DOCKETED

Docket Number:	15-AFC-01
Project Title:	Puente Power Project
TN #:	215395
Document Title:	Application to VCAPCD for an Authority to Construct/ Determination of Compliance for the Proposed Puente Power Project
Description:	Letter dated 3/19/15
Filer:	Paul Kihm
Organization:	Latham & Watkins LLP
Submitter Role:	Applicant Representative
Submission Date:	1/15/2017 12:27:36 PM
Docketed Date:	1/17/2017

NRG Oxnard Energy Center LLC
5790 Fleet Street, Suite 200
Carlsbad, CA 92008
Phone: 760-710-2156
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March 19, 2015

Michael Villegas
Air Pollution Control Officer/Executive Officer
Ventura County APCD
669 County Square Drive
Ventura, CA 93003

Subject: Application for an Authority to Construct/Determination of Compliance for the Proposed Puente Power Project

Dear Mr. Villegas:

On behalf of NRG Energy Center Oxnard LLC, NRG Energy is pleased to submit the enclosed application for an Authority to Construct (ATC)/Determination of Compliance (DOC) for the proposed Puente Power Project (P3). This permit application package includes the signed VCAPCD permit application forms and air quality modeling files on a compact disc.

The proposed P3 consists of the replacement of the existing Mandalay Generating Station (MGS) Units 1 and 2 (215 MW each) with a new simple-cycle natural gas-fired GE H-Class combustion turbine generator with a nominal net electric generating capacity of approximately 262 MW. In addition, the project includes the replacement of the existing Diesel emergency generator engine with a new emergency engine, and the shutdown of the existing Diesel emergency fire pump engine. The remainder of the facility will remain unchanged: one natural gas fired peaker combustion turbine (Unit 3), and ancillary facilities.

We have also included a check for $2,450 to cover the initial filing fee for the ATC/DOC application package.

If you have any questions regarding this application package, please contact me at (760) 710-2156 (office) or 760-707-6833 (cell).

Best Regards,

George L. Piantka

George L. Piantka, PE
Director, Regulatory Environmental Services
NRG, West Region

Enclosures (filing fee check, APCD application forms, regulatory analysis, CD with modeling files):

cc: CEC Dockets
Michael J. Carroll, Latham & Watkins
Anne Connell, AECOM

VENTURA COUNTY AIR POLLUTION CONTROL DISTRICT

669 County Square Drive, Ventura CA 93003 805/ 645-1401 FAX 805/ 645-1444 www.vcapcd.org

APPLICATION FOR AUTHORITY TO CONSTRUCT OR PERMIT TO OPERATE WITHOUT AUTHORITY TO CONSTRUCT

IMPORTANT: Include all of the following when submitting this application.

✓ **Appropriate Fee** ✓ **Completed Supplemental Forms** ✓ **Signature on Application**

All applications require supplemental forms and additional data. In addition, plans or drawings have to be submitted with the application(s). Please contact the District engineering staff for additional information. Failure to adhere to the instructions outlined by the District could result in the application being returned as incomplete. Knowingly submitting false information in this application is a misdemeanor punishable by a fine of up to $25,000 (Rule 12.D and H&SC 42400.2(c)).

Please specify the legal name and address of the person, partnership, company, corporation or agency to be named on the permit. All permits and billings will be mailed to the first address below.

Organization Type	☒ Corporation ☐ Partnership ☐ Individual Owner ☐ Government Agency		
Organization Name	NRG Energy Center Oxnard LLC		
Mailing Address	5790 Fleet Street, Suite 200		
City, State Zip	Carlsbad, CA 92008		
Contact Person	Thomas A. Di Ciolli	Title	Plant Manager
Phone Number	805-984-5241	FAX Number	805-984-5295

Please specify the facility name, street address, and phone number where the equipment is or is proposed to be installed.

Facility Name	Puente Power Project		
Facility Address	393 North Harbor Blvd.		
City, State Zip	Oxnard, CA 93035		
Contact Person	Thomas A. Di Ciolli	Title	Plant Manager
Phone Number	805-984-5241	FAX Number	805-984-5295
Type of Facility (e.g., electronics assembly)	Power Plant		
SIC Code of Facility (if known)	4911		

Please specify the name, address, and phone number of the contractor, consultant, or contact person for this project. (OPTIONAL)

Project Contact Company	NRG Energy Center Oxnard LLC		
Contact Address	5790 Fleet Street, Suite 200		
City, State Zip	Carlsbad, CA 92008		
Contact Person	George L. Piantka, PE	Title	Director, Environmental Bus.
Phone Number	760-710-2156	FAX Number	760-710-2158

DISTRICT USE ONLY

Amount Paid: $________ Date Received: ________ Receipt No.: ________

APPLICATION FOR AUTHORITY TO CONSTRUCT OR PERMIT TO OPERATE WITHOUT AUTHORITY TO CONSTRUCT

REQUIRED FOR ALL APPLICATIONS

Is the emission unit/process for which you are submitting this application: (Check all that apply.)	☐ New? ☐ Modified? ☐ Relocated? ☒ Replaced?
Will the proposed facility operate within 1000 feet from the outer boundary of a school site? See California Health and Safety Code Section 42301.6(f) for additional information.	Yes ☐ No ☒
Do you claim confidentiality of data with respect to information submitted with this application? If yes, you must also submit written justification to support your claim of confidentiality.	Yes ☐ No ☒
Is this an application for a publicly owned sewage treatment plant, jail, police or fire fighting facility, school, hospital, ambulance service, landfill gas control or processing equipment, or publicly owned or nonprofit water delivery operation?	Yes ☐ No ☒
Are you requesting that the emissions units on this application be designated as portable pursuant to Rule 20, "Transfer of Permit"?	Yes ☐ No ☒
Is this application the result of a Notice to Comply or Notice of Violation that was issued to this facility?	Yes ☐ No ☒
Is this application for existing equipment or processes that do not have a permit? If yes, date of installation/initial operation:	Yes ☐ No ☒ / /

REQUIRED ONLY IF YOUR FACILITY HAS AN EXISTING APCD PERMIT

APCD Permit to Operate Number	00013
Is this an application ONLY to increase the throughput, fuel consumption or hours of operation of the facility?	Yes ☐ No ☒
Is this an application ONLY to modify a condition on an existing permit which will not require any physical change in any emissions unit?	Yes ☐ No ☒
Is this an application ONLY to modify an existing emissions unit with no emissions increase?	Yes ☐ No ☒
Is this an application ONLY to relocate existing emissions units within 5 miles of their present location?	Yes ☐ No ☒
Is this an application ONLY to comply with a regulatory requirement with no increase in throughput or fuel consumption?	Yes ☐ No ☒
Is this an application ONLY to voluntarily reduce emissions with no increase in throughput or fuel consumption?	Yes ☐ No ☒
Is this an application ONLY to remove or shutdown emissions units and bank the resulting emission reduction credits?	Yes ☐ No ☒

I hereby certify that the equipment which is the subject of this application can be expected to comply with all applicable rules when operated as proposed. I hereby certify that all information provided on this application is true and correct. I agree to pay any and all fees required by District rules for processing this application and for issuance of any Authority to Construct or Permit to Operate. If I withdraw my application or should my application be disapproved, I agree that the obligation exists to compensate the District for time spent processing my application.

Signature of responsible official, partner, or sole proprietor (not a consultant or contractor) Original Signature Required/No Photocopies	*[signature]*
Print Name	John Chillemi
Organization or Company Name	NRG Energy Center Oxnard LLC
Date	2/25/15

San Joaquin Valley Air Pollution Control District
Supplemental Application Form

Gas Turbines

Please complete one form for each gas turbine.

This form must be accompanied by a completed Application for Authority to Construct and Permit to Operate form

PERMIT TO BE ISSUED TO: NRG Energy Center Oxnard LLC

EQUIPMENT DESCRIPTION

Equipment Details	☒ Industrial Frame ☐ Aero Derivative ☐ Other: ________
	Manufacturer: GE — Model: 7HA.01 — Serial Number: TBD
	☒ Simple Cycle ☐ Combined Cycle ☐ Co-generation ☐ Other: ________
	Nominal (ISO) Rating: 275 (gross) MW (at 1 atm, 59°F, 60% Relative Humidity)
	Is the unit equipped with an auxiliary/duct burner? ☐ Yes ☒ No (Note: If yes, please complete a *Boiler, Steam Generator, Dryer, and Process Heater Supplemental Application form* for the unit.)
Rule 4703 Type of Use and Emissions Monitoring Provisions	☐ Peaking Unit - limited to no more than 877 hrs/yr of operation
	☐ Emergency Standby - limited to less than 200 hrs/yr of operation
	☒ Full Time - must have either a Continuous Emission Monitoring System (CEMS) or an alternate emissions monitoring plan (must be approved by the APCO)
	☒ CEMS, please specify all pollutants monitored: ☒ NO_x ☒ CO ☒ O_2 ☐ Other: ________
	☐ Alternate Emissions Monitoring Plan (please provide details in additional documentation)
Fuel Use Meter	☒ Gaseous Fuel Meter ☐ Liquid Fuel Meter ☐ None
Process Data	Will this unit be used in an electric utility rate reduction program? ☐ Yes ☒ No
Combustor(s)	Manufacturer: GE — Model: DLN 2.6+ — Number of Combustors: 12
	Maximum Heat Input Rating (for all combustors @ ISO standard conditions): 2568 MM Btu/hr
	Water Injection: ☐ Yes ☒ No — Dry Low NO_x Technology: ☒ Yes ☐ No
	Steam Injection: ☐ Yes ☒ No — Other NO_x Control Technology: SCR

EMISSIONS DATA

Note: See District BACT and District Rule 4703 requirements for applicability to proposed unit at http://www.valleyair.org/busind/pto/bact/chapter3.pdf and http://www.valleyair.org/rules/currntrules/r4703.pdf

Primary Fuel	Fuel Type: ☒ Natural Gas ☐ LPG/Propane ☐ Diesel ☐ Other: ________
	Higher Heating Value: ____ Btu/gal or 1018 Btu/scf — Sulfur Content: ____ % by weight or 0.75 gr/scf
	Maximum Fuel Use @ HHV: 2.5 MM scf/hr or ____ gal/hr — Rated Efficiency (EFF_{Mfg}): tbd %

Primary Fuel Emissions Data

Operational Mode	Steady State (ppmv)	Steady State (lb/MMBtu)	Start-up (ppmv)	Start-up (lb/hr)	Shutdown (ppmv)	Shutdown (lb/hr)
Nitrogen Oxides	2.5			98.7		22.6
Carbon Monoxide	4.0			178.2		163.2
Volatile Organic Compounds	2.0			20.3		30.2
Duration			4 hr/day	200 hr/yr	4 hr/day	200 hr/yr

% O_2, dry basis, if corrected to other than 15%: ____ %

EMISSIONS DATA (continued)

Secondary Fuel	When will the secondary fuel be used? ☐ Primary fuel curtailment ☐ Simultaneously with primary fuel ☐ Other: ________
	Fuel Type: ☐ Natural Gas ☐ LPG/Propane ☐ Diesel ☐ Other: ________
	Higher Heating Value: _______ Btu/gal or _______ Btu/scf — Sulfur Content: _______ % by weight or ______ gr/scf
	Maximum Fuel Use @ HHV: ______ scf/hr or _______gal/hr — Rated Efficiency (EFF_{Mfg}): _______ %

Secondary Fuel Emissions Data	Operational Mode	Steady State (ppmv)	Steady State (lb/MMBtu)	Start-up (ppmv)	Start-up (lb/hr)	Shutdown (ppmv)	Shutdown (lb/hr)
	Nitrogen Oxides						
	Carbon Monoxide						
	Volatile Organic Compounds						
	Duration (please provide justification)			______ hr/day	______ hr/yr	______ hr/day	______ hr/yr
	% O_2, dry basis, if corrected to other than 15%: _______ %						

Source of Data	■ Manufacturer's Specifications ☐ Emission Source Test ☐ Other ____________ (please provide copies)

EMISSIONS CONTROL

Emissions Control Equipment (Check all that apply)	■ Inlet Air Filter/Cooler ■ Lube Oil Vent Coalescer
	■ Selective Catalytic Reduction - Manufacturer: Cormetech Model: CH21HT ■ Ammonia (NH_3) ☐ Urea ☐ Other: ________
	■ Oxidation Catalyst - Manufacturer: BASF Model: Camet Control Efficiencies: NO_x 90 %, SO_x _______ %, PM_{10} _______ %, CO 90 %, VOC 50 %
	☐ Other (please specify):
	For units equipped with exhaust gas NO_x control equipment and rated < 10 MW, or rated ≥ 10 MW but operated < 4,000 hr/yr, one may choose at least one of the following alternate emission monitoring schemes in lieu of a CEMS (each option below must be approved by APCO on a case-by-case basis. Please include a detailed proposal for each option chosen): ☐ Periodic NO_x emission concentration ☐ Turbine exhaust O_2 concentration ☐ Air-to-Fuel ratio ☐ Flow rate of reducing agents added to turbine exhaust ☐ Catalyst inlet and outlet temperature ☐ Catalyst inlet and exhaust O_2 conc. ☐ Other operational characteristics as approved by the APCO (specify on attached sheet)

HEALTH RISK ASSESSMENT DATA

Operating Hours	Maximum Operating Schedule: 24 hours per day, and 2453 hours per year		
Receptor Data	Distance to nearest Residence	3,900 feet	Distance is measured from the proposed stack location to the nearest boundary of the nearest apartment, house, dormitory, etc.
	Direction to nearest Residence	South	Direction from the stack to the receptor, i.e. Northeast or South.
	Distance to nearest Business	1,050 feet	Distance is measured from the proposed stack location to the nearest boundary of the nearest office building, factory, store, etc.
	Direction to nearest Business	South	Direction from the stack to the receptor, i.e. North or Southwest.
Stack Parameters	Release Height	188 feet above grade	
	Stack Diameter	264 inches at point of release	
	Rain Cap	☐ Flapper-type ☐ Fixed-type ■ None ☐ Other: ________	
	Direction of Flow	■ Vertically Upward ☐ Horizontal ☐ Other: _____° from vert. or _____° from horiz.	
Exhaust Data	Flowrate: 3,551,200 acfm	Temperature: 900 °F	
Facility Location	☐ Urban (area of dense population) ■ Rural (area of sparse population)		

FOR DISTRICT USE ONLY

Date:	**FID:**	**Project:**	**Public Notice: [ ] Yes [ ] No**
Comments:			

VENTURA COUNTY AIR POLLUTION CONTROL DISTRICT

669 County Square Drive, Ventura CA 93003 805/ 645-1401 FAX 805/ 645-1444 www.vcapcd.org

DIESEL-FIRED EMERGENCY STANDBY ENGINES

Complete a separate form for each engine. Attach manufacturer's literature, if available, to this form.

Information on Engine

Reason for Submitting this Form (Check One)	❑ Existing Unit Date of Installation ________ ☒ Replacement of Existing Unit Specify replace existing gen. ❑ New or Additional Unit Specify________
Manufacturer	Caterpillar
Year of Manufacture	2015 or newer
Model	C15ATAAC
Serial Number	TBD
EPA/ARB 12-character Engine Family Name	ECPXL15.2HZA
Maximum Rated Brake Horsepower	779 BHP
Your I.D. For Engine (if any)	n/a
Equipped with a non-resettable hour meter? Note: Non-resettable hour meters are required for all Emergency Standby Engines.	☒ Yes ❑ No
Current Hour Meter Reading	n/a hrs Date ________
Describe Emergency Use of Engine	☒ Electrical Power ❑ Runway Lights ❑ Mechanical Work ❑ Pumping Water or Sewage ❑ Fire Suppression ❑ Other________

Fuel and Emissions

Diesel Fuel Type	❑ Rule 64 Compliant (0.5% Sulfur) ❑ Other ☒ CARB Diesel (15ppm Sulfur) (specify)________
Emission Controls (Check All that Apply)	❑ Diesel Particulate Filter ❑ Injection Timing Retard ☒ Turbocharger ❑ Selective Catalytic Reduction ☒ Aftercooler ❑ Other (specify)________
Guaranteed Emission Rates or Certification Levels (If Any) Documentation must be attached.	Non-methane Organics ______ ppm or 0.14 g/BHP-hr Nitrogen Oxides ______ ppm or 0.50 g/BHP-hr Particulate Matter ______ ppm or 0.02 g/BHP-hr Carbon Monoxide ______ ppm or 2.61 g/BHP-hr (ppm at 15% oxygen)

Maintenance Operation

Hours of Operation for Maintenance and Testing (does not include hours used for emission testing to show ATCM compliance)	*Corresponding ATCM Particulate Matter Limits:*	Existing	New
	❑ ≤20 hours per year	none	0.15 g/bhp-hr
	❑ 21-30 hours per year	0.40 g/bhp-hr	0.15 g/bhp-hr
	☒ 31-50 hours per year	0.15 g/bhp-hr	0.15 g/bhp-hr
	❑ 51-100 hours per year	0.01 g/bhp-hr	0.01 g/bhp-hr
Is the engine located within 500 feet of a school? (K-12)	❑ Yes	☒ No	

VENTURA COUNTY AIR POLLUTION CONTROL DISTRICT

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DIESEL ENGINE SUPPLEMENTAL QUESTIONNAIRE

Complete a separate form for each engine.

Information on Engine

Manufacturer	Caterpillar
Model	C15ATAAC
Serial Number	TBD
Maximum Rated Brake Horsepower	779
Your I.D. For Engine (if any)	2015 or newer
Is the engine stationary or portable for purposes of compliance with the applicable state Air Toxic Control Measure (ATCM)? *A stationary compression ignition (CI) engine is a CI engine designed to stay in one location, or that remains in one location.* *A portable CI engine is a CI engine designed and capable of being carried or moved from one location to another. Indicators of portability include, but are not limited to, wheels, skids, carrying handles, dolly, trailer, or platform. An engine with indicators of portability that remains at the same location for more than 12 consecutive rolling months or 365 rolling days, whichever occurs first, not including time spent in a storage facility, shall be deemed a stationary engine.* Note that for ATCM compliance purposes, an engine that is not eligible for registration under the state Portable Equipment Registration Program (PERP) may be considered portable. This includes engines subject to federal MACT, NESHAP, or NSPS; equipment operated in the OCS; and equipment that qualifies as part of a stationary source.	☒ Stationary ☐ Portable Describe how you determined whether the engine is stationary or portable. The engine will stay in one location

Complete for stationary engines only

Exhaust stack height from ground	70 feet
Diameter of stack outlet	6 inches
Direction of stack outlet	☐ Horizontal ☒ Vertical ☐ Other_____________
End of stack	☐ Open ☐ Capped ☒ Flapper-type cap
Typical load (percent of maximum bhp rating)	50 percent
Typical annual hours of operation	200 hours
If seasonal, months of year operated and typical hours per month operated	Months operated _____________through _______________ ___________ typical hours per month
Fuel usage rate (if available)	35.9 gallons per hour
Nearest receptor description (type)	offsite worker
Distance to nearest offsite receptor	1,060 feet
Distance to nearest school grounds	11,000 feet
Is the engine included in an existing AB2588 emission inventory?	☐ Yes ☒ No

Application to the Ventura County APCD for an Authority to Construct and Determination of Compliance for the Puente Power Project

prepared for:

NRG Energy Center Oxnard LLC

March 2015

prepared by:

sierra research

Sierra Research, Inc.
1801 J Street
Sacramento, California 95811
(916) 444-6666

APPLICATION TO THE
VENTURA COUNTY APCD

for an

AUTHORITY TO CONSTRUCT
and
DETERMINATION OF COMPLIANCE

for

PUENTE POWER PROJECT

Submitted by:

NRG Energy Center Oxnard LLC

March 2015

Prepared by:

Sierra Research, Inc.
1801 J Street
Sacramento, CA 95811
(916) 444-6666

SUMMARY

NRG Energy Center Oxnard LLC (Applicant) requests an Authority to Construct (ATC) and Determination of Compliance (DOC) from the Ventura County Air Pollution Control District (VCAPCD or District) for the installation of a new H-Class simple-cycle natural gas fired combustion turbine generator (CTG) and a new emergency Diesel generator engine. The Puente Power Project ("P3" or project) will consist of replacing the existing Mandalay Generating Station (MGS) Units 1 and 2 (1,990 MMBtu/hr each, 215 MW net each, natural gas fired boilers) with a new natural gas fired H-Class simple-cycle CTG (approximately 2,500 MMBtu/hr, 262 MW net nominal), replacing the existing Diesel emergency generator engine with a new unit, and shutting down the existing Diesel emergency fire pump engine. The remainder of the facility will remain unchanged: one natural gas fired peaker combustion turbine (Unit 3), and ancillary facilities. The P3 is located in the City of Oxnard, within Ventura County.

The new CTG will incorporate best available control technology (BACT) to reduce emissions of carbon monoxide (CO), nitrogen oxides (NOx), reactive organic compounds (ROC), and fine particulate matter (less than 10 microns in diameter, or PM_{10}), including dry low-NOx combustion, selective catalytic reduction (SCR), and an oxidation catalyst. The project will trigger emission offset requirements for NOx emissions. The proposed project is not subject to Prevention of Significant Deterioration (PSD) requirements. The results of the criteria pollutant air quality modeling analysis indicate that the P3 will not cause or contribute to violations of state or federal air quality standards, with the exception of the 24-hr and annual state PM_{10} standards. For this pollutant and these averaging periods, existing background concentrations already exceed state standards. In addition, the health risks associated with toxic air contaminant emissions for the proposed new equipment will not exceed established significance thresholds.

APPLICATION TO THE
VENTURA COUNTY APCD
for an
AUTHORITY TO CONSTRUCT
and
DETERMINATION OF COMPLIANCE
for
PUENTE POWER PROJECT

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I. PROJECT DESCRIPTION

A. Applicant's Name and Business Description

Name of Applicant:	NRG Energy Center Oxnard LLC
Mailing Address:	5790 Fleet Street, Suite 200 Carlsbad, CA 92008
Facility Location:	393 North Harbor Blvd Oxnard, CA 93035
General Business:	Power Plant
Submitting Official:	George L. Piantka, PE NRG Energy 5790 Fleet Street, Suite 200 Carlsbad, CA 92008 760-710-2156 (o) 760-707-6833 (c) george.piantka@nrg.com
Consultant:	Sierra Research, Inc. 1801 J Street Sacramento, California 95811 Contact: Tom Andrews (916) 444-6666 tandrews@sierraresearch.com
Estimated Construction Date:	Installation of the new equipment is anticipated to begin in the 1st quarter in 2019

B. Type of Application

This is an application for an Authority to Construct (ATC) and Determination of Compliance (DOC) for new sources at an existing facility.

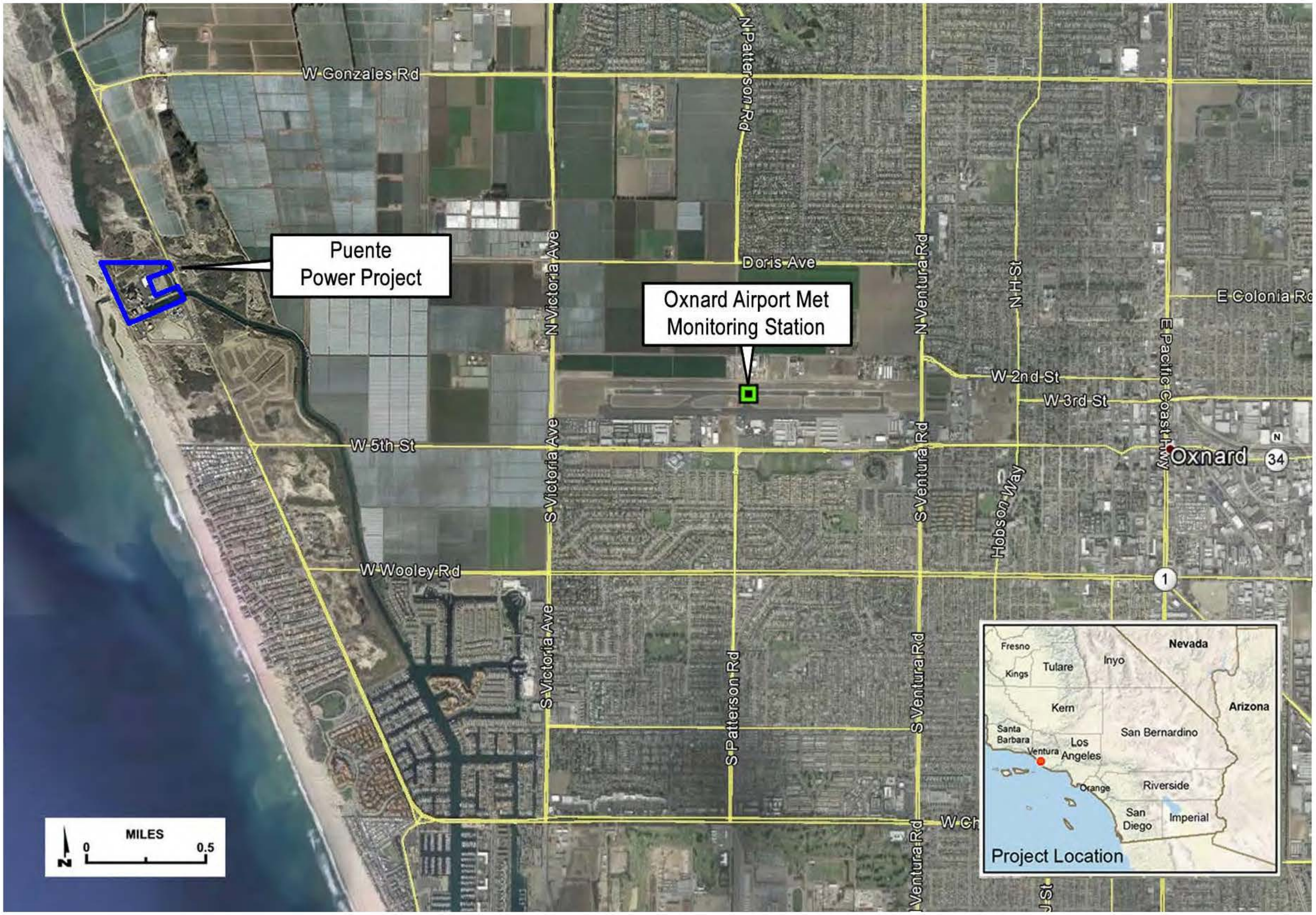
C. General Purpose

The purpose of the project is to install a new H-Class natural gas fired simple-cycle CTG and a new emergency Diesel generator engine.

D. Background

The Puente Power Project ("P3" or project) will consist of replacing the existing Mandalay Generating Station (MGS) Units 1 and 2 (1,990 MMBtu/hr each, 215 MW net each, natural gas fired boilers) with a new natural gas fired H-Class simple-cycle CTG (approximately 2,500 MMBtu/hr, 262 MW net nominal), replacing the existing Diesel emergency generator engine with a new emergency engine, and shutting down the existing Diesel emergency fire pump engine. The remainder of the facility will remain unchanged: one natural gas fired peaker combustion turbine (Unit 3), and ancillary facilities. The P3 is located in the City of Oxnard, within Ventura County. The location of the MGS facility, within which the P3 will be located, is shown in Figure 1.

Figure 1
Location of the Proposed Project



E. Equipment

The MGS consists of the following existing permitted equipment:

- Units 1 and 2 – 1990 MMBtu/hr each, 215 MW net each, natural gas fired boilers.
- Unit 3 – 2,510 MMBtu/hr, 130 MW net, natural gas fired peaker gas turbine.
- 201 bhp Diesel emergency generator engine.
- 154 bhp Diesel emergency fire pump engine.

The Applicant proposes to replace existing Units 1 and 2 with a new natural gas fired H-Class simple-cycle CTG, replace the existing emergency Diesel generator engine with a new emergency engine, and shutdown the existing Diesel emergency fire pump engine. The remainder of the facility will remain unchanged: Unit 3 and ancillary facilities.

The new CTG will be fueled with pipeline quality natural gas and will be equipped with dry low-NOx combustion, selective catalytic reduction (SCR), and an oxidation catalyst. The operating schedule for the new unit will vary and may range from no operation during the winter months to potentially 24 hours of operation per day during the summer months. For the worst case operating day, the unit may undergo four startup/shutdown events with operation the remainder of the day at full load. The maximum annual operation for the unit assumes a total of 200 startups, 200 shutdowns, and 2,053 hours of full load operation. The new Diesel emergency generator engine will be certified to meet non-road Diesel engine EPA Tier 4 (final) standards. Other than emergency operation, the new emergency Diesel engine will only be operated for testing purposes (up to 50 hours per year testing, up to 200 hours per year all types of operation). Appendix A contains a site plan for the project showing the locations of the new unit.

The proposed new emergency generator set will be fueled with CARB Diesel, which has a sulfur content not exceeding 15 parts per million (0.015 %) by weight. A 779 bhp combustion engine will drive a 500 kW generator in a Caterpillar engine generator set. Equipment specifications for the emergency generator set are summarized in Table 2.

Engineering specifications for the new CTG and the emergency Diesel generator engine are contained in Appendix B.

Table 1
New Simple-Cycle CTG Design Specifications

Manufacturer	GE
Model	7HA.01
Fuel	Natural gas
Design Ambient Temperature [a]	38.9 °F
Maximum Gas Turbine Heat Input Rate[a]	2,579 MMBtu/hr @ HHV
Stack Exhaust Temperature [a]	900 °F
Exhaust Flow Rate [a]	3,551,200 acfm
Exhaust O_2 Concentration, dry volume [a]	14.0 %
Exhaust CO_2 Concentration, dry volume [a]	3.2 %
Exhaust Moisture Content, wet volume [a]	6.4 %
Emission Controls	Dry low-NOx combustion, SCR, oxidation catalyst
Notes: a. This ambient temperature at 100% load results in maximum heat input/power output; exhaust characteristics shown reflect this ambient temperature and load.	

Table 2
Emergency Generator Design Specifications

Generator Set Manufacturer	Caterpillar
Engine Manufacturer	Caterpillar
Engine Model	C15 ATAAC
Fuel	Diesel
Generator Power Output (kW)	500
Engine Work Output (bhp)	779
Fuel Consumption Rate (gal/hr)	35.9
Heat Input Rate (MMBtu/hr @ HHV)	4.9
Exhaust Flow Rate (acfm)	3,185
Exhaust Temperature (ºF)	1263
Stack Diameter (inch)	6
EPA Nonroad Engine Certification	Tier 4 (final)
Notes: Engine specifications data reflect engine at full load.	

II. EMISSION ASSESSMENT

A. Criteria Pollutant Emissions:

The new CTG and emergency engine emission rates have been calculated from vendor data, project design criteria, and established emission calculation procedures. The emission rates for the CTG and emergency engine are shown in the tables provided and discussed below; the detailed emission calculations are shown in Appendix B.

1. Gas Turbine Emissions during Commissioning.

The commissioning period begins when the CTG is prepared for first fire and ends upon successful completion of performance/compliance testing. The commissioning process entails several relatively short periods of operation prior to and following installation of the emission control systems. During these periods, NOx emissions will be higher than normal operating levels because the NOx emission control system would not be fully operational and because the CTG would not be tuned for optimum performance. CO emissions would also be higher than normal because turbine performance would not be optimized and the CO emissions control system would not be fully operational.

