619	14,524	12,452	16,689	16,527	14,423	12,381	14,790	13,783	12,370	10,898
per turbine (lbs/year) [d]	-	-	-	29,350	29,148	26,517	23,963	-	-	-	-
per turbine (tpy) [d]	-	-	-	14.7	14.6	13.3	12.0	-	-	-	-
all turbines (tpy) [d]	-	-	-	29.4	29.1	26.5	24.0	-	-	-	-
VOC Emissions											
per turbine (lbs/hr) [a]	2.30	1.87	1.44	2.31	2.28	1.85	1.43	1.92	1.72	1.43	1.13
per turbine (lbs/day) [b]	63.6	53.9	44.3	63.9	63.1	53.4	44.0	55.1	50.5	43.9	37.1
per turbine (lbs/month) [c]	1,971	1,671	1,374	1,981	1,958	1,656	1,364	1,709	1,565	1,362	1,152
all turbines (lbs/month) [c]	3,941	3,341	2,748	3,961	3,915	3,313	2,728	3,418	3,129	2,725	2,303
per turbine (lbs/year) [d]	-	-	-	6,097	6,039	5,285	4,554	-	-	-	-
per turbine (tpy) [d]	-	-	-	3.05	3.02	2.64	2.28	-	-	-	-
all turbines (tpy) [d]	-	-	-	6.10	6.04	5.29	4.55	-	-	-	-
SO_2 Emissions [e]											
per turbine (lbs/hr) [a]	1.63	1.32	1.02	1.64	1.61	1.31	1.01	1.36	1.22	1.01	0.80
per turbine (lbs/day) [b]	39.0	31.7	24.5	39.3	38.7	31.4	24.3	32.7	29.2	24.3	19.1
per turbine (lbs/month) [c]	1,210	984	761	1,218	1,200	973	753	1,013	904	752	593
all turbines (lbs/month) [c]	2,420	1,968	1,522	2,435	2,400	1,947	1,507	2,026	1,809	1,504	1,187
per turbine (lbs/year) [d]	-	-	-	1,091	1,076	873	675	-	-	-	-
per turbine (tpy) [d]	-	-	-	0.55	0.54	0.44	0.34	-	-	-	-
all turbines (tpy) [d]	-	-	-	1.09	1.08	0.87	0.68	-	-	-	-
PM Emissions											
per turbine (lbs/hr) [a]	6.24	6.24	6.24	6.24	6.24	6.24	6.24	6.24	6.24	6.24	6.24
per turbine (lbs/day) [b]	150	150	150	150	150	150	150	150	150	150	150
per turbine (lbs/month) [c]	4,644	4,644	4,644	4,644	4,644	4,644	4,644	4,644	4,644	4,644	4,644
all turbines (lbs/month) [c]	9,288	9,288	9,288	9,288	9,288	9,288	9,288	9,288	9,288	9,288	9,288
per turbine (lbs/year) [d]	-	-	-	12,489	12,489	12,489	12,489	-	-	-	-
per turbine (tpy) [d]	-	-	-	6.24	6.24	6.24	6.24	-	-	-	-
all turbines (tpy) [d]	-	-	-	12.5	12.5	12.5	12.5	-	-	-	-

Notes:

[a] The hourly emission rates are for the turbine in normal operation only (i.e., excludes startup or shutdown emissions).

[b] The daily emission rates include the number of daily starts and stops per the PPA (2 starts and 2 shutdowns per day).

[c] The monthly emission rates assume 31 days and include 62 starts and 62 shutdowns per month.

[d] The annual emission rate assumes 1,750 hours of operation, 350 starts, and 350 shutdowns per year.

[e] Hourly, daily, and monthly SO_2 emissions assume a peak fuel sulfur content of 0.75 gr/100 cf, while annual SO_2 emissions assume an annual average fuel sulfur content of 0.25 gr/100 cf.

Huntington Beach Energy Project
Appendix A, Table 10
Simple Cycle: Summary of Operation Emissions – Air Toxics
March 2016

Assumptions:

Maximum Heat Input Case:	Base load operation	
Total Operations (per turbine - includes startup and shutdown hours):	2,001	hrs/yr
Gas Heat Content:	1,050	MMBtu/MMscf
Maximum Hourly Heat Input (per turbine):	885	MMBtu/hr (HHV)
Average Annual Heat Input (per turbine):	885	MMBtu/hr (HHV)
Number of Turbines:	2	

Proposed Project	Emission Factors		Emissions (per Turbine)			Emissions (Facility Total)		
Compound	**lb/MMcf [a]**	**lb/MMBtu [a]**	**lbs/hr**	**lbs/yr**	**tpy**	**lbs/hr**	**lbs/yr**	**tpy**
Ammonia [b]	5 ppm	-	6.14	12,277	6.14	12.3	24,553	12.3
1,3-Butadiene	4.39E-04	4.18E-07	0.00037	0.74	0.00037	0.00074	1.48	0.00074
Acetaldehyde [c]	1.80E-01	1.71E-04	0.15	304	0.15	0.30	607	0.30
Acrolein [c]	3.69E-03	3.51E-06	0.0031	6.22	0.0031	0.0062	12.4	0.0062
Benzene [c]	3.33E-03	3.17E-06	0.0028	5.62	0.0028	0.0056	11.2	0.0056
Ethylbenzene	3.26E-02	3.10E-05	0.027	55.0	0.027	0.055	110	0.055
Formaldehyde [c]	3.67E-01	3.50E-04	0.31	619	0.31	0.62	1,238	0.62
Naphthalene	1.33E-03	1.27E-06	0.0011	2.24	0.0011	0.0022	4.49	0.0022
PAHs [d]	9.18E-04	8.74E-07	0.00039	0.77	0.00039	0.00077	1.55	0.00077
Propylene Oxide	2.96E-02	2.82E-05	0.025	49.9	0.025	0.050	100	0.050
Toluene	1.33E-01	1.27E-04	0.11	224	0.11	0.22	449	0.22
Xylene	6.53E-02	6.22E-05	0.055	110	0.055	0.11	220	0.11
TOTAL HAPs				**1,378**	**0.69**		**2,756**	**1.38**
TOTAL TACs				**625**	**0.31**		**1,251**	**0.63**

Notes:

[a] Provided by SCAQMD via e-mail correspondence on 11/3/2015, with the exception of ammonia. Units of lb/MMBtu calculated by dividing lb/MMscf by the gas heat content.

[b] Based on the operating exhaust NH_3 limit of 5 ppmv @ 15% O_2 and an F-factor of 8,710.

[c] Emission factors account for the use of an oxidation catalyst, as provided by SCAQMD via e-mail correspondence on 11/3/2015.

[d] Per Section 3.1.4.3 of *AP-42* (EPA, 2000), PAH emissions were assumed to be controlled up to 50% through the use of an oxidation catalyst.

Huntington Beach Energy Project
Appendix A, Table 11
Auxiliary Boiler: Performance Data
March 2016

Performance Data

Parameter	Units	Estimated/ Expected Value	Note
Gross Steaming Capacity	pph	58,537	
Net Steaming Capacity	pph	50,000	
Design Pressure	psig	540	
Design Steam Conditions		saturated	
Design Max Turndown Capability	%	25	
Design Max Heat Input	MMBtu/hr (HHV)	71	1, 2, and 3
Design Min Heat Input (at max turndown)	MMBtu/hr (HHV)	18	1
Estimated Exhaust Temp at Max Heat Input	°F	318	1
Estimated Exhaust Temp at Min Heat Input	°F	256	1
Estimated Exhaust Gas Flow at Max Heat Input	ACFM	29,473	1
Estimated Exhaust Gas Flow at Min Heat Input	ACFM	6,860	1
Estimated Stack Emissions			
Gas Heat Content	Btu/scf	1,050	
NO_X	ppmvd @ 3% oxygen	5	4
NO_X	lb/MMBtu (HHV)	0.0060	6
CO	ppmvd @ 3% oxygen	50	4
CO	lb/MMBtu (HHV)	0.040	6
VOC	lb/MMBtu (HHV)	0.0067	4
PM_{10}	lb/MMBtu (HHV)	0.0071	4
SO_2 - 0.75 gr/100 cf, Maximum Fuel Sulfur	lb/MMBtu (HHV)	0.0020	5
SO_2 - 0.25 gr/100 cf, Maximum Fuel Sulfur	lb/MMBtu (HHV)	0.00068	5
NH_3	ppmvd @ 3% oxygen	5	4
NH_3	lb/MMBtu (HHV)	0.0022	6
Estimated Exhaust Gas Analysis (analysis will vary across the operating load range)			
CO_2	% by wt	12.96	2
H_2O	% by wt	10.03	2
N_2	% by wt	72.64	2
O_2	% by wt	4.36	2
Stack Height	ft	80	
Stack Diameter	in	36	

Notes:

1. Reflects representative aux boiler OEM provided information. SPC recommends AES add margin to the stated for the purposes of air modeling and development of air permit application values.
2. Reflects the following gas analysis (%vol): 74.246% methane, 1.473% ethane, 11.909% propane, 0.177% butane, 0.034% pentane, 1.232% hexane, 0.529% CO_2, 9.686% N_2, 0.891% O_2.
3. Auxiliary boiler sizing reflects conservative design assumptions for use in establishing permit limits. Final equipment size and selection (based on major equipmet OEM selection) during detailed design phase will likely reduce aux boiler size to ~50-60 MMBtu/hr.
4. Reflects emission factors from SCAQMD PDOC Table D.1.
5. Calculated as follows: Fuel Sulfur Content (gr/100 cf) x 1,000,000 Btu/MMBtu x 2 lb SO_2/lb S / (7,000 gr/lb x 1,050 Btu/scf x 100 scf).
6. Calculated using EPA Reference Method 19.

Huntington Beach Energy Project
Appendix A, Table 11
Auxiliary Boiler: Performance Data
March 2016

Auxiliary Boiler Startup Emissions

	NO_X	CO	VOC	SO_2	PM_{10}	Duration	Fuel Consumption
Startup	lbs/event	lbs/event	lbs/event	lbs/event	lbs/event	min/event	MMBtu/hr (HHV)
Cold (Aux Boiler)	4.22	4.34	4.69	0.24	0.84	170	41.36
Warm (Aux Boiler)	2.11	2.17	2.34	0.12	0.42	85	41.36
Hot (Aux Boiler)	0.62	0.64	0.69	0.035	0.12	25	41.36

Notes:
1. Emissions are based on achieving BACT levels at the end of the startup duration.
2. BACT levels are 2 ppmvd @ 15% O_2 for NO_X, CO, and VOC and 5 ppmvd @ 15% O_2 for NH_3.
3. Values presented here are not for for Guarantee. See the Guarantee performance section for further reference.

Auxiliary Boiler Emission Rates

	NO_X	CO	VOC	SO_2	PM_{10}	$PM_{2.5}$	NH_3	Fuel Use (MMbtu)
Hourly Emissions (lbs/hr)	0.42	2.83	0.47	0.14	0.51	0.51	0.16	70.8
Daily Emissions (lbs/day)	3.75	21.4	4.17	1.09	3.82	3.82	1.20	535
Monthly Baseload Emissions (lbs/month)	93.1	621	103	31.7	111	111	34.7	15,517
Monthly Emissions (lbs/month)	112	641	125	32.8	115	115	35.9	16,055
Annual Emissions (lbs/year)	1,328	7,547	1,476	137	1,351	1,351	409	189,155
Annual Emissions (tpy)	0.66	3.77	0.74	0.069	0.68	0.68	0.20	--

Notes:
1. Hourly emissions are based on the maximum hourly firing rate.
2. Daily emissions are the monthly emissions averaged over 30 days.
3. Monthly and annual emissions assume two cold starts, four warm starts, and four hot starts per month, with monthly fuel consumption of 16,055 MMBtu and annual fuel consumption of 189,155 MMBtu.
4. Hourly, daily, and monthly SO_2 emission rates assume a maximum fuel sulfur level of 0.75 gr/100 cf. Annual SO_2 emission rates assume an average fuel sulfur level of 0.25 gr/100 cf.

Revisions made consistent with PDOC methodology and proposed operating profile

Huntington Beach Energy Project
Appendix A, Table 12
Auxiliary Boiler: Summary of Operation Emissions – Criteria Pollutants
March 2016

NO_X Emissions	
(lbs/hr) [a]	0.42
(lbs/day) [b]	3.75
(lbs/month) [c]	112
(lbs/year) [d]	1,328
(tpy) [d]	0.66
CO Emissions	
(lbs/hr) [a]	2.83
(lbs/day) [b]	21.4
(lbs/month) [c]	641
(lbs/year) [d]	7,547
(tpy) [d]	3.77
VOC Emissions	
(lbs/hr) [a]	0.47
(lbs/day) [b]	4.17
(lbs/month) [c]	125
(lbs/year) [d]	1,476
(tpy) [d]	0.74
SO_2 Emissions	
(lbs/hr) [a]	0.14
(lbs/day) [b]	1.09
(lbs/month) [c]	32.8
(lbs/year) [d]	137
(tpy) [d]	0.069
PM Emissions	
(lbs/hr) [a]	0.51
(lbs/day) [b]	3.82
(lbs/month) [c]	115
(lbs/year) [d]	1,351
(tpy) [d]	0.68

Notes:

[a] The hourly emission rates are for the auxiliary boiler in normal operation only (i.e., excludes startup or shutdown emissions).

[b] The daily emission rates are the monthly emission rates averaged over 30 days.

[c] The monthly emission rates assume 2 cold starts, 4 warm starts, 4 hot starts, and 16,055 MMBtu of fuel consumption per month.

[d] The annual emission rates assume 24 cold starts, 48 warm starts, 48 hot starts, and 189,155 MMBtu of fuel consumption per year.

Revisions made consistent with PDOC methodology and proposed operating profile

Huntington Beach Energy Project
Appendix A, Table 13
Auxiliary Boiler: Summary of Operation Emissions – Air Toxics
March 2016

Assumptions:

Total Operations:	8,760	hrs/yr
Gas Heat Content:	1,050	MMBtu/MMscf
Maximum Hourly Heat Input:	70.8	MMBtu/hr (HHV)
Maximum Annual Heat Input [a]:	189,155	MMBtu/yr (HHV)

Proposed Project	Emission Factors		Emissions		
Compound	**lb/MMscf [a]**	**lb/MMBtu [a]**	**lbs/hr**	**lbs/yr**	**tpy**
Ammonia [b]	5 ppm	2.24E-03	1.59E-01	4.09E+02	2.05E-01
Benzene	5.80E-03	5.52E-06	3.91E-04	1.04E+00	5.22E-04
Formaldehyde	1.23E-02	1.17E-05	8.29E-04	2.22E+00	1.11E-03
PAHs	1.00E-04	9.52E-08	6.74E-06	1.80E-02	9.01E-06
Naphthalene	3.00E-04	2.86E-07	2.02E-05	5.40E-02	2.70E-05
Acetaldehyde	3.10E-03	2.95E-06	2.09E-04	5.58E-01	2.79E-04
Acrolein	2.70E-03	2.57E-06	1.82E-04	4.86E-01	2.43E-04
Toluene	2.65E-02	2.52E-05	1.79E-03	4.77E+00	2.39E-03
Xylene	1.97E-02	1.88E-05	1.33E-03	3.55E+00	1.77E-03
Ethylbenzene	6.90E-03	6.57E-06	4.65E-04	1.24E+00	6.22E-04
Hexane	4.60E-03	4.38E-06	3.10E-04	8.29E-01	4.14E-04
TOTAL HAPs				**14.8**	**0.0074**
TOTAL TACs				**4.09**	**0.0020**

Notes:

[a] Provided by SCAQMD via e-mail correspondence on 11/3/2015. Units of lb/MMBtu calculated by dividing lb/MMscf by the gas heat rate.

[b] Based on the operating exhaust NH_3 limit of 5 ppmv @ 15% O_2 and an F-factor of 8,710.

Revisions made consistent with proposed operating profile

Huntington Beach Energy Project
Appendix A, Table 14
Facility Wide Natural Gas Fuel Use
March 2016

Hours/Year/Unit

GE 7FA.05	6,640
GE LMS100 PB	2,001
Auxiliary Boiler	8,760

Number of Units

GE 7FA.05	2
GE LMS100 PB	2
Auxiliary Boiler	1

Max Fuel Use	GE 7FA.05 (per unit)	GE LMS100 PB (per unit)	Auxiliary Boiler	Total
Max Fuel Use Per Hour (MMBtu)	2,273	885	70.8	6,388
Max Fuel Use Per Day (MMBtu) [a]	54,563	21,246	535	152,154
Annual Average Fuel Use Per Year (MMBtu)	14,927,689	1,771,276	189,155	33,587,083

Notes:

[a] Maximum daily fuel use for the turbines is based on the maximum rated heat capacity multiplied by 24 hours/day. Refer to Table 11 for details on the auxiliary boiler's daily fuel use.

Revisions made consistent with proposed operating profile

Huntington Beach Energy Project
Appendix A, Table 15
Summary of Facility Operation Emissions – Greenhouse Gas Pollutants
March 2016

Facility Heat Input

GE 7FA.05 Natural Gas Use (PTE):	29,855,377	MMBtu/yr
GE LMS100 PB Natural Gas Use (PTE):	3,542,551	MMBtu/yr
Auxiliary Boiler Natural Gas Use (PTE):	189,155	MMBtu/yr
HBEP Total Natural Gas Use (PTE):	33,587,083	MMBtu/yr

GHG Netting

Pollutant	HBEP PTE Emissions (metric tons/year)
CO_2	1,782,131
CH_4	33.6
N_2O	3.36
CO_2 Equivalent (Total) [a]	1,783,971

Notes:
[a] The following global warming potentials were used to estimate CO_2 Equivalents, per Table A-1 of 40 CFR Part 98, Subpart A:

CH_4 =	25
N_2O =	298

GHG Emission Factors [a]

Pollutant	Combined Cycle Emission Factor (kg/MMBtu)	Simple Cycle Emission Factor (kg/MMBtu)	Boiler Emission Factor (kg/MMBtu)
CO_2	53.06	53.06	53.06
CH_4	0.001	0.001	0.001
N_2O	0.0001	0.0001	0.0001

Notes:
[a] Emission factors from Table 1 of EPA's *Emission Factors for Greenhouse Gas Inventories* (EPA, 2014).

Revisions made consistent with proposed operating profile

Huntington Beach Energy Project
Appendix A, Table 16
Oil-Water Separator Calculations
March 2016

1. Estimated volume throughput of water (an instantaneous gpm):
This value will be driven by the tank rated flow rate. At this stage, we estimate that the most conservative rated flow rate will be 400 gpm.
It is estimated that there will be one 5,000 gallon capacity, 400 gpm rated above ground oil/water separator tank for the Simple Cycle Power Block.
It is estimated that there will be one 5,000 gallon capacity, 300 gpm rated above ground oil/water separator tank for the Combined Cycle Power Block.
2. Total expected annual volume (in gallons):
The estimated annual volume is: 115,000 gallons for the Simple Cycle Power Block and 898,000 gallons for the Combined Cycle Power Block.

Area for LMS100 PB Components at HBEP					
	L	**W**	**Count**	**Total Area**	
	(ft)	(ft)		(ft^2)	
Lube Oil Skids	23	11	2	506	
GSU Transformers	35	22	2	1,540	
Aux Transformers	10	10	2	200	
Fin Fan Cooler Pump Skid	8	15	2	240	
Gas Conditioning	123	40	1	4,920	
GT Fuel Gas Skid	20	12	2	480	
LMS 100 PB Miscellaneous Skids	20	20	1	400	
Ammonia Containment and Unloading	95	75	1	7,125	
Sum of LMS100 PB Area				**15,411**	
Area for 7FA.05 Components at HBEP					
Total Containment Area				121,000	ft^2
Oil-Water Separator Throughput at HBEP					
One 10 Year Storm, 24 Hour Rain Event (LMS100 PB Area)				4,726	ft^3
One 10 Year Storm, 24 Hour Rain Event (7FA.05 Area)				37,107	ft^3
Rain Event (LMS100 PB Area)				35,351	gallons
Rain Event (7FA.05 Area)				277,558	gallons
Amnt. of time it will take LMS100 PB 400 gpm system to process event				88	minutes
Amnt. of time it will take 7FA.05 300 gpm system to process event				925	minutes
Tank Capacity (LMS100 PB Area)				5,000	gallons
Tank Capacity (7FA.05 Area)				5,000	gallons
Expected Annual Volume of Water Processed by LMS100 PB Tank				15,283	ft^3
Expected Annual Volume of Water Processed by 7FA.05 Tank				119,992	ft^3
Expected Annual Volume of Water Processed by All Tanks				135,274	ft^3
				1,011,851	**gallons**

Notes:
Source: 'HB and Alamitos Oil-Water Separator Tank and Sump Estimate for LMS 100.xlsx' and 'HB and Alamitos Oil-Water Separator Tank and Sump Estimate for 2x1FA.xlsx'.
1. It is assumed that the components listed will have their own containment dikes with normally shut drains. Dike contents will be pumped to an above ground separator.
2. Mechanical components located within enclosures are not counted because the oil drains on these enclosures would normally be shut.
3. Huntington Beach 10-year, 24 hour storm event ~ 3.68 inches
Source: Table B.1 in *Orange County Hydrology Manual* (Orange County Environmental Management Agency, 1986)
4. Huntington Beach Yearly Average Precipitation ~ 11.9 inches (30 Year Average)
Source: Weather Base: http://www.weatherbase.com/weather/weatherall.php3?s=519227&cityname=Huntington+Beach%2C+California%2C+United+States+of+America&units=

VOC Emission Calculations

Annual				Monthly Maximum [b]		
Actual Annual Volume (gal/yr)	Rounded Annual Volume (gal/yr)	VOC Emission Factor (lb VOC/gal) [a]	Annual VOC Emissions (lbs/year)	Max Monthly Volume (gal/month)	Monthly VOC Emissions (lbs/month)	Daily VOC Emissions (lbs/day) [c]
1,011,851	1,010,000	0.0002	202	252,500	50.5	1.68

Notes:
[a] Derived from Table 5.1-3 of *AP-42* (EPA, 2015). VOC Emission Factor = 0.2 lb/1,000 gallons, which accounts for gasketed covers on the OWS.
[b] Assumption: 25% precipitation falls in a single month.
[c] Daily emissions are based on a 30-day average month.

Huntington Beach Energy Project
Appendix A, Table 17
SF_6 Calculations
March 2016

Project Data [a]		Calculation Factors		Annual Emissions		
AEC Electric Breakers [a]	Total SF_6 (lbs)	Annual Leak Rate [b]	SF_6 GWP [c]	Annual SF_6 Emissions (lbs/year)	Annual SF_6 Emissions (metric tons/year)	CO_2e (metric tons/year)
1200A 230 kV	230	1.0%	22,800	2.30	0.0010	23.8
1200A 230 kV	230	1.0%	22,800	2.30	0.0010	23.8
1200A 230 kV	230	1.0%	22,800	2.30	0.0010	23.8
3000A 230 kV	230	1.0%	22,800	2.30	0.0010	23.8
10000A 18 kV	25	1.0%	22,800	0.25	0.00011	2.59
10000A 18 kV	25	1.0%	22,800	0.25	0.00011	2.59
10000A 18 kV	25	1.0%	22,800	0.25	0.00011	2.59
2000A 230 kV	216	1.0%	22,800	2.16	0.00098	22.3
GCB 13.8 kV	24	1.0%	22,800	0.24	0.00011	2.48
GCB 13.8 kV	24	1.0%	22,800	0.24	0.00011	2.48
Total	**1,259**	**1.0%**	**22,800**	**12.6**	**0.0057**	**130**

Notes:

[a] Project data provided in 'Alamtios and HB SF6_arb.xlsx' and 'Alamitos and HB SF6 LMS 100.xlsx'. Electrical breakers include three 18-kilovolt transmission breakers, five 230-kilvolt transmission breakers, and two 13.8-kilovolt generator circuit breakers.

[b] As allowed by the *Regulation for Reducing Sulfur Hexafluoride Emissions from Gas Insulated Switchgear* (17 CCR 95350-95359).

[c] GWP from Table A-1 of 40 CFR Part 98, Subpart A.

Huntington Beach Energy Project
Appendix A, Table 18
Combined Cycle: GHG BACT Analysis
March 2016

1x1 Performance Data

1 on 1 Configuration	Minimum CTG Turndown (Approximately 44% CTG Load)	First Intermediate Point (Approximately 63% CTG Load)	Second Intermediate Point (Approximately 81% CTG Load)	Base Load (100% CTG Load)
Net Plant Electrical Output (kW)	167,083	214,510	267,595	326,268
Net Plant Heat Rate (Btu/kWh-LHV)	7,132	6,413	6,281	6,190
Gross Heat Rate (Btu/kWh-LHV)	6,711	6,056	5,992	5,942
Net Heat Rate (Btu/kWh-HHV)	7,913	7,116	6,970	6,868
Gross Power Output (kW)	177,553	227,169	280,534	339,854
Average Net Electrical Output (kW)	243,864			

2x1 Performance Data

2 on 1 Configuration	Minimum CTG Turndown (Approximately 44% CTG Load)	First Intermediate Point (Approximately 63% CTG Load)	Second Intermediate Point (Approximately 81% CTG Load)	Base Load (100% CTG Load)
Net Plant Electrical Output (kW)	347,857	444,518	547,347	661,631
Net Plant Heat Rate (Btu/kWh-LHV)	6,851	6,190	6,142	6,105
Gross Heat Rate (Btu/kWh-LHV)	6,502	5,928	5,917	5,908
Net Heat Rate (Btu/kWh-HHV)	7,602	6,868	6,815	6,774
Gross Power Output (kW)	366,550	464,168	568,112	683,675
Average Net Electrical Output (kW)	500,338			

GHG Efficiency Calculations

Parameter	Value	Notes
1 on 1 Operating Hours/Year	1,200	Assumed
2 on 1 Operating Hours/Year	4,900	Assumed
Average Net 1 on 1 Heat Rate (Btu/kWh-HHV)	7,217	
Average Net 2 on 1 Heat Rate (Btu/kWh-HHV)	7,015	
Operating Hours/Year	6,100	
Number of Hot/Warm Startups/Year	420	For two turbines
Number of Cold Startups/Year	80	For two turbines
Number of Shutdowns/Year	500	For two turbines
Duration of Hot/Warm Startup (to Baseload) (Hours)	0.25	First fire to base load reached in 15 minutes
Duration of Baseload to Completion After Hot/Warm Startup (Hours)	0.25	Assuming baseload is reached in 15 minutes, completion is reached at 30 minutes
Duration of Cold Startup (to Baseload) (Hours)	0.33	First fire to base load reached in 20 minutes
Duration of Baseload to Completion After Cold Startup (Hours)	0.67	Assuming baseload is reached in 20 minutes, completion is reached at 60 minutes
Duration of Shutdown (Baseload to No Fuel Combustion) (Hours)	0.50	Baseload to no fuel combustion
Startup Hours/Year	132	420 * 0.25 + 80 * 0.33
Baseload to Completion Hours/Year	158	420 * 0.25 + 80 * 0.67
Shutdown Hours/Year	250	500 * 0.50
Startup Net Heat Rate (Btu/kWh-HHV)	19,783	Assumed 2.5 times the 44% load heat rate
Baseload to Completion Net Heat Rate (Btu/kWh-HHV)	7,217	Assumed same as 1 x 1 configuration for simplicity
Shutdown Net Heat Rate (Btu/kWh-HHV)	11,870	Assumed 1.5 times the 44% load heat rate
Overall Net Heat Rate (Btu/kWh-HHV)	7,492	
Net lb CO_2/MWh	877	Based on 53.06 kg CO_2/MMBtu-HHV
Net lb CO_2/MWh (with 8% Degradation)	947	877 Net lb CO_2/MWh * 1.08
Capacity Factor (%)	47.35	

Revisions made consistent with PDOC methodology and revised operating profile

Huntington Beach Energy Project
Appendix A, Table 19
Simple Cycle: GHG BACT Analysis
March 2016

Performance Data

Data for 1 LMS-100PB	100 Percent Load	75 Percent Load	50 Percent Load
Net Electrical Output (kW)	99,355	72,448	47,476
Net Heat Rate (Btu/kWh-LHV)	8,027	8,801	10,394
Gross Heat Rate (Btu/kWh-LHV)	7,911	8,627	10,084
Net Heat Rate (Btu/kWh-HHV)	8,910	9,769	11,537
Gross Electrical Output (kW)	100,814	73,908	48,935