CTG commissioning activities can be broken down into several separate test phases, as shown on the commissioning summary table included in Appendix B. The emission estimates shown in the detailed commissioning summary table in Appendix B are based on vendor-supplied emission rates. At the conclusion of the commissioning period, emissions rates will be at the normal operating levels discussed in the following paragraphs. While the required continuous emissions monitoring system (CEMS) for NOx and CO will be calibrated and operating during the commissioning test phases, the CEMS will not be certified until the end of the commissioning period.

The commissioning of the new CTG is expected to occur over approximately a six-week period. During this commissioning period, it will be necessary to continue to operate the existing MGS Units 1-2 as well as operate Unit 3. Consequently, the commissioning air quality modeling analysis performed for the proposed project includes the simultaneous operation of the new CTG (commissioning tests) and the existing MGS Units 1-3. Once the commissioning and performance tests are complete MGS Units 1 and 2 would be retired; Unit 3 will remain in operation.

2. CTG Emissions during Normal Operations.

Emissions of NOx, CO, and ROC were calculated from the proposed emission limits (in ppmv @ 15% O_2) and the exhaust flow rates. The NOx emission limit reflects the application of dry low-NOx combustion and SCR. The ROC and CO emission limits reflect the use of good combustion practices and, for CO, an oxidation catalyst. SOx, PM_{10}, and $PM_{2.5}$ emission rates are based on the use of natural gas as the fuel and good combustion practices.

SOx emissions were calculated from the heat input (in MMBtu) and a SOx emission factor (in lb/MMBtu). The short-term SOx emission factor of 0.0021 lb/MMBtu was derived from the maximum allowable (i.e., tariff limit) fuel sulfur content of 0.75 grains per 100 standard cubic feet (gr/100 scf). The annual average SOx emissions were based on the expected annual average sulfur grain loading of 0.25 gr/100 scf.

Maximum hourly PM_{10} emissions are based on vendor-supplied emission levels. $PM_{2.5}$ emissions were determined based on the assumption that all CTG exhaust particulate is less than 2.5 microns in diameter.

Emission rates for the CTG are summarized in Table 3. The BACT analysis upon which the emission factors are based is presented in Appendix C.

Table 3
Maximum Hourly Emission Rates: CTG

Pollutant	ppmvd @ 15% O_2	lb/MMBtu	lb/hr
NOx	2.5	9.1×10^{-3}	23.4
SOx (short term)	n/a	2.1×10^{-3}	5.4
SOx (long term)	n/a	7.0×10^{-4}	1.8
CO	4.0	8.8×10^{-3}	22.8
ROC	2.0	2.5×10^{-3}	6.5
PM_{10}/$PM_{2.5}$[b]	n/a	8.9×10^{-3}	10.6

Notes:
a. Emission rates shown reflect the highest value at any operating load during normal operation (excluding startups/shutdowns).
b. 100% of PM_{10} emissions assumed to be emitted as $PM_{2.5}$.

3. <u>CTG Emissions During Startup and Shutdown.</u>

Maximum emission rates expected to occur during a CTG startup or shutdown are shown in Table 4. PM and SO_2 emissions are not included in this table because emissions of these pollutants will not be higher during startup and shutdown than during normal CTG operation. During a CTG startup, there are approximately 30 minutes with elevated emissions (emissions higher than during normal operation). Consequently, the hourly emission rates during CTG startups are based on 30 minutes of elevated emissions followed by 30 minutes of normal operating emission levels. During a CTG shutdown, there are approximately 12 minutes with elevated emissions (emissions higher than during normal operation). Consequently, the hourly emission rates during CTG shutdowns are based on 48 minutes of normal operating emission levels followed by 12 minutes of elevated emission levels.

Table 4
CTG Startup and Shutdown Emission Rates

	NOx	CO	ROC
CTG Startup, lbs/hr	98.7	178.4	20.3
CTG Shutdown, lbs/hr	22.7	163.2	30.2
CTG Startup/Shutdown/Restart, lbs/hr	143.2	412.2	52.2
Note: Startup and shutdown emission rates reflect the maximum hourly emissions during an hour in which a startup, shutdown, or both occur.			

It is also anticipated that periodically there could be an hour when a startup, shutdown, and restart occur. For this hour, there would be 30 minutes of elevated emissions due to the startup, 12 minutes of elevated emissions due to a shutdown, followed by 18 minutes of elevated emissions due to the restart. While this situation is expected to occur very infrequently, from an hourly emission standpoint this would represent worst-case hourly emissions, and as such it is included in the ambient air impact analysis for the P3. The detailed CTG startup hourly emission calculations are shown in the startup/shutdown summary tables in Appendix B.

4. Criteria Pollutant Emissions Summary

The calculation of maximum proposed project emissions shown in Table 5 is based on the CTG emission rates shown in the above tables and the assumptions outlined below.

- Worst-case hour: CTG will undergo a startup/shutdown/restart sequence in one hour. The new emergency generator engine will not be operated during this hour.

- Worst-case day: CTG will undergo 4 startup hours (hours including a startup), 4 shutdown hours (hours including a shutdown), and 16 hours of normal operation. The new emergency generator engine will be operated for 1 hour for testing/maintenance purposes.

- Worst-case year: CTG will undergo 200 startups, 200 shutdowns, with a total of 2,453 hours of operation per year (including startup/shutdown periods). The new emergency generator engine will be operated a total of 200 hours (including 50 hours for testing/maintenance operation).

- The assumptions used in calculating maximum hourly, daily, and annual emissions from the new facility are shown in Appendix B.

Cooling for the project will be through the use of an external dry cooling fan module; therefore, there will be no emissions associated with this equipment. The only other source of criteria pollutant emissions for project operations will be fugitive leaks from the new compressor used to increase the natural gas pressure to levels required by the CTG. These leaks will result in a small amount of ROC emissions to the atmosphere. The gas compressor fugitive emission calculations are included in Appendix B.

- The maximum hourly, daily, and annual emissions in Table 5 are used in the air dispersion modeling to calculate the maximum potential ground-level concentrations contributed by the proposed project to the ambient air.

Table 5
Maximum Emissions From New Equipment

Emissions/Equipment	**Pollutant**				
	NOx	**CO**	**ROC**	**$PM_{10}/PM_{2.5}$**	**SOx**
Maximum Hourly Emissions[a]					
CTG[a]	143.2	412.2	52.2	10.6	5.4
Diesel Emergency Engine[b]	N/A	N/A	N/A	N/A	N/A
Gas Compressor	-	-	0.0	-	-
Total, pounds per hour =	143.2	412.2	52.2	10.6	5.4
Maximum Daily Emissions[a]					
CTG	859.2	1730.5	306.1	245.5	130.6
Diesel Emergency Engine	0.9	4.5	0.2	0.0	0.0
Gas Compressor	0.0	0.0	0.3	0.0	0.0
Total, pounds per day =	860.1	1735.0	306.6	245.6	130.6
Maximum Annual Emissions[a]					
CTG	36.0	57.4	11.7	12.8	2.2
Diesel Emergency Engine	0.1	0.4	0.0	0.0	0.0
Gas Compressor	-	-	0.0	-	-
Total, tons per year =	36.1	57.9	11.8	12.8	2.2

Notes:
a. Maximum hourly, daily and annual CTG emission rates include emissions during startups/shutdowns.
b. The Diesel emergency generator engine will not be operated during a CTG startup and/or shutdown. Consequently, n/a is shown for all pollutants.

B. Emissions for Existing Units at the Mandalay Generating Station

The MGS consists of two conventional steam boiler units (Units 1 and 2) with a combined generating capacity of 430 MW net, and one gas combustion turbine unit (Unit 3), rated at 130 MW net. If P3 is approved and developed, MGS Units 1 and 2 would retire after commissioning and performance testing of the GE Frame 7HA.01. Unit 3 will remain in operation.

To determine the historical actual emissions associated with the operation of the existing MGS units, it is necessary to determine the baseline period. The three regulatory programs that discuss baseline periods for air quality purposes are the California Environmental Quality Act (CEQA), the VCAPCD New Source Review (NSR) regulations, and the federal Prevention of Signification Deterioration (PSD) regulations. These three baseline periods are summarized below.

- CEQA – Under the CEQA regulations, the CEQA baseline period needs to reflect the actual conditions that exist at the start of the environmental review process for a project.

- VCAPCD NSR – Under VCAPCD NSR rules (Rule 26.6.C), the baseline period to establish the actual emissions for existing units is the two-year period immediately preceding the submittal of a permit application, or a more representative consecutive two-year (determined by the District) period during the five years preceding the submittal of a permit application.

- Federal PSD – Under the federal PSD regulations (40 CFR 52.21.b.48.1), the baseline period to establish the actual emissions for existing units is any consecutive 24-month period within the five-year period preceding when actual construction of a new project begins. The EPA does allow the use of a different lookback period (up to ten years prior to construction of a new project) to calculate actual emissions if it is more representative of normal operation.

For CEQA purposes, this analysis examines actual historical emissions for the existing MGS units averaged over the past five years. For both NSR and PSD purposes, the baseline emissions for the existing MGS Units 1 and 2 and the associated emissions reductions from the shutdown of these units are based on actual emissions during the most representative consecutive two-year period during the five years preceding the filing of the VCAPCD permit application for the proposed project (2010 to 2014). The baseline emissions for the existing units are shown in Table 6 and are based on the two-year average of actual emissions during 2012 and 2013. This two-year period was determined to be the most representative period because it best reflects the current market conditions of the electricity system in the project area. The detailed calculation of the historical baseline emissions for the existing units at the MGS is included in Appendix B.

C. Net Changes in Criteria Pollutant Emissions for the Proposed Project

Net emissions changes as a result of the proposed project are calculated on an annual basis for federal PSD and CEQA purposes. These net emission changes are shown in Table 7 below with the emission reductions for Units 1 and 2 based on the representative two-year average over the past five years.

Table 6
Emissions for Existing Units 1 and 2 (Representative 2-Year Average for Period From 1/1/10 To 12/31/14)

Emissions/Equipment	Pollutant (tons/year)				
	NOx	CO	ROC	$PM_{10}/PM_{2.5}$	SOx
Unit 1	1.9	22.0	0.8	1.4	0.3
Unit 2	3.0	25.9	0.9	1.6	0.4
Total	4.9	47.9	1.7	3.0	0.7

Table 7
Net Emissions Change for Proposed Project (PSD and CEQA)

	Pollutant (tons/year)				
Emissions/Equipment	NOx	CO	ROC	$PM_{10}/PM_{2.5}$	SOx
Potential to Emit for New Equipment	36.1	57.9	11.8	12.8	2.2
Reductions from Shutdown of Existing Units 1 and 2	4.9	47.9	1.7	3.0	0.7
Net Emission Change	31.2	10.0	10.1	9.8	1.5

For VCAPCD NSR purposes, the net emission changes for the proposed project are based on the emission calculation approach allowed for replacement emissions units. Under VCAPCD Rule 26.1, Number 29, "Replacement Emissions Unit" is defined as "An emissions unit which supplants another emissions unit where the replacement emissions unit serves the identical function as the emission unit being replaced." Since the function of both existing Units 1 and 2 and the proposed new CTG is to supply electrical power to the grid on an as-needed basis to support the load pocket in this project area, both the existing and new units serve an identical function. The identical function of the new CTG and the existing Units 1 and 2 is supported by the similar number of annual startups for the new and existing units. As discussed above, the new CTG is expected to undergo approximately 200 startups per year. Over the past five years, Units 1 and 2 have undergone a combined average of approximately 175 startups per year.

The replacement emissions unit net emission change calculation approach is also being used for the replacement of the existing emergency Diesel generator engine with a new emergency engine. The net emission changes are shown in Table 8 below and the detailed calculations are included in Appendix B.

Table 8
Net Emissions Change for Proposed Project (VCAPCD NSR)

Emissions/Equipment	Pollutant (tons/year)				
	NOx	**CO**	**ROC**	**$PM_{10}/PM_{2.5}$**	**SOx**
Potential to Emit for New CTG	36.0	57.4	11.7	12.8	2.2
Reductions from Shutdown of Existing Units 1 and 2	4.9	644.4	23.2	41.5	10.0
Net Emission Change	31.1	-587.0	-11.5	-28.7	-7.7
Potential to Emit for New Emergency Generator Engine	0.1	0.4	0.0	0.0	0.0
Reductions from Shutdown of Existing Emergency Generator Engine	0.0	0.1	0.0	0.0	0.0
Net Emission Change	0.1	0.3	0.0	0.0	0.0
Facility-Wide Net Emission Change	31.2	-586.7	-11.5	-28.7	-7.7

D. Non-Criteria Pollutant Emissions

Non-criteria pollutant emissions were estimated for the proposed new CTG and emergency generator engine. These emissions are summarized in Table 9; the detailed non-criteria pollutant emissions calculations are included in Appendix D.

Table 10 summarizes the maximum potential to emit for non-criteria pollutants for the existing units at the facility. This information is provided for regulatory applicability purposes.

1. Greenhouse Gas Emissions

Potential maximum annual GHG emissions for the operation of the P3 were calculated using the calculation methods and emission factors from the EPA GHG Reporting Regulation.[1] Table 11 presents the estimated GHG emissions due to project operations in carbon dioxide equivalent [CO2e] emission rates. Emissions of methane, nitrous oxide, and sulfur hexafluoride have been converted to carbon dioxide equivalents using greenhouse gas (GHG) warming potentials of 25, 298, and 22,800, respectively. The estimated emissions include the combustion emissions for the CTG and the new emergency generator engine. They also include sulfur hexafluoride leakage emissions from two new circuit breakers associated with the proposed project. The detailed GHG emission calculations are included in Appendix B.

[1] 40 CFR 98 (as revised on 11/29/13).

Table 9
Non-Criteria Pollutant Emissions for New Equipment

Compound	Emissions (tons/yr)
CTG	
Ammonia (not a HAP)	21.06
Propylene (not a HAP)	2.56
Acetaldehyde	0.14
Acrolein	0.02
Benzene	0.04
1,3-Butadiene	0.00
Ethylbenzene	0.11
Formaldehyde	3.05
Hexane	0.86
Naphthalene	0.00
PAHs (other)	0.00
Propylene Oxide	0.10
Toluene	0.44
Xylene	0.22
Subtotal HAPs	4.98
Subtotal All	28.61
Emergency Engine	
Diesel PM (not a HAP)	0.00
Acrolein	0.00
Subtotal HAPs	0.00
Subtotal All	0.00
Total HAPs (Proposed Project)	4.98
Total All Proposed Project)	28.61

Table 10
Non-Criteria Pollutant Emissions for Existing Units 1, 2, and 3
(Maximum Potential to Emit)

Compound	Emissions (tons/yr)
Ammonia (not a HAP)	78.05
Benzene	0.03
Formaldehyde	0.15
Hexane	0.05
Naphthalene	0.01
Dichlorobenzene	0.00
Toluene	0.14
1,3-Butadiene	0.00
Acetaldehyde	0.02
Acrolein	0.01
Ethyl Benzene	0.04
PAHs (other)	0.00
Xylene	0.10
Total HAPs (Existing Facility) =	0.54
Total All (Existing Facility) =	78.93

Table 11
Project Greenhouse Gas Emissions For New Equipment

Unit	CO_2, metric tons/year	CH_4, metric tons/year	N_2O, metric tons/year	SF_6, metric tons/year	CO_2eq, metric tons/yr[a]	CO_2, metric tons/MWh
CTG	335,685	6	1	n/a	-	-
Emergency Engine	72	0	0	n/a	-	-
Existing Unit 3 Gas Turbine	4,799	0	0	n/a	-	-
Circuit Breakers	n/a	n/a	n/a	4.20×10^{-4}	-	-
Total =	340,557	6	1	0	340,918	0.49

Notes:
a. Includes CH_4, N_2O, and SF_6.

III. COMPLIANCE WITH APPLICABLE RULES AND REGULATIONS

A. Federal Requirements

The VCAPCD authority to implement and enforce most federal requirements that may be applicable to the proposed project, including new source performance standards and new source review for nonattainment pollutants. The proposed project will also be required to comply with the Federal Acid Rain requirements (Title IV). Because the VCAPCD is the delegated authority to implement Title IV through its Title V permit program, the modified Title V Federal Operating Permit that will be issued as a result of the proposed project will include the necessary requirements for compliance with the Title IV Acid Rain provisions. In addition, the VCAPCD is in the processing of obtaining delegation from the EPA to implement the PSD program. Until that delegation is in place, EPA Region 9 is the PSD permitting authority. As discussed below, the project does not trigger PSD review.

1. PSD Program

EPA has promulgated PSD regulations for areas that are designated attainment or unclassified for national ambient air quality standards (40 CFR 52.21). The PSD program allows new sources of air pollution to be constructed, or existing sources to be modified, while preserving the existing ambient air quality levels, protecting public health and welfare, and protecting Class I areas (e.g., specific national parks and wilderness areas). There are five principal areas of the PSD program: (1) Applicability; (2) Best Available Control Technology; (3) Pre-Construction Monitoring; (4) Increments Analysis; and (5) Air Quality Impact Analysis. Although issuance of a PSD permit would be the responsibility of either the VCAPCD or EPA Region 9 (depending on the timing for PSD delegation to the VCAPCD), the protection of Class I areas is still the responsibility of the Federal Land Managers (FLMs).

The federal 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 stationary source. (These terms are defined in federal regulations.) (40 CFR 52.21) Since the MGS is an existing major source, the determination of applicability is based on evaluating the emissions increases associated with the proposed project in addition to all other emissions increases and decreases at the facility over a five-year look-back period. In Table 12, the net emission changes at the MGS, based on the emissions from the new equipment and the shutdown of the existing Units 1 and 2, are compared to the regulatory significance thresholds. As shown in this table, the net emission changes associated with the proposed project are below these significance thresholds for all criteria pollutants. Therefore, the proposed project does not trigger PSD permitting.

Table 12
Net Emission Change and PSD Applicability

Pollutant	Facility Net Increase (tpy)	PSD Significance Levels (tpy)	Are Increases Significant?
NOx	31.2	40	No
SO_2	1.5	40	No
ROC	10.1	N/A[a]	N/A
CO	10.0	100	No
PM_{10}	9.8	15	No
$PM_{2.5}$	9.8	10	No

Notes:
a. Since the project area is classified as a federal nonattainment for ozone, this pollutant is not subject to PSD review.

2. Title V Operating Permits.

VCAPCD Rules 33.1 to 33.10 implement the Title V federal operating permit program. An application for a Title V permit modification for the new equipment will be submitted prior to the initial operation of the new equipment per Rule 33.5 (for significant Title V permit modifications).

3. 40 CFR Part 60, Subpart KKKK (Standards of Performance for Stationary Combustion Turbines).

This new source performance standard applies to gas turbines with heat inputs in excess of 1 MMBtu/hr that commence construction after February 18, 2005, and therefore is applicable to the P3 CTG. Subpart KKKK limits NOx and SO_2 emissions from a new gas turbine with a heat input greater than 850 MMBtu/hr to limits of 15 ppmv @ 15% O_2 (ppmc) for NOx and 0.90 lbs/MW-hr for SOx. As shown in Table 13, the proposed CTG at the P3 will comply with these limits.

Table 13
Compliance with 40 CFR 60 Subpart KKKK

Pollutant	Project Emission Levels			Subpart KKKK Limits
	Ppmc	lb/hr	lb/MW-hr	
NOx	2.5	N/A	N/A	15 ppmc
SOx	N/A	5.4	0.02	0.90 lb/MW-hr

Compliance with the NSPS limits must be demonstrated through an initial performance test. Because the P3 CTG will be equipped with a NOx continuous emissions monitoring system (CEMS) that will comply with NSPS requirements, the initial performance test will be met as part of the initial NOx CEMS certification testing process and ongoing annual performance testing will not be required under the NSPS.

On Sept. 20, 2013, the EPA issued a revised proposed NSPS to control GHG emissions from new power plants. The EPA proposed separate standards for natural gas-fired turbines and coal-fired units. The comment period for these revised standards ended on May 9, 2014, and the EPA expects to issue the final NSPS in the Summary of 2015. Based on the revised proposed draft regulations, the GHG emission limits (a revision to NSPS Subpart KKKK) for new natural gas-fired combustion turbines subject to the regulation are 1,000 lb $CO2$/MWh (new combustion turbines with a heat input rating greater than 850 MMBtu/hr) and 1,100 lb CO 2/MWh (new combustion turbines with a heat input rating equal to or less than 850 MMBtu/hr). New combustion turbines that supply less than one-third of their potential electric output (on a 3-year rolling average basis) to a utility distribution system are exempt from this regulation. Because the new gas turbine associated with the proposed project will supply less than one-third of their potential electric output to the local utility, the units will be exempt from this regulation. Consequently, there will be no further discussion of this GHG NSPS in this document.

4. <u>40 CFR Part 60, Subpart IIII (Standards of Performance for Stationary Compression Ignition Internal Combustion Engines).</u>

The new emergency Diesel generator engine will be subject to this NSPS. For engines in this size range, the NSPS requires manufacturers to provide engines that are certified to meet the NSPS emission standards (depending on the year an engine is manufactured). The P3 will comply with the emission limitations of the NSPS by purchasing an engine certified to EPA Tier 4 (final) standards for nonroad Diesel engines (standards for generator engines with ratings from 560 kw to 900 kw).

The NSPS also requires engines in this size range to use fuel with a sulfur content not to exceed 15 ppm. The new emergency engine will comply with this requirement by using only CARB Diesel fuel.

5. <u>National Emission Standards for Hazardous Air Pollutants (NESHAP).</u>

This program establishes national emission standards to limit emissions of hazardous air pollutants (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 major sources of HAPs in specific source categories. These standards are implemented at the local level with federal oversight. Only the NESHAPs for gas turbines, which limit formaldehyde emissions from a gas turbine, are potentially applicable to a new power plant project. However, as shown in Table 10, the gas turbine NESHAP is not expected to be applicable to the proposed project because the P3 would not be a major source of HAPs (i.e., 10 tpy of one HAP or 25 tpy of all HAPs). Thus, NESHAPs requirements will not be addressed further.

B. VCAPCD Requirements

The VCAPCD has responsibility for implementing local and most state and federal air quality regulations in Ventura County. The proposed project is subject to District regulations that apply to new stationary sources, to the prohibitory rules that specify emission standards for individual equipment categories, and to the requirements for evaluation of impacts from emissions of non-criteria pollutants. The facility's compliance with applicable District requirements is evaluated in the sections below.

1. New Source Review Requirements

Under the regulations that govern new sources of emissions (and, specifically, power plants subject to CEC jurisdiction), the proposed project is required to secure a preconstruction Determination of Compliance from the VCAPCD, as well as demonstrate continued compliance with regulatory limits when the new equipment becomes operational. The preconstruction review includes demonstrating that subject new equipment will use BACT, will provide any necessary emission offsets, and will perform an ambient air quality impact analysis. The requirements of each of these elements of the VCAPCD's New Source Review program are discussed below.

Best Available Control Technology

Under VCAPCD Rule 26.2.A, BACT must be applied to a new, replacement, modified, or relocated emissions unit that would have a potential to emit ROC, NOx, PM_{10}, or SOx. The new CTG and emergency generator engine emit these pollutants and will be subject to BACT for NOx, ROC, SOx, and PM_{10}.

BACT for the applicable pollutants was determined by reviewing a number of BACT guideline documents, including the South Coast Air Quality Management District BACT Guideline Manual and EPA's RACT/BACT/LAER Clearinghouse. The detailed BACT analysis is included in Appendix C. As discussed in this analysis, the P3 CTG will comply with BACT using the measures listed below.

- BACT for NOx emissions from the CTG will be the use of low-NOx emitting equipment and add-on controls. The CTG will use dry low-NOx combustion and SCR to reduce NOx emissions to 2.5 ppmvd NOx, corrected to 15 percent O_2 (ppmc).

- BACT for CO emissions will be achieved by using good combustion practices and an oxidation catalyst to achieve CO emissions of 4.0 ppmc.

- BACT for ROC emissions will be achieved by use of good combustion practices in the CTG to achieve ROC emissions of 2.0 ppmc.

- BACT for PM_{10} and SOx is best combustion practices and the use of natural gas. The proposed CTG will burn exclusively PUC-regulated natural gas with a maximum short-term sulfur content of 0.75 grains per 100 scf (gr/100 scf), and an annual average level of 0.25 gr/100 scf.

The new emergency generator engine will be certified to meet EPA Diesel non-road Tier 4 (final) requirements.

Emission Offsets

Under VCAPCD Rule 26.2.B.1, emission offsets are required on a pollutant-specific basis for any new, modified, relocated, or replacement emissions unit with an "emissions increase" of NOx, ROC, PM_{10}, or SOx that will be located at a stationary source with a potential to emit equal to or greater than 5.0 tons/yr for NOx and/or ROC, or 15.0 tons/yr for PM_{10} and/or SOx. While the facility-wide PTE of the MGS before the proposed installation of the new equipment is above these levels for all pollutants with the exception of SOx[2], the proposed project will result in a reduction in the facility-wide PTE to below 15 tons/yr for PM_{10}. As shown in Table 8 there is no emissions increase for ROC, with a negative value for this pollutant (there are negative values for PM_{10} and SOx as well). Therefore, the proposed new equipment triggers only emission offset requirements for NOx.

The detailed NOx emission offset calculations are included in Appendix B. As shown by these calculations, 40.4 tons/year of NOx emission offset credits must be provided for the proposed project. The Applicant currently controls the necessary amount of emission offsets (approximately 52.7 tons/year of NOx emission offsets credits). The appropriate amount of NOx emission offsets credits will be surrendered to the VCAPCD prior to the issuance of the final ATC.

Air Quality Impact Analysis

Under VCAPCD Rule 26.2.C, the District is required to confirm that a new, replacement, modified, or relocated emissions unit will not cause a violation of any ambient air quality standard. In order for the District to make this determination for the proposed project, the Applicant performed an ambient air quality impact analysis. The modeling analyses presented in Appendix E show that the proposed project will not interfere with the attainment or maintenance of the applicable air quality standards or cause additional violations of any standards.

Statewide Compliance

Under VCAPCD Rule 26.2.D, an Applicant is required to provide the District with a certification of statewide compliance for any new "Major Source" or "Major Modification." Under VCAPCD Rule 26.1, Number 19, "Major Modification" is defined as a physical change or change in method of operation of a Major Source that would result in a "contemporaneous net emissions increase" equal to or exceeding 25 tons/yr for NOx and/or ROC. As shown in Table 8, the "emissions increase" for the proposed project is above 25 tons/yr for NOx but is below that level for ROC. Therefore, the proposed project triggers the "Major Modification" threshold for NOx but does not trigger the threshold for ROC. As a major modification for NOx, a certification of statewide

[2] Per annual emission limits in current Title V permit.

compliance will be required for the proposed project. The Applicant will submit this certification to the VCAPCD in the near future.

Alternatives Analysis

According to VCAPCD Rule 26.2.E, an Applicant is required to perform an analysis of alternatives for any new "Major Source" or "Major Modification." As discussed above, the proposed project installation will be considered a "Major Modification" for NOx. Therefore, the Applicant will be required to perform an analysis of alternatives for the proposed project. This analysis will be included as part of the Application for Certification (AFC) prepared for the California Energy Commission (CEC). A copy of this analysis will be provided to the VCAPCD.

2. <u>VCAPCD Prohibitory Rules – General and Source Specific Regulations</u>

The general prohibitory rules of the VCAPCD applicable to the proposed project are summarized below.

Rule 50 – Visible Emissions.

Prohibits visible emissions as dark as, or darker than, Ringelmann No. 1 for periods greater than three minutes in any hour. With the use of natural gas fuel for the new CTG, and a Tier 4 engine for the new emergency generator, the P3 is expected to comply with this regulation.

Rule 51 – Nuisance.

Prohibits a facility from discharging air pollutants that cause injury, detriment, nuisance, or annoyance to the public, or that damage business or property. The P3 would not emit odorous pollutants, and the screening health risk assessment (see Appendix F) demonstrates that the potential health risks from the emissions are less than significant.

Rule 54 – Sulfur Compounds.

Prohibits sulfur emissions, calculated as SO_2, in excess of 300 parts per million by volume, ppmv @ 15% O_2 and prohibits offsite ambient SO_2 impacts above 0.25 ppmv (1-hour avg) and 0.04 ppmv (24-hour avg). SOx emissions from the proposed project will be below 0.5 ppmv, based on a maximum fuel sulfur content level of 0.75 gr/100 scf (short-term average). As shown in the ambient modeling analysis included in Appendix E, the SO_2 ambient impacts for the new equipment are well below these limits.

Rule 55 – Fugitive Dust Control.

This rule requires the control of dust emissions during construction activities and prohibits visible dust emissions beyond the property line; it also requires minimization of track-out onto public roadways, and includes other dust mitigation requirements. The proposed mitigation measures during construction of the P3 will be discussed in the AFC submitted to the CEC (a copy will be submitted to the VCAPCD). These mitigation measures will assure compliance with this regulation.

Rule 57.1 – Particulate Matter Emissions from Fuel Burning Equipment.

Prohibits particulate matter emissions above 0.12 lbs/MMBtu for fuel burning equipment. The PM_{10} emissions for the proposed project will be well below this limit, with maximum emissions of approximately 0.009 lbs/MMBtu.

Rule 64 – Sulfur Content of Fuels.

Prohibits the burning of gaseous fuel with a sulfur content of more than 50 gr/100 scf and liquid fuel with a sulfur content of more than 0.5% sulfur by weight. The natural gas that would be used in the P3 will have a sulfur content that will be less than 0.75 gr S/100 scf (short-term average) and 0.25 gr S/100 scf (long-term average). The Diesel fuel used in the emergency engines will comply with the current CARB fuel sulfur limit of 15 ppm, or 0.0015%, well below the limit of this rule.

Rule 72 – New Source Performance Standards.

By reference, this rule requires units to comply with the applicable sections of the federal New Source Performance Standards (NSPS). The applicability of NSPS is discussed above.

Rule 73 – National Emission Standards for Hazardous Air Pollutants.

By reference, this rule requires units to comply with the applicable sections of the federal National Emission Standards for Hazardous Air Pollutants (NESHAP) program. The applicability of NESHAP rules is discussed above.

Rule 74.9 – Stationary Internal Combustion Engines.

Limits CO, NOx, and ROC emissions from stationary reciprocating internal combustion engines rated greater than or equal to 50 bhp. However, emergency equipment operating less than or equal to 50 hours per year for testing or maintenance purposes and less than or equal to 200 hours per year for any purpose is exempt from the emission limits of Rule 74.9. Therefore, with an annual operating limit of 200 hours per year for any purpose, the new emergency generator engine is exempt from these emission limits.

Rule 74.23 – Stationary Gas turbine.

Limits NOx emissions from stationary gas turbines rated greater than or equal to 10 MW with post-combustion controls to 9 ppmv (at 15% O_2, corrected for efficiency). The NOx emissions from the P3 CTG will be limited to 2.5 ppmvc, and thus complies with this rule.

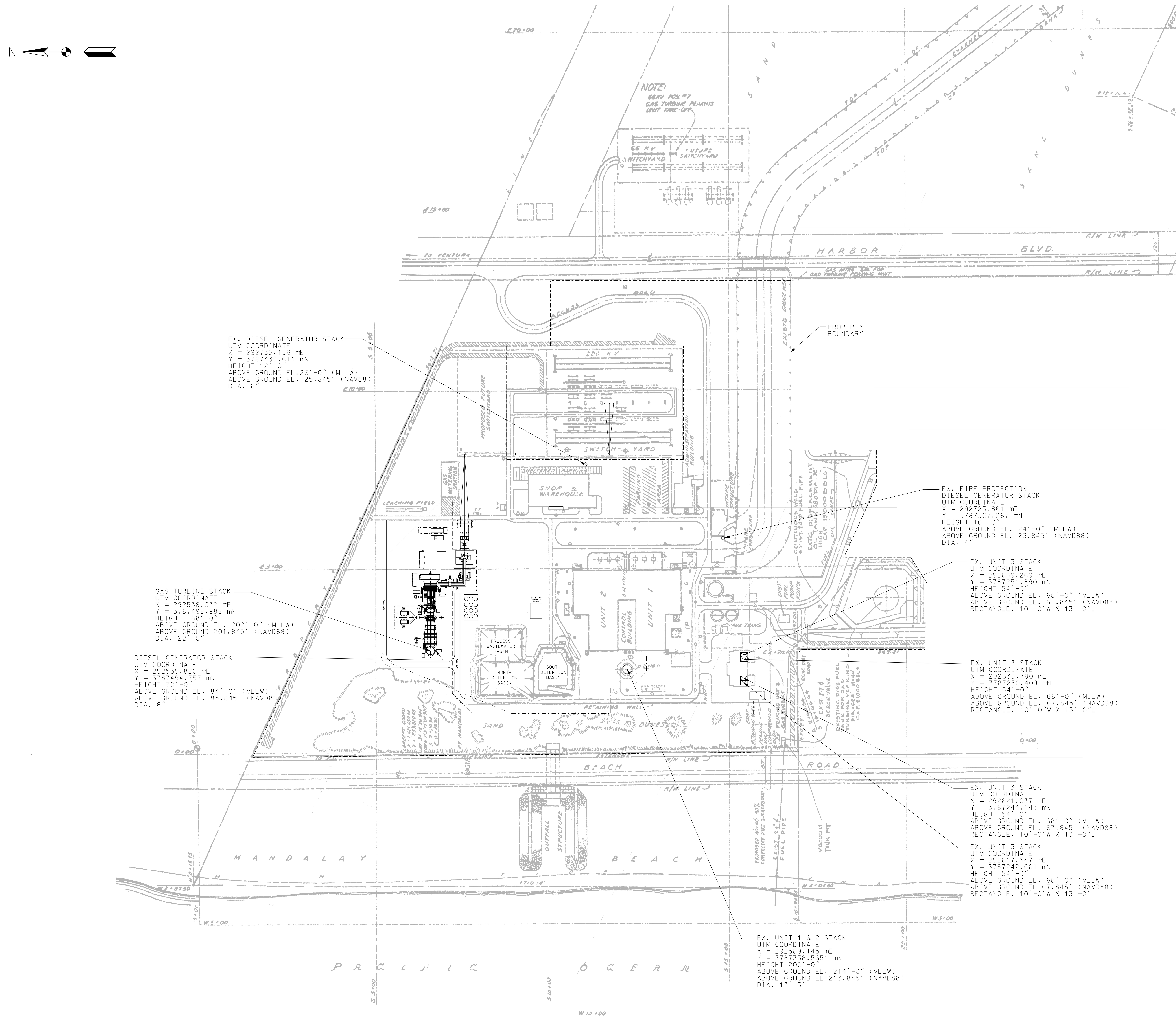
3. Toxic Air Contaminant New Source Review

The VCAPCD does not have a toxic air contaminant (TAC) New Source Review (NSR) regulation. A typical District TAC NSR regulation (for example, SCAQMD Rule 1401 or SDACPD Rule 1200) requires preparation of a health risk assessment and demonstration that a project will not result in unacceptable health risks (cancer risk > 10 in a million, chronic health index > 1, acute health index > 1). These are also the typical significance levels used by the CEC for recent projects. As discussed in Appendix F, the proposed project will comply with these requirements.

APPENDIX A

SITE PLAN

SKETCH 3



NOTES:

1. VERTICAL DATUM ELEVATIONS WERE CONVERTED FROM MLLW TO NAVD88 AS FOLLOWS:

   EXISTING PLANT REFERENCE DRAWING NO.550001-5 (SITE PREPARATION PLAN) WAS USED AS A BASIS FOR CONVERSION. THE REFERENCE DRAWING WAS ORIGINATED IN THE 1950'S AND ELEVATIONS PROVIDED ARE IN MLLW DATUM (ASSUMED 1955). A CONVERSION TO MSL (ASSUMED NGVD 1929) WAS PROVIDED ON THE DRAWING AS FOLLOWS: MLLW - 2.57' = MSL.

   THE RESULTING MSL VALUE WAS THEN INPUT INTO THE US ARMY CORPS OF ENGINEERS CONVERSION SOFTWARE CORPSCON VERSION 6.0.1 AND CONVERTED TO NAVD88. THE DIFFERENCE RESULTED IN THE ADDITION OF 2.415' WHEN CONVERTING FROM NGVD29 TO NAVD88.

   THEREFORE, (MLLW - 2.57' + 2.415') = NAVD88

   THIS CONVERSION METHOD MUST BE VERIFIED BY A LICENSED SURVEYOR IN THE STATE OF CALIFORNIA PRIOR TO DESIGN PHASE OF PROJECT.

PRELIMINARY
2/18/15

50' 0 50' 100' 150'
SCALE: 1" = 100'

REVISION APPROVAL RECORD			REV						
DISCIPLINE	BY	DATE	DISCIPLINE	BY	DATE	REV NO	DATE	REVISIONS	BY	CHKR
ARCH.			MECHANICAL			A	1/16/15	PRELIMINARY - FOR REVIEW	RLR	
BUILDING SERVICES			PIPING			B	1/20/15	PRELIMINARY - INCORPORATED CLIENT COMMENTS	RLR	
CIVIL			PROCESS			C	2/18/15	PRELIMINARY - ROTATED GAS TURBINE AND SCR 180 DEG.	RLR	
ELECTRICAL			QA / QC							
ENVIRON.			STRUCTURAL							
GEN. ARRANG.										
I & C										

DRAWING STATUS				
ISSUED	REV	DATE	SDE	PEM
PRELIMINARY	C	2/18/15		
APPROVED FOR CONSTRUCTION				

NOT APPROVED FOR CONSTRUCTION UNLESS SIGNED AND DATED. DESTROY ALL PRINTS BEARING EARLIER DATE AND/OR REV.NO.

PROJECT NO.: 31380
DRAWN: RLR DATE: 12/30/14
CHECKED: DATE:
SCALE: 1" = 100'-0"

URS
510 CARNEGIE CTR.
PRINCETON, NJ 08540
(609) 720-2000
URS ENERGY & CONSTRUCTION, Inc.

PUENTE POWER PLANT
SIMPLE CYCLE PROJECT
EMISSION LOCATIONS

DWG. NO. 31380-P029-MAN-SKETCH 3 REV C

APPENDIX B

DETAILED EMISSION CALCULATIONS/ENGINEERING SPECIFICATIONS

Table B-1
Puente Power Project

Performance Runs for Gas Turbine

Ambient Condition	Winter	Winter	ISO	ISO	Summer	Summer	Summer	Summer	Summer	Summer
Ambient Temperature (deg. F)	38.9	38.9	59	59	77.8	77.8	77.8	82	82	82
Relative Humidity, %	26%	26%	60%	60%	50%	50%	50%	31%	31%	31%
Load	Maximum	Minimum	Maximum	Minimum	Maximum	Maximum	Minimum	Maximum	Maximum	Minimum
Evap Cooling?	Off	Off	Off	Off	On	Off	Off	On	Off	Off
Output Summary										
Gross Output, MW	278	83	275	82	267	253	87	270	247	89
HHV Fuel Input, MMBtu/hr	2,579.09	1,176.50	2,567.81	1,159.67	2,513.13	2,392.95	1,179.34	2,534.45	2,348.76	1,191.87
Fuel Flow, scf/hr	2,537,233	1,156,852	2,525,966	1,140,403	2,471,887	2,352,461	1,159,781	2,492,166	2,309,648	1,171,949
Stack Parameters										
Stack Exhaust Flow, 1000s lb/hr	6,147.00	3,496.00	6,272.00	3,506.00	6,201.00	6,006.00	3,586.00	6,252.00	5,955.00	3,634.00
Stack Exhaust Temperature, Deg.F	900	900	900	900	900	900	900	900	900	900
Exhaust Composition, Vol %										
N2	75.48%	75.96%	74.94%	75.39%	74.30%	74.56%	74.97%	74.51%	74.93%	75.29%
O2	13.99%	15.34%	14.01%	15.29%	13.92%	14.09%	15.19%	13.97%	14.23%	15.29%
CO2	3.21%	2.59%	3.12%	2.54%	3.08%	3.03%	2.52%	3.09%	3.01%	2.53%
H2O	6.41%	5.20%	7.03%	5.88%	7.81%	7.43%	6.42%	7.54%	6.94%	5.99%
Ar	0.90%	0.90%	0.89%	0.90%	0.88%	0.89%	0.89%	0.89%	0.89%	0.90%
Molecular Weight	28.55	28.63	28.48	28.55	28.39	28.43	28.49	28.42	28.48	28.54
Stack Exhaust Flow, 1000s ACFM	3,551.20	2,026.94	3,631.02	2,037.43	3,601.37	3,485.05	2,087.61	3,626.46	3,450.84	2,111.79
Stack Emission Rates										
NOx, ppmvd@15% O2	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
CO, ppmvd@15% O2	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
ROC as CH4, ppmvd@15% O2	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
NH3, ppmvd@15% O2	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Particulates, lb/hr	10.6	10.6	10.6	10.6	10.6	10.6	10.6	10.6	10.6	10.6
NOx, lb/hr	23.4	10.6	23.3	10.5	22.8	21.7	10.7	23.0	21.3	10.8
CO, lb/hr	22.8	10.4	22.7	10.2	22.2	21.1	10.4	22.4	20.7	10.5
ROC as CH4, lb/hr	6.5	3.0	6.5	2.9	6.4	6.0	3.0	6.4	5.9	3.0
NH3 Slip, lb---mole/hr	1.01	0.49	1.01	0.47	0.99	0.94	0.48	1	0.92	0.49

Table B-2
Puente Power Project
Gas Turbine Hourly Emissions - Startup/Shutdown Emissions

Gas Turbine - Hourly Startup Emissions

	Time (minutes)	NOx Emissions (lbs/hr)	CO Emissions (lbs/hr)	ROC Emissions (lbs/hr)	PM10 Emissions (lbs/hr)	SOx Emissions (lbs/hr)	NOx Emissions (lbs)	CO Emissions (lbs)	ROC Emissions (lbs)	PM10 Emissions (lbs)	SOx Emissions (lbs)
Maximum Startup Emissions	30	N/A	N/A	N/A	N/A	5.4	87.0	167.0	17.0	3.7	2.7
Maximum Normal Operation Emissions	30	23.4	22.8	6.5	10.6	5.4	11.7	11.4	3.3	5.3	2.7
Total =	60						98.7	178.4	20.3	9.0	5.4

Gas Turbine - Hourly Shutdown Emissions

	Time (minutes)	NOx Emissions (lbs/hr)	CO Emissions (lbs/hr)	ROC Emissions (lbs/hr)	PM10 Emissions (lbs/hr)	SOx Emissions (lbs/hr)	NOx Emissions (lbs)	CO Emissions (lbs)	ROC Emissions (lbs)	PM10 Emissions (lbs)	SOx Emissions (lbs)
Maximum Shutdown Emissions	12	N/A	N/A	N/A	N/A	5.4	4.0	145.0	25.0	1.5	1.1
Maximum Normal Operation Emissions	48	23.4	22.8	6.5	10.6	5.4	18.7	18.2	5.2	8.5	4.4
Total =	60						22.7	163.2	30.2	10.0	5.4

Gas Turbine - Hourly Startup/Shutdown/Restart Emissions

	Time (minutes)	NOx Emissions (lbs/hr)	CO Emissions (lbs/hr)	ROC Emissions (lbs/hr)	PM10 Emissions (lbs/hr)	SOx Emissions (lbs/hr)	NOx Emissions (lbs)	CO Emissions (lbs)	ROC Emissions (lbs)	PM10 Emissions (lbs)	SOx Emissions (lbs)
Maximum Startup Emissions	30	N/A	N/A	N/A	N/A	5.4	87.0	167.0	17.0	3.7	2.7
Maximum Shutdown Emissions	12	N/A	N/A	N/A	N/A	5.4	4.0	145.0	25.0	1.5	1.1
Maximum Restart Emissions*	18	N/A	N/A	N/A	N/A	5.4	52.2	100.2	10.2	2.2	1.6
Total =	60						143.2	412.2	52.2	7.4	5.4

Note: * Calculated based on maximum startup emissions reduced for 18 minute period.

TABLE B-3
GE 7HA.01 SIMPLE CYCLE CTG
OPERATION EMISSIONS

GE Energy

Andrew Dicke
Environmental Marketing Manager
Power Generation Products

1 River Road,
Schenectady, NY 12345
USA

T 518-385-4708
C 518-698-9807
E Andrew.Dicke@GE.com

Mr. Steve Rose
Sr Director - Development Engineering
1000 Main Street
Houston, TX 77002

January 9, 2015

Dear Mr. Steve Rose:

Per your request, GE confirms that the NRG Mandalay Bay 7HA.01 gas turbine, installed in a simple cycle configuration and equipped with an SCR and CO catalyst will achieve the following steady state operation emission values.

Constituent	**Steady state stack emissions during emission compliance mode**
NOx	2.5 ppmvd, Ref 15%O2
CO	4.0 ppmvd, Ref 15%O2
VOC	2.0 ppmvd, Ref 15%O2
NH3	5.0 ppmvd, Ref 15%O2
Total Particulates	10.6 lbs/hr

Please do not hesitate to contact me if you have any questions.

Best regards,

Andrew Dicke
PGP Environmental Marketing Manager

cc: M. Thuillez
C. Dutcher
A. St. John – Grover
P. Kulkarni
C. Matis

Table B-4
Puente Power Project
Gas Turbine Commissioning Schedule

Day	Activity	Duration (hr)	GT Load (%)	No. of GT Shutdowns	Daily Fuel Consumption (MMSCF-HHV)	Daily Energy Production (MWh)	Total Emissions: NOx (lbs)	CO (lbs)	ROC (lbs)	PM10 (lbs)	SOx (lbs)	SCR (Y/N)	Calculated Hourly Emissions (lbs/hr): Nox	CO	ROC	PM10*	SOx*
1	GT Testing (1st Fire, FSNL)	8	0	1	4.8	0.0	1076.5	15783.7	1312.9	85.2	9.9	N	134.6	1,973.0	164.1	10.6	5.4
2	GT Testing (FSNL, Excitation Test, Dummy Synch Checks)	8	0	1	4.8	0.0	1076.5	15783.7	1312.9	85.2	9.9	N	134.6	1,973.0	164.1	10.6	5.4
3	GT Testing / Initial 4 Hour Run / Overspeed Testing	8	0-50	1.0	13.9	1,091.3	1560.2	6163.1	544.6	86.9	28.5	N	195.0	770.4	68.1	10.6	5.4
4	Base Load Run-In Lean-Lean for Strainer Cleaniliness	10	100	1.0	27.6	2,750.0	2443.7	830.2	107.8	111.2	56.6	N	244.4	83.0	10.8	10.6	5.4
5	GT Testing / DLN Tuning	8	0-50	1.0	13.9	1,091.3	1560.2	6163.1	544.6	86.9	28.5	N	195.0	770.4	68.1	10.6	5.4
6	GT Testing / DLN Tuning	8	0-50	1.0	13.9	1,091.3	1560.2	6163.1	544.6	86.9	28.5	N	195.0	770.4	68.1	10.6	5.4
7	GT Testing / DLN Tuning	8	50-75	1.0	18.3	1,652.2	1174.0	498.5	58.0	88.3	37.4	N	146.8	62.3	7.3	10.6	5.4
8	GT Testing / DLN Tuning	8	50-75	1.0	18.3	1,652.2	1174.0	498.5	58.0	88.3	37.4	N	146.8	62.3	7.3	10.6	5.4
9	GT Testing / DLN Tuning	8	75-100	1.0	22.4	2,214.8	1970.8	726.5	94.6	90.0	45.9	N	246.3	90.8	11.8	10.6	5.4
10	GT Testing / DLN Tuning	8	75-100	1.0	22.4	2,214.8	1970.8	726.5	94.6	90.0	45.9	N	246.3	90.8	11.8	10.6	5.4
11	No Operation	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	N					
12	Load Catalyst	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	N					
13	Load Catalyst	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	N					
14	Load Catalyst	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	N					
15	Load Catalyst	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	N					
16	GT Base Load / Commissioning of Ammonia system	16	50-100	1.0	43.3	4,355.6	457.4	680.5	147.3	174.8	88.7	Y	28.6	42.5	9.2	10.6	5.4
17	GT Load Test	12	100	1.0	32.9	3,285.2	362.8	588.4	121.0	132.4	67.3	Y	30.2	49.0	10.1	10.6	5.4
18	No Operation	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Y					
19	Install Emissions Test Equipment	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Y					
20	Emissions Tuning / Drift Test	12	50-100	1.0	32.9	3,285.2	362.8	588.4	121.0	132.4	67.3	Y	30.2	49.0	10.1	10.6	5.4
21	Emissions Tuning / Drift Test	12	50-100	1.0	32.9	3,285.2	362.8	588.4	121.0	132.4	67.3	Y	30.2	49.0	10.1	10.6	5.4
22	Pre-performance Testing / Drift Test	16	100	1.0	43.3	4,355.6	457.4	680.5	147.3	174.8	88.7	Y	28.6	42.5	9.2	10.6	5.4
23	Pre-performance Testing / Drift Test	16	100	1.0	43.5	4,386.6	469.4	616.5	140.3	174.8	89.2	Y	29.3	38.5	8.8	10.6	5.4
24	Pre-performance Testing / Drift Test	16	100	1.0	43.5	4,386.6	469.4	616.5	140.3	174.8	89.2	Y	29.3	38.5	8.8	10.6	5.4
25	RATA / Pre-performance Testing / Source Testing	16	100	1.0	43.3	4,355.6	457.4	680.5	147.3	174.8	88.7	Y	28.6	42.5	9.2	10.6	5.4
26	RATA / Pre-performance Testing / Source Testing	16	100	1.0	43.5	4,386.6	469.4	616.5	140.3	174.8	89.2	Y	29.3	38.5	8.8	10.6	5.4
27	Pre-performance Testing / Source Testing	16	100	1.0	43.5	4,386.6	469.4	616.5	140.3	174.8	89.2	Y	29.3	38.5	8.8	10.6	5.4
28	Pre-performance Testing / Source Testing	16	50-100	1.0	43.5	4,386.6	469.4	616.5	140.3	174.8	89.2	Y	29.3	38.5	8.8	10.6	5.4
29	Remove Emissions Test Equipment	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Y					
30	Torque Exhaust Bolts & Remove A179 Strainers	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Y					
31	Torque Exhaust Bolts & Remove A179 Strainers	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Y					
32	Torque Exhaust Bolts & Remove A179 Strainers	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Y					
33	Water Wash & Performance preparation	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Y					
34	Water Wash & Performance preparation	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Y					
35	Water Wash & Performance preparation	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Y					
36	Performance/Reliability Testing	24	100	0.0	64.4	6,525.3	654.5	655.7	167.9	258.1	131.8	Y	27.3	27.3	7.0	10.6	5.4
37	Performance/Reliability Testing	24	100	1.0	62.7	6,424.3	571.5	697.7	182.9	255.9	128.3	Y	23.8	29.1	7.6	10.6	5.4
38	No Operation	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Y					
39	SCE 72 Hour Test - Day 1	24	50-100	0.0	64.4	6,525.3	654.5	655.7	167.9	258.1	131.8	Y	27.3	27.3	7.0	10.6	5.4
40	SCE 72 Hour Test - Day 2	24	50-100	0.0	62.6	6,422.3	567.5	552.7	157.9	254.4	128.2	Y	23.6	23.0	6.6	10.6	5.4
41	SCE 72 Hour Test - Day 3	24	50-100	1.0	62.7	6,424.3	571.5	697.7	182.9	255.9	128.3	Y	23.8	29.1	7.6	10.6	5.4
	Total GT operation hours =	366					23,393.9	63,485.9	7,038.4	3,976.9	1,890.8	max =	246.3	1,973.0	164.1	10.6	5.4
							11.7	31.7	3.5	2.0	0.9						

Table B-5
Puente Power Project
Proposed New Emergency Generator Engine

Rating (bhp) =	779				
Fuel =	Diesel				
Fuel Consumption (gal/hr) =	35.9				
Exhaust Temperature (F) =	1263				
Exhaust Diameter (inches) =	6				
Exhaust Flow Rate (acfm) =	3,185				
Exhaust Velocity (ft/sec) =	270				
	NOx	**CO**	**ROC**	**PM10**	**SOx**
Emission Factor (g/bhp-hr)(1) =	0.50	2.61	0.14	0.02	0.00
Hourly Emissions (lbs/hr)(2) =	8.58E-01	4.48E+00	2.43E-01	3.84E-02	8.42E-03

Notes:
(1) Based on non-road Diesel EPA Tier 4 (final) certification standards for 2015 and new engine year standby generator sets (560 to 900 kw eng
(2) Assumes testing at 100% load.

TABLE B-6-1

DIESEL GENERATOR SET ENGINE SPECIFICATIONS

DIESEL GENERATOR SET

Image shown may not reflect actual package

Standby
500 ekW 625 kVA
60 Hz 1800 rpm 480 Volts

Caterpillar is leading the power generation Market place with Power Solutions engineered to deliver unmatched flexibility, expandability, reliability, and cost-effectiveness.

DESIGN CRITERIA
- The generator set accepts 100% rated load in one step per NFPA 110 and meets ISO 8528-5 transient response.

UL 2200
- UL 2200 packages available. Certain restrictions may apply. Consult with your Cat® dealer.

FULL RANGE OF ATTACHMENTS
- Wide range of bolt-on system expansion attachments, factory designed and tested
- Flexible packaging options for easy and cost effective installation

SINGLE-SOURCE SUPPLIER
- Fully prototype tested with certified torsional vibration analysis available

WORLDWIDE PRODUCT SUPPORT
- Cat dealers provide extensive post sale support including maintenance and repair agreements
- Cat dealers have over 1,800 dealer branch stores operating in 200 countries.
- The Caterpillar S•O•S℠ program effectively detects internal engine component condition, even the presence of unwanted fluids and combustion by products.

CAT® C15 ATAAC DIESEL ENGINE
- Reliable, rugged, durable design
- Field proven in thousands of applications worldwide
- Four-stroke diesel engine combines consistent performance and excellent fuel economy with minimum weight

CAT GENERATOR
- Matched to the performance and output characteristics of Cat engines
- Single point access to accessory connections
- UL 1446 Recognized Class H insulation

CAT EMCP 4 CONTROL PANELS
- Simple user friendly interface and navigation
- Scalable system to meet a wide range of customer needs
- Integrated Control System and Communications Gateway

FACTORY INSTALLED STANDARD & OPTIONAL EQUIPMENT

System	Standard	Optional
Air Inlet	• Standard duty air filter	[ ] Air cleaner- Single stage canister style [ ] Heavy duty air filter- Single stage canister w/pre-cleaner
Cooling	• Radiator package mounted • Coolant drain line with valve. Drain hose terminated at edge • Fan and belt guards • Coolant level sight gauge • Cat Extended Life Coolant	[ ] Radiator duct flange (open set only) [ ] Radiator guard (open set only)
Exhaust	• Dry exhaust manifold • Male full V-band style flanged outlet • Stainless steel flex with female full V-band flange connections	[ ] Mufflers [ ] Male full V-band weld flange with V-band clamp
Fuel	• Primary fuel filter with integral water separator • Secondary fuel filters-spin on • Fuel priming pump • Flex fuel lines • Fuel cooler	[ ] 12 & 24 hour UL listed dual wall sub-base fuel tanks with low fuel level switch
Generator	• Brushless Exciter • Class H insulation • IP 23 Protection • VR6 voltage regulator with 3 phase sensing	[ ] Cat digital voltage regulator (Cat DVR) with reactive droop control [ ] Oversize harsh environment generators [ ] Permanent magnet excitation [ ] Anti-condensation space heaters
Power Termination	• Power termination strips mounted inside power center • Segregated low voltage wiring panel • Bottom entry	[ ] Circuit breakers, UL/EC listed, 3 pole [ ] Circuit breaker shunt trip [ ] Circuit breaker auxiliary contact
Governor	• ADEM™ A4	[ ] Load share module
Control Panel	• EMCP 4.2 (rear mounted) • Speed adjust • Emergency Stop Pushbutton • Voltage adjust	[ ] EMCP 4.4 [ ] Local annunciator modules (NFPA 99/110) [ ] Remote annunciator modules (NFPA 99/110) [ ] Discrete I/O module
Lube	• Lubricating oil and filter • Oil drain line with valves • Open crankcase ventilation (OCV) filter • Gear type lube oil pump	
Mounting	• Rails - engine / generator / radiator mounting • Rubber vibration isolator	
Starting / Charging	• 24 volt starting motor • Batteries with rack and cables (dry) • 45 amp charging alternator • Battery disconnect switch	[ ] Jacket water heater [ ] 10 Amp UL recognized battery charger
General	• Paint – Cat yellow except rails and radiators gloss black	[ ] UL 2200 listed [ ] CSA Certification

***Not included with packages without radiators**

SPECIFICATIONS

CAT GENERATOR

Frame ……………………..…………………….. 6124F
Excitation ………………………………………..….IE
Pitch………………………………………………0.6667
Number of poles………………………………………4
Number of leads……………………………………..12
Number of bearings …………………….……………Single
Insulation ………………………………………Class H
IP rating ………………………………..Drip proof IP23
Over speed capability - % of rated………………125%
Wave form deviation……………………………...2 %
Voltage regulator………… 3 phase sensing with load adjustable module
Voltage regulation….Less than ±1/2% (steady state)
Less than ±1/2% (3% speed change)
Telephone Influence Factor ……………Less than 50
Harmonic Distortion ……………………..Less than 5%

CAT DIESEL ENGINE

C15 ATAAC, L-6, 4 stroke, water-cooled diesel

Bore ………………….………… ...137.20 mm (5.4 in)
Stroke ……………………………171.4 mm (6.75 in)
Displacement …………………...15.20 L (927.56 in^3)
Compression ratio…………….…………………..16:1
Aspiration…………………….…..….….……….ATAAC
Fuel system……………………………….………..MEUI
Governor Type………………………….. ADEM™ A4

CAT EMCP 4 CONTROL PANELS

EMCP 4 controls including:
- Run / Auto / Stop Control
- Speed & Voltage Adjust
- Engine Cycle Crank
- Emergency stop pushbutton

EMCP 4.2 controller features:
- 24-volt DC operation
- Environmental sealed front face
- Text alarm/event descriptions

Digital indication for:
- RPM
- DC volts
- Operating hours
- Oil pressure (psi, kPa or bar)
- Coolant temperature
- Volts (L-L & L-N), frequency (Hz)
- Amps (per phase & average)
- Power Factor (per phase & average)
- kW (per phase, average & percent)
- kVA (per phase, average & percent)
- kVAr (per phase, average & percent)
- kW-hr & kVAr-hr (total)

Warning/shutdown with common LED indication of shutdowns for:
- Low oil pressure
- High coolant temperature
- Overspeed
- Emergency stop
- Failure to start (overcrank)
- Low coolant temperature
- Low coolant level

Programmable protective relaying functions:
- Generator phase sequence
- Over/Under voltage (27/59)
- Over/Under Frequency (81 o/u)
- Reverse Power (kW) (32)
- Reverse Reactive Power (kVAr) (32RV)
- Overcurrent (50/51)

Communications
- Customer data link (Modbus RTU)
- Accessory module data link
- Serial annunciator module data link

- 6 programmable digital inputs
- 4 programmable relay outputs (Form A)
- 2 programmable relay outputs (Form C)
- 2 programmable digital outputs

Compatible with the following optional modules:
- Digital I/O module
- Local Annunciator
- Remote annunciator
- RTD module
- Thermocouple module

TECHNICAL DATA

Open Generator Set - 1800 rpm/60 Hz/480 Volts	**STANDBY** EM0177	
Genset Package Performance		
Power rating @ 0.8 pf	625 kVA	
Power rating w/fan	500 ekW	
Fuel Consumption[1]		
100% load with fan	136.6 L/hr	35.9 Gal/hr
75% load with fan	108.0 L/hr	28.6 Gal/hr
50% load with fan	78.0 L/hr	20.5 Gal/hr
Cooling System[2]		
Ambient air temperature	51°C	123 °F
Air flow restriction (system)	0.12 kPa	0.5 in water
Air flow (max @rated speed)	819.6 m^3/min	28958 cfm
Engine coolant Capacity with radiator arrangement)	68 L	18.0 US Gal
Engine coolant capacity	27 L	7.1 US Gal
Radiator coolant capacity	41 L	10.9 US Gal
Inlet Air		
Combustion air inlet flow rate	35.2 m^3/min	1243 cfm
Exhaust System		
Exhaust stack gas temperature	683.8 °C	1263 °F
Exhaust gas flow rate	90.2 m^3/min	3185 cfm
Exhaust flange size (internal diameter)	139 mm	5.5 in
Exhaust system backpressure (minimum allowable) [3]	1 kPa	4 in. water
Exhaust system backpressure (maximum allowable) [3]	10 kPa	40 in. water
Heat Rejection		
Heat rejection to coolant (total)	253 kW	14375 Btu/min
Heat rejection to exhaust (total)	430 kW	24457 Btu/min
Heat rejection to atmosphere from engine	95.6 kW	5436 Btu/min
Heat rejection to atmosphere from generator	29.1 kW	1655 Btu/min
Alternator[4]		
Motor starting capability @ 30% voltage dip	1712 skVA	
Frame	LC6124F	
Temperature Rise	130°C	234°F
Lube System [5]		
Lube oil refill with filter change for standard sump	60 L	15.9 US Gal

RATING DEFINITIONS AND CONDITIONS

Meets or Exceeds International Specifications: · AS1359, CSA, IEC60034-1, ISO3046, ISO8528, NEMA MG 1-22, NEMA MG 1-33, UL508A, 72/23/EEC, 98/37/EC, 2004/108/EC

Standby - Output available with varying load for the duration of the interruption of the normal source power. Average power output is 70% of the standby power rating. Typical operation is 200 hours per year, with maximum expected usage of 500 hours per year. Standby power in accordance with ISO8528. Fuel stop power in accordance with ISO3046. Standby ambients shown indicate ambient temperature at 100% load which results in a coolant top tank temperature just below the shutdown temperature.