GHG Efficiency Calculations

Parameter	Value	Notes
Average Net Heat Rate (Btu/kWh-HHV)	10,072	
Operating Hours/Year	1,750	
Number of Startups and Shutdowns/Year/CTG	350	
Duration of Startup (to Baseload) (Hours)	0.17	Assumed 10 minutes from first fire to full load operation
Duration of Baseload to Completion (Hours)	0.33	Assuming baseload is reached in 10 minutes, completion is reached at 30 minutes
Duration of Shutdown (Baseload to No Fuel Combustion) (Hours)	0.22	Assumed 13 minutes from full load operation to no fuel combustion
Startup Hours/Year	58	350 * 0.17
Baseload to Completion Hours/Year	117	350 * 0.33
Shutdown Hours/Year	76	350 * 0.22
Startup Net Heat Rate (Btu/kWh-HHV)	28,843	Assumed 2.5 times the 50% load heat rate
Baseload to Completion Net Heat Rate (Btu/kWh-HHV)	10,072	Assumed same as average net heat rate
Shutdown Net Heat Rate (Btu/kWh-HHV)	17,306	Assumed 1.5 times the 50% load heat rate
Overall Net Heat Rate (Btu/kWh-HHV)	10,894	
Net lb CO_2/MWh	1,275	Based on 53.06 kg CO_2/MMBtu-HHV
Net lb CO_2/MWh (with 8% Degradation)	1,376	1,275 Net lb CO_2/MWh * 1.08

Revisions made consistent with PDOC methodology and proposed operating profile

Appendix B
Air Quality Impact Analysis—Commissioning

Huntington Beach Energy Project
Appendix B, Table 1
Commissioning Stack Parameters
March 2016

Point Sources

Scenario	Source ID	Easting (X) (m)	Northing (Y) (m)	Base Elevation (m)	Stack Height (m)	Temperature (K)	Exit Velocity (m/s)	Stack Diameter (m)
GE 7FA.05, 10% Load	7FA01	409449	3723146	3.66	45.7	361	9.33	6.10
	7FA02	409474	3723182	3.66	45.7	361	9.33	6.10
	Aux Boiler	409438	3723236	3.66	24.4	432	21.2	0.91
GE 7FA.05, 40% Load	7FA01	409449	3723146	3.66	45.7	359	11.9	6.10
	7FA02	409474	3723182	3.66	45.7	359	11.9	6.10
	Aux Boiler	409438	3723236	3.66	24.4	432	21.2	0.91
GE 7FA.05, 80% Load	7FA01	409449	3723146	3.66	45.7	366	16.1	6.10
	7FA02	409474	3723182	3.66	45.7	366	16.1	6.10
	Aux Boiler	409438	3723236	3.66	24.4	432	21.2	0.91
GE LMS 100PB, 5% Load	7FA01	409449	3723146	3.66	45.7	350	12.2	6.10
	7FA02	409474	3723182	3.66	45.7	350	12.2	6.10
	LMS01	409149	3723193	3.66	24.4	728	10.0	4.11
	LMS02	409185	3723168	3.66	24.4	728	10.0	4.11
	Aux Boiler	409438	3723236	3.66	24.4	432	21.2	0.91
GE LMS 100PB, 75% Load	7FA01	409449	3723146	3.66	45.7	350	12.2	6.10
	7FA02	409474	3723182	3.66	45.7	350	12.2	6.10
	LMS01	409149	3723193	3.66	24.4	694	33.3	4.11
	LMS02	409185	3723168	3.66	24.4	694	33.3	4.11
	Aux Boiler	409438	3723236	3.66	24.4	432	21.2	0.91
GE LMS 100PB, Full Load	7FA01	409449	3723146	3.66	45.7	350	12.2	6.10
	7FA02	409474	3723182	3.66	45.7	350	12.2	6.10
	LMS01	409149	3723193	3.66	24.4	748	23.8	4.11
	LMS02	409185	3723168	3.66	24.4	748	23.8	4.11
	Aux Boiler	409438	3723236	3.66	24.4	432	21.2	0.91

Huntington Beach Energy Project
Appendix B, Table 2
Commissioning Emission Rates
March 2016

Short-Term Pollutant Commissioning Emissions

		1-hour NO_2		1-hour CO		8-hour CO	
Scenario	Source ID	(g/s)	(lb/hr)	(g/s)	(lb/hr)	(g/s)	(lb/hr)
GE 7FA.05, 10% Load	7FA01	16.4	130	239	1,900	239	1,900
	7FA02	16.4	130	239	1,900	239	1,900
	Aux Boiler	0.054	0.42	0.36	2.83	0.30	2.37
GE 7FA.05, 40% Load	7FA01	8.60	68.3	Emission rates are captured by another modeled commissioning or operation scenario			
	7FA02	8.60	68.3				
	Aux Boiler	0.054	0.42				
GE 7FA.05, 80% Load	7FA01	7.94	63.0				
	7FA02	7.94	63.0				
	Aux Boiler	0.054	0.42				
GE LMS 100PB, 5% Load	7FA01	7.69	61.0	41.0	325	14.9	118
	7FA02	7.69	61.0	41.0	325	14.9	118
	LMS01	5.05	40.1	30.7	244	30.7	244
	LMS02	5.05	40.1	30.7	244	30.7	244
	Aux Boiler	0.054	0.42	0.36	2.83	0.30	2.37
GE LMS 100PB, 75% Load	7FA01	Emission rates are captured by another modeled commissioning or operation scenario		41.0	325	14.9	118
	7FA02			41.0	325	14.9	118
	LMS01			9.13	72.5	9.13	72.5
	LMS02			9.13	72.5	9.13	72.5
	Aux Boiler			0.36	2.83	0.30	2.37
GE LMS 100PB, Full Load	7FA01			41.0	325	14.9	118
	7FA02			41.0	325	14.9	118
	LMS01			11.3	90.0	11.3	90.0
	LMS02			11.3	90.0	11.3	90.0
	Aux Boiler			0.36	2.83	0.30	2.37

Annual Pollutant Commissioning Emissions

		Annual NO_2		Annual PM_{10}		Annual $PM_{2.5}$	
Scenario	Source ID	(g/s)	(lb/hr)	(g/s)	(lb/hr)	(g/s)	(lb/hr)
GE 7FA.05 [a]	7FA01	1.45	11.5	0.93	7.38	0.93	7.38
	7FA02	1.45	11.5	0.93	7.38	0.93	7.38
	Aux Boiler	0.030	0.23	0.019	0.15	0.019	0.15
GE LMS 100PB [b]	7FA01	1.02	8.12	0.81	6.42	0.81	6.42
	7FA02	1.02	8.12	0.81	6.42	0.81	6.42
	LMS01	0.35	2.76	0.21	1.63	0.21	1.63
	LMS02	0.35	2.76	0.21	1.63	0.21	1.63
	Aux Boiler	0.019	0.15	0.019	0.15	0.019	0.15

[a] GE 7FA.05 annual emissions include emissions from commissioning as well as annual operation.

[b] GE LMS 100PB annual emissions include emissions from commissioning as well as annual operation.

Revisions made consistent with revised operational emissions

Huntington Beach Energy Project
Appendix B, Table 3
Commissioning Building Parameters
March 2016

GE 7FA.05 Commissioning Scenarios

Building Name	Number of Tiers	Tier Number	Base Elevation (m)	Tier Height (m)	Number of Corners	Corner 1 East (X) (m)	Corner 1 North (Y) (m)	Corner 2 East (X) (m)	Corner 2 North (Y) (m)	Corner 3 East (X) (m)	Corner 3 North (Y) (m)	Corner 4 East (X) (m)	Corner 4 North (Y) (m)	Corner 5 East (X) (m)	Corner 5 North (Y) (m)	Corner 6 East (X) (m)	Corner 6 North (Y) (m)	Corner 7 East (X) (m)	Corner 7 North (Y) (m)	Corner 8 East (X) (m)	Corner 8 North (Y) (m)	Corner 9 East (X) (m)	Corner 9 North (Y) (m)
'AIRIN3'	1	-	3.66	21.6	9	409385	3723198	409377	3723187	409384	3723182	409387	3723182	409395	3723177	409401	3723185	409393	3723191	409391	3723194	409385	3723198
'AIRIN4'	1	-	3.66	21.6	9	409426	3723221	409421	3723213	409412	3723218	409409	3723219	409402	3723223	409410	3723234	409416	3723230	409418	3723227	409426	3723221
'HRSG1'	1	-	3.66	25.6	5	409424	3723169	409447	3723152	409443	3723145	409418	3723162	409424	3723169								
'HRSG2'	1	-	3.66	25.6	5	409449	3723205	409473	3723188	409468	3723182	409444	3723198	409449	3723205								
'ACC'	1	-	3.66	33.5	5	409549	3723302	409551	3723173	409512	3723173	409510	3723301	409549	3723302								
'STG'	1	-	3.66	17.9	5	409482	3723251	409490	3723251	409490	3723235	409482	3723235	409482	3723251								
'WALL1'	1	-	3.66	15.2	9	409566	3723274	409567	3723158	409519	3723157	409437	3723109	409436	3723110	409519	3723158	409566	3723159	409565	3723274	409566	3723274
'WALL2'	1	-	3.66	6.10	7	409447	3723302	409427	3723301	409402	3723266	409402	3723265	409427	3723301	409447	3723301	409447	3723301				
'UNIT1L1'	2	1	3.66	23.2	4	409293	3723102	409312	3723128	409335	3723112	409317	3723086										
'UNIT1L2'	-	2	3.66	37.6	4	409301	3723114	409312	3723128	409335	3723112	409326	3723098										
'UNIT2L1'	2	1	3.66	23.2	4	409252	3723127	409272	3723153	409295	3723137	409277	3723111										
'UNIT2L2'	-	2	3.66	37.6	4	409261	3723139	409272	3723153	409295	3723137	409285	3723123										
'UNIT3L1'	2	1	3.66	23.2	4	409187	3723175	409206	3723202	409229	3723186	409211	3723159										
'UNIT3L2'	-	2	3.66	37.6	4	409195	3723187	409206	3723202	409229	3723186	409220	3723172										
'UNIT4L1'	2	1	3.66	23.2	4	409146	3723201	409165	3723228	409188	3723212	409170	3723185										
'UNIT4L2'	-	2	3.66	37.6	4	409154	3723213	409165	3723228	409188	3723212	409179	3723198										

Cylindical Building Name	Base Elevation (m)	Center East (X) (m)	Center North (Y) (m)	Tank Height (m)	Tank Diameter (m)
Stack12	3.66	409274	3723095	61.0	6.27
Stack34	3.66	409165	3723168	61.0	6.27

Huntington Beach Energy Project
Appendix B, Table 3
Commissioning Building Parameters
March 2016

GE LMS 100PB Commissioning Scenarios

Building Name	Number of Tiers	Tier Number	Base Elevation (m)	Tier Height (m)	Number of Corners	Corner 1 East (X) (m)	Corner 1 North (Y) (m)	Corner 2 East (X) (m)	Corner 2 North (Y) (m)	Corner 3 East (X) (m)	Corner 3 North (Y) (m)	Corner 4 East (X) (m)	Corner 4 North (Y) (m)	Corner 5 East (X) (m)	Corner 5 North (Y) (m)	Corner 6 East (X) (m)	Corner 6 North (Y) (m)	Corner 7 East (X) (m)	Corner 7 North (Y) (m)	Corner 8 East (X) (m)	Corner 8 North (Y) (m)	Corner 9 East (X) (m)	Corner 9 North (Y) (m)
'AIRIN3'	1	-	3.66	21.6	9	409385	3723198	409377	3723187	409384	3723182	409387	3723182	409395	3723177	409401	3723185	409393	3723191	409391	3723194	409385	3723198
'AIRIN4'	1	-	3.66	21.6	9	409426	3723221	409421	3723213	409412	3723218	409409	3723219	409402	3723223	409410	3723234	409416	3723230	409418	3723227	409426	3723221
'HRSG1'	1	-	3.66	25.6	5	409424	3723169	409447	3723152	409443	3723145	409418	3723162	409424	3723169								
'HRSG2'	1	-	3.66	25.6	5	409449	3723205	409473	3723188	409468	3723182	409444	3723198	409449	3723205								
'ACC'	1	-	3.66	33.5	5	409549	3723302	409551	3723173	409512	3723173	409510	3723301	409549	3723302								
'STG'	1	-	3.66	17.9	5	409482	3723251	409490	3723251	409490	3723235	409482	3723235	409482	3723251								
'WALL1'	1	-	3.66	15.2	9	409566	3723274	409567	3723158	409519	3723157	409437	3723109	409436	3723110	409519	3723158	409566	3723159	409565	3723274	409566	3723274
'WALL2'	1	-	3.66	6.10	7	409447	3723302	409427	3723301	409402	3723266	409402	3723265	409427	3723301	409447	3723301	409447	3723301				
'UNIT1L1'	2	1	3.66	23.2	4	409293	3723102	409312	3723128	409335	3723112	409317	3723086										
'UNIT1L2'	-	2	3.66	37.6	4	409301	3723114	409312	3723128	409335	3723112	409326	3723098										
'UNIT2L1'	2	1	3.66	23.2	4	409252	3723127	409272	3723153	409295	3723137	409277	3723111										
'UNIT2L2'	-	2	3.66	37.6	4	409261	3723139	409272	3723153	409295	3723137	409285	3723123										
'AIRIN1'	1	-	3.66	15.6	5	409161	3723216	409148	3723225	409142	3723217	409155	3723207	409161	3723216								
'AIRIN2'	1	-	3.66	15.6	5	409196	3723179	409202	3723187	409216	3723178	409210	3723169	409196	3723179								
'CTG1'	1	-	3.66	9.45	7	409160	3723207	409158	3723209	409151	3723201	409147	3723197	409153	3723193	409156	3723198	409160	3723207				
'CTG2'	1	-	3.66	9.45	7	409194	3723184	409197	3723182	409192	3723172	409190	3723168	409184	3723172	409187	3723176	409194	3723184				

Cylindical Building Name	Base Elevation (m)	Center East (X) (m)	Center North (Y) (m)	Tank Height (m)	Tank Diameter (m)
Stack12	3.66	409274	3723095	61.0	6.27

Huntington Beach Energy Project
Appendix B, Table 4
Commissioning Results
March 2016

Short-Term Pollutant Commissioning Results

Scenario	Year	NO_2 (µg/m³) [a] 1-hour	CO (µg/m³) 1-hour	CO (µg/m³) 8-hour
GE 7FA.05, 10% Load [b]	2010	159	4,094	3,000
	2011	151	3,993	2,734
	2012	161	4,309	2,972
	2013	169	4,249	2,807
	2014	169	4,341	2,787
GE 7FA.05, 40% Load	2010	65.7	-	-
	2011	63.0	-	-
	2012	64.9	-	-
	2013	67.6	-	-
	2014	72.7	-	-
GE 7FA.05, 80% Load	2010	42.6	-	-
	2011	35.3	-	-
	2012	45.3	-	-
	2013	31.6	-	-
	2014	44.7	-	-
GE LMS 100PB, 5% Load [c]	2010	75.6	504	126
	2011	75.9	506	118
	2012	79.0	527	131
	2013	77.3	515	125
	2014	79.1	527	129
GE LMS 100PB, 75% Load [c]	2010	-	503	119
	2011	-	506	113
	2012	-	526	123
	2013	-	514	120
	2014	-	526	112
GE LMS 100PB, Full Load [c]	2010	-	503	119
	2011	-	506	113
	2012	-	526	124
	2013	-	515	120
	2014	-	526	113

[a] The maximum 1-hour NO_2 concentrations include an ambient NO_2 ratio of 0.80 (EPA, 2011), unless otherwise noted.
[b] 1-hour NO_2 impacts were modeled using the Plume Volume Molar Ratio Method.

[c] The modeled impacts for the GE LMS 100PB commissioning scenarios include impacts from the auxiliary boiler and the GE 7FA.05 turbines operating in emissions scenario CC03.

Annual Pollutant Commissioning Results

Scenario	Year	NO_2 (µg/m³) [d] Annual	PM_{10} (µg/m³) Annual	$PM_{2.5}$ (µg/m³) Annual
GE 7FA.05 [e]	2010	0.59	0.51	0.51
	2011	0.60	0.52	0.52
	2012	0.66	0.57	0.57
	2013	0.66	0.57	0.57
	2014	0.65	0.57	0.57
GE LMS 100PB [f]	2010	0.45	0.46	0.46
	2011	0.46	0.48	0.48
	2012	0.51	0.52	0.52
	2013	0.51	0.52	0.52
	2014	0.51	0.52	0.52

[d] The maximum annual NO_2 concentrations include an ambient NO_2 ratio of 0.75 (EPA, 2005).

[e] Annual commissioning impacts are based on total emissions from commissioning and annual operation of 2 GE 7FA.05 turbines operating in exhaust scenario CC07 and the auxiliary boiler.

[f] Annual commissioning impacts are based on total emissions from operation of 2 GE 7FA.05 turbines operating in exhaust scenario CC07 and the auxiliary boiler, and commissioning and annual operation of 2 GE LMS 100PB turbines operating in exhaust scenario SC06 for NO_2 and SC07 for PM_{10} and $PM_{2.5}$.

Revisions made as a result of modeling with revised commissioning emission rates

Appendix C
Air Quality Impact Analysis—Operation

Huntington Beach Energy Project
Appendix C, Table 1
Operational Stack Parameters
March 2016

Point Sources

Exhaust Scenario	Turbine Load (%)	Source ID	Easting (X) (m)	Northing (Y) (m)	Base Elevation (m)	Stack Height (m)	Temperature (K)	Exit Velocity (m/s)	Stack Diameter (m)
CC01	100	GE 7FA.05-01	409449	3723146	3.66	45.7	375	20.4	6.10
	100	GE 7FA.05-02	409474	3723182	3.66	45.7	375	20.4	6.10
CC02	75	GE 7FA.05-01	409449	3723146	3.66	45.7	354	15.6	6.10
	75	GE 7FA.05-02	409474	3723182	3.66	45.7	354	15.6	6.10
CC03	45	GE 7FA.05-01	409449	3723146	3.66	45.7	350	12.2	6.10
	45	GE 7FA.05-02	409474	3723182	3.66	45.7	350	12.2	6.10
CC04	100	GE 7FA.05-01	409449	3723146	3.66	45.7	374	20.1	6.10
	100	GE 7FA.05-02	409474	3723182	3.66	45.7	374	20.1	6.10
CC05	100	GE 7FA.05-01	409449	3723146	3.66	45.7	375	20.2	6.10
	100	GE 7FA.05-02	409474	3723182	3.66	45.7	375	20.2	6.10
CC06	75	GE 7FA.05-01	409449	3723146	3.66	45.7	353	14.9	6.10
	75	GE 7FA.05-02	409474	3723182	3.66	45.7	353	14.9	6.10
CC07	44	GE 7FA.05-01	409449	3723146	3.66	45.7	350	11.8	6.10
	44	GE 7FA.05-02	409474	3723182	3.66	45.7	350	11.8	6.10
CC08	100	GE 7FA.05-01	409449	3723146	3.66	45.7	378	20.2	6.10
	100	GE 7FA.05-02	409474	3723182	3.66	45.7	378	20.2	6.10
CC09	100	GE 7FA.05-01	409449	3723146	3.66	45.7	379	18.0	6.10
	100	GE 7FA.05-02	409474	3723182	3.66	45.7	379	18.0	6.10
CC10	75	GE 7FA.05-01	409449	3723146	3.66	45.7	365	13.9	6.10
	75	GE 7FA.05-02	409474	3723182	3.66	45.7	365	13.9	6.10
CC11	48	GE 7FA.05-01	409449	3723146	3.66	45.7	358	12.1	6.10
	48	GE 7FA.05-02	409474	3723182	3.66	45.7	358	12.1	6.10
SC01	100	GE LMS 100PB-01	409149	3723193	3.66	24.4	694	33.3	4.11
	100	GE LMS 100PB-02	409185	3723168	3.66	24.4	694	33.3	4.11
SC02	75	GE LMS 100PB-01	409149	3723193	3.66	24.4	709	28.7	4.11
	75	GE LMS 100PB-02	409185	3723168	3.66	24.4	709	28.7	4.11
SC03	50	GE LMS 100PB-01	409149	3723193	3.66	24.4	748	23.8	4.11
	50	GE LMS 100PB-02	409185	3723168	3.66	24.4	748	23.8	4.11
SC04	100	GE LMS 100PB-01	409149	3723193	3.66	24.4	697	33.1	4.11
	100	GE LMS 100PB-02	409185	3723168	3.66	24.4	697	33.1	4.11
SC05	100	GE LMS 100PB-01	409149	3723193	3.66	24.4	699	33.0	4.11
	100	GE LMS 100PB-02	409185	3723168	3.66	24.4	699	33.0	4.11
SC06	75	GE LMS 100PB-01	409149	3723193	3.66	24.4	709	28.4	4.11
	75	GE LMS 100PB-02	409185	3723168	3.66	24.4	709	28.4	4.11
SC07	50	GE LMS 100PB-01	409149	3723193	3.66	24.4	748	23.6	4.11
	50	GE LMS 100PB-02	409185	3723168	3.66	24.4	748	23.6	4.11
SC08	100	GE LMS 100PB-01	409149	3723193	3.66	24.4	726	29.4	4.11
	100	GE LMS 100PB-02	409185	3723168	3.66	24.4	726	29.4	4.11
SC09	100	GE LMS 100PB-01	409149	3723193	3.66	24.4	746	27.1	4.11
	100	GE LMS 100PB-02	409185	3723168	3.66	24.4	746	27.1	4.11
SC10	75	GE LMS 100PB-01	409149	3723193	3.66	24.4	769	23.7	4.11
	75	GE LMS 100PB-02	409185	3723168	3.66	24.4	769	23.7	4.11
SC11	50	GE LMS 100PB-01	409149	3723193	3.66	24.4	809	20.0	4.11
	50	GE LMS 100PB-02	409185	3723168	3.66	24.4	809	20.0	4.11
AB	100	Auxiliary Boiler	409438	3723236	3.66	24.4	432	21.2	0.91

Huntington Beach Energy Project
Appendix C, Table 2
Operational Emission Rates
March 2016

GE 7FA.05 Per Turbine Emission Rates

Exhaust	1-hour NO_2 [a]		1-hour CO [a]		8-hour CO [b]		1-hour SO_2		3-hour SO_2		24-hour SO_2		24-hour PM_{10}		24-hour $PM_{2.5}$		Annual NO_2 [c]		Annual PM_{10}		Annual $PM_{2.5}$	
Scenario	(g/s)	(lb/hr)	(g/s)	(lb/hr)	(g/s)	(lb/hr)	(g/s)	(lb/hr)	(g/s)	(lb/hr)	(g/s)	(lb/hr)	(g/s)	(lb/hr)	(g/s)	(lb/hr)	(g/s)	(lb/hr)	(g/s)	(lb/hr)	(g/s)	(lb/hr)
CC01	7.69	61.0	41.0	325	15.2	121	0.61	4.86	0.61	4.86	0.61	4.86	1.07	8.50	1.07	8.50	-	-	-	-	-	-
CC02	7.69	61.0	41.0	325	15.0	119	0.48	3.84	0.48	3.84	0.48	3.84	1.07	8.50	1.07	8.50	-	-	-	-	-	-
CC03	7.69	61.0	41.0	325	14.9	118	0.37	2.95	0.37	2.95	0.37	2.95	1.07	8.50	1.07	8.50	-	-	-	-	-	-
CC04	7.18	57.0	36.2	287	13.6	108	0.61	4.81	0.61	4.81	0.61	4.81	1.07	8.50	1.07	8.50	1.66	13.2	0.81	6.42	0.81	6.42
CC05	7.18	57.0	36.2	287	13.6	108	0.60	4.78	0.60	4.78	0.60	4.78	1.07	8.50	1.07	8.50	1.65	13.1	0.81	6.42	0.81	6.42
CC06	7.18	57.0	36.2	287	13.4	106	0.47	3.72	0.47	3.72	0.47	3.72	1.07	8.50	1.07	8.50	1.33	10.5	0.81	6.42	0.81	6.42
CC07	7.18	57.0	36.2	287	13.2	105	0.35	2.79	0.35	2.79	0.35	2.79	1.07	8.50	1.07	8.50	1.06	8.38	0.81	6.42	0.81	6.42
CC08	6.68	53.0	27.7	220	10.7	85.1	0.58	4.60	0.58	4.60	0.58	4.60	1.07	8.50	1.07	8.50	-	-	-	-	-	-
CC09	6.68	53.0	27.7	220	10.6	84.5	0.52	4.16	0.52	4.16	0.52	4.16	1.07	8.50	1.07	8.50	-	-	-	-	-	-
CC10	6.68	53.0	27.7	220	10.5	83.5	0.42	3.33	0.42	3.33	0.42	3.33	1.07	8.50	1.07	8.50	-	-	-	-	-	-
CC11	6.68	53.0	27.7	220	10.4	82.7	0.34	2.67	0.34	2.67	0.34	2.67	1.07	8.50	1.07	8.50	-	-	-	-	-	-

GE LMS 100PB Per Turbine Emission Rates

Exhaust	1-hour NO_2 [d]		1-hour CO [e]		8-hour CO [d]		1-hour SO_2		3-hour SO_2		24-hour SO_2		24-hour PM_{10}		24-hour $PM_{2.5}$		Annual NO_2 [f]		Annual PM_{10}		Annual $PM_{2.5}$	
Scenario	(g/s)	(lb/hr)	(g/s)	(lb/hr)	(g/s)	(lb/hr)	(g/s)	(lb/hr)	(g/s)	(lb/hr)	(g/s)	(lb/hr)	(g/s)	(lb/hr)	(g/s)	(lb/hr)	(g/s)	(lb/hr)	(g/s)	(lb/hr)	(g/s)	(lb/hr)
SC01	2.78	22.0	5.77	45.8	2.20	17.5	0.20	1.63	0.20	1.63	0.20	1.63	0.79	6.24	0.79	6.24	-	-	-	-	-	-
SC02	2.72	21.6	5.71	45.3	2.04	16.2	0.17	1.32	0.17	1.32	0.17	1.32	0.79	6.24	0.79	6.24	-	-	-	-	-	-
SC03	2.67	21.2	5.66	44.9	1.89	15.0	0.13	1.02	0.13	1.02	0.13	1.02	0.79	6.24	0.79	6.24	-	-	-	-	-	-
SC04	2.78	22.1	5.77	45.8	2.20	17.5	0.21	1.64	0.21	1.64	0.21	1.64	0.79	6.24	0.79	6.24	0.31	2.44	0.18	1.43	0.18	1.43
SC05	2.77	22.0	5.76	45.7	2.19	17.4	0.20	1.61	0.20	1.61	0.20	1.61	0.79	6.24	0.79	6.24	0.30	2.42	0.18	1.43	0.18	1.43
SC06	2.72	21.6	5.71	45.3	2.04	16.2	0.16	1.31	0.16	1.31	0.16	1.31	0.79	6.24	0.79	6.24	0.27	2.11	0.18	1.43	0.18	1.43
SC07	2.67	21.2	5.66	44.9	1.89	15.0	0.13	1.01	0.13	1.01	0.13	1.01	0.79	6.24	0.79	6.24	0.23	1.81	0.18	1.43	0.18	1.43
SC08	2.73	21.7	5.72	45.4	2.06	16.4	0.17	1.36	0.17	1.36	0.17	1.36	0.79	6.24	0.79	6.24	-	-	-	-	-	-
SC09	2.70	21.5	5.69	45.2	1.99	15.8	0.15	1.22	0.15	1.22	0.15	1.22	0.79	6.24	0.79	6.24	-	-	-	-	-	-
SC10	2.67	21.2	5.66	44.9	1.89	15.0	0.13	1.01	0.13	1.01	0.13	1.01	0.79	6.24	0.79	6.24	-	-	-	-	-	-
SC11	2.63	20.9	5.62	44.6	1.78	14.1	0.10	0.80	0.10	0.80	0.10	0.80	0.79	6.24	0.79	6.24	-	-	-	-	-	-

Auxiliary Boiler Emission Rates

Exhaust	1-hour NO_2		1-hour CO		8-hour CO		1-hour SO_2		3-hour SO_2		24-hour SO_2		24-hour PM_{10}		24-hour $PM_{2.5}$		Annual NO_2		Annual PM_{10}		Annual $PM_{2.5}$	
Scenario	(g/s)	(lb/hr)	(g/s)	(lb/hr)	(g/s)	(lb/hr)	(g/s)	(lb/hr)	(g/s)	(lb/hr)	(g/s)	(lb/hr)	(g/s)	(lb/hr)	(g/s)	(lb/hr)	(g/s)	(lb/hr)	(g/s)	(lb/hr)	(g/s)	(lb/hr)
AB	0.054	0.42	0.36	2.83	0.30	2.37	0.0061	0.048	0.0061	0.048	0.0031	0.025	0.020	0.157	0.020	0.157	0.019	0.15	0.019	0.15	0.019	0.15

[a] Hourly CO and NO_2 emission rates for the GE 7FA.05s are based on cold startup events.