Ratings are based on SAE J1349 standard conditions. These ratings also apply at ISO3046 standard conditions

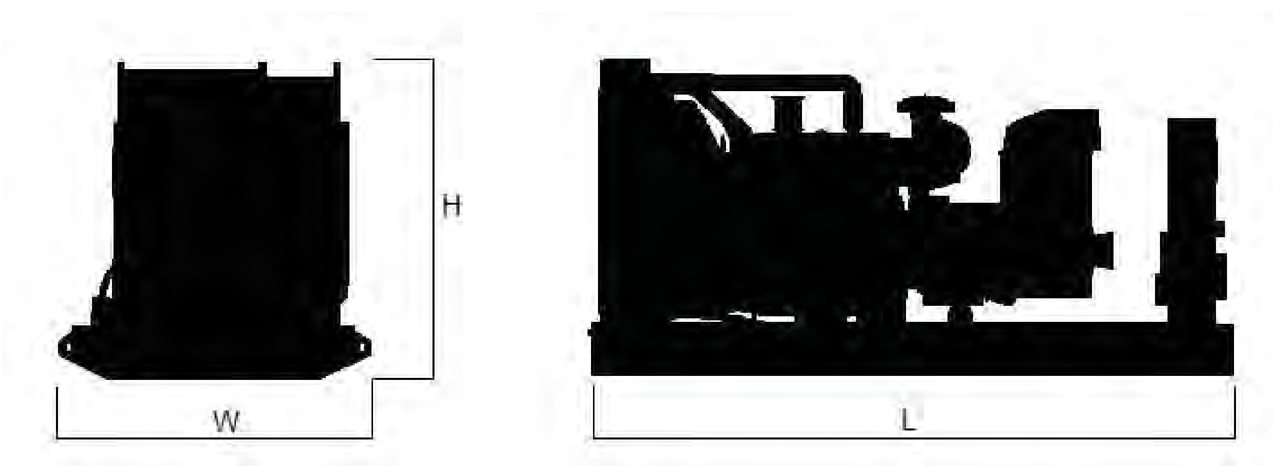
Fuel Rates are based on fuel oil of 35º API [16º C (60º F)] gravity having an LHV of 42 780 kJ/kg (18,390 Btu/lb) when used at 29º C (85º F) and weighing 838.9 g/liter (7.001 lbs/U.S. gal.). Additional ratings may be available for specific customer requirements, contact your Cat representative for details. For information regarding Low Sulfur fuel and Biodiesel capability, please consult your Cat dealer.

STANDBY 500 ekW 625 kVA

60 Hz 1800 rpm 480 Volts

DIMENSIONS

Package Dimensions		
Length	4273 mm	169 in
Width	2058 mm	81 in
Height	2092 mm	83 in
Weight	3759 kg	8288 lb



www.Cat-ElectricPower.com

Performance No.: EM0177

Feature Code: C15DEBH

Gen. Arr. Number: 235-1212

Sourced: U.S. Sourced

LEHE0305-01 (06/11)

TABLE B-6-2

EPA EMISSION STANDARDS REFERENCE GUIDE FOR NONROAD COMPRESSION IGNITION ENGINES EXHAUST EMISSION STANDARDS

Emission Standards Reference Guide

Nonroad Compression-Ignition Engines -- Exhaust Emission Standards

	Rated Power (kW)	Tier	Model Year	NMHC (g/kW-hr)	NMHC + NOx (g/kW-hr)	NOx (g/kW-hr)	PM (g/kW-hr)	CO (g/kW-hr)	Smoke[a] (Percentage)	Useful Life (hours /years)[b]	Warranty Period (hours /years)[b]
Federal	kW < 8	1	2000-2004	-	10.5	-	1.0	8.0	20/15/50	3,000/5	1,500/2
		2	2005-2007	-	7.5	-	0.80	8.0			
		4	2008+	-	7.5	-	0.40[c]	8.0			
	8 ≤ kW < 19	1	2000-2004	-	9.5	-	0.80	6.6		3,000/5	1,500/2
		2	2005-2007	-	7.5	-	0.80	6.6			
		4	2008+	-	7.5	-	0.40	6.6			
	19 ≤ kW < 37	1	1999-2003	-	9.5	-	0.80	5.5		5,000/7[d]	3,000/5[e]
		2	2004-2007	-	7.5	-	0.60	5.5			
		4	2008-2012	-	7.5	-	0.30	5.5			
			2013+	-	4.7	-	0.03	5.5			
	37 ≤ kW < 56	1	1998-2003	-	-	9.2	-	-		8,000/10	3,000/5
		2	2004-2007	-	7.5	-	0.40	5.0			
		3[f]	2008-2011	-	4.7	-	0.40	5.0			
		4 (Option 1)[g]	2008-2012	-	4.7	-	0.30	5.0			
		4 (Option 2)[g]	2012	-	4.7	-	0.03	5.0			
		4	2013+	-	4.7	-	0.03	5.0			
	56 ≤ kW < 75	1	1998-2003	-	-	9.2	-	-			
		2	2004-2007	-	7.5	-	0.40	5.0			
		3	2008-2011	-	4.7	-	0.40	5.0			
		4	2012-2013[h]	-	4.7	-	0.02	5.0			
			2014+[i]	0.19	-	0.40	0.02	5.0			
	75 ≤ kW < 130	1	1997-2002	-	-	9.2	-	-			
		2	2003-2006	-	6.6	-	0.30	5.0			
		3	2007-2011	-	4.0	-	0.30	5.0			
		4	2012-2013[h]	-	4.0	-	0.02	5.0			
			2014+	0.19	-	0.40	0.02	5.0			
	130 ≤ kW < 225	1	1996-2002	1.3[j]	-	9.2	0.54	11.4			
		2	2003-2005	-	6.6	-	0.20	3.5			
		3	2006-2010	-	4.0	-	0.20	3.5			
		4	2011-2013[h]	-	4.0	-	0.02	3.5			
			2014+[i]	0.19	-	0.40	0.02	3.5			
	225 ≤ kW < 450	1	1996-2000	1.3[j]	-	9.2	0.54	11.4			
		2	2001-2005	-	6.4	-	0.20	3.5			

		3	2006-2010	-	4.0	-	0.20	3.5			
		4	2011-2013[h]	-	4.0	-	0.02	3.5			
			2014+[i]	0.19	-	0.40	0.02	3.5			
	450 ≤ kW < 560	1	1996-2001	1.3[j]	-	9.2	0.54	11.4			
		2	2002-2005	-	6.4	-	0.20	3.5			
		3	2006-2010	-	4.0	-	0.20	3.5			
		4	2011-2013[h]	-	4.0	-	0.02	3.5			
			2014+[i]	0.19	-	0.40	0.02	3.5			
	560 ≤ kW < 900	1	2000-2005	1.3[j]	-	9.2	0.54	11.4			
		2	2006-2010	-	6.4	-	0.20	3.5			
		4	2011-2014	0.40	-	3.5	0.10	3.5			
			2015+[i]	0.19	-	3.5[k]	0.04[l]	3.5			
	kW > 900	1	2000-2005	1.3[j]	-	9.2	0.54	11.4			
		2	2006-2010	-	6.4	-	0.20	3.5			
		4	2011-2014	0.40	-	3.5[k]	0.10	3.5			
			2015+[i]	0.19	-	3.5[k]	0.04[l]	3.5			

Notes:

- For Tier 1, 2, and 3 standards, exhaust emissions of nitrogen oxides (NOx), carbon monoxide (CO), hydrocarbons (HC), and non-methane hydrocarbons (NMHC) are measured using the procedures in 40 Code of Federal Regulations (CFR) Part 89 Subpart E. For Tier 1, 2, and 3 standards, particulate matter (PM) exhaust emissions are measured using the California Regulations for New 1996 and Later Heavy-Duty Off-Road Diesel Cycle Engines.

- For Tier 4 standards, engines are tested for transient and steady-state exhaust emissions using the procedures in 40 CFR Part 1039 Subpart F. Transient standards do not apply to engines below 37 kilowatts (kW) before the 2013 model year, constant-speed engines, engines certified to Option 1, and engines above 560 kW.

- Tier 2 and later model naturally aspirated nonroad engines shall not discharge crankcase emissions into the atmosphere unless these emissions are permanently routed into the exhaust. This prohibition does not apply to engines using turbochargers, pumps, blowers, or superchargers.

- In lieu of the Tier 1, 2, and 3 standards for NOX, NMHC + NOX, and PM, manufacturers may elect to participate in the averaging, banking, and trading (ABT) program described in 40 CFR Part 89 Subpart C.

a Smoke emissions may not exceed 20 percent during the acceleration mode, 15 percent during the lugging mode, and 50 percent during the peaks in either mode. Smoke emission standards do not apply to single-cylinder engines, constant-speed engines, or engines certified to a PM emission standard of 0.07 grams per kilowatt-hour (g/kW-hr) or lower. Smoke emissions are measured using procedures in 40 CFR Part 86 Subpart I.

b Useful life and warranty period are expressed hours and years, whichever comes first.

c Hand-startable air-cooled direct injection engines may optionally meet a PM standard of 0.60 g/kW-hr. These engines may optionally meet Tier 2 standards through the 2009 model years. In 2010 these engines are required to meet a PM standard of 0.60 g/kW-hr.

d Useful life for constant speed engines with rated speed 3,000 revolutions per minute (rpm) or higher is 5 years or 3,000 hours, whichever comes first.

e Warranty period for constant speed engines with rated speed 3,000 rpm or higher is 2 years or 1,500 hours, whichever comes first.

f These Tier 3 standards apply only to manufacturers selecting Tier 4 Option 2. Manufacturers selecting Tier 4 Option 1 will be meeting those standards in lieu of Tier 3 standards.

g A manufacturer may certify all their engines to either Option 1 or Option 2 sets of standards starting in the indicated model year. Manufacturers selecting Option 2 must meet Tier 3 standards in the 2008-2011 model years.

h These standards are phase-out standards. Not more than 50 percent of a manufacturer's engine production is allowed to meet these standards in each model year of the phase out period. Engines not meeting these standards must meet the final Tier 4 standards.

i These standards are phased in during the indicated years. At least 50 percent of a manufacturer's engine production must meet these standards during each year of the phase in. Engines not meeting these standards must meet the applicable phase-out standards.

j For Tier 1 engines the standard is for total hydrocarbons.

k The NOx standard for generator sets is 0.67 g/kW-hr.

l The PM standard for generator sets is 0.03 g/kW-hr.

Code of Federal Regulations (CFR) Citations:

- 40 CFR 89.112 = Exhaust emission standards
- 40 CFR 1039.101 = Exhaust emission standards for after 2014 model year
- 40 CFR 1039.102 = Exhaust emission standards for model year 2014 and earlier
- 40 CFR 1039 Subpart F = Exhaust emissions transient and steady state test procedures
- 40 CFR 86 Subpart I = Smoke emission test procedures
- 40 CFR 1065 = Test equipment and emissions measurement procedures

Last updated on Wednesday, March 06, 2013

Table B-7
Puente Power Project
Natural Gas Compressor Fugitive Emissions (one new fuel compressor)

Fitting	Number	Emission factor (kg/hr/unit)(1)	Organic Compound Emissions (kg/hr)	Organic Compound Emissions (lb/day)	ROC Emissions(2) (lb/day)	CH4 Emissions(3) (lb/day)
Valves	50	4.50E-03	0.225	2.45	0.23	2.36
Connectors	112	2.00E-04	0.0224	0.24	0.02	0.24
Compressor Seals	1	8.80E-03	0.0088	0.10	0.01	0.09
TOTAL =				2.79	0.26	2.69

Notes:
(1) EPA's Protocol for Equipment Leak Emission Estimates, November 1995, Table 2-4 (Oil and Gas Production Operations).
(2) Based on a VOC fraction of total organic compound of 9.46%wt (based on gas composition specified by SDAPCD for Pio Pico Energy Center with high VOC due to LNG).
(3) Based on CH4 fraction (96.57%wt) of site specific gas composition.

Table B-8
Puente Power Project
Hourly Emissions

Hourly Mass Emission Rates, lbs/hr (Commissioning Period)	NOx	CO	ROC	PM10	SOx	NH3(1)
New GT Normal Operation	23.36	22.76	6.52	10.60	5.44	17.17
New GT Startups	98.68	178.38	20.26	9.00	5.44	17.17
New GT Shutdowns	22.69	163.21	30.21	9.98	5.44	17.17
New GT Startup/Shutdown/Restart	143.20	412.20	52.20	7.42	5.44	17.17
New GT Commissioning	246.35	1972.96	164.12	10.60	5.44	17.17
New GT Maximum =	246.35	1972.96	164.12	10.60	5.44	17.17
New Emergency Generator Engine	N/A(2)	N/A(2)	N/A(2)	N/A(2)	N/A(2)	N/A
New Natural Gas Compressor	N/A	N/A	0.01	N/A	N/A	N/A
Existing Unit 3(3)	1104.41	276.10	18.07	48.53	1.43	
Total New Equipment =	**246.35**	**1972.96**	**164.13**	**10.60**	**5.44**	**17.17**
Total Emergency Engine =	N/A(2)	N/A(2)	N/A(2)	N/A(2)	N/A(2)	N/A
Total Entire Facility =	**1350.76**	**2249.06**	**182.20**	**59.13**	**6.87**	**17.17**

Hourly Mass Emission Rates, lbs/hr (Non-Commissioning Period)	NOx	CO	ROC	PM10	SOx	NH3(1)
New GT Normal Operation	23.36	22.76	6.52	10.60	5.44	17.17
New GT Startups	98.68	178.38	20.26	9.00	5.44	17.17
New GT Shutdowns	22.69	163.21	30.21	9.98	5.44	17.17
New GT Startup/Shutdown/Restart	143.20	412.20	52.20	7.42	5.44	17.17
New GT Maximum =	143.20	412.20	52.20	10.60	5.44	17.17
New Emergency Generator Engine	N/A(2)	N/A(2)	N/A(2)	N/A(2)	N/A(2)	N/A
New Natural Gas Compressor	N/A	N/A	0.01	N/A	N/A	N/A
Existing Unit 3(3)	1104.41	276.10	18.07	48.53	1.43	
Total New Equipment =	**143.20**	**412.20**	**52.21**	**10.60**	**5.44**	**17.17**
Total Emergency Engine =	N/A(2)	N/A(2)	N/A(2)	N/A(2)	N/A(2)	N/A
Total Entire Facility =	1247.61	688.30	70.28	59.13	6.87	17.17

Notes:
(1) Set startup/shutdown hourly emission rate to 100% load normal emission level to determine worst case hourly emissions for AQ modeling purposes.
(2) Emergency engine will not be operated during commissioning testing of new gas turbine and/or during startups/shutdowns of new gas turbine.
(3) Based on hourly emission limits in Title V permit for this unit.

Table B-9
Puente Power Project
Daily Emissions

Daily Emission Rates, lbs/day (Commissioning Period)													
	Operating	Hourly Emission Rate (lbs/hr)						Daily Emissions (lbs/day)					
	Hours	NOx	CO	ROC	PM10	SOx	NH3	NOx	CO	ROC	PM10	SOx	NH3
New GT Normal Operation	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
New GT Startups	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
New GT Shutdowns	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
New GT Commissioning	various	various	various	various	various	various	various	23,393.9	0.0	0.0	254.4	59.7	412.1
New GT Total =								**23,393.9**	**0.0**	**0.0**	**254.4**	**59.7**	**412.1**
New Emergency Generator Engine	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
New Natural Gas Compressor	24									0.3			
Existing Unit 3(2)	10	1104.41	276.10	18.07	48.53	1.43	0.00	11044.10	2761.00	180.70	485.30	14.30	0.00
Total New Equipment =								**23,393.9**	**0.0**	**0.3**	**254.4**	**59.7**	**412.1**
Total Emergency Engine =								N/A	N/A	N/A	N/A	N/A	N/A
Total Entire Facility =								**34,438.0**	**2,761.0**	**181.0**	**739.7**	**74.0**	**412.1**

Daily Emission Rates, lbs/day (Non-Commissioning Period)													
	Operating	Hourly Emission Rate (lbs/hr)						Daily Emissions (lbs/day)					
	Hours	NOx	CO	ROC	PM10	SOx(1)	NH3(1)	NOx	CO	ROC	PM10	SOx	NH3
New GT Normal Operation	16	23.36	22.76	6.52	10.60	5.44	17.17	373.8	364.2	104.3	169.6	87.1	274.7
New GT Startups	4	98.68	178.38	20.26	9.00	5.44	17.17	394.7	713.5	81.0	36.0	21.8	68.7
New GT Shutdowns	4	22.69	163.21	30.21	9.98	5.44	17.17	90.8	652.8	120.9	39.9	21.8	68.7
New GT Total =								**859.2**	**1730.5**	**306.1**	**245.5**	**130.6**	**412.1**
New Emergency Generator Engine	1	0.86	4.48	0.24	0.04	0.01		0.9	4.5	0.2	0.0	0.0	
New Natural Gas Compressor	24									0.3			
Existing Unit 3(2)	10	1104.41	276.10	18.07	48.53	1.43		11044.1	2761.0	180.7	485.3	14.3	
Total New Equipment =								**860.1**	**1,735.0**	**306.6**	**245.6**	**130.6**	**412.1**
Total Emergency Engine =								**0.9**	**4.5**	**0.2**	**0.0**	**0.0**	
Total Entire Facility =								**11904.2**	**4496.0**	**487.3**	**730.9**	**144.9**	**412.1**

Notes:

(1) Set startup/shutdown hourly emission rate to 100% load normal emission level to determine worst case daily emissions for AQ modeling purposes.

(2) Based on maximum number of actual hours of operation per day during period from 2010 to 2014 and Title V hourly emission limits for this unit.

Table B-10
Puente Power Project
Annual Emissions - Commissioning Year

	Hours per Year	NOx (lbs/hr)	CO (lbs/hr)	ROC (lbs/hr)	PM10 (lbs/hr)	SOx(1) (lbs/hr)	NH3(1) (lbs/hr)	NOx (lbs/year)	CO (lbs/year)	ROC (lbs/year)	PM10 (lbs/year)	SOx (lbs/year)	NH3 (lbs/year)
New GT Commissioning	366	various	various	various	various	various	17.17	23,394	63,486	7,038	3,977	1,891	6,284
New GT Start-Up	200	98.68	178.38	20.26	9.00	1.81	17.17	19,736	35,676	4,052	1,800	361	3,434
New GT Normal Operation	1,030	23.26	22.66	6.49	10.60	1.81	17.17	23,958	23,340	6,684	10,918	1,860	17,685
New GT Shutdown	200	22.69	163.21	30.21	9.98	1.81	17.17	4,538	32,642	6,043	1,996	361	3,434
New GT Total =	**1,796**							**71,625**	**155,143**	**23,816**	**18,691**	**4,473**	**30,837**
New Emergency Generator Engine	200	0.86	4.48	0.24	0.04	0.01	0.00	172	896	49	8	2	
New Natural Gas Compressor										96			
Existing Unit 3(2)								4,119	10,228	669	1,798	53	n/a
Total New Equipment Annual Emissions (lb/year) =								**71,797**	**156,040**	**23,961**	**18,699**	**4,475**	**30,837**
Total New Equipment Annual Emissions (tons/year) =								**35.9**	**78.0**	**12.0**	**9.3**	**2.2**	**15.4**
Total New Gas Turbine Annual Emissions (tons/year) =								**35.8**	**77.6**	**11.9**	**9.3**	**2.2**	**15.4**
Total New Emergency Engine Annual Emissions (tons/year) =								**0.1**	**0.4**	**0.0**	**0.0**	**0.0**	**0.0**
Total New Gas Compressor Annual Emissions (tons/year) =										**0.0**			
Total Entire Facility Annual Emissions (tons/year) =								**38.0**	**83.1**	**12.3**	**10.2**	**2.3**	**15.4**

Notes:

(1) Set hourly startup/shutdown emission rate to 100% load normal emission level to determine worst case annual emissions for AQ modeling purposes.

(2) Based on 2-year average of actual annual emissions during 2012 and 2013.

Table B-11
Puente Power Project
Annual Emissions - Non-Commissioning Year

	Hours per Year	NOx (lbs/hr)	CO (lbs/hr)	ROC (lbs/hr)	PM10 (lbs/hr)	SOx(1) (lbs/hr)	NH3(1) (lbs/hr)	NOx (lbs/year)	CO (lbs/year)	ROC (lbs/year)	PM10 (lbs/year)	SOx (lbs/year)	NH3 (lbs/year)
New GT Start-Up	200	98.68	178.38	20.26	9.00	1.81	17.17	19,736	35,676	4,052	1,800	361	3,434
New GT Normal Operation	2,053	23.26	22.66	6.49	10.60	1.81	17.17	47,753	46,521	13,322	21,762	3,708	35,250
New GT Shutdown	200	22.69	163.21	30.21	9.98	1.81	17.17	4,538	32,642	6,043	1,996	361	3,434
New GT Total =	**2,453**							**72,026**	**114,839**	**23,416**	**25,558**	**4,430**	**42,118**
New Emergency Generator Engine	200	0.86	4.48	0.24	0.04	0.01		172	896	49	8	2	
New Natural Gas Compressor										96			
Existing Unit 3(2)								4,119	10,228	669	1,798	53	n/a
Total New Equipment Annual Emissions (lb/year) =								**72,198**	**115,735**	**23,561**	**25,565**	**4,432**	**42,118**
Total New Equipment Annual Emissions (tons/year) =								**36.1**	**57.9**	**11.8**	**12.8**	**2.2**	**21.1**
Total New Gas Turbine Annual Emissions (tons/year) =								**36.0**	**57.4**	**11.7**	**12.8**	**2.2**	**21.1**
Total New Emergency Engine Annual Emissions (tons/year) =								**0.1**	**0.4**	**0.0**	**0.0**	**0.0**	
Total New Gas Compressor Annual Emissions (tons/year) =										**0.0**			
Total Entire Facility Annual Emissions (tons/year) =								**38.2**	**63.0**	**12.1**	**13.7**	**2.2**	**21.1**

Notes:

(1) Set hourly startup/shutdown emission rate to 100% load normal emission level to determine worst case annual emissions for AQ modeling purposes.

(2) Based on 2-year average of actual annual emissions during 2012 and 2013.

Table B-12
Puente Power Project
Hourly Emissions for Existing Units 1-3

Device	Unit 1	Unit 2	Unit 3 Gas Turbine
Fuel	Natural Gas	Natural Gas	Natural Gas
Maximum Power Rating (MW)	215	215	130
Maximum Heat Input (MMBtu/hr)	1900	1900	2510
Natural Gas F-factor (dscf/MMBtu)	8710	8710	8710
Natural Gas F-factor (wscf/MMBtu)	10610	10610	10610
Reference O2	3.0%	3.0%	15.0%
Actual O2	8.0%	6.6%	16.9%
Exhaust Temperature (F)	194	181	712
Exhaust Rate (dscfm @ ref. O2)	322,043	322,043	1,290,729
Exhaust Rate (wacfm @ actual O2)	673,202	595,313	5,122,144

	Emission Factors					
Pollutant	NOx (lb/MMscf)	CO (lb/MMscf)	ROC (lb/MMscf)	PM10 (lb/MMscf)	SOx (lb/MMscf)	NH3 (lb/MMscf)
Unit 1[1]	3.42	40.00	1.40	2.50	0.60	--
Unit 2[1]	4.68	40.00	1.40	2.50	0.60	--
Unit 3 Gas Turbine[2]	462.00	115.50	7.56	20.30	0.60	n/a

	Hourly Emissions[3]					
Unit	NOx (lbs/hr)	CO (lbs/hr)	ROC (lbs/hr)	PM10 (lbs/hr)	SOx (lbs/hr)	NH3 (lbs/hr)[4]
Unit 1	6.35	75.81	2.66	4.74	1.14	8.91
Unit 2	8.71	75.81	2.66	4.74	1.14	8.91
Unit 3 Gas Turbine	1104.41	276.10	18.07	48.53	1.43	n/a

Notes:
1. For NOx , based on a 2-Year average of CEMS data 2012 to 2013. CO, ROC, Sox, PM10 emission factors based on VCAPCD inventory factors.
2. Nox, CO, ROC, Sox, and PM10 emissions factors based on VCAPCD inventory factors.
3. Hourly emissions based on emission factors and maximum hourly heat input.
4. NH3 emissions based on Title V emission limits.

Table B-13-1: Mandalay Generating Station - Baseline NOx emissions (tons/year)

	2009	2010	2011	2012	2013	2014
U1	1.15	0.55	0.29	1.97	1.79	1.67
U2	3.32	1.40	0.40	2.77	3.30	1.92
U3	2.08	0.99	0.71	2.55	1.57	0.51
Total =	6.55	2.94	1.39	7.29	6.66	4.09
Total Units 1 + 2 =	4.47	1.95	0.68	4.75	5.09	3.58
2-Year Average (all) =		4.74	2.16	4.34	6.98	5.38
2-Yr Avg. Units 1 + 2 =		3.21	1.32	2.71	4.92	4.34
2-Yr Avg. Unit 1 =		0.85	0.42	1.13	1.88	1.73
2-Yr Avg. Unit 2 =		2.36	0.90	1.59	3.04	2.61
2-Yr Avg. Unit 3 =		1.53	0.85	1.63	2.06	1.04

Notes:
1. Units 1 and 2 based on hourly CEMS data.
2. Unit 3 based on VCAPCD emission inventories (2014 based on fuel use and VCAPCD emission factor)

Table B-13-2: Mandalay Generating Station - Baseline CO emissions (tons/year)

	2009	2010	2011	2012	2013	2014
U1	32.61	6.29	6.68	22.80	21.26	15.37
U2	33.81	11.75	10.16	23.31	28.58	16.95
U3	5.16	2.45	1.76	6.33	3.90	1.26
Total =	71.57	20.49	18.60	52.44	53.74	33.58
Total Units 1 + 2 =	66.42	18.04	16.84	46.11	49.84	32.32
2-Year Average (all) =		46.03	19.54	35.52	53.09	43.66
2-Yr Avg. Units 1 + 2 =		42.23	17.44	31.48	47.98	41.08
2-Yr Avg. Unit 1 =		19.45	6.49	14.74	22.03	18.32
2-Yr Avg. Unit 2 =		22.78	10.95	16.73	25.95	22.76
2-Yr Avg. Unit 3 =		3.80	2.10	4.04	5.11	2.58

Notes:
1. 2009 to 2013 based on VCAPCD emission inventories.
2. 2014 based on fuel use and VCAPCD emission factors.

Table B-13-3: Mandalay Generating Station - Baseline ROC emissions (tons/year

	2009	2010	2011	2012	2013	2014
U1	1.14	0.22	0.23	0.80	0.74	0.54
U2	1.18	0.41	0.36	0.82	1.00	0.59
U3	0.34	0.16	0.11	0.41	0.26	0.08
Total =	2.66	0.79	0.70	2.03	2.00	1.21
Total Units 1 + 2 =	2.32	0.63	0.59	1.61	1.74	1.13
2-Year Average (all) =		1.73	0.75	1.37	2.01	1.61
2-Yr Avg. Units 1 + 2 =		1.48	0.61	1.10	1.68	1.44
2-Yr Avg. Unit 1 =		0.68	0.23	0.52	0.77	0.64
2-Yr Avg. Unit 2 =		0.80	0.38	0.59	0.91	0.80
2-Yr Avg. Unit 3 =		0.25	0.14	0.26	0.33	0.17

Notes:
1. 2009 to 2013 based on VCAPCD emission inventories.
2. 2014 based on fuel use and VCAPCD emission factors.

Table B-13-4: Mandalay Generating Station - Baseline SOx emissions (tons/year)

	2009	2010	2011	2012	2013	2014
U1	0.49	0.09	0.10	0.34	0.32	0.23
U2	0.51	0.18	0.15	0.35	0.43	0.25
U3	0.03	0.01	0.01	0.03	0.02	0.01
Total =	1.02	0.28	0.26	0.72	0.77	0.49
Total Units 1 + 2 =	1.00	0.27	0.25	0.69	0.75	0.48
2-Year Average (all) =		0.65	0.27	0.49	0.75	0.63
2-Yr Avg. Units 1 + 2 =		0.63	0.26	0.47	0.72	0.62
2-Yr Avg. Unit 1 =		0.29	0.10	0.22	0.33	0.27
2-Yr Avg. Unit 2 =		0.34	0.16	0.25	0.39	0.34
2-Yr Avg. Unit 3 =		0.02	0.01	0.02	0.03	0.01

Notes:

1. 2009 to 2013 based on VCAPCD emission inventories.
2. 2014 based on fuel use and VCAPCD emission factors.

Table B-13-5: Mandalay Generating Station - Baseline PM10 emissions (tons/year)

	2009	2010	2011	2012	2013	2014
U1	2.04	0.39	0.42	1.43	1.33	0.96
U2	2.11	0.73	0.63	1.46	1.79	1.06
U3	0.91	0.43	0.31	1.11	0.69	0.22
Total =	5.06	1.56	1.36	3.99	3.80	2.24
Total Units 1 + 2 =	4.15	1.13	1.05	2.88	3.12	2.02
2-Year Average (all) =		3.31	1.46	2.68	3.90	3.02
2-Yr Avg. Units 1 + 2 =		2.64	1.09	1.97	3.00	2.57
2-Yr Avg. Unit 1 =		1.22	0.41	0.92	1.38	1.14
2-Yr Avg. Unit 2 =		1.42	0.68	1.05	1.62	1.42
2-Yr Avg. Unit 3 =		0.67	0.37	0.71	0.90	0.45

Notes:
1. 2009 to 2013 based on VCAPCD emission inventories.
2. 2014 based on fuel use and VCAPCD emission factors.

Table B-13-6: Mandalay Generating Station - Fuel Use (MMSCF)

		2009	2010	2011	2012	2013	2014
U1	Natural Gas	1630.4	314.3	334.2	1140.2	1063.2	768.6
U2	Natural Gas	1690.4	587.6	507.8	1165.5	1429.0	847.5
U3	Natural Gas	89.3	42.4	30.4	109.6	67.5	21.8
Total (all) =		3410.1	944.3	872.4	2415.3	2559.7	1637.9
Total Units 1 + 2 =		3320.8	901.9	842.0	2305.7	2492.2	1616.0
2-Year Average (all) =			2177.20	908.35	1643.85	2487.50	2098.79
2-Yr Avg. Units 1 + 2 =			2111.35	871.95	1573.85	2398.95	2054.12
2-Yr Avg. Unit 1 =			972.35	324.25	737.20	1101.70	915.89
2-Yr Avg. Unit 2 =			1139.00	547.70	836.65	1297.25	1138.23
2-Yr Avg. Unit 3 =			65.85	36.40	70.00	88.55	44.67

Notes:
1. 2009 to 2013 based on VCAPCD emission inventory fuel use values.
2. 2014 based on fuel use data collected by the power plant.

Table B-14
Puente Power Project
Net Emission Changes For PSD Applicability Purposes
Based on Representative 2-year Average during Past 5 Years

	Emissions (tons/year)					
	NOx Emissions	CO Emissions	ROC Emissions	PM10 Emissions	PM2.5 Emissions	SOx Emissions
Emissions New Equipment =	36.1	57.9	11.8	12.8	12.8	2.2
Emission Reductions Units 1 and 2[1] =	4.9	48.0	1.7	3.0	3.0	0.7
Net Emission Change =	31.2	9.9	10.1	9.8	9.8	1.5
Major Modification Thresholds[1] =	40	100	40	15	10	40
Major Modification?	no	no	no	no	no	no
Triggers PSD?	no	no	no	no	no	no

Notes:

1. Based on representative two-year average (2012 to 2013) emissions during the past 5-years (see 40 CFR 52.21.b.21.i).
2. Based on 40 CFR 52.21.b.2.i and 40 CFR 52.21.b.23.i.

Table B-15
Puente Power Project
Net Emission Changes For NSR Applicability Purposes

	Emissions (tons/year) NOx Emissions	CO Emissions	ROC Emissions	PM10 Emissions	PM2.5 Emissions	SOx Emissions
To Determine If Project is a Major Modification Under NSR Regulations						
Emissions New Equipment =	36.1	57.9	11.8	12.8	N/A	2.2
Emission Reductions Units 1 and 2[1] =	4.9	48.0	1.7	3.0	N/A	0.7
Net Emission Change =	31.2	9.9	10.1	9.8	N/A	1.5
Major Modification Thresholds[2] =	25	N/A	25	N/A	N/A	N/A
Major Modification?	Yes	N/A	No	N/A	N/A	N/A
To Determine ERC Requirements Under NSR Regulations (Using Replacement Emission Unit Approach)						
Emissions New GT =	36.0	57.4	11.7	12.8	N/A	2.2
Emission Reductions Units 1 and 2[3] =	4.9	644.4	23.2	41.5	N/A	10.0
Net Emission Change GT[4] =	31.1	-587.0	-11.5	-28.7	N/A	-7.7
Emissions New Emergency Generator Engine =	0.09	0.45	0.02	0.00	N/A	0.00
Emission Reductions Existing Generator Engine5 =	0.00	0.12	0.01	0.00	N/A	0.00
Net Emission Change Engine[4] =	0.08	0.33	0.02	0.00	N/A	0.00
Facility-Wide Net Emission Change =	31.2	-586.7	-11.5	-28.7	N/A	-7.7
Is There An Emissions Increase?	Yes	N/A	No	No	N/A	No
ERC Requirement Triggered?	Yes	N/A	No	No	N/A	No
Offset Ratio6 =	1.3	N/A	N/A	N/A	N/A	N/A
ERCs Required =	40.5	N/A	N/A	N/A	N/A	N/A
ERCs Controlled by Applicant =	52.7	N/A	N/A	N/A	N/A	N/A
Surplus/Shortfall =	-12.2	N/A	N/A	N/A	N/A	N/A

Notes:
1. Based on representative two-year average (2012 to 2013) emissions during the past 5-years.
2. Based on VCAPCD Rule 26.1.
3. For NOx, based on representative two-year average (2012 to 2013) emissions during the past 5-years. For CO, ROC, SOx, PM10 based on PTE levels using Title V permit annual emission limits with CO PTE corrected to a BACT level of 50 ppm @ 3% O2 (other pollutants meet current BACT levels).
4. VCAPCD Rule 26.6(D)(2) -for CO, SOx, and PM 10 emission increases for a replacement emissions unit calculated as the emissions unit's post-project potential to emit (adjusted to reflect current BACT) minus the emissions unit's pre-project potential to emit (adjusted to reflect current BACT). Because the project is a major modification for NOx, the NOx emission increase is calculated as the emissions unit's post-project potential to emit minus the unit pre-project actual emissions (per VCAPCD Rule 26.6(D)(7)(a)).
5. For NOx based on representative two-year average (2012 to 2013) emissions during the past 5-years. For CO, ROC, SOx, PM10 based on PTE corrected to current BACT levels assuming 200 hrs/year of operation (all types of operating including testing).
6. Per VCAPCD Rule 26.2(B)(2)(a).

Table B-16
Puente Power Project
Greenhouse Gas Emissions Calculations

Unit	Total Number of Units	Per Unit Heat Input (MMBtu/hr)	Per Unit Gross Output (MW)	Operating Hours per year	Annual Fuel Use (MMBtu/yr)	Estimated Annual Gross MWh	Maximum Emissions, metric tonnes/yr				Facility-Wide Emissions, MT/yr CO2e	Facility-Wide Emissions, tons/yr CO2e	New GT CO2 MT/MWh	New GT CO2 lbs/MWh
							CO2	CH4	N2O	SF6				
New Gas Turbine	1	2,579	278.0	2,453	6,326,518	681,934	335,685	6	1	--				
New Emergency Generator Engine	1	4.9		200	976	n/a	72	0	0	--				
Existing Unit 3 Gas Turbine	1	2,510			90,450	n/a	4,799	0	0	--				
New circuit breakers	2	--		8760	0	n/a	--	--	--	4.2E-04				
Total =				--	6,417,945	681,934	340,557	6	1	4.2E-04				
CO2-Equivalent =							340,557	160	191	10	340,918	375,794	0.49	1,085

Fuel	Emission Factors, kg/MMBtu			Emission Factor
	CO2 (1)	CH4 (2)	N2O (2)	SF6 (4)
Natural Gas	*53.060*	*1.00E-03*	1.00E-04	n/a
Diesel Fuel	*73.960*	3.00E-03	6.00E-04	n/a
Global Warming Potential (3)	1	25	298	22,800

Notes:
1. 40 CFR 98, Table C-1 (revised 11/29/13).
2. 40 CFR 98, Table C-2 (revised 11/29/13).
3. 40 CFR 98, Table A-1 (revised 11/29/13).
4. Sulfur hexafluoride (SF6) will be used as an insulating medium in two circuit breakers. The SF6 contained in one of the circuit breakers is approximately 24 lbs and the remaining breaker will contain approximately 161 lbs. The IEC standard for SF6 leakage is less than 0.5%; the NEMA leakage standard for new circuit breakers is 0.1%. A maximum leakage rate of 0.5% per year is assumed.

Table B-17
Puente Power Project
Nitrogen Emission Rates - New Equipment

New Gas Turbine		
NOx emission rate =	36.01	tpy
N/NO2 molecular weight ratio (14/46) =		0.3043478
N emission rate from NOx =	10.96	tpy
	0.32	g/s
NH3 emission rate =	21.06	tpy
N/NH3 molecular weight ratio (14/17) =		0.8235294
N emission rate from NH3 =	17.34	tpy
	0.50	g/s
Total N emission rate (N from NOx plus N from ammonia) =	28.30	tpy
Total N emission rate (N from NOx plus N from ammonia) =	0.81	g/s
Emergency Engine		
NOx emission rate =	0.09	tpy both units
N/NO2 molecular weight ratio (14/46) =		0.3043478
N emission rate from NOx =	0.03	tpy both units
	0.00	g/s both units
Total N emission rate for new GT, new/existing engines, existing Unit 3 (N from NOx plus N from ammonia) =	28.33	tpy

Table B-18
Puente Power Project
Nitrogen Emission Rates - Existing Units 1 and 2

NOx emission rate for Units 1 and 2, 5-year avg. (tpy)=	3.21	tpy
NOx emission rate for Units 1 and 2, 10-year avg. (tpy)=	5.88	tpy
N/NO2 molecular weight ratio (14/46) =		0.3043478
N emission rate from NOx, 5-year avg. (tpy) =	0.98	tpy
N emission rate from NOx, 10-year avg. (tpy) =	1.79	tpy
NH3 emission rate for Units 1 and 2, 5-year avg. (tpy) =	3.91	tpy
NH3 emission rate for Units 1 and 2, 10-year avg. (tpy) =	6.89	tpy
N/NH3 molecular weight ratio (14/17) =		0.8235294
N emission rate from NH3, 5-year avg. (tpy) =	3.22	tpy
N emission rate from NH3, 10-year avg. (tpy) =	5.67	tpy
Total N emission rate for Units 1 and 2 (N from NOx plus N from ammonia), 5-yr avg. =	4.20	tpy
Total N emission rate for Units 1 and 2 (N from NOx plus N from ammonia), 10-yr avg. =	7.46	tpy

APPENDIX C

BACT ANALYSIS

Appendix C
Best Available Control Technology Analysis

The new combustion turbine generator (CTG) and emergency engine proposed for the Puente Power Project (P3) are required to use best available control technology (BACT) in accordance with the requirements of Ventura County Air Pollution Control District (VCAPCD or District) rules. BACT is defined in VCAPCD Rule 26.1(3):

> *"**Best Available Control Technology (BACT)**": The most stringent emission limitation or control technology for an emissions unit which:*
>
> a. *Has been achieved in practice for such emissions unit category, or*
>
> b. *Is contained in any implementation plan approved by the Environmental Protection Agency for such emissions unit category. A specific limitation or control shall not apply if the owner or operator of such emissions unit demonstrates to the satisfaction of the Air Pollution Control Officer (APCO) that such limitation or control technology is not presently achievable, or*
>
> c. *Is contained in any applicable New Source Performance Standard or National Emission Standard for Hazardous Air Pollutants set forth in 40 CFR Parts 60 and 61, or*
>
> d. *Any other emission limitation or control technology, including, but not limited to, replacement of such emissions unit with a lower emitting emissions unit, application of control equipment or process modifications, determined by the APCO to be technologically feasible for such emissions unit and cost effective as compared to the BACT cost effectiveness threshold adopted by the Ventura County Air Pollution Control Board.*
>
> *In defining emissions unit categories, the APCO may take into account the function of the emissions unit, the capacity of the emissions unit, the annual throughput of the emissions unit and the location of the emissions unit with respect to electricity or fuels needed to achieve an emission limitation or control technology.*

As discussed in Section III of the permit application package, the P3 CTG and emergency generator engine will not trigger PSD review (including BACT requirements). However, the CTG and emergency engine will trigger District NSR BACT requirements for NOx, reactive organic compounds (ROC), SOx, and PM_{10}. The emission rates and control technologies determined to be BACT for this project are discussed in detail in the following sections. For the CTG, separate determinations are provided for normal operation and startup/shutdown operation. BACT is assessed using EPA's Top-Down methodology.

Steps in a Top-Down BACT Analysis

Step 1 – Identify All Possible Control Technologies

The first step in a top-down analysis is to identify, for the emissions unit and pollutant in question, all available control options. Available control options are those air pollution control technologies or techniques, including alternate basic equipment or processes, with a practical potential for application to the emissions unit in question. The control alternatives should include not only existing controls for the source category in question, but also, through technology transfer, controls applied to similar source categories and gas streams.

BACT must be at least as stringent as what has been achieved in practice (AIP) for a category or class of source. Additionally, EPA guidelines require that a technology that is determined to be AIP for one category of source be considered for transfer to other source categories. There are two types of potentially transferable control technologies: (1) exhaust stream controls, and (2) process controls and modifications. For the first type, technology transfer must be considered between source categories that produce similar exhaust streams. For the second type, technology transfer must be considered between source categories with similar processes.

Candidate control options that do not meet basic project requirements (i.e., alternative basic designs that "redefine the source") are eliminated at this step.

Step 2 – Eliminate Technologically Infeasible Options

To be considered, the candidate control option must be technologically feasible for the application being reviewed.

Step 3 – Rank Remaining Control Options by Control Effectiveness

All feasible options are ranked in the order of decreasing control effectiveness for the pollutant under consideration. In some cases, a given control technology may be listed more than once, representing different levels of control (e.g., the use of SCR for control of NOx may be evaluated at 2 and 2.5 parts per million by volume, dry [ppmvd], @ 15% O_2). Any control option less stringent than what has been already achieved in practice for the category of source under review must also be eliminated at this step.

Step 4 – Evaluate Most Effective Control Technology Considering Environmental, Energy, and Cost Impacts

To be required as BACT, the candidate control option must be cost effective, considering energy, environmental, economic, and other costs. The most stringent control technology for control of one pollutant may have other undesirable environmental or economic impacts. The purpose of Step 4 is to validate the suitability of the top control option or provide a clear justification as to why that option should not be selected as BACT.

Once all of the candidate control technologies have been ranked, and other impacts have been evaluated, the most stringent candidate control technology is deemed to be BACT, unless the other impacts are unacceptable.

Step 5 – Determine BACT/Present Conclusions

BACT is determined to be the most effective control technology subject to evaluation, and not rejected as infeasible or having unacceptable energy, environmental, or cost impacts.

BACT for the Gas Turbine: Normal Operations

NOx Emissions

Step 1 – Identify All Possible Control Technologies

The emission unit for which BACT is being considered is a nominal 262 MW (net nominal) simple-cycle CTG (GE 7HA.01)

Potential NOx control technologies were identified by searching the following sources for determinations pertaining to combustion gas turbines:

- VCAPCD BACT Guidance;
- South Coast Air Quality Management District (SCAQMD) BACT Guidelines;
- San Joaquin Valley Air Pollution Control District (SJVAPCD) BACT Clearinghouse;
- Bay Area Air Quality Management District (BAAQMD) BACT Guidelines;
- EPA Reasonably Available Control Technology (RACT)/BACT/ Lowest Achievable Emission Rate (LAER) Clearinghouse;
- Other district and state BACT Guidelines; and
- BACT/LAER requirements in New Source Review permits issued by a local air district[3] or other air pollution control agency.

Listed below are the technologies for control of NOx that were identified as a result of this search.

- Low NOx burner design (e.g., dry low NOx (DLE) combustors)
- Water or steam injection
- Inlet air coolers
- A Selective Catalytic Reduction (SCR) system capable of continuously complying with a limit of 2.0 ppmvd @15% oxygen (O_2) (1-hour average)
- An EMx (formerly SCONOx) system capable of continuously complying with a limit of 2.0 ppmvd @15% O_2 (1-hour average)
- Selective Non-Catalytic Reduction (SNCR) capable of continuously complying with a limit of 4.5 ppmvd @15% O_2 (1-hour average)

[3] Any air quality management district or air pollution control district in California.

- Alternative Basic Equipment:
    - Renewable Energy Source (e.g., solar, wind, etc.)
    - Combined-Cycle Turbine

It should be noted that the use of renewable energy in lieu of a simple-cycle gas turbine would "redefine the source." Renewable energy facilities require significantly more land to construct, and need to be located in areas with very specific characteristics. Wind and solar facilities have power generation profiles that cannot match demand; conventional power plants are needed in order to follow demand. The capital costs for wind or solar facilities are substantially higher than for a comparable conventional facility, making financing of such a project significantly different. Finally, one of the fundamental objectives of the proposed P3 is to provide firming capacity for renewable energy facilities, making the use of renewable energy for the project fundamentally incompatible with the project objective. Nevertheless, these technologies are theoretically feasible, and the technical feasibility of renewable energy sources for this specific application will be considered in Step 2.

Step 2 – Eliminate Technologically Infeasible Options

Exhaust Stream Controls

The most recent NOx BACT listings for simple-cycle combustion turbines in this size range are summarized in Table C-1. The most stringent NOx limit in these recent BACT determinations is a 2.5 ppm[4] limit averaged over a 1-hour averaging period, excluding startups and shutdowns. This level is achieved using water injection and SCR. The GE 7HA.01 gas turbine proposed for this project will use dry low-NOx (DLE) emissions technology, which yields turbine-out NOx concentrations as low as 25 ppmvd @ 15% O_2 which is comparable to the turbine-out NOx levels for current generation water injected gas turbines.

[4] All turbine/HRSG (heat recovery steam generator) exhaust emissions concentrations shown are by volume, dry corrected to 15% O_2.

Table C-1
Recent NOx BACT Determinations for Simple-Cycle Combustion Turbines

Facility	District	NOx Limit[a]	Averaging Period	Control Method Used	Date Permit Issued	Source
EI Colton (LM6000)	SCAQMD	3.5 ppmvd	3 hrs	Water injection and SCR	1/10/2003	SCAQMD website
MID Ripon (LM6000)	SJVAPCD	2.5 ppmvd	3 hrs	Water injection and SCR	2004	ATC
SF Electric Reliability Project (LM6000)	BAAQMD	2.5 ppmvd	1 hr	Water injection and SCR	2/8/2006 (FDOC)	CEC website
EIF Panoche (LMS100)	SJVAPCD	2.5 ppmvd	1 hr	Water injection and SCR	7/13/2007 (FDOC)	CEC website
Walnut Creek Energy (LMS100)	SCAQMD	2.5 ppmvd	1 hr	Water injection and SCR	2/27/2008	FDOC
Miramar Energy Facility II (LM6000)	SDAPCD	2.5 ppmvd	3 hrs	Water injection and SCR	11/4/2008	ATC
Orange Grove Energy, LLP (LM6000)	SDAPCD	2.5 ppmvd	1 hr	Water injection and SCR	12/4/2008	CEC website
El Cajon Energy, LLC (LM6000)	SDAPCD	2.5 ppmvd	1 hr	Water injection and SCR	12/11/2009	ATC
TID Almond 2 Power Plant (LM6000)	SJVAPCD	2.5 ppmvd	1 hr	Water injection and SCR	2/16/2010	FDOC
CPV Sentinel (LMS100)	SCAQMD	2.5 ppmvd	1 hr	Water injection and SCR	12/1/2010	FDOC
Mariposa Energy Project (LM6000)	BAAQMD	2.5 ppmvd	1 hr	Water injection and SCR	Nov. 2010	FDOC
Pio Pico Energy Center (LMS100)	SDAPCD	2.5 ppmvd	1 hr	Water injection and SCR	9/12/2012	FDOC
El Segundo Power Facility Modification (Rolls Royce Trent 60)	SCAQMD	2.5 ppmvd	1 hr	Water injection and SCR	8/26/2014	FDOC

Note:
a. All concentrations expressed as parts per million by volume dry, corrected to 15% O_2.

The SCR system uses ammonia injection to reduce NOx emissions. SCR systems have been widely used in simple-cycle gas turbine applications of all sizes. The SCR process involves the injection of ammonia into the flue gas stream via an ammonia injection grid upstream of a reducing catalyst. The ammonia reacts with the NOx in the exhaust stream to form N_2 and water vapor. The catalyst does not require regeneration, but must be replaced periodically; typical SCR catalyst lifetimes are in excess of three years.

Either SCR or EMx technology is capable of achieving a NOx emission level of 2.5 ppmvd @ 15% O_2. Neither has been demonstrated to consistently achieve lower emission levels in simple-cycle turbines in demand-response service. Both technologies are evaluated further in Step 3.

Alternative Basic Technology

- *Combined Cycle Gas Turbines* – The use of combined-cycle turbines instead of the proposed simple-cycle turbine would be technically infeasible for the project. The simple-cycle turbine is needed to effectively handle variable loads and perform multiple startups/shutdowns per day. While advanced combined-cycle turbines can start relatively quickly (within approximately 12 minutes to reach 100% rated capacity of the gas turbine generator), they may need as much as 2 hours to reach full combined cycle output (combined output of gas turbine and steam turbine generators).[5] While operating in simple cycle mode (while waiting for the steam system to warm up), fast-start combined cycle units will have efficiencies that are no better than, and potentially worse than, those achieved with advanced simple cycle turbines such as the GE 7HA.01. In addition, advanced combined-cycle gas turbines require an auxiliary steam source to achieve fast startup times. This steam must be provided by an auxiliary boiler, which would be an additional source of emissions and is not a part of this project. Finally, such units cannot perform up to four starts per day—as required for this project—without substantially shortening the life of the unit. Therefore, combined-cycle turbines are eliminated because they do not meet the basic project requirements.

- *Solar Thermal* – Solar thermal facilities collect solar radiation, then heat a working fluid (water or a hydrocarbon liquid) to create steam to power a steam turbine generator. All solar thermal facilities require considerable land for the collection field and are best located in areas of high solar incident energy per unit area. In addition, power is generated only while the sun shines, so the units do not supply power at night or on cloudy days. The P3 parcel is not sufficiently large to be feasible for a commercial solar power plant. Furthermore, a solar power plant would not meet the project's objective of providing firming capability for intermittent renewable resources such as solar and wind energy projects. For these reasons, a solar thermal power plant is rejected as BACT for this application.

- *Wind* – Wind power facilities use a wind-driven rotor to turn a generator to generate electricity. Only limited sites in California have an adequate wind resource to allow for the economic construction and operation of large-scale wind generators. Most of these sites have already been developed or are remote from electric load centers and have little or no transmission access. Even in prime locations the wind does not blow continuously, so power is not always available. Due to the limited available space on the P3 parcel, limited dependability, and relatively high cost, this technology is not

[5] El Segundo Energy Center LLC, 00-AFC-014C: Petition to Amend, 4/23/13, Section 2.2.7

feasible for this project. Furthermore, a wind power plant would not meet the project's objective of providing firming capability for intermittent renewable resources such as solar and wind energy projects. For these reasons, a wind power plant is rejected as BACT for this application.

- *Other Alternatives* **–** A number of other alternative generating systems are described in the Alternatives Analysis Section of the Application for Certification (AFC) that will be filed with the California Energy Commissioning (CEC) in April 2015. These additional analyses failed to identify an alternative generating technology that was technically feasible for this site and that would meet the project's objectives.

Step 3 – Rank Remaining Control Technologies by Control Effectiveness

Both SCR and EMx technologies, each in combination with combustion controls, are capable of achieving a NOx emission level of 2.5 ppmvd @ 15% O_2. They are therefore ranked together in terms of control effectiveness, and the evaluation of these technologies continues in Step 4.

Step 4 – Evaluate the Most Effective Control Technology Considering Environmental, Energy, and Cost Impacts

The use of SCR will result in ammonia emissions due to an allowable ammonia slip limit of 5 ppmvd @ 15% O_2. A health risk screening analysis of the proposed project using air dispersion modeling has been prepared to demonstrate that both the acute health hazard index and the chronic health hazard index are much less than 1, based on an ammonia slip limit of 5 ppmvd @ 15% O_2. In accordance with currently accepted practice, a hazard index below 1.0 is not considered significant. Therefore, the toxic impact of the ammonia slip resulting from the use of SCR is deemed to be not significant, and is not a sufficient reason to eliminate SCR as a control alternative.

A second potential environmental impact that may result from the use of SCR involves the storage and transport of aqueous or anhydrous ammonia.[6] Although ammonia is toxic if swallowed or inhaled and can irritate or burn the skin, eyes, nose, or throat, it is a commonly used material that is typically handled safely and without incident. The project operator will be required to develop and maintain a Risk Management Plan (RMP) and to implement a Risk Management Program to prevent accidental releases of ammonia. The RMP provides information on the hazards of the substance handled at the facility and the programs in place to prevent and respond to accidental releases. The accident prevention and emergency response requirements reflect existing safety regulations and proven industry safety codes and standards. Thus, the potential environmental impact due to aqueous ammonia use at the project is minimal and does not justify the elimination of SCR as a control alternative.

Regeneration of the EMx catalyst is accomplished by passing hydrogen gas over an isolated catalyst module. The hydrogen gas is generated by reforming steam, so steam would be required. This would require installation of an auxiliary boiler, which is not

[6] The Project proposes to use the less concentrated, safer aqueous form of ammonia.

currently proposed for this project. There would also be additional natural gas consumption, and increased emissions, per megawatt hour of electricity produced associated with operation of the steam reformer.

"Achieved in Practice" Criteria

In general, the method for determining when emission control technologies are achieved in practice (AIP) is similar in each District. The SCAQMD has established formal criteria for determining when emission control technologies should be considered AIP for the purposes of BACT determinations. The criteria include the elements outlined below.

- *Commercial Availability* **–** At least one vendor must offer this equipment for regular or full-scale operation in the United States. A performance warranty or guarantee must be available with the purchase of the control technology, as well as parts and service.
- *Reliability* **–** All control technologies must have been installed and operated reliably for at least six months. If the operator did not require the basic equipment to operate daily, then the equipment must have at least 183 cumulative days of operation. During this period, the basic equipment must have operated (1) at a minimum of 50% design capacity; or (2) in a manner that is typical of the equipment in order to provide an expectation of continued reliability of the control technology.
- *Effectiveness* **–** The control technology must be verified to perform effectively over the range of operation expected for that type of equipment. If the control technology will be allowed to operate at lesser effectiveness during certain modes of operation, then those modes of operation must be identified. The verification shall be based on a performance test or tests, when possible, or other performance data.

Each of these criteria is discussed separately below for SCR and for EMx.

<u>SCR Technology</u> – SCR has been achieved in practice at numerous combustion turbine installations throughout the world. There are numerous simple-cycle gas turbine projects that limit NOx emissions to 2.5 ppmc using SCR technology, as shown in Table C-1. An evaluation of the proposed AIP criteria as applied to the achievement of 2.5 ppmc, and to extremely low NOx levels (below 2.5 ppmc) using SCR technology, is summarized below.

- Commercial Availability: Turbine-out NOx from the GE 7HA.01 gas turbine is generally guaranteed at 25 ppmc. Achieving a controlled NOx limit below 2.5 ppmc would require SCR technology to achieve reductions greater than 90 percent. Furthermore, because of the relatively high temperature of exhaust from simple-cycle turbines compared with combined-cycle units, there is a more limited selection of SCR technology available. Consequently, it is not clear that this criterion is satisfied for limits below 2.5 ppmc for the GE 7HA.01 gas turbine. As shown in Table C-1 above, this criterion is satisfied for gas turbines at a 2.5 ppmc permit level.

- Reliability: SCR technology has been shown to be capable of achieving NOx levels consistent with a 2.5 ppmc permit limit during extended, routine operations at many commercial power plants. There are no reported adverse effects of operation of the SCR system at these levels on overall plant operation or reliability. There has been no demonstration of operation at levels below 2.5 ppmc during extended, routine operation of simple-cycle gas turbines; consequently, this criterion is not satisfied for NOx limits below 2.5 ppmc.

- Effectiveness: SCR technology has been demonstrated to achieve NOx levels of 2.5 ppmc with turbines, but not at lower limits for this generating technology. Short-term excursions have resulted in NOx concentrations above the permitted level of 2.5 ppmc; however, these excursions are not frequent, and have not been associated with diminished effectiveness of the SCR system. Rather, these excursions typically have been associated with SCR inlet NOx levels in excess of those for which the SCR system was designed, or with malfunctions of the ammonia injection system. Consequently, this criterion is satisfied at a NOx limit of 2.5 ppmc, but not at lower NOx limits.

- Conclusion: SCR technology capable of achieving NOx levels of 2.5 ppmc is considered to be achieved in practice. The permit limits for the proposed project CTG include a NOx limit of 2.5 ppmc. This proposed limit is consistent with the available data. The AIP criteria are not met for SCR on simple-cycle gas turbines at NOx limits lower than 2.5 ppmc.

EMx Technology – EMx has been demonstrated in service in five applications: the Sunlaw Federal cogeneration plant, the Wyeth BioPharma cogeneration facility, the Montefiore Medical Center cogeneration facility, the University of California San Diego facility, and the City of Redding Power Plant. The combustion turbines at these facilities are much smaller than for the proposed project turbine, and none of the existing installations are simple-cycle turbines. The largest installation of the EMx system is at the Redding Power Plant. The Redding Power Plant includes two combined-cycle combustion turbines—a 43 MW Alstom GTX100 with a permitted NOx emission rate of 2.5 ppmc (Unit 5), and a 45 MW Siemens SGT 800 with a permitted NOx emission rate of 2.0 ppmc (Unit 6).

A review of NOx continuous emissions monitoring (CEM) data obtained from the EPA's Acid Rain program website[7] indicates a mean NOx level for the Redding Unit 5 of less than 1.0 ppm during the period from 2002 to 2007, but not continuous compliance with a 2.5 ppmc limit. After the first year of operation, Unit 5 experienced only a few hours of non-compliance per year (fewer than 0.1% of the annual operating hours exceed that plant's NOx permit limit of 2.5 ppmc). The experience at the Redding Power Plant indicates the ability of the EMx system to control NOx emissions to levels of 2.5 ppmc. These data do not indicate the ability to consistently achieve NOx levels below 2.0 ppm, notwithstanding the lower annual average emission rate. This is due to the cyclical nature of EMx NOx levels between plant shutdowns and scheduled catalyst cleanings.

Redding Unit 6 started up on October 2011. A review of annual Title V compliance certification reports for the unit indicates that the number of NOx emissions-related

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[7] Available at *http://camddataandmaps.epa.gov/gdm/index.cfm?fuseaction=prepackaged.results*.

deviations has declined between 2012 and 2014. The deviations during the early years were generally related to the inability of the EMx system to achieve control of NOx emissions within the 2-hour startup period allowed by the permit, and not to the any failure to maintain the 2.0 ppmc limit during routine operation. However, based on the fundamental design criterion of multiple daily startups of the P3 gas turbine, the startup issues experienced at Redding Unit 6 suggests that the EMx NOx control technology could not be successfully applied to the proposed project.

Based on this information, the following paragraphs evaluate the proposed AIP criteria as applied to the achievement of low NOx levels (2.5 ppmc) using EMx technology.

- Commercial Availability: While a proposal has not been sought, presumably EmeraChem would offer standard commercial guarantees for the proposed project. Consequently, this criterion is expected to be satisfied. However, no EMx units are currently in operation on simple-cycle units.

- Reliability: Redding Unit 5 was originally permitted with a 2.0 ppmc permit limit. It was subsequently found that the unit could not maintain compliance with a 2.0 ppmc limit on a consistent basis, and the limit was eventually changed to 2.5 ppmc. As discussed above, based on a review of the CEM data for Redding Unit 5, the EMx system complied with the 2.5 ppmc NOx permit limit but with a few hours each year of excess emissions (approximately 3% of annual operating hours following the first year, and approximately 2% following the second year, dropping to approximately 0.1% after 4 years). This level of performance was also associated with some significant operating and reliability issues. According to a June 23, 2005 letter from the Shasta County Air Quality Management District,[8] repairs to the EMx system began shortly after initial startup and have continued during several years of operation. Redesign of the EMx system was required due to a problem with the reformer reactor combustion production unit that led to sulfur poisoning of the catalyst, despite the sole use of low-sulfur, pipeline quality natural gas as the turbine fuel. In addition, the EMx system catalyst washings had to occur at a frequency several times higher than anticipated during the first three years of operation, which resulted in substantial downtime of the combustion turbine. Since the Redding Power Plant installation is the most representative of all of the EMx-equipped combustion turbine facilities for comparison to the proposed project, the problems encountered at the Redding plant bring into question the reliability of the EMx system for the proposed project. In addition, the EMx unit has not been demonstrated in use in a simple cycle application.

- Effectiveness: The EMx system at Redding Power Plant Unit 5 has recently been able to demonstrate compliance with a NOx level of 2.0 ppmc, and the new Redding Unit 6 has been permitted with a 2.0 ppmc NOx limit. As discussed above, the number of known excursions beyond the permit limit for Unit 6 has declined since the unit started up in 2011; however, there are no EMx-equipped facilities on simple-cycle facilities in demand-response service. In addition, Redding Unit 6 is a

[8] Letter dated June 23, 2005, from Shasta County Air Quality Management District to the Redding Power Plant regarding Unit 5 demonstration of compliance with its NOx permit limit.

combined-cycle unit. Consequently, due to the lack of actual performance data in a comparable installation, there is some question regarding the effectiveness of the EMx systems on simple-cycle, demand-response combustion turbine projects.