[b] 8-hour CO emission rates for the GE 7FA.05s are based on two cold starts, two shutdowns, and the balance of the period at steady-state operation.

[c] Annual emission rates for the GE 7FA.05s are based on 80 cold startups, 88 warm startups, 332 hot startups, 500 shutdowns, and 6,100 hours of steady-state operation.

[d] Hourly CO and NO_2 emission rates for the GE LMS 100PBs are based on one startup, one shutdown, and the balance of the hour at steady-state operation.

[e] 8-hour CO emission rates for the GE LMS 100PBs are based on two startups, two shutdowns, and the balance of the period at steady-state operation.

[f] Annual emission rates for the GE LMS 100PBs are based on 350 hot startups, 350 shutdowns, and 1,750 hours of steady-state operation.

Revised consistent with the revised operational emissions

Huntington Beach Energy Project
Appendix C, Table 3
Operational Building Parameters
March 2016

Building Name	Number of Tiers	Tier Number	Base Elevation (m)	Tier Height (m)	Number of Corners	Corner 1 East (X) (m)	Corner 1 North (Y) (m)	Corner 2 East (X) (m)	Corner 2 North (Y) (m)	Corner 3 East (X) (m)	Corner 3 North (Y) (m)	Corner 4 East (X) (m)	Corner 4 North (Y) (m)	Corner 5 East (X) (m)	Corner 5 North (Y) (m)	Corner 6 East (X) (m)	Corner 6 North (Y) (m)	Corner 7 East (X) (m)	Corner 7 North (Y) (m)	Corner 8 East (X) (m)	Corner 8 North (Y) (m)	Corner 9 East (X) (m)	Corner 9 North (Y) (m)
'AIRIN3'	1	-	3.66	21.6	9	409385	3723198	409377	3723187	409384	3723182	409387	3723182	409395	3723177	409401	3723185	409393	3723191	409391	3723194	409385	3723198
'AIRIN4'	1	-	3.66	21.6	9	409426	3723221	409421	3723213	409412	3723218	409409	3723219	409402	3723223	409410	3723234	409416	3723230	409418	3723227	409426	3723221
'HRSG1'	1	-	3.66	25.6	5	409424	3723169	409447	3723152	409443	3723145	409418	3723162	409424	3723169								
'HRSG2'	1	-	3.66	25.6	5	409449	3723205	409473	3723188	409468	3723182	409444	3723198	409449	3723205								
'ACC'	1	-	3.66	33.5	5	409549	3723302	409551	3723173	409512	3723173	409510	3723301	409549	3723302								
'STG'	1	-	3.66	17.9	5	409482	3723251	409490	3723251	409490	3723235	409482	3723235	409482	3723251								
'WALL1'	1	-	3.66	15.2	9	409566	3723274	409567	3723158	409519	3723157	409437	3723109	409436	3723110	409519	3723158	409566	3723159	409565	3723274	409566	3723274
'WALL2'	1	-	3.66	6.1	7	409447	3723302	409427	3723301	409402	3723266	409402	3723265	409427	3723301	409447	3723301	409447	3723301				
'AIRIN1'	1	-	3.66	15.6	5	409161	3723216	409148	3723225	409142	3723217	409155	3723207	409161	3723216								
'AIRIN2'	1	-	3.66	15.6	5	409196	3723179	409202	3723187	409216	3723178	409210	3723169	409196	3723179								
'CTG1'	1	-	3.66	9.4	7	409160	3723207	409158	3723209	409151	3723201	409147	3723197	409153	3723193	409156	3723198	409160	3723207				
'CTG2'	1	-	3.66	9.4	7	409194	3723184	409197	3723182	409192	3723172	409190	3723168	409184	3723172	409187	3723176	409194	3723184				

Huntington Beach Energy Project
Appendix C, Table 4
Operational Results – Load Analysis
March 2016

32°F Ambient Temperature Scenarios

Scenario Description [a]	Exhaust Scenario	Year	NO_2 (µg/m^3) [b] 1-hour	1-hour (federal) [c]	CO (µg/m^3) 1-hour	8-hour	SO_2 (µg/m^3) 1-hour	1-hour (federal)	3-hour	24-hour	PM_{10} (µg/m^3) 24-hour	$PM_{2.5}$ (µg/m^3) 24-hour
		2010	43.2	102	288	34.1	4.28	2.08	2.95	0.55	1.10	0.72
GE 7FA.05 100% Load/		2011	22.2	105	148	30.4	2.20	1.80	1.59	0.43	0.86	0.73
GE LMS 100PB 100%	CC01/SC01/AB	2012	43.0	102	287	32.0	4.26	1.75	1.69	0.63	1.20	0.74
Load		2013	21.6	103	144	32.0	2.14	1.78	1.61	0.48	0.97	0.75
		2014	41.5	103	276	33.2	4.11	2.14	2.25	0.53	1.04	0.79
		2010	43.2	102	288	34.1	4.28	2.08	2.95	0.55	1.10	0.72
GE 7FA.05 100% Load/		2011	22.2	105	148	30.4	2.20	1.80	1.59	0.43	0.87	0.75
GE LMS 100PB 75%	CC01/SC02/AB	2012	43.0	103	287	32.0	4.26	1.75	1.69	0.63	1.21	0.76
Load		2013	21.6	103	144	32.0	2.14	1.78	1.61	0.48	0.98	0.77
		2014	41.5	103	276	33.2	4.11	2.14	2.25	0.53	1.05	0.81
		2010	43.2	102	288	34.1	4.28	2.08	2.95	0.55	1.10	0.73
GE 7FA.05 100% Load/		2011	22.2	105	148	30.5	2.20	1.80	1.59	0.42	0.88	0.77
GE LMS 100PB 50%	CC01/SC03/AB	2012	43.0	103	287	32.0	4.26	1.75	1.69	0.63	1.23	0.77
Load		2013	21.7	103	144	32.1	2.14	1.78	1.60	0.48	0.99	0.80
		2014	41.5	103	276	33.2	4.11	2.14	2.25	0.53	1.07	0.85
		2010	64.4	118	430	74.9	5.07	4.31	4.16	1.20	2.81	1.28
GE 7FA.05 75% Load/		2011	58.0	108	387	65.6	4.52	3.76	3.44	0.70	1.66	1.27
GE LMS 100PB 100%	CC02/SC01/AB	2012	68.9	108	459	79.6	5.37	3.73	3.61	1.05	2.42	1.47
Load		2013	57.8	105	385	80.1	4.51	3.81	3.84	0.89	2.12	1.28
		2014	67.8	106	452	72.7	5.28	4.24	4.07	1.01	2.44	1.35
		2010	64.4	118	430	74.9	5.07	4.31	4.16	1.20	2.81	1.28
GE 7FA.05 75% Load/		2011	58.0	109	387	65.6	4.52	3.76	3.44	0.70	1.67	1.28
GE LMS 100PB 75%	CC02/SC02/AB	2012	68.9	108	459	79.6	5.37	3.73	3.61	1.05	2.42	1.48
Load		2013	57.8	105	385	80.1	4.51	3.81	3.84	0.89	2.13	1.28
		2014	67.8	106	452	72.7	5.28	4.24	4.07	1.01	2.45	1.36
		2010	64.4	118	430	74.9	5.07	4.31	4.16	1.20	2.81	1.29
GE 7FA.05 75% Load/		2011	58.0	109	387	65.6	4.52	3.76	3.44	0.70	1.68	1.29
GE LMS 100PB 50%	CC02/SC03/AB	2012	68.9	108	459	79.6	5.37	3.73	3.61	1.05	2.44	1.48
Load		2013	57.8	105	385	80.1	4.51	3.81	3.84	0.89	2.13	1.29
		2014	67.8	106	452	72.7	5.28	4.24	4.06	1.01	2.46	1.37
		2010	89.0	140	594	140	5.41	4.81	4.35	1.52	4.51	2.53
GE 7FA.05 45% Load/		2011	85.2	122	569	132	5.20	4.66	4.56	1.20	3.60	2.60
GE LMS 100PB 100%	CC03/SC01/AB	2012	89.8	128	599	149	5.48	4.84	5.01	1.51	4.40	2.81
Load		2013	88.4	117	590	130	5.40	4.92	4.81	1.35	3.98	2.86
		2014	94.5	123	630	134	5.76	5.05	4.70	1.53	4.57	3.11
		2010	89.0	140	594	140	5.41	4.81	4.35	1.52	4.51	2.53
GE 7FA.05 45% Load/		2011	85.2	122	569	132	5.20	4.66	4.56	1.20	3.60	2.60
GE LMS 100PB 75%	CC03/SC02/AB	2012	89.8	128	600	149	5.48	4.84	5.01	1.51	4.40	2.82
Load		2013	88.5	117	591	130	5.40	4.92	4.81	1.35	3.98	2.86
		2014	94.5	123	630	134	5.76	5.05	4.70	1.53	4.57	3.12
		2010	89.0	140	594	140	5.41	4.81	4.35	1.52	4.51	2.54
GE 7FA.05 45% Load/		2011	85.2	122	569	132	5.19	4.66	4.56	1.20	3.61	2.60
GE LMS 100PB 50%	CC03/SC03/AB	2012	89.8	128	600	149	5.48	4.84	5.01	1.51	4.41	2.82
Load		2013	88.5	117	591	130	5.40	4.92	4.81	1.35	3.98	2.86
		2014	94.5	123	631	134	5.76	5.05	4.70	1.52	4.58	3.12

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Scenario Description [a]	Exhaust Scenario		NO_2 (µg/m^3) [b]			CO (µg/m^3)		SO_2 (µg/m^3)				PM_{10} (µg/m^3)		$PM_{2.5}$ (µg/m^3)	
		Year	1-hour	1-hour (federal) [c]	Annual	1-hour	8-hour	1-hour	1-hour (federal)	3-hour	24-hour	24-hour	Annual	24-hour	Annual
GE 7FA.05 100% Load with Evap./ GE LMS 100PB 100% Load with Evap.	CC04/SC04/AB	2010	41.0	102	0.26	258	32.4	4.35	2.27	3.05	0.58	1.16	0.23	0.73	0.23
		2011	22.2	105	0.29	140	27.8	2.36	1.86	1.54	0.44	0.88	0.25	0.74	0.25
		2012	41.7	102	0.30	263	31.0	4.43	1.71	1.77	0.68	1.28	0.26	0.76	0.26
		2013	21.0	102	0.33	132	29.4	2.23	1.86	1.71	0.49	0.98	0.27	0.76	0.27
		2014	40.1	103	0.34	253	30.4	4.26	2.25	2.36	0.55	1.06	0.28	0.80	0.28
GE 7FA.05 100% Load with Evap./ GE LMS 100PB 100% Load	CC04/SC05/AB	2010	41.0	102	0.26	258	32.4	4.35	2.27	3.05	0.58	1.16	0.23	0.73	0.23
		2011	22.2	105	0.29	140	27.8	2.36	1.86	1.54	0.44	0.88	0.25	0.74	0.25
		2012	41.7	102	0.30	263	31.0	4.43	1.71	1.77	0.68	1.28	0.26	0.76	0.26
		2013	21.0	102	0.33	132	29.4	2.23	1.86	1.71	0.49	0.98	0.27	0.76	0.27
		2014	40.1	103	0.34	253	30.4	4.26	2.25	2.36	0.55	1.06	0.28	0.80	0.28
GE 7FA.05 100% Load with Evap./ GE LMS 100PB 75% Load	CC04/SC06/AB	2010	41.0	102	0.26	258	32.4	4.35	2.27	3.05	0.58	1.16	0.24	0.75	0.24
		2011	22.2	105	0.29	140	27.9	2.36	1.86	1.54	0.43	0.89	0.25	0.76	0.25
		2012	41.7	102	0.30	263	31.1	4.43	1.71	1.77	0.67	1.29	0.26	0.77	0.26
		2013	21.0	103	0.33	132	29.5	2.23	1.86	1.71	0.49	0.99	0.27	0.78	0.27
		2014	40.1	103	0.34	253	30.4	4.26	2.25	2.36	0.54	1.08	0.28	0.82	0.28
GE 7FA.05 100% Load with Evap./ GE LMS 100PB 50% Load	CC04/SC07/AB	2010	41.0	102	0.26	258	32.4	4.35	2.27	3.05	0.58	1.16	0.24	0.76	0.24
		2011	22.2	105	0.29	140	27.9	2.36	1.86	1.53	0.43	0.91	0.26	0.78	0.26
		2012	41.7	102	0.30	263	31.1	4.43	1.71	1.77	0.67	1.31	0.26	0.78	0.26
		2013	21.0	103	0.33	132	29.5	2.23	1.86	1.71	0.48	1.01	0.28	0.81	0.28
		2014	40.1	103	0.34	253	30.5	4.26	2.25	2.36	0.54	1.10	0.28	0.86	0.28
GE 7FA.05 100% Load/ GE LMS 100PB 100% Load with Evap.	CC05/SC04/AB	2010	40.8	102	0.25	257	32.0	4.26	2.16	2.98	0.56	1.14	0.23	0.72	0.23
		2011	21.4	105	0.29	135	27.5	2.24	1.90	1.53	0.42	0.86	0.25	0.74	0.25
		2012	41.1	102	0.30	259	30.8	4.30	1.66	1.70	0.66	1.27	0.26	0.75	0.26
		2013	20.7	102	0.33	130	29.2	2.16	1.81	1.64	0.48	0.97	0.27	0.75	0.27
		2014	39.6	103	0.33	250	30.1	4.14	2.14	2.28	0.53	1.05	0.27	0.79	0.27
GE 7FA.05 100% Load/ GE LMS 100PB 100% Load	CC05/SC05/AB	2010	40.8	102	0.25	257	32.0	4.26	2.16	2.98	0.56	1.14	0.23	0.72	0.23
		2011	21.4	105	0.29	135	27.5	2.24	1.90	1.53	0.42	0.86	0.25	0.74	0.25
		2012	41.1	102	0.30	259	30.8	4.30	1.66	1.70	0.66	1.27	0.26	0.75	0.26
		2013	20.7	102	0.33	130	29.2	2.16	1.81	1.64	0.48	0.97	0.27	0.75	0.27
		2014	39.6	103	0.33	250	30.1	4.14	2.14	2.28	0.53	1.05	0.27	0.79	0.27
GE 7FA.05 100% Load/ GE LMS 100PB 75% Load	CC05/SC06/AB	2010	40.8	102	0.25	257	32.0	4.26	2.16	2.98	0.56	1.14	0.24	0.74	0.24
		2011	21.4	105	0.29	135	27.6	2.24	1.90	1.53	0.42	0.87	0.25	0.76	0.25
		2012	41.1	102	0.30	259	30.8	4.30	1.66	1.70	0.66	1.28	0.26	0.76	0.26
		2013	20.7	103	0.33	130	29.2	2.16	1.81	1.64	0.47	0.99	0.27	0.78	0.27
		2014	39.6	103	0.33	250	30.2	4.14	2.14	2.28	0.53	1.07	0.28	0.82	0.28
GE 7FA.05 100% Load/ GE LMS 100PB 50% Load	CC05/SC07/AB	2010	40.8	102	0.25	257	32.0	4.26	2.16	2.98	0.56	1.14	0.24	0.75	0.24
		2011	21.4	105	0.29	135	27.6	2.24	1.90	1.53	0.42	0.89	0.26	0.78	0.26
		2012	41.2	102	0.30	259	30.8	4.30	1.66	1.70	0.66	1.30	0.26	0.77	0.26
		2013	20.7	103	0.33	130	29.2	2.16	1.81	1.64	0.47	1.00	0.28	0.81	0.28
		2014	39.6	103	0.33	250	30.2	4.14	2.14	2.28	0.53	1.09	0.28	0.85	0.28

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			NO_2 (µg/m^3)[b]			CO (µg/m^3)		SO_2 (µg/m^3)				PM_{10} (µg/m^3)		$PM_{2.5}$ (µg/m^3)	
Scenario Description[a]	Exhaust Scenario	Year	1-hour	1-hour (federal)[c]	Annual	1-hour	8-hour	1-hour	1-hour (federal)	3-hour	24-hour	24-hour	Annual	24-hour	Annual
		2010	65.1	121	0.38	412	79.4	5.37	4.60	4.33	1.32	3.13	0.34	1.49	0.34
GE 7FA.05 75% Load/		2011	58.6	109	0.41	370	69.0	4.80	4.12	3.83	0.81	1.95	0.36	1.39	0.36
GE LMS 100PB 100%	CC06/SC04/AB	2012	67.5	108	0.43	426	88.3	5.52	4.13	4.00	1.11	2.66	0.38	1.57	0.38
Load with Evap.		2013	55.7	105	0.45	351	82.6	4.56	4.17	4.26	1.00	2.42	0.40	1.52	0.40
		2014	67.1	107	0.45	423	82.9	5.49	4.59	4.34	1.26	3.05	0.41	1.46	0.41
		2010	65.1	121	0.38	412	79.4	5.37	4.60	4.33	1.32	3.13	0.34	1.49	0.34
GE 7FA.05 75% Load/		2011	58.6	109	0.41	370	69.0	4.80	4.12	3.83	0.81	1.95	0.36	1.39	0.36
GE LMS 100PB 100%	CC06/SC05/AB	2012	67.5	108	0.43	426	88.3	5.52	4.13	4.00	1.11	2.66	0.38	1.57	0.38
Load		2013	55.7	105	0.45	351	82.6	4.56	4.17	4.26	1.00	2.42	0.40	1.52	0.40
		2014	67.1	107	0.45	423	82.9	5.49	4.59	4.34	1.26	3.05	0.41	1.46	0.41
		2010	65.1	121	0.38	412	79.4	5.37	4.60	4.33	1.32	3.13	0.34	1.49	0.34
GE 7FA.05 75% Load/		2011	58.7	109	0.41	370	69.0	4.80	4.12	3.83	0.81	1.96	0.36	1.40	0.36
GE LMS 100PB 75%	CC06/SC06/AB	2012	67.5	108	0.43	426	88.4	5.52	4.13	4.00	1.11	2.67	0.38	1.58	0.38
Load		2013	55.7	105	0.45	351	82.6	4.56	4.17	4.26	1.00	2.42	0.40	1.52	0.40
		2014	67.1	107	0.45	423	82.9	5.49	4.59	4.33	1.26	3.06	0.41	1.47	0.41
		2010	65.1	121	0.38	412	79.4	5.37	4.59	4.33	1.32	3.13	0.34	1.50	0.34
GE 7FA.05 75% Load/		2011	58.7	109	0.41	370	69.0	4.80	4.12	3.83	0.81	1.97	0.36	1.41	0.36
GE LMS 100PB 50%	CC06/SC07/AB	2012	67.5	108	0.43	426	88.4	5.52	4.13	4.00	1.11	2.68	0.39	1.59	0.39
Load		2013	55.7	105	0.45	351	82.6	4.56	4.17	4.26	1.00	2.43	0.41	1.52	0.41
		2014	67.1	107	0.45	423	82.9	5.49	4.59	4.33	1.26	3.07	0.42	1.48	0.42
		2010	85.7	137	0.51	541	139	5.28	4.79	4.36	1.52	4.74	0.55	2.78	0.55
GE 7FA.05 44% Load/		2011	82.1	124	0.51	519	124	5.07	4.63	4.52	1.22	3.85	0.56	2.72	0.56
GE LMS 100PB 100%	CC07/SC04/AB	2012	87.8	130	0.56	555	140	5.43	4.78	5.01	1.66	5.10	0.61	2.97	0.61
Load with Evap.		2013	86.7	117	0.58	548	122	5.36	4.86	4.75	1.28	3.99	0.62	3.32	0.62
		2014	92.1	123	0.59	582	132	5.69	4.93	4.68	1.56	4.90	0.63	3.37	0.63
		2010	85.7	137	0.51	541	139	5.28	4.79	4.36	1.52	4.74	0.55	2.78	0.55
GE 7FA.05 44% Load/		2011	82.1	124	0.51	519	124	5.07	4.63	4.52	1.22	3.85	0.56	2.72	0.56
GE LMS 100PB 100%	CC07/SC05/AB	2012	87.8	130	0.56	555	140	5.43	4.78	5.01	1.66	5.10	0.61	2.97	0.61
Load		2013	86.7	117	0.58	548	122	5.36	4.86	4.75	1.28	3.99	0.62	3.32	0.62
		2014	92.1	123	0.59	582	132	5.69	4.93	4.68	1.56	4.90	0.63	3.37	0.63
		2010	85.7	137	0.51	541	139	5.28	4.79	4.36	1.52	4.74	0.56	2.79	0.56
GE 7FA.05 44% Load/		2011	82.1	124	0.51	519	124	5.07	4.63	4.52	1.22	3.85	0.56	2.73	0.56
GE LMS 100PB 75%	CC07/SC06/AB	2012	87.9	130	0.56	555	140	5.43	4.78	5.01	1.66	5.11	0.61	2.97	0.61
Load		2013	86.7	117	0.58	548	122	5.36	4.86	4.75	1.28	3.99	0.63	3.33	0.63
		2014	92.1	123	0.59	582	132	5.69	4.93	4.68	1.55	4.91	0.64	3.37	0.64
		2010	85.7	137	0.51	541	139	5.28	4.79	4.36	1.52	4.74	0.56	2.80	0.56
GE 7FA.05 44% Load/		2011	82.1	124	0.51	519	124	5.07	4.63	4.52	1.22	3.85	0.56	2.73	0.56
GE LMS 100PB 50%	CC07/SC07/AB	2012	87.9	130	0.56	555	140	5.43	4.78	5.01	1.66	5.11	0.61	2.98	0.61
Load		2013	86.7	117	0.58	548	122	5.36	4.86	4.75	1.28	4.00	0.63	3.33	0.63
		2014	92.1	123	0.59	582	132	5.69	4.93	4.68	1.55	4.92	0.64	3.38	0.64

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			NO_2 (µg/m^3) [b]		CO (µg/m^3)		SO_2 (µg/m^3)				PM_{10} (µg/m^3)	$PM_{2.5}$ (µg/m^3)
Scenario Description [a]	Exhaust Scenario	Year	1-hour	1-hour (federal) [c]	1-hour	8-hour	1-hour	1-hour (federal)	3-hour	24-hour	24-hour	24-hour
GE 7FA.05 100% Load with Evap./ GE LMS 100PB 100% Load with Evap.	CC08/SC08/AB	2010	37.8	102	196	25.8	4.11	2.01	2.83	0.53	1.11	0.72
		2011	19.3	104	100	22.1	2.09	1.74	1.45	0.40	0.86	0.74
		2012	37.4	102	194	23.1	4.06	1.67	1.61	0.60	1.21	0.75
		2013	18.8	102	97.1	23.0	2.03	1.66	1.52	0.45	0.97	0.76
		2014	36.3	102	188	24.1	3.94	2.07	2.15	0.50	1.04	0.80
GE 7FA.05 100% Load with Evap./ GE LMS 100PB 100% Load	CC08/SC09/AB	2010	37.8	102	196	25.8	4.11	2.01	2.83	0.53	1.11	0.72
		2011	19.3	104	100	22.1	2.09	1.74	1.45	0.40	0.87	0.75
		2012	37.4	102	194	23.1	4.06	1.67	1.61	0.60	1.22	0.76
		2013	18.8	102	97.1	23.0	2.03	1.66	1.52	0.45	0.97	0.77
		2014	36.3	102	188	24.2	3.94	2.07	2.15	0.50	1.05	0.81
GE 7FA.05 100% Load with Evap./ GE LMS 100PB 75% Load	CC08/SC10/AB	2010	37.8	102	196	25.8	4.11	2.01	2.83	0.53	1.11	0.73
		2011	19.3	104	100	22.1	2.09	1.74	1.45	0.40	0.88	0.77
		2012	37.4	102	194	23.1	4.06	1.67	1.61	0.60	1.23	0.76
		2013	18.8	102	97.2	23.1	2.03	1.66	1.52	0.45	0.98	0.80
		2014	36.3	102	188	24.2	3.94	2.07	2.15	0.50	1.06	0.84
GE 7FA.05 100% Load with Evap./ GE LMS 100PB 50% Load	CC08/SC11/AB	2010	37.8	102	196	25.8	4.11	2.01	2.83	0.53	1.11	0.74
		2011	19.3	105	100	22.2	2.09	1.74	1.44	0.40	0.89	0.79
		2012	37.4	102	194	23.1	4.06	1.66	1.60	0.60	1.24	0.77
		2013	18.9	102	97.3	23.1	2.02	1.65	1.51	0.45	1.00	0.83
		2014	36.3	102	188	24.2	3.94	2.07	2.15	0.49	1.08	0.88
GE 7FA.05 100% Load/ GE LMS 100PB 100% Load with Evap.	CC09/SC08/AB	2010	44.5	103	231	33.8	4.33	2.67	3.23	0.70	1.57	0.83
		2011	29.0	105	150	24.7	2.82	1.96	1.55	0.42	0.97	0.79
		2012	45.7	102	237	28.3	4.44	2.05	1.96	0.67	1.45	0.88
		2013	23.6	102	122	31.4	2.30	1.98	2.00	0.55	1.25	0.82
		2014	44.3	103	230	30.1	4.31	2.57	2.73	0.58	1.30	0.86
GE 7FA.05 100% Load/ GE LMS 100PB 100% Load	CC09/SC09/AB	2010	44.5	103	231	33.8	4.33	2.67	3.23	0.70	1.57	0.84
		2011	29.0	105	150	24.7	2.82	1.96	1.55	0.42	0.98	0.80
		2012	45.7	102	237	28.3	4.44	2.05	1.96	0.66	1.45	0.88
		2013	23.6	102	122	31.5	2.30	1.98	2.00	0.55	1.25	0.83
		2014	44.3	103	230	30.2	4.31	2.57	2.73	0.58	1.31	0.87
GE 7FA.05 100% Load/ GE LMS 100PB 75% Load	CC09/SC10/AB	2010	44.5	103	231	33.8	4.33	2.67	3.23	0.70	1.57	0.84
		2011	29.0	105	150	24.8	2.82	1.96	1.55	0.42	0.99	0.82
		2012	45.7	102	237	28.3	4.44	2.05	1.96	0.66	1.46	0.88
		2013	23.6	103	122	31.5	2.30	1.98	2.00	0.55	1.26	0.84
		2014	44.3	103	230	30.2	4.31	2.57	2.73	0.58	1.31	0.89
GE 7FA.05 100% Load/ GE LMS 100PB 50% Load	CC09/SC11/AB	2010	44.5	103	231	33.8	4.33	2.67	3.23	0.70	1.57	0.85
		2011	29.0	105	150	24.8	2.82	1.96	1.55	0.42	1.00	0.85
		2012	45.7	102	237	28.3	4.44	2.05	1.96	0.66	1.48	0.90
		2013	23.6	103	122	31.5	2.30	1.97	2.00	0.55	1.27	0.88
		2014	44.3	103	230	30.2	4.31	2.57	2.72	0.57	1.32	0.92