There are additional issues with the application of EMx technology to simple-cycle gas turbines. First, simple cycle turbines have significantly higher turbine exhaust gas temperatures (approximately 800°F) than the typical combined cycle temperature (around 500°F) at the location of the emission control systems. The higher temperature would require the use of tempering air fans to cool the exhaust gas before it reaches the EMx catalyst. Additionally, simple cycle units do not produce steam, which is needed as a carrier gas for the regeneration hydrogen. As a result, the project would have to add a small auxiliary steam boiler, which is not currently part of the facility. The auxiliary boiler would also use natural gas fuel and produce emissions, resulting in reduced overall plant efficiency as well as higher criteria and GHG emissions.

- Conclusion: EMx systems are capable of achieving NOx levels of 2.5 ppmc and potentially lower levels. However, the operating history does not support a conclusion that this technology is achieved in practice for simple-cycle, demand-response turbines, based on the above guidelines.

Summary of Achieved in Practice Evaluation

SCR's capability to consistently achieve 2.5 ppmc NOx (1-hour average) in simple-cycle turbines has been demonstrated by numerous installations. EMx's ability to consistently achieve a NOx emission rate below 2.5 ppmc in large turbines has not been demonstrated, nor has the technology been demonstrated in simple-cycle, demand-response service. An emission level of 2.5 ppmc NOx has therefore been achieved in practice, and any BACT determination must be at least as stringent as that.

Technologically Feasible/Cost Effective Criterion

No candidate technology with lower emission levels than those achieved in practice has been identified.

<u>Step 5 – Determine BACT/Present Conclusions</u>

BACT must be at least as stringent as the most stringent level achieved in practice, federal NSPS, or district prohibitory rule. Based upon the results of this analysis, the NOx BACT determinations of 2.5 ppmc on a 1-hour average basis made for recently permitted simple-cycle turbine projects in SCAQMD and SDAPCD reflect the most stringent NOx emission limit that has been achieved in practice. No more stringent level has been suggested as being technologically feasible. Therefore, BACT/LAER for NOx for this application is any technology capable of achieving 2.5 ppmc on a 1-hour average basis.

Both SCR and EMx are expected to achieve the proposed BACT NOx emission limit of 2.5 ppmc averaged over one hour. However, concerns remain regarding the long-term effectiveness of EMx as a control technology because the technology has not been demonstrated on the type of turbine used in this project—a simple-cycle demand-response application. For the reasons described in the "achieved in practice" discussion above, EMx technology is eliminated as BACT and SCR has been selected as the NOx control technology to be used for the project.

The gas turbine used for the proposed project will be designed to meet a NOx level of 2.5 ppmc on a 1-hour average basis using SCR.

ROC Emissions

Step 1 – Identify All Possible Control Technologies

Most ROCs emitted from natural gas-fired turbines are the result of incomplete combustion of fuel. Therefore, most of the ROCs are methane and ethane, which are not effectively controlled by an oxidation catalyst. However, oxidation catalyst technology designed to control CO can also provide some degree of control of ROC emissions, especially the more complex and toxic compounds formed in the combustion process. Therefore, the use of good combustion practices is generally considered BACT for ROC, with some additional benefit provided by an oxidation catalyst.

Alternative basic equipment—including renewable energy sources, such as solar and wind, and combined cycle technology—was already discussed above (Step 1 for NOx BACT on the CTGs). For the same reasons discussed above for NOx, solar, wind and other renewable energy sources are rejected as ROC BACT for this application.

Step 2 – Eliminate Technologically Infeasible Options

The only technology under consideration is combustion controls, with some additional benefit provided by an oxidation catalyst. This combination of technologies has been demonstrated to be feasible in many applications. No other technologies have been identified that are capable of achieving the same level of control. As a result, the goal of the rest of this analysis is to determine the appropriate emission limit that constitutes BACT for this application.

As shown in Table C-2, CARB's BACT guidance document for electric generating units rated at greater than 50 MW indicates that BACT for the control of ROC emissions for simple-cycle power plants is 2 ppmvd @ 15% O_2.

The BAAQMD's BACT guidelines do not include a BACT determination for ROC for simple-cycle turbines greater than 40 MW.

Table C-2
CARB BACT Guidance for Power Plants

Pollutant	BACT
Nitrogen Oxides	2.5 ppmv @ 15% O_2 (1-hour average) 2.0 ppmv @ 15% O_2 (3-hour average)
Sulfur Dioxide	Fuel sulfur limit of 1.0 grains/100 scf
Carbon Monoxide	Nonattainment areas: 6 ppmv @ 15% O_2 (3-hour average) Attainment areas: District discretion
ROC	2 ppmv @ 15% O_2 (3-hour average)
NH_3	5 ppmv @ 15% O_2 (3-hour average)
PM_{10}	Fuel sulfur limit of 1.0 grains/100 scf

The SJVAPCD's most recent BACT determination for ROC for gas turbines rated at larger than 47 MW with variable load and without heat recovery was for the Turlock Irrigation District (TID) Almond 2 Power Plant project. The SJVAPCD concluded that a ROC exhaust concentration of 2.0 ppmvd @ 15% O_2, 3-hour average basis, constituted BACT that is considered technologically feasible.

The SCAQMD's most recent BACT determination for ROC emissions from simple-cycle gas turbines was for the El Segundo Power Facility Modification. The SCAQMD determined that a ROC exhaust concentration of 2.0 ppmc, 1-hour average basis, was BACT for two 60 MW Rolls Royce Trent gas turbines.

In May 2012, the SDAPCD determined that 2.0 ppmc, 1-hour average basis, was BACT for ROC for the LMS100 gas turbines to be used at the Pio Pico Energy Center project. Published prohibitory rules from the BAAQMD, Sacramento Metropolitan AQMD (SMAQMD), San Diego APCD (SDAPCD), SJVAPCD, and SCAQMD were reviewed to identify the ROC standards that govern existing natural gas-fired simple-cycle combustion gas turbines. None of the prohibitory rules for combustion gas turbines specify an emission limit for ROC. The applicable NSPS (40 CFR 60 Subpart KKKK) does not include a ROC limit.

This "top-down" ROC BACT analysis will consider the following ROC emission limitations:

- 2 ppmvd @ 15% O_2

A summary of recent ROC BACT determinations is shown in Table C-3.

Table C-3
Recent ROC BACT Determinations for Simple-Cycle Combustion Turbines

Facility	District	ROC Limit[a]	Averaging Period	Control Method Used	Date Permit Issued	Source
EIF Panoche (LMS100)	SJVAPCD	2.0 ppmc	3 hrs	Oxidation Catalyst	7/13/2007 (FDOC)	CEC website
Starwood Midway Firebaugh/Panoche (P&W SwiftPac)	SJVAPCD	2.0 ppmc	3 hrs	Oxidation Catalyst	9/5/2007 (FDOC)	CEC website
Walnut Creek Energy (LMS100)	SCAQMD	2.0 ppmc	1 hr	Oxidation Catalyst	2/27/2008	FDOC
Orange Grove Energy, LLP (LM6000)	SDAPCD	2.0 ppmc	1 hr	Oxidation Catalyst	12/4/2008	CEC website
El Cajon Energy, LLC (LM6000)	SDAPCD	2.0 ppmc	1 hr	Oxidation Catalyst	12/11/2009	ATC
TID Almond 2 Power Plant (LM6000)	SJVAPCD	2.0 ppmc	3 hrs	Oxidation Catalyst	2/16/2010	FDOC
CPV Sentinel (LMS100)	SCAQMD	2.0 ppmc	1 hr	Oxidation Catalyst	12/1/2010	FDOC
Pio Pico Energy Center (LMS100)	SDAPCD	2.0 ppmc	1 hr	Oxidation Catalyst	9/12/2012	FDOC
El Segundo Power Facility Modification	SCAQMD	2.0 ppmc	1 hr	Oxidation Catalyst	8/26/2014	FDOC

Note:
a. All concentrations expressed as parts per million by volume dry, corrected to 15% O_2 (ppmc).

Step 3 – Rank Remaining Control Technologies by Control Effectiveness

The control technologies under consideration are ranked as follows:

- 2 ppmvd @ 15% O_2

Step 4 – Evaluate the Most Effective Control Technology Considering Environmental, Energy, and Cost Impacts

This step evaluates any source-specific environmental, energy, or economic impacts that demonstrate that the top alternative listed in the previous step is inappropriate as BACT. The Applicant has proposed to meet a 2.0 ppmvd limit on a 1-hour average basis. This level meets BACT.

Step 5 – Determine BACT/Present Conclusions

BACT must be at least as stringent as the most stringent achieved in practice, required in a federal NSPS or district prohibitory rule, or considered technologically feasible. Based upon the results of this analysis, the ROC emission limit of 2.0 ppmc is considered to be BACT for the proposed project.

Sulfur Oxide Emissions

Step 1 – Identify All Possible Control Technologies

Natural gas fired combustion turbines have inherently low SOx emissions due to the small amount of sulfur present in the fuel. With typical pipeline quality natural gas sulfur content well below 1 grain/100 scf, the SOx emissions for natural gas fired combustion turbines are orders of magnitude less than oil-fired turbines. Firing by natural gas, and the resulting control of SOx emissions, has been used by numerous combustion turbines throughout the world. Due to the prevalence of the use of natural gas to control SOx emissions from combustion turbines, only an abbreviated discussion of post-combustion controls will be addressed in this section.

Post-combustion SOx control systems include dry and wet scrubber systems. These types of systems are typically installed on high SOx emitting sources such as coal-fired power plants.[9]

Step 2 – Eliminate Technically Infeasible Options

All of the control options discussed above are technically feasible.

Step 3 – Rank Remaining Control Technologies by Control Effectiveness

The typical SOx control level for a well-designed wet or dry scrubber installed on a coal fired boiler ranges from approximately 70% to 90%,[10] with some installations achieving even higher control levels.

Step 4 – Evaluate Most Effective Controls and Document Results

The use of low sulfur content pipeline natural gas has been achieved in practice at numerous combustion turbine installations throughout the world, and the use of this fuel minimizes SOx emissions. While it would be theoretically feasible to install some type of post-combustion control such as a dry/wet scrubber system on a natural gas fired turbine, due to the inherently low SOx emissions associated with the use of natural gas, these systems are not cost effective and regulatory agencies do not require them. Consequently, no further discussion of post-combustion SOx control is necessary.

Step 5 – Determine BACT/Present Conclusions

BACT for this project is the use of pipeline-quality natural gas. The SOx control method for the proposed project is the use of pipeline-quality natural gas. Consequently, the proposed project is consistent with BACT requirements.

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[9] Although EmeraChem previously offered the ESx catalyst system, that product no longer appears to be on the market.
[10] Air Pollution Control Manual, Air and Waste Management Association, Second Edition, page 206.

$PM/PM_{10}/PM_{2.5}$ Emissions

Step 1 – Identify All Possible Control Technologies

Alternative basic equipment—including renewable energy sources, such as solar and wind—has also been identified as a potential option for the control of $PM/PM_{10}/PM_{2.5}$ emissions. Such alternative basic equipment was already discussed above (Step 1 for NOx BACT on the CTG). For the same reasons discussed above for NOx, solar, wind and other renewable energy sources are rejected as $PM_{10}/PM_{2.5}$ BACT for this application.

Achievable Controlled Levels and Available Control Options

PM emissions from natural gas-fired turbines primarily result from carryover of noncombustible trace constituents in the fuel. PM emissions are minimized by using clean-burning pipeline quality natural gas with low sulfur content.

The CARB BACT Clearinghouse, as well as the BAAQMD BACT guideline, identify the use of natural gas as the primary fuel as "achieved in practice" for the control of $PM_{10}/PM_{2.5}$ for combustion gas turbines.

CARB's BACT guidance document for stationary gas turbines used for power plant configurations[11] indicates that BACT for the control of PM emissions is an emission limit corresponding to natural gas with a fuel sulfur content of no more than 1 grain/100 standard cubic foot.

Title 40 CFR Part 60 Subpart KKKK contains the applicable NSPS for combustion gas turbines. Subpart KKKK does not regulate $PM_{10}/PM_{2.5}$ emissions.

Published prohibitory rules from the SCAQMD, SJVAPCD, SMAQMD, and units were reviewed to identify the PM_{10} standards that govern natural gas-fired combustion gas turbines. These prohibitory rules do not regulate $PM_{10}/PM_{2.5}$ emissions.

In the recently issued PSD permit for the Pio Pico project, EPA performed an extensive BACT analysis for PM. This analysis included a review of data specifically for the GE LMS100 simple cycle turbines. EPA considered what PM limit would be technically feasible to meet on an ongoing basis, in addition to reviewing source test data from GE LMS100 turbines installed at other locations and reviewing permit limits for other installations with the same model and size turbine, operated in simple-cycle mode. The most recent approved BACT $PM_{10}/PM_{2.5}$ limit for an LMS100 gas turbine is 5.0 lb/hr for Pio Pico Energy Center, as approved on February 28, 2014.[12] This is the lowest BACT $PM_{10}/PM_{2.5}$ limit approved for GE LMS100 simple-cycle turbines. This emission limit can be scaled to approximately 13.2 lbs/hr[13] for the larger GE 7HA.01 unit.

[11] Ibid, Table I-2.
[12] EPA PSD Permit for PPEC, http://www.regulations.gov/#!documentDetail;D=EPA-R09-OAR-2011-0978-0034
[13] Based on heat input rating of approximately 950 MMBtu/hr for GE LMS100 vs. 2,500 MMBtu/hr for GE 7HA.01 (2,500/950 x 5 lbs/hr = 13.2 lbs/hr).

The “top-down” $PM_{10}/PM_{2.5}$ BACT analysis will consider the following emission limitations:

GE 7HA.01

- 10.6 lb/hr

Step 2 – Eliminate Technologically Infeasible Options

As discussed above, solar, wind and other renewable energy alternatives are not considered technologically feasible for this application.

Step 3 – Rank Remaining Control Technologies by Control Effectiveness

No control technology other than use of clean natural gas fuel has been identified for this application.

Step 4 – Evaluate the Most Effective Control Technology Considering Environmental, Energy, and Cost Impacts

No control technology other than use of clean natural gas fuel has been identified for this application.

Step 5 – Determine BACT/Present Conclusions

Based upon the results of this analysis, the use of natural gas as the primary fuel source constitutes BACT for $PM_{10}/PM_{2.5}$ emissions from combustion gas turbines. Through the use of natural gas, the turbine is expected to be able to meet the proposed emission limits of 10.6 lbs/hr for the GE 7HA.01 turbine.

BACT for the Simple-Cycle CTGs: Startup/Shutdown

Startup and shutdown periods are a normal part of the operation of simple-cycle power plants such as the P3. BACT must also be applied during the startup and shutdown periods of gas turbine operation. The BACT limits discussed in the previous section apply to steady-state operation, when the turbine has reached stable operations and the emission control systems are fully operational.

NOx Emissions

Step 1 – Identify All Possible Control Technologies

The following technologies for control of NOx during startups and shutdowns have been identified:

- A Selective Catalytic Reduction (SCR) system capable of continuously complying with a limit of 2.5 ppmc (1-hour average);
- Fast-start technologies; and
- Operating practices to minimize the duration of startup and shutdown.

The GE 7HA.01 turbine proposed for this project is controlled by SCR, which will operate at all times that the stack temperature is in the proper operating range.

Step 2 – Eliminate Technologically Infeasible Options

During gas turbine startup, there are equipment and process requirements that must be met in sequential order to protect the equipment.

For all turbine technologies, incomplete combustion at low loads results in higher CO and ROC emission rates. Furthermore, the post-combustion controls that are used to achieve additional emissions reductions (SCR and oxidation catalyst) require that specific exhaust temperature ranges be reached to be fully effective. The use of SCR to control NOx is not technically feasible when the surface of the SCR catalyst is below the manufacturer’s recommended operating range. When catalyst surface temperatures are low, ammonia will not react completely with the NOx, resulting in excess NOx emissions or excess ammonia slip or both. The oxidation catalyst is not effective at controlling CO emissions when exhaust temperature is below the optimal temperature range. Therefore, exhaust gas controls used to achieve BACT for normal operations are not feasible control techniques during startups and shutdowns.

This “top-down” BACT analysis will consider the following NOx emission limitations:

- Operating practices to minimize emissions during startup and shutdown; and
- Design features to minimize the duration of startup and shutdown.

Step 3 – Rank Remaining Control Technologies by Control Effectiveness

Operating Practices to Minimize Emissions during Startup and Shutdown

There are basic principles of operation, or Best Management Practices, that minimize emissions during startups and shutdowns. These Best Management Practices are outlined below.

- During a startup, bring the gas turbine to the minimum load necessary to achieve compliance with the applicable NOx and CO emission limits as quickly as possible, consistent with the equipment manufacturers' recommendations and safe operating practices.

- During a startup, initiate ammonia injection to the SCR system as soon as the SCR catalyst temperature and ammonia vaporization system have reached their minimum operating temperatures.

- During a shutdown, once the turbine reaches a load that is below the minimum load necessary to maintain compliance with the applicable NOx and CO emission limits, reduce the gas turbine load to zero as quickly as possible, consistent with the equipment manufacturers' recommendations and safe operating practices.

- During a shutdown, maintain ammonia injection to the SCR system as long as the SCR catalyst temperature and ammonia vaporization system remain above their minimum operating temperatures.

A key underlying consideration of these Best Management Practices is the overall safety of the plant staff by promoting operation within the limitations of the equipment and systems, and allowing for operator judgment and response times to respond to alarms and trips during the startup sequence.

Design Features to Minimize the Duration of Startup and Shutdown

An additional technique to reduce startup emissions is to minimize the amount of time the gas turbine spends in startup. The use of simple-cycle gas turbine technology inherently minimizes this time, in that simple-cycle gas turbines generally start up and shut down much more quickly than combined-cycle turbines.

<u>Step 4 – Evaluate the Most Effective Control Technology Considering Environmental, Energy, and Cost Impacts</u>

Utilizing best operating practices to minimize emissions during startups and shutdowns has no adverse environmental or energy impacts, nor does it require additional capital expenditure.

The approach of reducing startup/shutdown duration has no adverse environmental or energy impacts, and the use of simple-cycle generating technology minimizes startup/shutdown duration.

Step 5 - Determine BACT/Present Conclusions

BACT for NOx during startups/shutdowns is the use of operating systems/practices that reduce the duration of startups and shutdowns to the greatest extent feasible, and the use of operational techniques to initiate ammonia injection as soon as possible during a startup. Therefore, BACT is determined to be the use of simple-cycle gas turbine technology and the application of operating systems/practices that minimize startup and shutdown durations, in combination with the use of operational techniques to initiate ammonia injection as soon as possible during a startup.

ROC Emissions

Step 1 – Identify All Possible Control Technologies

The ROC control technologies under consideration for startups and shutdowns are ranked as follows:

- Operating practices to minimize the duration of startup and shutdown

Step 2 – Eliminate Technologically Infeasible Options

None of the proposed alternatives is infeasible for this application.

Step 3 – Rank Remaining Control Technologies by Control Effectiveness

The only proposed control technology is operating practices to minimize the duration of startups and shutdowns.

Step 4 – Evaluate the Most Effective Control Technology Considering Environmental, Energy, and Cost Impacts

ROC emissions during startup and shutdown are minimized by minimizing the duration of startup and shutdown.

Step 5 – Determine BACT/Present Conclusions

BACT for ROC during startups/shutdowns is the use of simple-cycle gas turbine technology and operating practices that reduce the duration of startups and shutdowns to the greatest extent feasible.

Sulfur Oxide Emissions

Step 1 – Identify All Possible Control Technologies

The SOx control technologies under consideration for startups and shutdowns are ranked as follows:

- Use of natural gas as a fuel

- Operating practices to minimize the duration of startup and shutdown

Step 2 – Eliminate Technologically Infeasible Options

None of the proposed alternatives is infeasible for this application.

Step 3 – Rank Remaining Control Technologies by Control Effectiveness

Ranking for the control technologies is as indicated in Step 1.

Step 4 – Evaluate the Most Effective Control Technology Considering Environmental, Energy, and Cost Impacts

SOx emissions during startup and shutdown are minimized by minimizing duration of startup and shutdown.

Step 5 – Determine BACT/Present Conclusions

BACT for SOx during startups/shutdowns is the use of simple-cycle gas turbine technology and operating practices that reduce the duration of startups and shutdowns to the greatest extent feasible.

PM/PM_{10}/$PM_{2.5}$ Emissions

Step 1 – Identify All Possible Control Technologies

The analysis for particulate emissions is identical to the analysis for SOx.

Step 2 – Eliminate Technologically Infeasible Options

The analysis for particulate emissions is identical to the analysis for SOx.

Step 3 – Rank Remaining Control Technologies by Control Effectiveness

The analysis for particulate emissions is identical to the analysis for SOx.

Step 4 – Evaluate the Most Effective Control Technology Considering Environmental, Energy, and Cost Impacts

The analysis for particulate emissions is identical to the analysis for SOx.

Step 5 – Determine BACT/Present Conclusions

BACT for particulate during startups/shutdowns is the use of simple-cycle gas turbine technology and operating practices that reduce the duration of startups and shutdowns to the greatest extent feasible.

Summary

Proposed BACT determinations for the P3 gas turbine are summarized in Table C-4.

Table C-4
Proposed BACT Determinations for the P3 Gas Turbine

Pollutant	Proposed BACT Determination for the GE 7HA.01
Nitrogen Oxides	Dry low-NOx combustion controls and SCR systems, 2.5 ppmc[a], 1-hour average, with exemptions for startup/shutdown conditions
Sulfur Dioxide	Natural gas fuel (sulfur content not to exceed 0.75 grain/100 scf)
ROC	Good combustion practices, 2.0 ppmc, 1-hour average
PM_{10}	Natural gas fuel, 10.6 PM_{10} lbs/hr
Startup/Shutdown	Best operating practices to minimize startup/shutdown times and emissions

Note:
a. ppmc: parts per million by volume, corrected to 15% O_2.

BACT for the Emergency Engine: Normal Operations

The emission unit for which BACT is being considered is a nominal 779 HP Tier 4 (final) Caterpillar Diesel engine driving a 500 kW emergency generator. Potential control levels were identified by searching the following sources for BACT determinations pertaining to emergency Diesel engines:

- VCAPCD BACT Guidance;
- South Coast Air Quality Management District (SCAQMD) BACT Guidelines;
- San Joaquin Valley Air Pollution Control District (SJVAPCD) BACT Clearinghouse;
- Bay Area Air Quality Management District (BAAQMD) BACT Guidelines;
- EPA Reasonably Available Control Technology (RACT)/BACT/ Lowest Achievable Emission Rate (LAER) Clearinghouse.

NOx Emissions

Step 1 – Identify All Possible Control Technologies

Listed below are the technologies for control of NOx that were identified as a result of review of sources of BACT determinations.

- Combustion process modifications. Design features that minimize emissions include electronic fuel/air ratio and timing controllers, pre-chamber ignition, and intercoolers. These design features form the basis for EPA's Tier emission standards, and are therefore considered the baseline case for purposes of the BACT analysis.
- Selective Catalytic Reduction (SCR): This is an add-on control technology that reduces NOx emissions by reaction with ammonia in the presence of a catalyst.
- Non-selective Catalytic Reduction (NSCR): Similar to automobile catalytic converters, this is an add-on control technology that reduces NOx emissions by reacting NOx with CO and hydrocarbons to form CO_2, N_2, and H_2O. This catalyst requires a fuel-rich exhaust to work, and is therefore not applicable to Diesel engines, which operate in a lean-burn mode.

Step 2 – Eliminate Technologically Infeasible Options

As discussed in Step 1, NSCR is not technologically feasible for a lean-burn IC engine. It was therefore eliminated from consideration for BACT for this application.

Step 3 – Rank Remaining Control Technologies by Control Effectiveness

The most recent NOx BACT listings for Diesel emergency engines in this size range are summarized in Table C-5. The most stringent NOx limit in these recent BACT determinations is a 0.5 gm/hp-hr limit, based on compliance with applicable EPA Tier 4 standards and the federal NSPS Subpart IIII.

Table C-5
Recent NOx BACT Determinations for Emergency Compression-Ignition Engines

Facility	District	NOx Limit[a,b]	Control Method Used	Date Permit Issued	Source
Power Systems	SCAQMD	4.8 (Tier 2 limit)	Engine Designed to meet EPA Tier 2	8/29/2002	SCAQMD BACT (A/N 392543)
General Guidelines	SCAQMD	3.0 (Tier 3 limit)	Engine Designed to meet EPA Tier 3	7/14/2006	SCAQMD guidelines for non-major facilities
BACT Handbook	BAAQMD	3.0 (CARB ATCM)	Engine Designed to meet EPA Tier 3	12/22/2010	BAAQMD BACT guideline 96.1.3
BACT Guidelines	SJVAPCD	3.0 (Tier 3 limit)	Engine Designed to meet EPA Tier 3	9/10/2013	SJVAPCD BACT Guideline 3.1.1
Energy Answers Arecibo	Puerto Rico	2.85	Engine Design	4/10/2014	EPA RBL Clearinghouse
EPA Tier 4 (final)		0.5	Engine Design		40 CFR 1039.101
AQMD Prohibitory Rule	Rule 74.9.B.1	80 ppm	Not Specified	11/78/05	VCAPCD Rule 74.9
Federal NSPS	Subpart IIII	0.5	Engine Designed to meet EPA Tier 4 (final)		40 CFR 60.4205

Note:
a. All concentrations expressed as grams per horsepower-hour
b. For Tier 2 and Tier 3 limits, values are for NOx + NMHC.

<u>Step 4 – Evaluate the Most Effective Control Technology Considering Environmental, Energy, and Cost Impacts</u>

The most stringent limit in Table C-5 is the EPA Tier 4 (final) limit. Engine manufacturers are using a combination of techniques, including incorporation of exhaust control devices as part of the basic engine, to achieve this limit. For this reason, an engine capable of achieving EPA Tier 4 (final) limits is the most effective control technology considering environmental, energy, and cost impacts.

Step 5 – Determine BACT/Present Conclusions

BACT must be at least as stringent as the most stringent level achieved in practice, federal NSPS, or district prohibitory rule. Based upon the results of this analysis, the NOx emission rate of 0.5 gm/hp-hr required to meet EPA Tier 4 (final) requirements is BACT. No more stringent level has been suggested as being technologically feasible. Therefore, BACT/LAER for NOx for this application is any technology capable of achieving 0.5 gm/hp-hr.

The engine selected for this project is equipped with advanced combustion controls, and is certified to meet Tier 4 (final) standards, and therefore complies with BACT for NOx.

ROC Emissions

Step 1 – Identify All Possible Control Technologies

Listed below are the technologies for control of ROC that were identified as a result of review of sources of BACT determinations.

- Combustion process modifications. Design features that minimize emissions include electronic fuel/air ratio and timing controllers, pre-chamber ignition, and intercoolers. These design features form the basis for EPA's Tier emission standards, and are therefore considered the baseline case for purposes of the BACT analysis.
- Catalytic Oxidation: This is an add-on control technology that oxidizes ROC emissions by reaction with the oxygen in the exhaust in the presence of a catalyst. Typical vendor guarantees are 50 percent reduction in ROC.

Step 2 – Eliminate Technologically Infeasible Options

Both of the options are technologically feasible.

Step 3 – Rank Remaining Control Technologies by Control Effectiveness

The most recent ROC BACT listings for Diesel emergency engines in this size range are summarized in Table C-6. The most stringent ROC limit in these recent BACT determinations is a 0.07 gm/hp-hr limit, based on the certified engine family emissions for a Tier 2 engine. However, it is clear from SCAQMD's BACT documentation that SCAQMD's BACT determination is actually compliance with Tier 2, and not the specific ROC emission rate listed in the BACT document. This is made clear by the fact that SCAQMD's general guidance, issued four years after the permit in questions, specifies that BACT for ROC for all emissions from an emergency engine is compliance with Tier 3 limits. For this reason, it can be concluded that the District did not consider 0.07 gm/hp-hr to be a BACT limit in 2002; rather, it considered compliance with Tier 2 limits to be BACT. The most stringent ROC limit in these recent BACT determinations is a

0.14 gm/hp-hr limit, based on compliance with applicable EPA Tier 4 (final) standards and the federal NSPS Subpart IIII.

Table C-6
Recent ROC BACT Determinations for Emergency Compression-Ignition Engines

Facility	District	ROC Limit[a,b]	Control Method Used	Date Permit Issued	Source
Power Systems	SCAQMD	0.07 (Certification)	Engine Designed to meet EPA Tier 2	8/29/2002	SCAQMD BACT (A/N 392543)
General Guidelines	SCAQMD	3.0 (Tier 3 limit)	Engine Designed to meet EPA Tier 3	7/14/2006	SCAQMD guidelines for non-major facilities
BACT Handbook	BAAQMD	None		12/22/2010	BAAQMD BACT guideline 96.1.3
BACT Guidelines	SJVAPCD	3.0 (Tier 3 limit)	Engine Designed to meet EPA Tier 3	9/10/2013	SJVAPCD BACT Guideline 3.1.1
Energy Answers Arecibo	Puerto Rico	0.15	Engine Design	4/10/2014	EPA RBL Clearinghouse
EPA Tier 4 (final)		0.14	Engine Design		40 CFR 1039.101
AQMD Prohibitory Rule	Rule 74.9.B.1	80 ppm	Not Specified	11/78/05	VCAPCD Rule 74.9
Federal NSPS	Subpart IIII	0.14	Engine Designed to meet EPA Tier 4		40 CFR 60.4205

Note:
a. All concentrations expressed as grams per horsepower-hour
b. For Tier 2 and Tier 3 limits, values are for NOx + NMHC. The NMHC fraction is often assumed to be 5% of the sum of NOx +NMHC.

<u>Step 4 – Evaluate the Most Effective Control Technology Considering Environmental, Energy, and Cost Impacts</u>

The most stringent limit in Table C-6 is the EPA Tier 4 (final) limit. Engine manufacturers are using a combination of techniques, including incorporation of exhaust control devices as part of the basic engine, to achieve this limit. For this reason, an engine capable of achieving EPA Tier 4 limits is the most effective control technology considering environmental, energy, and cost impacts.

Step 5 – Determine BACT/Present Conclusions

BACT must be at least as stringent as the most stringent level achieved in practice, federal NSPS, or district prohibitory rule. Based upon the results of this analysis, the ROC emission rate of 0.14 gm/hp-hr required to meet EPA Tier 4 (final) requirements is BACT. No more stringent level has been suggested as being technologically feasible. Therefore, BACT/LAER for ROC for this application is any technology capable of achieving 0.14 gm/hp-hr.

The engine selected for this project is equipped with advanced combustion controls, and is certified to meet Tier 4 (final) standards, and therefore complies with BACT for ROC.

Sulfur Oxide Emissions

Step 1 – Identify All Possible Control Technologies

Listed below are the technologies for control of SOx that were identified as a result of review of sources of BACT determinations.

- Use of CARB Diesel Fuel (Ultra Low Sulfur Diesel Fuel) (fuel sulfur content less than 15 ppm [wt]).

Step 2 – Eliminate Technically Infeasible Options

All of the control options discussed above are technically feasible.

Step 3 – Rank Remaining Control Technologies by Control Effectiveness

Only one control method was identified.

Step 4 – Evaluate Most Effective Controls and Document Results

The use of CARB Diesel Fuel has been achieved in practice at numerous diesel engines throughout the state, and the use of this fuel minimizes SOx emissions.

Step 5 – Determine BACT/Present Conclusions

BACT for this project is the use of CARB Diesel Fuel (Ultra Low Sulfur Diesel Fuel) (fuel sulfur content less than 15 ppm (wt)). The project will use this fuel, and thus will meet BACT.

$PM/PM_{10}/PM_{2.5}$ Emissions

Step 1 – Identify All Possible Control Technologies

Listed below are the technologies for control of PM ($PM_{10}/PM_{2.5}$) that were identified as a result of review of sources of BACT determinations.

- Use of ultra low sulfur Diesel fuel in an engine designed to meet Tier 4 (final) emission levels. Use of this fuel is required by regulation; this is the baseline technology for determining BACT.
- Use of ultra low sulfur Diesel fuel plus Diesel oxidation catalyst (DOC): This is an add-on control technology that oxidizes organic aerosols by reaction with the oxygen in the exhaust in the presence of a catalyst. EPA estimates that DOC technology can result in a 20 percent reduction in PM.[14]
- Use of ultra low sulfur Diesel fuel plus catalyzed Diesel particulate filter (CDPF): This is an add-on control technology that use filters to capture Diesel particulate, then oxidizes particulate in the filters. EPA estimates that CDPF technology can result in a 90 percent reduction in PM.[15]

Step 2 – Eliminate Technologically Infeasible Options

All of the options are technologically feasible.

Step 3 – Rank Remaining Control Technologies by Control Effectiveness

The most recent PM BACT listings for Diesel emergency engines in this size range are summarized in Table C-7. The most stringent PM limit in these recent BACT determinations is a 0.02 gm/hp-hr limit, based on the certified engine family emissions for a Tier 4 (final) engine.

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[14] EPA, *Diesel Retrofit Technology, An Analysis of the Cost-Effectiveness of Reducing Particulate Matter and Nitrogen Oxides Emissions from Heavy-Duty Nonroad Diesel Engines Through Retrofits*, p. 5.
[15] EPA, *Diesel Retrofit Technology, An Analysis of the Cost-Effectiveness of Reducing Particulate Matter and Nitrogen Oxides Emissions from Heavy-Duty Nonroad Diesel Engines Through Retrofits*, p. 5.

Table C-7

Recent PM BACT Determinations for Emergency Compression-Ignition Engines

Facility	District	PM Limit[a]	Control Method Used	Date Permit Issued	Source
Power Systems	SCAQMD	0.07 (Certification)	Engine Designed to meet EPA Tier 2	8/29/2002	SCAQMD BACT (A/N 392543)
General Guidelines	SCAQMD	0.15 (Tier 3 limit)	Engine Designed to meet EPA Tier 3	7/14/2006	SCAQMD guidelines for non-major facilities
BACT Handbook	BAAQMD	0.15	Not	12/22/2010	BAAQMD BACT guideline 96.1.3
BACT Guidelines	SJVAPCD	0.15	Not specified	9/10/2013	SJVAPCD BACT Guideline 3.1.1
Energy Answers Arecibo	Puerto Rico	0.15	Engine Design	4/10/2014	EPA RBL Clearinghouse
EPA Tier 4 (final)		0.02	Engine Design		40 CFR 1039.101
AQMD Prohibitory Rule	Rule 74.9.B.1	none	Not Specified	11/78/05	VCAPCD Rule 74.9
Federal NSPS	Subpart IIII	0.02	Engine Designed to meet EPA Tier 4 (final)		40 CFR 60.4205

Note:

a. All concentrations expressed as grams per horsepower-hour

Step 4 – Evaluate the Most Effective Control Technology Considering Environmental, Energy, and Cost Impacts

The most stringent limit in Table C-7 is the EPA Tier 4 (final) limit. Engine manufacturers are using a combination of techniques, including incorporation of exhaust control devices as part of the basic engine, to achieve this limit. For this reason, an engine capable of achieving EPA Tier 4 (final) limits is the most effective control technology considering environmental, energy, and cost impacts.

Step 5 – Determine BACT/Present Conclusions

BACT must be at least as stringent as the most stringent level achieved in practice, federal NSPS, or district prohibitory rule. Based upon the results of this analysis, the PM emission rate of 0.02 gm/hp-hr required to meet EPA Tier 4 (final) requirements is BACT. No more stringent level has been suggested as being technologically feasible. Therefore, BACT/LAER for PM for this application is any technology capable of achieving 0.02 gm/hp-hr.

The engine selected for this project is equipped with advanced combustion controls, and is certified to meet Tier 4 (final) standards, and therefore complies with BACT for PM.

Summary

Proposed BACT determinations for the P3 Diesel emergency generator engine are summarized in Table C-8.

Table C-8

Proposed BACT Determinations for P3 Diesel Emergency Generator Engine

Pollutant	Proposed BACT Determination
Nitrogen Oxides	Engine designed to meet Tier 4 (final) standards.
Sulfur Dioxide	Use of CARB Diesel Fuel.
ROC	Engine designed to meet Tier 4 (final) standards.
PM_{10}	Engine designed to meet Tier 4 (final) standards.

APPENDIX D

NON-CRITERIA POLLUTANT EMISSION CALCULATIONS

Table D-1
Puente Power Project
Non-Criteria Pollutant Emission Calculations New Gas Turbine (Hourly Emissions)

Pollutant	Uncontrolled Emission Factor (lbs/MMBtu)	Basis	Normal Oper. Controlled Emission Factor (lbs/MMBtu)	Worst Case Startup/Shutdown VOC Emiss. Vs. Normal Operation VOC Emiss.(4) (lbs/hr)/(lbs/hr)	Startup/Shutdown Emission Factor(4) (lbs/MMBtu)	Commissioning Emission Factor(5) (lbs/MMBtu)	New GT Max. Firing Rate (MMBtu/hr)	New GT Normal Oper. Emissions (lbs/hr)	New GT Startup/Shutdown Emissions (lbs/hr)	New GT Commissioning Emissions (lbs/hr)
Ammonia	6.66E-03	Permit Limit(3)	6.66E-03	8.01	6.66E-03	6.66E-03	2,579	1.72E+01	1.72E+01	1.72E+01
Propylene	7.56E-04	0.5*CATEF(2)	3.78E-04	8.01	3.03E-03	7.56E-04	2,579	9.75E-01	7.81E+00	1.95E+00
Hazardous Air Pollutants (HAPs) - Federal										
Acetaldehyde	4.00E-05	0.5*AP-42(1)	2.00E-05	8.01	1.60E-04	4.00E-05	2,579	5.16E-02	4.13E-01	1.03E-01
Acrolein	6.42E-06	0.5*AP-42(1)	3.21E-06	8.01	2.57E-05	6.42E-06	2,579	8.28E-03	6.63E-02	1.66E-02
Benzene	1.20E-05	0.5*AP-42(1)	5.99E-06	8.01	4.80E-05	1.20E-05	2,579	1.54E-02	1.24E-01	3.09E-02
1,3-Butadiene	4.30E-07	0.5*AP-42(1)	2.15E-07	8.01	1.72E-06	4.30E-07	2,579	5.55E-04	4.44E-03	1.11E-03
Ethylbenzene	3.20E-05	0.5*AP-42(1)	1.60E-05	8.01	1.28E-04	3.20E-05	2,579	4.13E-02	3.31E-01	8.25E-02
Formaldehyde	9.00E-04	0.5*CATEF(2)	4.50E-04	8.01	3.60E-03	9.00E-04	2,579	1.16E+00	9.30E+00	2.32E+00
Hexane, n-	2.54E-04	0.5*CATEF(2)	1.27E-04	8.01	1.02E-03	2.54E-04	2,579	3.28E-01	2.62E+00	6.55E-01
Naphthalene	1.31E-06	0.5*AP-42(1)	6.53E-07	8.01	5.23E-06	1.31E-06	2,579	1.68E-03	1.35E-02	3.37E-03
Total PAHs (listed individually below)	6.43E-07	SUM	3.22E-07	8.01	2.58E-06	6.43E-07	2,579	8.30E-04	6.65E-03	1.66E-03
Acenaphthene	1.86E-08	0.5*CATEF(2)	9.32E-09	8.01	7.47E-08	1.86E-08	2,579	2.40E-05	1.93E-04	4.81E-05
Acenapthyene	1.44E-08	0.5*CATEF(2)	7.21E-09	8.01	5.78E-08	1.44E-08	2,579	1.86E-05	1.49E-04	3.72E-05
Anthracene	3.32E-08	0.5*CATEF(2)	1.66E-08	8.01	1.33E-07	3.32E-08	2,579	4.28E-05	3.43E-04	8.56E-05
Benzo(a)anthracene	2.22E-08	0.5*CATEF(2)	1.11E-08	8.01	8.89E-08	2.22E-08	2,579	2.86E-05	2.29E-04	5.73E-05
Benzo(a)pyrene	1.36E-08	0.5*CATEF(2)	6.82E-09	8.01	5.46E-08	1.36E-08	2,579	1.76E-05	1.41E-04	3.52E-05
Benzo(e)pyrene	5.34E-10	0.5*CATEF(2)	2.67E-10	8.01	2.14E-09	5.34E-10	2,579	6.89E-07	5.52E-06	1.38E-06
Benzo(b)fluoranthrene	1.11E-08	0.5*CATEF(2)	5.54E-09	8.01	4.44E-08	1.11E-08	2,579	1.43E-05	1.14E-04	2.86E-05
Benzo(k)fluoranthrene	1.08E-08	0.5*CATEF(2)	5.40E-09	8.01	4.33E-08	1.08E-08	2,579	1.39E-05	1.12E-04	2.79E-05
Benzo(g,h,i)perylene	1.34E-08	0.5*CATEF(2)	6.72E-09	8.01	5.38E-08	1.34E-08	2,579	1.73E-05	1.39E-04	3.47E-05
Chrysene	2.48E-08	0.5*CATEF(2)	1.24E-08	8.01	9.93E-08	2.48E-08	2,579	3.20E-05	2.56E-04	6.40E-05
Dibenz(a,h)anthracene	2.30E-08	0.5*CATEF(2)	1.15E-08	8.01	9.21E-08	2.30E-08	2,579	2.97E-05	2.38E-04	5.93E-05
Fluoranthene	4.24E-08	0.5*CATEF(2)	2.12E-08	8.01	1.70E-07	4.24E-08	2,579	5.47E-05	4.38E-04	1.09E-04
Fluorene	5.70E-08	0.5*CATEF(2)	2.85E-08	8.01	2.28E-07	5.70E-08	2,579	7.35E-05	5.89E-04	1.47E-04
Indeno(1,2,3-cd)pyrene	2.30E-08	0.5*CATEF(2)	1.15E-08	8.01	9.21E-08	2.30E-08	2,579	2.97E-05	2.38E-04	5.93E-05
Phenanthrene	3.08E-07	0.5*CATEF(2)	1.54E-07	8.01	1.23E-06	3.08E-07	2,579	3.97E-04	3.18E-03	7.94E-04
Pyrene	2.72E-08	0.5*CATEF(2)	1.36E-08	8.01	1.09E-07	2.72E-08	2,579	3.51E-05	2.81E-04	7.02E-05
Propylene oxide	2.90E-05	0.5*AP-42(1)	1.45E-05	8.01	1.16E-04	2.90E-05	2,579	3.74E-02	3.00E-01	7.48E-02
Toluene	1.31E-04	0.5*AP-42(1)	6.53E-05	8.01	5.23E-04	1.31E-04	2,579	1.68E-01	1.35E+00	3.37E-01
Xylene	6.40E-05	0.5*AP-42(1)	3.20E-05	8.01	2.56E-04	6.40E-05	2,579	8.25E-02	6.61E-01	1.65E-01

Notes:
(1) AP-42, Table 3.1-3, 4/00.
(2) From CARB CATEF database (converted from lbs/MMscf to lbs/MMBtu based on site natural gas HHV).
(3) Based on 5 ppm ammonia slip from SCR system.
(4) Controlled emission factor adjusted upward based on VOC emission ratio - as required by SDAPCD for the Pio Pico Energy Center and the Amended Carlsbad Energy Center Project.
(5) Based on uncontrolled emission factors - as required by SDAPCD for the Pio Pico Energy Center and the Amended Carlsbad Energy Center Project.

Table D-2
Puente Power Project
Non-Criteria Pollutant Emissions New Gas Turbine (Annual Emissions)

Pollutant	New Gas Turbine Normal Operating Hours (hrs/yr)	New Gas Turbine Startup/Shutdown Hours (hrs/yr)	New Gas Turbine Commissioning Hours (hrs/yr)	New Gas Turbine(1) Annual Emissions (tons/yr)	New Gas Turbine Annual Commissioning Emissions (tons/yr)
Ammonia	2,053	400	366	21.06	3.14
Propylene	2,053	400	366	2.56	0.36
Hazardous Air Pollutants (HAPs) - Federal					
Acetaldehyde	2,053	400	366	0.136	0.019
Acrolein	2,053	400	366	0.022	0.003
Benzene	2,053	400	366	0.041	0.006
1,3-Butadiene	2,053	400	366	0.001	0.000
Ethylbenzene	2,053	400	366	0.108	0.015
Formaldehyde	2,053	400	366	3.051	0.425
Hexane, n-	2,053	400	366	0.861	0.120
Naphthalene	2,053	400	366	0.004	0.001
Total PAHs (listed individually below)	2,053	400	366	0.002	0.000
Acenaphthene	2,053	400	366	0.000	0.000
Acenapthyene	2,053	400	366	0.000	0.000
Anthracene	2,053	400	366	0.000	0.000
Benzo(a)anthracene	2,053	400	366	0.000	0.000
Benzo(a)pyrene	2,053	400	366	0.000	0.000
Benzo(e)pyrene	2,053	400	366	0.000	0.000
Benzo(b)fluoranthrene	2,053	400	366	0.000	0.000
Benzo(k)fluoranthrene	2,053	400	366	0.000	0.000
Benzo(g,h,i)perylene	2,053	400	366	0.000	0.000
Chrysene	2,053	400	366	0.000	0.000
Dibenz(a,h)anthracene	2,053	400	366	0.000	0.000
Fluoranthene	2,053	400	366	0.000	0.000
Fluorene	2,053	400	366	0.000	0.000
Indeno(1,2,3-cd)pyrene	2,053	400	366	0.000	0.000
Phenanthrene	2,053	400	366	0.001	0.000
Pyrene	2,053	400	366	0.000	0.000
Propylene oxide	2,053	400	366	0.098	0.014
Toluene	2,053	400	366	0.443	0.062
Xylene	2,053	400	366	0.217	0.030
Total (HAPs) =				4.98	0.69
Total (All) =				28.61	4.19

Notes:
(1) Includes startup/shutdown emissions.

Table D-3
Puente Power Project
Non-Criteria Pollutant Emission Calculations Emergency Engine

Pollutant	Emission Factor (lbs/Mgal)	Basis	New Generator Fuel Use (gals/hr)	New Generator Fuel Use (gals/year)	Generator Hourly Emissions (lbs/hr)	Generator Annual Emissions (tons/yr)
Diesel PM (Not a HAPS)	N/A	N/A	35.9	7,180	3.84E-02	3.84E-03
Acrolein	1.07E-03	CATEF	35.9	7,180	3.84E-05	3.8413E-06

Pollutant	New Generator Acute Modeling Hourly Emission Rate (g/sec)	New Generator Chronic/Cancer Risk Modeling Annual Emission Rate (g/sec)
Diesel PM (Not a HAPS)	N/A	1.11E-04
Acrolein	4.84E-06	N/A

Table D-4
Puente Power Project
Non-Criteria Pollutant Emission Factors
MGS Existing Units 1 - 3

Pollutant	Boiler Emission Factors(1) lb/MMscf	Unit 3 GT Emission Factors(2) lb/MMscf	Unit 1 Max Firing Rate MMBtu/hr	Unit 2 Max Firing Rate MMBtu/hr	Unit 3 GT Max Firing Rate MMBtu/hr
Ammonia (not a HAP)	4.79E+00	0.00E+00	1900	1900	2510
Propylene (Not a HAP)	1.55E-02	7.72E-01	1900	1900	2510
Propylene oxide		2.96E-02	1900	1900	2510
Benzene	1.70E-03	1.22E-02	1900	1900	2510
Formaldehyde	3.60E-03	9.19E-01	1900	1900	2510
Hexane	1.30E-03	2.59E-01	1900	1900	2510
Naphthalene	3.00E-04	1.33E-03	1900	1900	2510
Dichlorobenzene			1900	1900	2510
Toluene	7.80E-03	1.33E-01	1900	1900	2510
1,3-Butadiene		4.39E-04	1900	1900	2510
Acetaldehyde	9.00E-04	4.09E-02	1900	1900	2510
Acrolein	8.00E-04	6.56E-03	1900	1900	2510
Ethyl Benzene	2.00E-03	3.27E-02	1900	1900	2510
PAHs (other)	1.00E-04	6.57E-04	1900	1900	2510
Xylene	5.80E-03	6.54E-02	1900	1900	2510

Notes:
(1) All boiler factors except ammonia from Ventura County APCD AB2588 emission factors for natural gas external combustion (greater than 100 MMBtu/hr), May 17, 2001.
Ammonia based on Title V permit NH3 hourly emission limit.
(2) A combination of AP-42 (Table 3.1-3, 4/00) and CARB CATEF database emission factors.

Table D-5
Puente Power Project
Non-Criteria Pollutant Hourly Emissions
MGS Existing Units 1 - 3

Pollutant	Unit 1 Emissions lb/hr	Unit 2 Emissions lb/hr	Unit 3 GT Emissions lb/hr
Ammonia (not a HAP)	8.91E+00	8.91E+00	0.00E+00
Propylene (Not a HAP)	2.89E-02	2.89E-02	1.90E+00
Propylene oxide	0.00E+00	0.00E+00	7.28E-02
Benzene	3.16E-03	3.16E-03	3.01E-02
Formaldehyde	6.70E-03	6.70E-03	2.26E+00
Hexane	2.42E-03	2.42E-03	6.38E-01
Naphthalene	5.58E-04	5.58E-04	3.28E-03
Dichlorobenzene	0.00E+00	0.00E+00	0.00E+00
Toluene	1.45E-02	1.45E-02	3.28E-01
1,3-Butadiene	0.00E+00	0.00E+00	1.08E-03
Acetaldehyde	1.67E-03	1.67E-03	1.00E-01
Acrolein	1.49E-03	1.49E-03	1.61E-02
Ethyl Benzene	3.72E-03	3.72E-03	8.03E-02
PAHs (other)	1.86E-04	1.86E-04	1.61E-03
Xylene	1.08E-02	1.08E-02	1.61E-01

Table D-6
Puente Power Project
Non-Criteria Pollutant Annual Emissions (maximum 2-year avg. over past 5-years)
MGS Existing Units 1 - 3

Pollutant	Unit 1 Annual Avg Firing Rate MMscf/yr	Unit 2 Annual Avg Firing Rate MMscf/yr	Unit 3 GT Annual Avg Firing Rate MMscf/yr	Unit 1 Annual Emissions tons/yr	Unit 2 Annual Emissions tons/yr	Unit 3 GT Annual Emissions tons/yr	Subtotal tons/yr
Ammonia (not a HAP)	1,102	1,297	89	2.639	3.107	0.000	5.746
Propylene (Not a HAP)	1,102	1,297	89	0.009	0.010	0.034	0.053
Propylene oxide	1,102	1,297	89	0.000	0.000	0.001	0.001
Benzene	1,102	1,297	89	0.001	0.001	0.001	0.003
Formaldehyde	1,102	1,297	89	0.002	0.002	0.041	0.045
Hexane	1,102	1,297	89	0.001	0.001	0.011	0.013
Naphthalene	1,102	1,297	89	0.000	0.000	0.000	0.000
Dichlorobenzene	1,102	1,297	89	0.000	0.000	0.000	0.000
Toluene	1,102	1,297	89	0.004	0.005	0.006	0.015
1,3-Butadiene	1,102	1,297	89	0.000	0.000	0.000	0.000
Acetaldehyde	1,102	1,297	89	0.000	0.001	0.002	0.003
Acrolein	1,102	1,297	89	0.000	0.001	0.000	0.001
Ethyl Benzene	1,102	1,297	89	0.001	0.001	0.001	0.004
PAHs (other)	1,102	1,297	89	0.000	0.000	0.000	0.000
Xylene	1,102	1,297	89	0.003	0.004	0.003	0.010
						Total (HAPs) =	0.096
						Total (All) =	5.894

Table D-7
Puente Power Project
Non-Criteria Pollutant Emissions New Gas Turbine (Modeling Inputs)

Pollutant	For Acute Modeling Hourly Normal Oper. Emission Rate (g/sec)	For Acute Modeling Hourly Startup/Shutdown Emission Rate (g/sec)	For Acute Modeling Hourly Commissioning Emission Rate (g/sec)	For Chronic/Cancer Risk Modeling Annual Normal Oper. Emission Rate(1) (g/sec)	For Chronic/Cancer Risk Modeling Annual Commissioning Emission Rate(1) (g/sec)
Ammonia	2.16E+00	2.16E+00	2.16E+00	6.06E-01	9.04E-02
Propylene	1.23E-01	9.84E-01	2.46E-01	7.37E-02	1.03E-02
Hazardous Air Pollutants (HAPs) - Federal					
Acetaldehyde	6.50E-03	5.21E-02	1.30E-02	3.90E-03	5.43E-04
Acrolein	1.04E-03	8.36E-03	2.09E-03	6.26E-04	8.72E-05
Benzene	1.95E-03	1.56E-02	3.89E-03	1.17E-03	1.63E-04
1,3-Butadiene	6.99E-05	5.60E-04	1.40E-04	4.19E-05	5.84E-06
Ethylbenzene	5.20E-03	4.17E-02	1.04E-02	3.12E-03	4.34E-04
Formaldehyde	1.46E-01	1.17E+00	2.92E-01	8.78E-02	1.22E-02
Hexane, n-	4.13E-02	3.31E-01	8.25E-02	2.48E-02	3.45E-03
Naphthalene	2.12E-04	1.70E-03	4.24E-04	1.27E-04	1.77E-05
Total PAHs (listed individually below)	1.05E-04	8.37E-04	2.09E-04	6.27E-05	8.74E-06
Acenaphthene	3.03E-06	2.43E-05	6.06E-06	1.82E-06	2.53E-07
Acenapthyene	2.34E-06	1.88E-05	4.69E-06	1.41E-06	1.96E-07
Anthracene	5.39E-06	4.32E-05	1.08E-05	3.24E-06	4.51E-07
Benzo(a)anthracene	3.61E-06	2.89E-05	7.21E-06	2.16E-06	3.01E-07
Benzo(a)pyrene	2.22E-06	1.78E-05	4.43E-06	1.33E-06	1.85E-07
Benzo(e)pyrene	8.68E-08	6.95E-07	1.74E-07	5.21E-08	7.25E-09
Benzo(b)fluoranthrene	1.80E-06	1.44E-05	3.60E-06	1.08E-06	1.50E-07
Benzo(k)fluoranthrene	1.75E-06	1.41E-05	3.51E-06	1.05E-06	1.47E-07
Benzo(g,h,i)perylene	2.18E-06	1.75E-05	4.37E-06	1.31E-06	1.82E-07
Chrysene	4.03E-06	3.23E-05	8.06E-06	2.42E-06	3.37E-07
Dibenz(a,h)anthracene	3.74E-06	2.99E-05	7.47E-06	2.24E-06	3.12E-07
Fluoranthene	6.89E-06	5.52E-05	1.38E-05	4.13E-06	5.76E-07
Fluorene	9.26E-06	7.42E-05	1.85E-05	5.56E-06	7.74E-07
Indeno(1,2,3-cd)pyrene	3.74E-06	2.99E-05	7.47E-06	2.24E-06	3.12E-07
Phenanthrene	5.00E-05	4.01E-04	1.00E-04	3.00E-05	4.18E-06
Pyrene	4.42E-06	3.54E-05	8.84E-06	2.65E-06	3.69E-07
Propylene oxide	4.71E-03	3.77E-02	9.42E-03	2.83E-03	3.94E-04
Toluene	2.12E-02	1.70E-01	4.24E-02	1.27E-02	1.77E-03
Xylene	1.04E-02	8.33E-02	2.08E-02	6.24E-03	8.69E-04

Notes:
(1) Includes startup/shutdown emissions.

Table D-8
Puente Power Project
Non-Criteria Pollutant Modeling Inputs
MGS Existing Units 1 - 3

Pollutant	Unit 1 Hourly Emiss. (g/sec)	Unit 2 Hourly Emiss. (g/sec)	Unit 3 GT Hourly Emiss. (g/sec)	Unit 1 Annual Emiss. (g/sec)	Unit 2 Annual Emiss (g/sec)	Unit 3 GT Annual Emiss. (g/sec)
Ammonia (not a HAP)	1.12E+00	1.12E+00	0.00E+00	7.59E-02	8.94E-02	0.00E+00
Propylene (Not a HAP)	3.64E-03	3.64E-03	2.39E-01	2.46E-04	2.90E-04	9.84E-04
Propylene oxide	0.00E+00	0.00E+00	9.17E-03	0.00E+00	0.00E+00	3.77E-05
Benzene	3.98E-04	3.98E-04	3.79E-03	2.69E-05	3.17E-05	1.56E-05
Formaldehyde	8.44E-04	8.44E-04	2.85E-01	5.70E-05	6.72E-05	1.17E-03
Hexane	3.05E-04	3.05E-04	8.03E-02	2.06E-05	2.43E-05	3.30E-04
Naphthalene	7.03E-05	7.03E-05	4.13E-04	4.75E-06	5.60E-06	1.70E-06
Dichlorobenzene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Toluene	1.83E-03	1.83E-03	4.13E-02	1.24E-04	1.46E-04	1.70E-04
1,3-Butadiene	0.00E+00	0.00E+00	1.36E-04	0.00E+00	0.00E+00	5.59E-07
Acetaldehyde	2.11E-04	2.11E-04	1.27E-02	1.43E-05	1.68E-05	5.20E-05
Acrolein	1.87E-04	1.87E-04	2.03E-03	1.27E-05	1.49E-05	8.35E-06
Ethyl Benzene	4.69E-04	4.69E-04	1.01E-02	3.17E-05	3.73E-05	4.16E-05
PAHs (other)	2.34E-05	2.34E-05	2.03E-04	1.58E-06	1.87E-06	8.37E-07
Xylene	1.36E-03	1.36E-03	2.02E-02	9.19E-05	1.08E-04	8.33E-05

APPENDIX E

AMBIENT AIR QUALITY IMPACT ANALYSIS

Ambient Air Quality Impact Analysis

An assessment of impacts from the P3 on ambient air quality has been conducted using EPA-approved air quality dispersion models. These models use a mathematical description of atmospheric turbulent entrainment and dispersion to simulate the actual processes by which emissions are transported to ground-level areas.

Using conservative assumptions, modeling was conducted to determine the maximum ground-level impacts of the P3. The results were compared with state and federal ambient air quality standards and PSD significance levels. If the standards are not exceeded in the analysis, then the facility will cause no exceedances under any operating or ambient conditions, at any location, under any meteorological conditions. In accordance with the air quality impact analysis guidelines developed by EPA,[1] the ground-level impact analysis includes the following assessments:

- Impacts in simple, intermediate, and complex terrain;
- Aerodynamic effects (downwash) due to nearby building(s) and structures; and
- Impacts from inversion breakup (fumigation).

Simple, intermediate, and complex terrain impacts were assessed for all meteorological conditions that would limit the amount of final plume rise. Plume impaction on elevated terrain, such as on the slope of a nearby hill, can cause high ground-level concentrations, especially under stable atmospheric conditions. Another dispersion condition that can cause high ground-level pollutant concentrations is caused by building downwash. A stack plume can be impacted by downwash when wind speeds are high and a sufficiently tall building or structure is in close proximity to the emission stack. This can result in building wake effects where the plume is drawn down toward the ground by the lower pressure region that exists in the lee (downwind) side of the building or structure.

Fumigation conditions occur when the plume is emitted into a layer of stable air (inversion) that then becomes unstable from below, resulting in a rapid mixing of pollutants out of the stable layer and towards the ground in the unstable layer underneath. The low mixing height that results from this condition allows little diffusion of the stack plume before it is carried downwind to the ground. Although fumigation conditions are short-term, rarely lasting as long as an hour, relatively high ground-level concentrations may be reached during that period. Fumigation tends to occur under clear skies and light winds, and is more prevalent in summer.

Two types of fumigation are analyzed: inversion breakup and shoreline. Inversion breakup fumigation occurs under low-wind conditions when a rising morning mixing height caps a stack and "fumigates" the air below. Shoreline fumigation occurs when a roughness boundary (generally a beach) causes turbulent dispersion to be much more enhanced near the ground, once again fumigating the air below. For shoreline fumigation, the lens-shape of the wedge of turbulent air rising from the beach is governed by several

[1] EPA. Guideline on Air Quality Models, 40 CFR Part 51, Appendix W.

factors. SCREEN3 modeling was performed to evaluate shoreline fumigation associated with the proposed project following the methodology provided by EPA.[2]

The basic model equation used in this analysis assumes that the concentrations of emissions within a plume can be characterized by a Gaussian (statistical) distribution around the centerline of the plume. Concentrations at any location downwind of a point source such as a stack can be determined from the following equation:

$$C(x,y,z,H) = \left(\frac{Q}{2\pi\sigma_y\sigma_z u}\right) * \left(e^{-1/2\left(y/\sigma_y\right)^2}\right) * \left[\left\{e^{-1/2\left(z-H/\sigma_z\right)^2}\right\} + \left\{e^{-1/2\left(z+H/\sigma_z\right)^2}\right\}\right] \qquad \text{(Eq. 1)}$$

where

C	=	pollutant concentration in the air
Q	=	pollutant emission rate
$\sigma_y\sigma_z$	=	horizontal and vertical dispersion coefficients, respectively, at downwind distance x
u	=	wind speed at the height of the plume center
x,y,z	=	variables that define the downwind, crosswind, and vertical distances from the center of the base of the stack in the model's three-dimensional Cartesian coordinate system
H	=	the height of the plume above the stack base (the sum of the height of the stack and the vertical distance that the plume rises due to the momentum and thermal buoyancy of the plume)

Gaussian dispersion models are approved by EPA for regulatory use and are based on conservative assumptions (i.e., the models tend to overpredict actual impacts by assuming steady-state conditions, no pollutant loss [through conservation of mass], no chemical reactions). The EPA models were used to determine if ambient air quality standards would be exceeded, and whether a more accurate and sophisticated modeling procedure would be warranted to make the impact determination.