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			NO_2 (µg/m³) [b]		CO (µg/m³)		SO_2 (µg/m³)				PM_{10} (µg/m³)	$PM_{2.5}$ (µg/m³)
Scenario Description [a]	Exhaust Scenario	Year	1-hour	1-hour (federal) [c]	1-hour	8-hour	1-hour	1-hour (federal)	3-hour	24-hour	24-hour	24-hour
GE 7FA.05 75% Load/ GE LMS 100PB 100% Load with Evap.	CC10/SC08/AB	2010	62.1	121	324	62.9	4.93	4.25	4.02	1.23	3.26	1.47
		2011	56.7	107	294	56.0	4.45	3.84	3.50	0.74	1.99	1.38
		2012	64.6	107	335	70.3	5.07	3.73	3.66	0.99	2.66	1.56
		2013	51.9	104	271	66.0	4.13	3.87	3.85	0.91	2.45	1.50
		2014	63.8	106	331	66.9	5.01	4.17	3.97	1.15	3.10	1.42
GE 7FA.05 75% Load/ GE LMS 100PB 100% Load	CC10/SC09/AB	2010	62.1	121	324	63.0	4.93	4.25	4.02	1.23	3.26	1.47
		2011	56.7	107	294	56.0	4.45	3.84	3.50	0.74	1.99	1.38
		2012	64.6	107	335	70.3	5.07	3.73	3.66	0.99	2.66	1.56
		2013	51.9	104	271	66.0	4.13	3.87	3.85	0.91	2.45	1.50
		2014	63.8	106	331	66.9	5.01	4.17	3.97	1.15	3.11	1.42
GE 7FA.05 75% Load/ GE LMS 100PB 75% Load	CC10/SC10/AB	2010	62.1	121	324	63.0	4.93	4.25	4.02	1.23	3.26	1.48
		2011	56.7	107	294	56.0	4.45	3.84	3.50	0.74	2.00	1.39
		2012	64.6	107	335	70.4	5.07	3.73	3.66	0.99	2.67	1.56
		2013	51.9	104	271	66.0	4.13	3.87	3.85	0.91	2.45	1.50
		2014	63.8	106	331	66.9	5.01	4.17	3.96	1.15	3.11	1.43
GE 7FA.05 75% Load/ GE LMS 100PB 50% Load	CC10/SC11/AB	2010	62.1	121	324	63.0	4.93	4.25	4.02	1.23	3.26	1.49
		2011	56.7	107	294	56.0	4.45	3.84	3.50	0.74	2.01	1.40
		2012	64.6	107	335	70.4	5.07	3.73	3.66	0.99	2.67	1.57
		2013	51.9	104	271	66.0	4.13	3.87	3.85	0.91	2.45	1.50
		2014	63.8	106	331	66.9	5.01	4.17	3.96	1.15	3.12	1.43
GE 7FA.05 48% Load/ GE LMS 100PB 100% Load with Evap.	CC11/SC08/AB	2010	74.9	127	390	94.5	4.82	4.21	3.83	1.34	4.31	2.34
		2011	70.7	117	369	81.1	4.56	4.04	3.97	0.95	3.09	2.32
		2012	73.0	116	381	98.2	4.72	4.12	4.27	1.23	3.93	2.48
		2013	72.0	109	376	85.8	4.65	4.18	4.22	1.13	3.61	2.59
		2014	78.0	111	407	89.4	5.03	4.31	4.05	1.26	4.09	2.68
GE 7FA.05 48% Load/ GE LMS 100PB 100% Load	CC11/SC09/AB	2010	74.9	127	390	94.6	4.82	4.21	3.83	1.34	4.31	2.34
		2011	70.7	117	369	81.1	4.56	4.04	3.97	0.95	3.10	2.33
		2012	73.0	116	381	98.2	4.72	4.12	4.27	1.23	3.93	2.48
		2013	72.0	109	376	85.9	4.65	4.17	4.22	1.13	3.61	2.59
		2014	78.0	111	407	89.4	5.03	4.31	4.05	1.26	4.09	2.69
GE 7FA.05 48% Load/ GE LMS 100PB 75% Load	CC11/SC10/AB	2010	74.9	127	390	94.6	4.82	4.21	3.83	1.34	4.31	2.34
		2011	70.7	117	369	81.1	4.56	4.04	3.97	0.95	3.10	2.33
		2012	73.0	116	381	98.2	4.72	4.12	4.27	1.23	3.93	2.49
		2013	72.0	109	376	85.9	4.65	4.17	4.22	1.13	3.62	2.59
		2014	78.0	111	407	89.5	5.03	4.31	4.05	1.26	4.10	2.69
GE 7FA.05 48% Load/ GE LMS 100PB 50% Load	CC11/SC11/AB	2010	74.9	127	390	94.6	4.82	4.21	3.83	1.34	4.31	2.35
		2011	70.7	117	369	81.2	4.56	4.04	3.97	0.95	3.11	2.33
		2012	73.0	116	381	98.3	4.72	4.12	4.27	1.23	3.94	2.49
		2013	72.0	109	376	85.9	4.65	4.17	4.22	1.13	3.62	2.59
		2014	78.1	111	407	89.5	5.03	4.31	4.04	1.26	4.11	2.69

[a] All modeled scenarios include two GE 7FA.05 turbines, two GE LMS 100PB turbines, and the auxiliary boiler.
[b] The maximum 1-hour and annual NO_2 concentrations include ambient NO_2 ratios of 0.80 (EPA, 2011) and 0.75 (EPA, 2005), respectively.
[c] The total predicted concentration for the federal 1-hour NO_2 standard is the high-8th-high modeled concentration paired with 98th percentile seasonal hour-of-day background concentrations for 2010 through 2012.

Revised based on modeling with the revised operational emission rates

Huntington Beach Energy Project
Appendix C, Table 5
Operational Results – SCAQMD Rule 2005
March 2016

GE 7FA.05 Unit 1

Year	1-hour Concentration (μg/m³) [a, b]	1-hour Federal Concentration (μg/m³) [a, c]	Annual Concentration (μg/m³) [a, d]
2010	38.9	40.0	0.17
2011	34.5	35.5	0.18
2012	38.9	41.0	0.19
2013	42.2	43.8	0.20
2014	43.1	39.4	0.20

GE 7FA.05 Unit 2

Year	1-hour Concentration (μg/m³) [a, b]	1-hour Federal Concentration (μg/m³) [a, c]	Annual Concentration (μg/m³) [a, d]
2010	60.3	52.0	0.24
2011	53.3	49.1	0.25
2012	52.7	51.2	0.28
2013	58.5	62.0	0.27
2014	55.0	53.6	0.28

GE LMS 100PB Unit 1

Year	1-hour Concentration (μg/m³) [a, b]	1-hour Federal Concentration (μg/m³) [a, c]	Annual Concentration (μg/m³) [a, d]
2010	2.94	2.96	0.014
2011	3.03	3.05	0.017
2012	3.09	3.11	0.017
2013	3.12	3.14	0.020
2014	2.60	2.61	0.019

GE LMS 100PB Unit 2

Year	1-hour Concentration (μg/m³) [a, b]	1-hour Federal Concentration (μg/m³) [a, c]	Annual Concentration (μg/m³) [a, d]
2010	2.95	2.97	0.014
2011	3.01	3.03	0.016
2012	3.12	3.14	0.017
2013	3.07	3.10	0.020
2014	2.88	2.91	0.019

Auxiliary Boiler

Year	1-hour Concentration (μg/m³) [a]	1-hour Federal Concentration (μg/m³) [a]	Annual Concentration (μg/m³) [a]
2010	2.73	2.73	0.15
2011	2.54	2.54	0.15
2012	2.67	2.67	0.15
2013	2.32	2.32	0.15
2014	2.38	2.38	0.15

[a] The maximum 1-hour and annual NO_2 concentrations include ambient NO_2 ratios of 0.80 (EPA, 2011) and 0.75 (EPA, 2005), respectively.
[b] The modeled impact for the 1-hour NO_2 CAAQS for the GE 7FA.05 and GE LMS 100PB units are based on exhaust scenarios CC03 and SC03, respectively.
[c] The modeled impact for the 1-hour NO_2 NAAQS for the GE 7FA.05 and GE LMS 100PB units are based on exhaust scenarios CC07 and SC07, respectively.
[d] The modeled impact for the Annual NO_2 AAQS for the GE 7FA.05 and GE LMS 100PB units are based on exhaust scenarios CC07 and SC06, respectively.

Revised based on modeling with the revised operational emission rates

Huntington Beach Energy Project
Appendix C, Table 6
Operational Results – Class II SIL and Increment
March 2016

Year	NO_2 (µg/m^3) [a]		CO (µg/m^3)		PM_{10} (µg/m^3)	
	1-hour [b]	Annual [c]	1-hour [b]	8-hour [b]	24-hour [d]	Annual [e]
2010	89.0	0.51	594	140	4.63	0.56
2011	85.2	0.51	569	132	3.69	0.56
2012	89.8	0.56	600	149	4.97	0.61
2013	88.5	0.58	591	130	3.89	0.63
2014	94.5	0.59	631	134	4.78	0.64

[a] The maximum 1-hour and annual NO_2 concentrations include ambient NO_2 ratios of 0.80 (EPA, 2011) and 0.75 (EPA, 2005), respectively.

[b] The modeled impact for the 1-hour NO_2, 1-hour CO, and 8-hour CO Class II SIL and Increment for the GE 7FA.05 and GE LMS 100PB units are based on exhaust scenarios CC03 and SC03, respectively.
[b] The modeled impact for the Annual NO_2 Class II SIL and Increment for the GE 7FA.05 and GE LMS 100PB units are based on exhaust scenarios CC07 and SC06, respectively.

[d] The 24-hour PM_{10} concentration is based on the GE LMS 100PB turbines operating in exhaust scenario SC07, one GE 7FA.05 turbine operating 24 hours per day in exhaust scenario CC07, and one GE 7FA.05 turbine operating 20 hours per day in exhaust scenario CC07 and 4 hours per day in exhaust scenario CC06.
[e] The modeled impact for the Annual PM_{10} Class II SIL and Increment for the GE 7FA.05 and GE LMS 100PB units are based on exhaust scenarios CC07 and SC07, respectively.

Revised based on modeling with the revised operational emission rates

Huntington Beach Energy Project

Appendix C, Table 7 [a]

Competing Source Stack Parameters

March 2016

Point Sources

Facility	Source ID	Easting (X) (m)	Northing (Y) (m)	Base Elevation (m)	Stack Height (m)	Temperature (K)	Exit Velocity (m/s)	Stack Diameter (m)
HBEP	7FA01	409449	3723146	3.66	45.7	350	11.8	6.10
	7FA02	409474	3723182	3.66	45.7	350	11.8	6.10
	LMS01	409149	3723193	3.66	24.4	748	23.6	4.11
	LMS02	409185	3723168	3.66	24.4	748	23.6	4.11
	AUXBOILER	409438	3723236	3.66	24.4	432	21.2	0.91
Huntington Beach Generating Station (HBGS)	BOILER12	409274	3723095	3.66	61.0	367	7.90	6.27
Orange County Sanitation - Fountain Valley (OCSFV)	1730101	412962	3728359	8.00	7.41	1,089	1.37	2.23
	1730102	412914	3728328	7.70	7.62	475	7.03	0.55
	1730103	412935	3728401	8.00	18.9	533	17.9	0.76
	1730104	412942	3728391	8.00	18.9	533	17.9	0.76
	1730105	412939	3728396	8.00	18.9	533	17.9	0.76
Orange County Sanitation - Huntington Beach (OCSHB)	2911001	411071	3722313	1.60	7.62	475	7.44	0.53
	2911002	411096	3722214	1.60	7.41	1089	1.37	0.68
	2911003	411240	3722455	1.60	18.0	589	22.9	0.76
	2911004	411248	3722455	1.60	18.0	589	22.9	0.76
	2911005	411255	3722455	1.60	18.0	589	22.9	0.76
	2911006	411263	3722455	1.60	18.0	589	22.9	0.76
	2911007	411270	3722455	1.60	18.0	589	22.9	0.76
Beta Offshore (Beta)	16607301	395222	3716431	0	18.3	661	31.1	0.30
	16607302	395222	3716431	0	18.3	641	30.0	0.30
	16607303	395222	3716431	0	18.3	585	24.2	0.30
	16607304	394082	3717932	0	18.3	663	28.7	0.30
	16607305	394082	3717932	0	18.3	684	34.7	0.30
	16607306	394082	3717932	0	18.3	583	21.1	0.30
	16607307	395265	3716554	0	18.3	671	39.4	0.61
	16607308	395265	3716554	0	18.3	671	38.1	0.61
	16607309	395265	3716554	0	18.3	677	37.5	0.61
	16607310	395265	3716554	0	18.3	671	81.2	0.76
	16607311	395265	3716554	0	18.3	669	81.1	0.76
	16607312	395265	3716554	0	18.3	668	81.4	0.76
	16607313	395265	3716554	0	22.9	464	8.35	0.51

Volume Sources

Facility	Source ID	Base Elevation (m)	Release Height (m)	Initial Horizontal Dimension (m)	Initial Vertical Dimension (m)
Shipping Lanes (525 sources)	734601-774425	0	0.0	186	23.3

[a] Competing source data provided by SCAQMD.

Huntington Beach Energy Project
Appendix C, Table 8 [a]
Competing Source Emission Rates
March 2016

Emission Rates for PSD 1-hour NO_2 Competing Source Modeling

Facility	Source ID	1-hour NO_2 (g/s)	1-hour NO_2 (lb/hr)
HBEP	7FA01	7.18	57.0
	7FA02	7.18	57.0
	LMS01	2.67	21.2
	LMS02	2.67	21.2
	AUXBOILER	0.054	0.42
HBGS	BOILER12	4.32	34.3
OCSFV	1730101	0.65	5.17
	1730102	0.01	0.08
	1730103	0.98	7.78
	1730104	0.98	7.78
	1730105	0.98	7.78
OCSHB	2911001	0.08	0.60
	2911002	0.11	0.87
	2911003	0.87	6.90
	2911004	0.87	6.90
	2911005	0.87	6.90
	2911006	0.87	6.90
	2911007	0.87	6.90
Beta	16607301	1.90	15.1
	16607302	1.90	15.1
	16607303	1.90	15.1
	16607304	1.90	15.1
	16607305	1.90	15.1
	16607306	1.90	15.1
	16607307	0.37	2.94
	16607308	0.31	2.46
	16607309	0.35	2.78
	16607310	2.52	20.0
	16607311	2.48	19.7
	16607312	2.48	19.7
	16607313	10.3	81.6
Shipping Lanes (Total for 525 sources)	734601-774425	25.5	202

[a] Competing source data provided by SCAQMD.

Huntington Beach Energy Project
Appendix C, Table 9
Competing Source Results
March 2016

1-hour NO_2 Concentrations ($\mu g/m^3$) [a, b]

Year	2010	2011	2012	2013	2014
All	140	147	148	143	144
HBEP	75.4	71.0	73.2	74.1	76.0
HBGS	5.15	5.08	5.32	5.12	4.73
OCSFV	8.92	8.92	8.87	8.91	9.02
OCSHB	56.2	54.0	54.1	54.1	53.7
BETA	58.2	63.2	62.6	66.8	66.1
SHIPS	24.3	23.4	23.9	22.6	23.3

[a] The total predicted concentration for the federal 1-hour NO_2 standard is the high-8th-high modeled concentration paired with 98th percentile seasonal hour-of-day background concentrations for 2010 through 2012.

[b] The modeled impact for the 1-hour NO_2 competing source assessment for the GE 7FA.05 and GE LMS 100PB units are based on exhaust scenarios CC03 and SC03, respectively.

Huntington Beach Energy Project
Appendix C, Table 10
Operational Results – Class I SIL and Increment
March 2016

Annual NO_2 Concentrations ($\mu g/m^3$) at 50 km Receptor Ring [a, b]

Year	2010	2011	2012	2013	2014
All	0.0055	0.0055	0.0057	0.0053	0.0049
GE 7FA.05 Unit 1	0.0022	0.0022	0.0023	0.0021	0.0020
GE 7FA.05 Unit 2	0.0022	0.0023	0.0023	0.0021	0.0020
GE LMS 100PB Unit 1	0.0005	0.0005	0.0005	0.0005	0.0004
GE LMS 100PB Unit 2	0.0005	0.0005	0.0005	0.0005	0.0004
Auxiliary Boiler	0.0001	0.0001	0.0001	0.0001	0.0001

24-hour PM_{10} Concentrations ($\mu g/m^3$) at 50 km Receptor Ring [c]

Year	2010	2011	2012	2013	2014
All	0.038	0.039	0.042	0.036	0.038
GE 7FA.05 Unit 1	0.012	0.012	0.013	0.011	0.012
GE 7FA.05 Unit 2	0.012	0.012	0.013	0.011	0.012
GE LMS 100PB Unit 1	0.0080	0.0074	0.008	0.0070	0.0075
GE LMS 100PB Unit 2	0.0080	0.0074	0.008	0.0071	0.0075
Auxiliary Boiler	0.0005	0.0007	0.0004	0.0006	0.0006

Annual PM_{10} Concentrations ($\mu g/m^3$) at 50 km Receptor Ring [c]

Year	2010	2011	2012	2013	2014
All	0.0055	0.0056	0.0057	0.0053	0.0049
GE 7FA.05 Unit 1	0.0023	0.0023	0.0023	0.0022	0.0020
GE 7FA.05 Unit 2	0.0023	0.0023	0.0023	0.0022	0.0020
GE LMS 100PB Unit 1	0.0005	0.0005	0.0005	0.0004	0.0004
GE LMS 100PB Unit 2	0.0005	0.0005	0.0005	0.0004	0.0004
Auxiliary Boiler	8.0E-05	8.0E-05	8.0E-05	8.0E-05	7.0E-05

[a] The maximum annual NO_2 concentrations include an ambient NO_2 ratio of 0.75 (EPA, 2005).

[b] The modeled impact for the Annual NO_2 Class I SIL and Increment for the GE 7FA.05 and GE LMS 100PB units are based on exhaust scenarios CC07 and SC06, respectively.

[c] The modeled impact for the 24-hour and annual PM_{10} Class I SIL and Increment for the GE 7FA.05 and GE LMS 100PB units are based on exhaust scenarios CC07 and SC07, respectively.

Revised based on modeling with the revised operational emission rates

Appendix D
Air Quality Impact Analysis—Joint Frequency Distributions for VISCREEN

Huntington Beach Energy Project
Appendix D, Table 1
Joint Frequency Distribution for Crystal Cove State Park
March 2016

Stability Class	Wind Speed (m/s)	Transport Time (hours)	σ_y (meters)	σ_z (meters)	μ (m/s)	$\sigma_y \times \sigma_z \times \mu$ (m^3/s)	Count	Frequency*	Cumulative Frequency*
F	1	3.47	330.4	50.9	0.5	8,406	120	0.3	0.3
E	1	3.47	496.3	87.8	0.5	21,776	67	0.2	0.4
F	2	1.74	330.4	50.9	1.5	25,219	54	0.1	0.5
F	3	1.16	330.4	50.9	2.5	42,032	5	0.0	0.6
D	1	3.47	662.9	153.0	0.5	50,726	45	0.1	0.7
E	2	1.74	496.3	87.8	1.5	65,327	41	0.1	0.8
E	3	1.16	496.3	87.8	2.5	108,878	21	0.0	0.8
D	2	1.74	662.9	153.0	1.5	152,178	59	0.1	0.9
E	4	0.87	496.3	87.8	3.5	152,429	0	0.0	0.9
D	3	1.16	662.9	153.0	2.5	253,630	12	0.0	1.0
D	4	0.87	662.9	153.0	3.5	355,082	19	0.0	1.0
D	5	0.69	662.9	153.0	4.5	456,534	8	0.0	1.0
D	6	0.58	662.9	153.0	5.5	557,986	1	0.0	1.0
D	7	0.50	662.9	153.0	6.5	659,438	0	0.0	1.0
D	8	0.43	662.9	153.0	7.5	760,890	0	0.0	1.0

* Frequency and cumulative frequency based on all hours of the day.

Notes:
m/s = meter(s) per second
m^3/s = cubic meters per second
σ_y = Pasquill-Gifford horizontal diffusion coefficient
σ_z = Pasquill-Gifford vertical diffusion coefficient
μ = wind speed (based off of wind speed Bin average)

Huntington Beach Energy Project
Appendix D, Table 2
Joint Frequency Distribution for Huntington Beach State Park
March 2016

Stability Class	Wind Speed (m/s)	Transport Time (hours)	σ_y (meters)	σ_z (meters)	μ (m/s)	$\sigma_y \times \sigma_z \times \mu$ (m^3/s)	Count	Frequency	Cumulative Frequency
F	1	0.017	2.64	1.59	0.5	2.10	1,702	3.9	3.9
E	1	0.017	3.98	2.39	0.5	4.76	675	1.5	5.4
F	2	0.009	2.64	1.59	1.5	6.31	955	2.2	7.6
D	1	0.017	5.33	3.10	0.5	8.27	370	0.8	8.4
F	3	0.006	2.64	1.59	2.5	10.51	195	0.4	8.9
E	2	0.009	3.98	2.39	1.5	14.28	635	1.4	10.3
E	3	0.006	3.98	2.39	2.5	23.81	158	0.4	10.7
D	2	0.009	5.33	3.10	1.5	24.80	527	1.2	11.9
E	4	0.004	3.98	2.39	3.5	33.33	63	0.1	12.0
D	3	0.006	5.33	3.10	2.5	41.33	264	0.6	12.7
D	4	0.004	5.33	3.10	3.5	57.87	66	0.2	12.8
D	5	0.003	5.33	3.10	4.5	74.40	53	0.1	12.9
D	6	0.003	5.33	3.10	5.5	90.93	96	0.2	13.1
D	7	0.002	5.33	3.10	6.5	107.47	64	0.1	13.3
D	8	0.002	5.33	3.10	7.5	124.00	46	0.1	13.4

Appendix E
Air Quality Impact Analysis—Fumigation

Huntington Beach Energy Project
Appendix E, Table 1
Inversion Break-up and Shoreline Fumigation Analyses
March 2016

AERSCREEN Inversion Break-Up Fumigation Impact Analysis Results

Pollutant	Averaging Period	Fumigation Impacts [a] ($\mu g/m^3$)	Background ($\mu g/m^3$)	Total ($\mu g/m^3$)	CAAQS ($\mu g/m^3$)	Above CAAQS?	NAAQS ($\mu g/m^3$)	Above NAAQS?
PM_{10}	24-hour	10.6	51.0	61.6	N/A	no	150	no
NO_2 [b]	1-hour	85.3	142	227	339	no	N/A	no
SO_2	1-hour	5.92	20.2	26.1	655	no	N/A	no
	3-hour	5.78	20.2	26.0	N/A	no	1,300	no
	24-hour	3.18	5.20	8.38	105	no	N/A	no
CO	1-hour	529	3,321	3,850	23,000	no	40,000	no
	8-hour	178	2,519	2,697	10,000	no	10,000	no

Notes:
[a] Fumigation impacts were calculated by multiplying the 1 g/s unit emission AERSCREEN impacts by source emissions. The sum of all emission sources are displayed.
[b] 1-hour NO_2 impact assumes an 80 percent ambient ratio method.

AERSCREEN Shoreline Fumigation Impact Analysis Results

Pollutant	Averaging Period	Fumigation Impacts [a] ($\mu g/m^3$)	Background ($\mu g/m^3$)	Total ($\mu g/m^3$)	CAAQS ($\mu g/m^3$)	Above CAAQS?	NAAQS ($\mu g/m^3$)	Above NAAQS?
PM_{10}	24-hour	10.5	51.0	61.5	N/A	no	150	no
NO_2 [b]	1-hour	47.2	142	189	339	no	N/A	no
SO_2	1-hour	3.52	20.2	23.7	655	no	N/A	no
	3-hour	3.55	20.2	23.8	N/A	no	1,300	no
	24-hour	2.13	5.20	7.33	105	no	N/A	no
CO	1-hour	125	3,321	3,446	23,000	no	40,000	no
	8-hour	37.6	2,519	2,557	10,000	no	10,000	no

Notes:
[a] Fumigation impacts were calculated by multiplying the 1 g/s unit emission AERSCREEN impacts by source emissions. The sum of all emission sources are displayed.
[b] 1-hour NO_2 impact assumes an 80 percent ambient ratio method.

Huntington Beach Energy Project
Appendix E, Table 1
Inversion Break-up and Shoreline Fumigation Analyses
March 2016

AERSCREEN Inputs for Shoreline Fumigation Impact Analysis for Unit Emissions

Emission Source	Scenario	Emission Rate (g/s)	Stack Height (m)	Stack Inside Diameter (m)	Stack Exit Velocity (m/s)	Stack Gas Exit Temperature (K)	Distance to Shore (m)
GE LMS 100PB Simple-cycle 1	1	1	24.4	4.11	33.3	694	350
GE LMS 100PB Simple-cycle 2	1	1	24.4	4.11	33.3	694	350
GE LMS 100PB Simple-cycle 1	3	1	24.4	4.11	23.8	748	350
GE LMS 100PB Simple-cycle 2	3	1	24.4	4.11	23.8	748	350
GE LMS 100PB Simple-cycle 1	4	1	24.4	4.11	33.1	697	350
GE LMS 100PB Simple-cycle 2	4	1	24.4	4.11	33.1	697	350
GE LMS 100PB Simple-cycle 1	7	1	24.4	4.11	23.6	748	350
GE LMS 100PB Simple-cycle 2	7	1	24.4	4.11	23.6	748	350
GE 7FA.05 Combined-cycle 1	3	1	45.7	6.10	12.2	350	500
GE 7FA.05 Combined-cycle 2	3	1	45.7	6.10	12.2	350	550
GE 7FA.05 Combined-cycle 1	7	1	45.7	6.10	11.8	350	500
GE 7FA.05 Combined-cycle 2	7	1	45.7	6.10	11.8	350	550
Auxiliary Boiler	N/A	1	24.4	0.91	21.2	432	575

Notes:
AERSCREEN was run with a Rural option, minimum temperature of 275.1 K and maximum temperature of 315.1 K (based on AERMET data), minimum wind speed of 0.5 m/s, and 100 m anemometer height. Surface profile of water and climate profile of average.

AERSCREEN Outputs for Shoreline Fumigation Impact Analysis for Unit Emissions

Emission Source	Scenario	Inversion Break-Up Fumigation Impacts (µg/m^3)				Shoreline Fumigation Impacts (µg/m^3)			
		1-hour	3-hour	8-hour	24-hour	1-hour	3-hour	8-hour	24-hour
GE LMS 100PB Simple-cycle 1	1	1.96	1.96	1.76	1.17	8.60	8.60	7.74	5.16
GE LMS 100PB Simple-cycle 2	1	1.96	1.96	1.76	1.17	8.60	8.60	7.74	5.16
GE LMS 100PB Simple-cycle 1	3	2.47	2.47	2.23	1.48	11.1	11.1	9.95	6.63
GE LMS 100PB Simple-cycle 2	3	2.47	2.47	2.23	1.48	11.1	11.1	9.95	6.63
GE LMS 100PB Simple-cycle 1	4	1.96	1.96	1.77	1.18	8.62	8.62	7.76	5.17
GE LMS 100PB Simple-cycle 2	4	1.96	1.96	1.77	1.18	8.62	8.62	7.76	5.17
GE LMS 100PB Simple-cycle 1	7	2.49	2.49	2.24	1.49	11.1	11.1	10.0	6.68
GE LMS 100PB Simple-cycle 2	7	2.49	2.49	2.24	1.49	11.1	11.1	10.0	6.68
GE 7FA.05 Combined-cycle 1	3	5.95	5.95	5.35	3.57				
GE 7FA.05 Combined-cycle 2	3	5.95	5.95	5.35	3.57				
GE 7FA.05 Combined-cycle 1	7	6.08	6.08	5.47	3.65				
GE 7FA.05 Combined-cycle 2	7	6.08	6.08	5.47	3.65				
Auxiliary Boiler	N/A	38.1	38.1	34.3	22.8				

Notes:
GE 7FA.05 Combined-cycle 1 and 2 and Auxiliary Boiler are all located > 500 m from the shore. As a result, AERSCREEN was not able to calculate shoreline fumigation impacts.

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Inversion Break-up and Shoreline Fumigation Analyses
March 2016

Criteria Pollutant Emissions

Pollutant	Averaging Period	GE LMS 100PB Simple-cycle 1	GE LMS 100PB Simple-cycle 2	GE 7FA.05 Combined-cycle 1	GE 7FA.05 Combined-cycle 2	Auxiliary Boiler
PM_{10}	24-hour	0.79	0.79	1.07	1.07	0.020
NO_2	1-hour	2.67	2.67	7.69	7.69	0.054
SO_2	1-hour	0.20	0.20	0.37	0.37	0.018
	3-hour	0.21	0.21	0.35	0.35	0.018
	24-hour	0.21	0.21	0.35	0.35	0.0057
CO	1-hour	5.66	5.66	41.0	41.0	0.36
	8-hour	1.89	1.89	14.9	14.9	0.30

Revisions made consistent with revised operating profile