Details of the analysis procedures are provided in the following subsections:

- Gas turbine screening modeling;
- Refined air quality impact analysis;
- Specialized modeling analyses;
- Results of the ambient air quality modeling analyses; and
- PSD significance levels.

Modeling for the proposed project was performed in accordance with the modeling protocol submitted to the VCAPCD and CEC (see Appendix G). The modeling procedures used for each type of modeling analysis are described in more detail in the subsections below.

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[2] EPA, "Screening Procedures for Estimating the Air Quality Impact of Stationary Sources, Revised", 1992b.

Two different EPA guideline models were used for different meteorological conditions in the ambient air quality impact analysis: AERMOD[3] and SCREEN3.

The EPA-approved AERMOD model was used to evaluate impacts in simple, intermediate, and complex terrain. AERMOD is a Gaussian dispersion model capable of assessing impacts from a variety of source types in areas of simple, intermediate, and complex terrain. The model can account for settling and dry deposition of particulates; area, line, and volume source types; downwash effects; and gradual plume rise as a function of downwind distance. The model is capable of estimating concentrations for a wide range of averaging times (from one hour to one year), and was applied with five years (2009 to 2013) of actual meteorological data recorded at the Oxnard Airport monitoring station.

The SCREEN3 model was used to evaluate CTG impacts under inversion breakup and shoreline fumigation conditions because these are special cases of meteorological conditions. The SCREEN3 model uses a range of meteorological conditions that could occur under inversion breakup and shoreline fumigation. Since the emissions from the emergency engines are so small compared to the CTG, they are excluded from this single-source model used for the fumigation analysis. The fumigation analysis is discussed in more detail below.

Gas Turbine Screening Modeling

The screening and refined air quality impact analyses were performed using the AERMOD model. The screening modeling is performed to determine the combination of ambient temperature and CTG operating conditions that generates the highest ambient air quality levels for each pollutant and averaging period. The refined modeling uses the stack parameters that the screening-level modeling shows produced the highest ambient impacts (for each pollutant and averaging period).

Inputs required by AERMOD include the following:

- Model options;
- Meteorological data;
- Source data; and
- Receptor data.

Standard AERMOD control parameters were used, including stack tip downwash, non-screening mode, non-flat terrain, and sequential meteorological data check. Stack-tip downwash, which adjusts the effective stack height downward following the methods of Briggs[4] for cases where the stack exit velocity is less than 1.5 times the wind speed at

[3] The acronym AERMOD was derived from American Meteorological Society/Environmental Protection Agency Regulatory Model.
[4] Briggs, G.A. (1972). "Discussion on Chimney Plumes in Neutral and Stable Surroundings." Atmos. Environ. 6:507-510.

stack top, were selected per EPA guidance. As approved by the District during its review of the modeling plan, the rural default option was used by not invoking the URBANOPT option.[5]

The required emission source data inputs to both models used in this analysis include source locations, source elevations, stack heights, stack diameters, stack exit temperatures and velocities, and emission rates. The source locations are specified for a Cartesian (x,y) coordinate system where x and y are distances east and north in meters, respectively. The Cartesian coordinate system used is the Universal Transverse Mercator Projection (UTM). The stack height that can be used in the model is limited by federal Good Engineering Practice (GEP) stack height restrictions, discussed in more detail below. In addition, Building Profile Input Program – Plume Rise Model Enhancements (BPIP-PRIME, current version 04274) requires nearby building dimension data to calculate the impacts of building downwash.

For the purposes of modeling, a stack height beyond what is required by Good Engineering Practices (GEP) is not allowed. However, this requirement does not place a limit on the actual constructed height of a stack. GEP as used in modeling is the height necessary to assure that emissions from the stack do not result in excessive concentrations of any air pollutant in the immediate vicinity of the source as a result of atmospheric downwash, eddies, or wakes that may be created by the source itself, nearby structures, or nearby terrain obstacles. In addition, the GEP modeling restriction assures that any required regulatory control measure is not compromised by the effect of that portion of the stack that exceeds the GEP. EPA guidance[6] for determining GEP stack height indicates that GEP is the greater of 65 meters or H_g, where H_g is calculated as follows:

$$H_g = H + 1.5L$$

where:

- H_g = Good Engineering Practice stack height, measured from the ground-level elevation at the base of the stack
- H = height of nearby structure(s) measured from the ground-level elevation at the base of the stack
- L = lesser dimension, height or maximum projected width, of nearby structure(s)

In using this equation, the guidance document indicates that both the height and width of the structure are determined from the frontal area of the structure, projected onto a plane perpendicular to the direction of the wind.

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[5] The rural vs. urban option in AERMOD is primarily designed to set the fraction of incident heat flux that is transferred into the atmosphere. This fraction becomes important in urban areas having an appreciable "urban heat island" effect due to a large presence of land covered by concrete, asphalt, and buildings. This situation does not exist for the proposed project site.

[6] U.S. Environmental Protection Agency (1985). "Guideline for Determination of Good Engineering Practice Stack Height," (Technical Support Document for the Stack Height Regulations) - Revised. EPA-450/4-80-023R.

For the new CTG, the nearby (influencing) structure is the catalyst housing for the new unit, which is 106 (32.3 m) high, 87 feet (26.5 m) long and 25 feet (7.6 m) wide. Thus H_g = 106 + (1.5 * 87) = 238 feet (72.6 m). Since H_g is more than 65 m, the GEP stack height is 72.6 m. The proposed stack height of 188 feet (57.3 m) does not exceed GEP stack height, and consequently satisfies the EPA requirement.

For regulatory applications, a building is considered sufficiently close to a stack to cause wake effects when the downwind distance between the stack and the nearest part of the building is less than or equal to five times the lesser of the height or the projected width of the building. Building dimensions for the buildings analyzed as downwash structures were obtained from plot plans. The building dimensions were analyzed using the BPIP-PRIME to calculate 36 wind-direction-specific building heights and projected building widths for use in building wake calculations. The building dimensions used in the GEP analysis are shown in Appendix H.

Screening Procedures and Unit Impact Modeling

Screening modeling was performed to select the worst-case CTG operating mode for each pollutant and averaging period. The modeling used emissions data based on an ISO temperature (59°F), average summer temperature (78°F), maximum summer temperature (82°F), and minimum temperature (39°F), and at nominal minimum and maximum CTG operating load points of 30% and 100% (% loads based on gross MW output levels). The determination of the worst-case CTG operating condition depends on how changes in emissions rates and stack characteristics (plume rise characteristics) interact with terrain features. For example, lower mass emissions resulting from lower load operations may cause higher concentrations than other operating conditions because lower final plume height may have a greater significant interaction with terrain features.

Initial AERMOD modeling runs were performed using normalized emission rates to assess the zone of impact and relative magnitude of the impacts. For the AERMOD CTG screening modeling, each CTG was modeled with a unit emission rate of 1 gram per second to obtain maximum 1-hour, 3-hour, 8-hour, 24-hour, and annual average concentration to emission rate (χ/Q in units of $\mu g/m^3$ per g/s) values. These χ/Q values were multiplied by the actual emission rate in grams per second from the CTG to calculate ambient impacts for NO_2, CO, SO_2, and $PM_{10}/PM_{2.5}$ in units of $\mu g/m^3$. Stack characteristics used in the screening modeling analysis are shown in Appendix H.

The results of the screening analysis are shown in Appendix H. The stack parameters and emission rates corresponding to the operating case that produced the maximum impacts in the CTG screening analysis for each pollutant and averaging period were used in the refined modeling analysis to evaluate the impacts of the new unit.

Refined Air Quality Impact Analysis

In simple, intermediate, and complex terrain, AERMOD was used to estimate proposed project impacts. The AERMOD model was used to calculate 1-hour, 3-hour, 8-hour, 24-hour, and annual average concentrations.

Refined modeling was performed in two phases: coarse grid modeling and fine grid modeling. Preliminary modeling was performed with the coarse grid to locate the areas of maximum concentration. Fine grids were used to refine the location of the maximum concentrations.

The stack parameters and emission rates used to model combined impacts from all new equipment at the facility are shown in Appendix H. The model receptor and source base elevations were determined from USGS National Elevation Dataset (NED) data in the GeoTIFF format at a horizontal resolution of 1 arc-second (approximately 30 meters). All coordinates were referenced to UTM North American Datum 1983 (NAD83), Zone 11. The AERMOD receptor elevations were interpolated among the DEM nodes according to standard AERMAP procedure. For determining concentrations in elevated terrain, the AERMAP terrain preprocessor receptor-output (ROU) file option was chosen.

A 250-meter resolution coarse receptor grid was developed and extended outwards at least 10 km. In addition, a nested grid was developed to fully represent the maximum impact area(s). The receptor grid was constructed as follows:

1. One row of receptors spaced 25 meters apart along the facility’s fence line;

2. Four tiers of receptors spaced 25 meters apart, extending 100 meters from the fence line;

3. Additional tiers of receptors spaced 100 meters apart, extending from 100 meters to 1,000 meters from the fenceline; and

4. Additional tiers of receptors spaced 250 meters apart, out to at least 10 km from the most distant source modeled, not to exceed 50 km from the project site.

Additional refined receptor grids with 25-meter resolution were placed around the maximum first-high or maximum second-high coarse grid impacts and extended out 1,000 meters in all directions. Concentrations within the facility fenceline were not calculated.

These terrain data are included in the modeling DVD submitted to the VCAPCD (as part of the ATC/DOC application package) and to the CEC (as part of the AFC) for the proposed project.

Specialized Modeling Analyses

Fumigation Modeling

Fumigation occurs when a stable layer of air lies a short distance above the release point of a plume and unstable air lies below. Under these conditions, an exhaust plume may cause high ground-level pollutant concentrations because the plume is unable to rise upwards normally due to the stable layer capping it from above, and be drawn to the ground by turbulence within the unstable layer. Although fumigation conditions rarely last as long as one hour, relatively high ground-level concentrations may be reached during that time. For this analysis, fumigation was assumed to occur for up to 90 minutes as required by EPA guidance.

The SCREEN3 model was used to evaluate maximum ground-level concentrations for short-term averaging periods (24 hours or less). Guidance from the EPA[7] was followed in evaluating fumigation impacts. This analysis is shown in more detail in Appendix H.

Shoreline Fumigation Modeling

Because land surfaces tend to both heat and cool more rapidly than water, shoreline fumigation tends to occur on sunny days when the denser cooler air over water displaces the warmer, lighter air over land. During an inland sea breeze, the unstable air over land gradually increases in depth with inland distance. The boundary between stable air over the water and unstable air over the land and the wind speed determine whether the plume will loop down before much dispersion of the pollutants has occurred.

SCREEN3 can examine sources within 3,000 meters of a large body of water, and was used to calculate the maximum shoreline fumigation impact. The model uses a stable onshore flow and a wind speed of 2.5 meters per second; the maximum ground-level shoreline fumigation concentration is assumed by the model to occur where the top of the stable plume intersects the top of the well-mixed thermal inversion boundary layer (TIBL). The model TIBL height was varied between 2 and 6 to determine the highest shoreline fumigation impact. The worst-case (highest) impact was used in determining facility impacts due to shoreline fumigation. Shoreline breakup fumigation was assumed to persist for up to 3 hours. The shoreline fumigation analysis is shown in more detail in Appendix H.

Gas Turbine Startup

Facility impacts were also evaluated during startup of the new CTG to evaluate short-term impacts under worst-case startup emissions. CTG exhaust parameters used to characterize CTG exhaust during startup and the CO and NO_x emission rates are shown in Appendix H.

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[7] U.S. Environmental Protection Agency (1992). "Screening Procedures for Estimating the Air Quality Impact of Stationary Sources, Revised," Report 454/R-92-019.

Ozone Limiting

One-hour NO_2 impacts during proposed project operation were modeled using the Ozone Limiting Method (OLM),[8] implemented through the "OLMGROUP ALL" option in AERMOD.[9] AERMOD OLM was used to calculate the NO_2 concentration based on the OLM method and hourly ozone data. Hourly ozone data collected at the Oxnard (Rio Mesa School) monitoring station during the years 2009-2013 were used in conjunction with OLM to calculate hourly NO_2 concentrations from hourly NOx concentrations.

Part of the NOx in the exhaust is converted to NO_2 during and immediately after combustion. The remaining percentage of the NOx emissions is assumed to be NO. For the new CTG, based on information provided by the CTG vendor, the analysis was performed using the following NO_2/NOx ratios:

- 30% during normal operating hours;
- 40% during hours in which a startup/shutdown occurs; and
- 40% during commissioning tests when the SCR system is not fully operational.

A NO_2/NOx ratio of 32.3% was used for the analysis of the new Diesel emergency generator engine.[10]

As the exhaust leaves the stack and mixes with the ambient air, the NO reacts with ambient ozone (O_3) to form NO_2 and molecular oxygen (O_2). The OLM assumes that at any given receptor location, the amount of NO that is converted to NO_2 by this oxidation reaction is proportional to the ambient O_3 concentration. If the O_3 concentration is less than the NO concentration, the amount of NO_2 formed by this reaction is limited; however, if the O_3 concentration is greater than or equal to the NO concentration, all of the NO is assumed to be converted to NO_2.

Annual nitrogen dioxide (NO_2) concentrations were calculated using the Ambient Ratio Method (ARM), originally adopted in Supplement C to the Guideline on Air Quality Models[11] with a revision issued by EPA in March 2011.[12] Based on guidance provided by

[8] Cole, Henry S. and John E. Summerhays (1979). "A Review of Techniques Available for Estimating Short-Term NO2 Concentrations," Journal of the Air Pollution Control Association, Volume 29, Number 8, pages 812-817, August 1979.

[9] U.S. Environmental Protection Agency (2011). Office of Air Quality Planning and Standards, Memo from Tyler Fox, Leader, Air Quality Modeling Group, to EPA Regional Air Division Directors, "Additional Clarification Regarding Application of Appendix W Modeling Guidance for the 1-hour NO2 National Ambient Air Quality Standard," March 1, 2011.

[10] EPA's ISR database is at http://www.epa.gov/ttn/scram/no2_isr_database.htm, for a Cat. C-15 engine at the Discoverer facility.

[11] U.S. Environmental Protection Agency (1995). "Supplement C to the Guideline on Air Quality Models (revised)." Office of Air Quality Planning and Standards, Research Triangle Park, NC.

[12] U.S. Environmental Protection Agency (2011). Office of Air Quality Planning and Standards, Memo from Tyler Fox, Leader, Air Quality Modeling Group, to EPA Regional Air Division Directors, "Additional Clarification Regarding Application of Appendix W Modeling Guidance for the 1-hour NO2 National Ambient Air Quality Standard," March 1, 2011.

the District, a default of 80% was used for the conversion of nitric oxide (NO) to NO_2 on an annual basis.

Gas Turbine Commissioning

CTG commissioning is the process of initial startup, tuning, and adjustment of the new CTG and auxiliary equipment and of the emission control systems. The commissioning process for the P3 will consist of sequential test operation of the CTG up through increasing load levels, and with successive application of the air pollution control systems. The total set of commissioning tests will require approximately 366 operating hours for the CTG with a total of approximately six weeks required to complete all commissioning tests for the new unit. The detailed CTG commissioning schedule is included in Appendix B.

During the commissioning phase of the proposed project, the existing Units 1-3 at the MGS will remain available for operation and the commissioning modeling analysis accounts for the combined impacts for the new unit (undergoing commissioning) and operation of the existing units. Once the commissioning and performance tests are complete MGS Units 1 and 2 would be retired; Unit 3 will remain in operation.

Impacts during Normal Operation

Table E-1 summarizes the maximum impacts during the normal operation of the P3, calculated from the refined, startup/shutdown and fumigation modeling analyses described above.

Table E-1
Normal Operation Air Quality Modeling Results for P3

Pollutant	Averaging Time	Modeled Maximum Concentrations ($\mu g/m^3$)			
		Normal Operations AERMOD	Startup/Shutdown AERMOD	Fumigation SCREEN3	Shoreline Fumigation SCREEN3
New CTG					
NO_2	1-hour	1.2	9.7	6.1	37.3
	98th Percentile	0.7	5.8	-	-
	Annual	0.0	N/A[a]	N/A[c]	N/A[c]
SO_2	1-hour	0.3	N/A[a]	0.2	1.4
	3-hour	0.2	N/A[a]	0.2	0.7
	24-hour	0.0	N/A[a]	0.0	0.1
	Annual	0.0	N/A[a]	N/A[c]	N/A[c]
CO	1-hour	1.4	33.2	17.6	107.3
	8-hour	0.4	10.4	10.7	22.5
$PM_{2.5}/PM_{10}$	24-hour	0.1	N/A[b]	0.2	0.2
	Annual	0.0	N/A[b]	N/A[c]	N/A[c]
New Emergency Generator Engine					
NO_2	1-hour	28.2	N/A[d]	N/A[e]	N/A[e]
	98th percentile	23.9	N/A[d]	N/A[e]	N/A[e]
	Annual	0.0	N/A[d]	N/A[e]	N/A[e]
SO_2	1-hour	0.3	N/A[d]	N/A[e]	N/A[e]
	3-hour	0.2	N/A[d]	N/A[e]	N/A[e]
	24-hour	0.0	N/A[d]	N/A[e]	N/A[e]
	Annual	0.0	N/A[d]	N/A[e]	N/A[e]
CO	1-hour	179.9	N/A[d]	N/A[e]	N/A[e]
	8-hour	8.7	N/A[d]	N/A[e]	N/A[e]
$PM_{2.5}/PM_{10}$	24-hour	0.0	N/A[d]	N/A[e]	N/A[e]
	Annual	0.0	N/A[d]	N/A[e]	N/A[e]
Existing Unit 3					
NO_2	1-hour	116.6	N/A	N/A[e]	N/A[e]
	98th percentile	67.6	N/A	N/A[e]	N/A[e]
	Annual	0.0	N/A	N/A[e]	N/A[e]
SO_2	1-hour	0.4	N/A	N/A[e]	N/A[e]
	3-hour	0.2	N/A	N/A[e]	N/A[e]
	24-hour	0.0	N/A	N/A[e]	N/A[e]
	Annual	0.0	N/A	N/A[e]	N/A[e]
CO	1-hour	86.1	N/A	N/A[e]	N/A[e]
	8-hour	21.9	N/A	N/A[e]	N/A[e]
$PM_{2.5}/PM_{10}$	24-hour	0.7	N/A	N/A[e]	N/A[e]
	Annual	0.0	N/A	N/A[e]	N/A[e]

Table E-1
Normal Operation Air Quality Modeling Results for P3

Pollutant	Averaging Time	Modeled Maximum Concentrations ($\mu g/m^3$) Normal Operations AERMOD	Startup/Shutdown AERMOD	Fumigation SCREEN3	Shoreline Fumigation SCREEN3
Combined Impacts New Equipment					
NO_2	1-hour	28.2	N/A[f]	N/A[f]	N/A[f]
	98th percentile	23.9	N/A[f]	N/A[f]	N/A[f]
	Annual	0.0	N/A[f]	N/A[f]	N/A[f]
SO_2	1-hour	0.3	N/A[f]	N/A[f]	N/A[f]
	3-hour	0.2	N/A[f]	N/A[f]	N/A[f]
	24-hour	0.0	N/A[f]	N/A[f]	N/A[f]
	Annual	0.0	N/A[f]	N/A[f]	N/A[f]
CO	1-hour	179.9	N/A[f]	N/A[f]	N/A[f]
	8-hour	8.7	N/A[f]	N/A[f]	N/A[f]
$PM_{2.5}/PM_{10}$	24-hour	0.1	N/A[f]	N/A[f]	N/A[f]
	Annual	0.0	N/A[f]	N/A[f]	N/A[f]
Combined Impacts New Equipment and Unit 3					
NO_2	1-hour	116.7	116.7	6.1	37.3
	98th percentile	67.6	67.6	-	-
	Annual	0.0	N/A[a]	N/A[c]	N/A[c]
SO_2	1-hour	0.4	N/A[b]	0.2	1.4
	3-hour	0.3	N/A[b]	0.2	0.7
	24-hour	0.0	N/A[b]	0.0	0.1
	Annual	0.0	N/A[a]	N/A[c]	N/A[c]
CO	1-hour	179.9	86.1	17.6	107.3
	8-hour	22.0	22.0	10.7	22.5
$PM_{2.5}/PM_{10}$	24-hour	0.7	N/A[b]	0.2	0.2
	Annual	0.0	N/A[b]	N/A[c]	N/A[c]

a. Not applicable, because startup/shutdown emissions are included in the modeling for annual average.
b. Not applicable, because emissions are not elevated above normal operation levels during startups/shutdowns.
c. Not applicable, because inversion breakup is a short-term phenomenon and as such is evaluated only for short-term averaging periods.
d. Not applicable, because engine will not operate during CTG startups/shutdowns.
e. Not applicable, this type of modeling is not performed for small combustion sources with relatively short stacks.
f. Impacts are the same as shown for CTG.

<u>Impacts During Gas Turbine Commissioning</u>

During the CTG commissioning phase, NO_2 and CO impacts may be higher than under the operating conditions evaluated above. The commissioning period is comprised of various equipment tests. These tests and the associated emissions are summarized in Appendix B.

It is assumed that the maximum modeled impacts during commissioning will occur under the CTG operating conditions that are least favorable for dispersion. These conditions are expected to occur under low-load conditions.

As discussed above, during the commissioning of the new unit it may be necessary to operate existing Units 1-3. Therefore, the commissioning modeling analysis analyzed the combined impacts for the commissioning of the new unit and the continued operation of the existing units. Emission rates and stack parameters for the new and existing units during the commissioning period are shown in Appendix H. Modeled short-term impacts (1-hr, 8-hr, and 24-hr average) during the commissioning period are summarized further below in Table E-4. While SOx and $PM_{10}/PM_{2.5}$ emissions during the commissioning of the new CTG are not expected to be higher than during normal operation, SO_2 and $PM_{10}/PM_{2.5}$ impacts are included in Table E-4 to show the combined short-term impacts for the new/existing units.

Ambient Air Quality Impacts from the Proposed Project

To determine a project's air quality impacts, the modeled concentrations are added to the maximum background ambient air concentrations and then compared to the applicable ambient air quality standards. The background $PM_{2.5}$, PM_{10}, O_3, and NO_2 data were collected at the Oxnard monitoring site (approximately 7 miles from the project site). The background SO_2 data were collected at the Santa Barbara - UCSB monitoring site (approximately 39 miles from project site), and the background CO data were collected at the Santa Barbara – East Canon Perdido monitoring site (approximately 29 miles from project site). Because these are the nearest ambient monitoring stations to the project site, the data collected at these stations are considered representative of ambient concentrations in the vicinity of the proposed project.

Table E-2 presents the maximum concentrations of NO_2, CO, SO_2, PM_{10}, and $PM_{2.5}$ recorded between 2011 and 2013 from representative nearby monitoring stations, as required by Appendix B(g)(8)(G) of the CEC guidelines.

The maximum modeled concentrations during normal operation shown in Table E-1 are combined with the maximum background ambient concentrations in Table E-2 and compared with the state and federal ambient air quality standards in Table E-3 (with and without Unit 3). In Table E-4, the maximum modeled concentrations (new CTG plus impacts from Units 1-3) during the commissioning period are compared with state and federal ambient air quality standards. Using the conservative assumptions described earlier, during normal operation the results indicate that the P3 will not cause or contribute to violations of state or federal air quality standards, with the exception of the 24-hour and annual state PM_{10} standards. For this pollutant and averaging periods, existing background concentrations already exceed state standards.

During commissioning activities the results indicate that once again the P3 will not cause or contribute to violations of state or federal air quality standards, with the exception of the 24-hour state PM_{10} standard (existing background concentrations already exceed state standard).

Table E-2
Maximum Background Concentrations,[a] Project Area, 2011 – 2013 ($\mu g/m^3$)

Pollutant	Averaging Time	2011	2012	2013
NO_2 (Oxnard)	1-hour	**169.5**	107.4	75.3
	Fed. 1-hour[c]	**67.8**	**67.8**	64.0
	Annual	**13.2**	**13.2**	**13.2**
SO_2 (Santa Barbara - UCSB)	1-hour	**7.9**	5.2	5.2
	Fed. 1-hour[d]	**7.9**	**7.9**	5.2
	24-hour	**2.6**	**2.6**	**2.6**
	Annual	0.0	-[b]	-[b]
CO (Santa Barbara – East Canon Perdido)	1-hour	**2875**	2415	**2875**
	8-hour	**2185**	1035	1265
PM_{10} (Oxnard)	24-hour	51.7	**56.9**	46.7
	Annual	21.6	20.4	**23.6**
$PM_{2.5}$ (Oxnard)	24-hour[e]	**18.3**	15.9	16.6
	Annual	8.9	**9.0**	**9.0**

Source: California Air Quality Data, California Air Resources Board website; EPA AIRData website. Reported values have been rounded to the nearest tenth of a $\mu g/m^3$ except for PM_{10} which were already rounded to the nearest integer.

Notes:

a. With the exception of federal 1-hr NO_2, federal 1-hr SO_2, and 24-hr $PM_{2.5}$, bolded values are the highest during the three years and are used to represent background concentrations.

b. There were insufficient data to determine annual SO_2 for 2012 and 2013.

c. Federal 1-hour NO_2 is shown as the 3-year average 98th percentile, as that is the basis of the federal standard.

d. Federal 1-hour SO_2 is shown as the 3-year average 99th percentile, as that is the basis of the federal standard.

e. 24-hour average $PM_{2.5}$ concentrations shown are 3-year average 98^{th} percentile values, rather than highest values, because compliance with the ambient air quality standards is based on 98^{th} percentile readings.

Table E-3
Modeled Maximum Proposed Project Impacts (Normal Operation)

Pollutant	Averaging Time	Maximum Project Impact ($\mu g/m^3$)	Background ($\mu g/m^3$)	Total Impact ($\mu g/m^3$)	State Standard ($\mu g/m^3$)	Federal Standard ($\mu g/m^3$)
Impacts for New Equipment						
NO_2	1-hour	37.3	169.5	207	339	--
	98th percentile	23.9	67.8[a]	69.3	--	188
	Annual	0.0	13.2	13	57	100
SO_2	1-hour	1.4	7.9	9	655	--
	99th percentile	1.4	7.9[c]	9	--	196
	24-hour	0.1	5.2	5	105	
CO	1-hour	179.9	2875.0	3055	23,000	40,000
	8-hour	22.5	2185.0	2208	10,000	10,000
PM_{10}	24-hour	0.2	56.9	57	50	150
	Annual	0.0	23.6	24	20	--
$PM_{2.5}$	24-hour	0.2	18.3[b]	19	--	35
	Annual	0.0	9.0	9	12	12
Impacts for New Equipment and Unit 3						
NO_2	1-hour	116.7	169.5	286	339	--
	98th percentile	67.6	67.8[a]	92	--	188
	Annual	0.0	13.2	13	57	100
SO_2	1-hour	1.4	7.9	9	655	--
	99th percentile	1.4	7.9[c]	9	--	196
	24-hour	0.1	5.2	5	105	
CO	1-hour	179.9	2875.0	3055	23,000	40,000
	8-hour	22.5	2185.0	2208	10,000	10,000
PM_{10}	24-hour	0.7	56.9	58	50	150
	Annual	0.0	23.6	24	20	--
$PM_{2.5}$	24-hour	0.7	18.3[b]	19	--	35
	Annual	0.0	9.0	9	12	12

a. 1-hour NO_2 background concentration is shown as the 3-year average of the 98th percentile as that is the basis of the federal standard.
b. 24-hr $PM_{2.5}$ background concentration reflects 3-year average of the 98th percentile values based on form of standard.
c. 1-hr SO_2 background concentration reflects 3-year average of the 99th percentile values based on form of standard.

Table E-4
Modeled Maximum Proposed Project Impacts (Commissioning Period)

Pollutant	Averaging Time	Maximum Project Impact[d] ($\mu g/m^3$)	Background ($\mu g/m^3$)	Total Impact ($\mu g/m^3$)	State Standard ($\mu g/m^3$)	Federal Standard ($\mu g/m^3$)
NO_2	1-hour	116.8	169.5	286	339	--
	98^{th} percentile	70.5	67.8[a]	95	--	188
SO_2	1-hour	1.0	7.9	9	655	--
	99^{th} percentile	1.0	7.9[c]	9	--	196
	24-hour	0.2	5.2	5	105	--
CO	1-hour	198.6	2,875	3,094	23,000	40,000
	8-hour	67.0	2,185	2,252	10,000	10,000
PM_{10}	24-hour	1.0	56.9	58	50	150
$PM_{2.5}$	24-hour	1.0	18.3[b]	19	--	35

a. 1-hour NO_2 background concentration is shown as the 98th percentile as that is the basis of the federal standard.
b. 24-hr $PM_{2.5}$ background concentration reflects 3-year average of the 98th percentile values based on form of standard.
c. 1-hr SO_2 background concentration reflects 3-year average of the 99^{th} percentile values based on form of standard.
d. Includes impacts from existing MGS Units 1-3.

PSD Significance Levels

The PSD program was established to allow emission increases that do not result in significant deterioration of ambient air quality in areas where criteria pollutants have not exceeded the NAAQS. As described in Section II.A.1, the P3 will not be a major modification (with the shutdown of existing Units 1-2) and will not trigger PSD review. While the proposed project will not trigger a PSD review, an analysis was conducted to determine whether the ambient impacts of the proposed project exceed the PSD significance thresholds, as these thresholds are generally used as one measure of whether the project’s ambient impacts will be significant. Modeled project impacts during normal operation are compared with the PSD significance thresholds in Table E-5 below. As shown in this table, the maximum impacts for the proposed project (new equipment) during normal operation are below the PSD significance thresholds with the exception of 1-hour NO_2 impacts. However, as shown on Table E-3 and E-4, maximum project impacts combined with maximum background levels are below the most stringent state and federal ambient air quality standards for this pollutant.

Table E-5
Comparison of Maximum Modeled Impacts and PSD Significant Impact Levels

Pollutant	Averaging Time	Significant Impact Level, µg/m^3	Maximum Modeled Impact for P3, µg/m^3	Exceed Significant Impact Level?
NO_2	1-Hour	7.5[a]	28.2	Yes
	Annual	1	0.0	No
SO_2	1-Hour	7.8[b]	0.3	No
	3-Hour	25	0.2	No
	24-Hour	5	0.0	No
	Annual	1	0.0	No
CO	1-Hour	2000	179.9	No
	8-Hour	500	8.7	No
PM_{10}	24-Hour	5	0.1	No
	Annual	1	0.0	No
$PM_{2.5}$[c]	24-Hour	1.2	0.1	No
	Annual	0.3	0.0	No

a. EPA has not yet defined significance levels (SILs) for one-hour NO_2 and SO_2 impacts. However, EPA has suggested that, until SILs have been promulgated, interim values of 4 ppb (7.5 µg/m^3) for NO_2 and 3 ppb (7.8 µg/m^3) for SO_2 may be used (USEPA (2010c); USEPA (2010d)). These values will be used in this analysis as interim SILs.
b. USEPA (2010e), p. 64891.
c. In January 2013, the D.C. Circuit Court of Appeals ruled that the $PM_{2.5}$ SILs could not be used as a definitive exemption from the requirements to perform $PM_{2.5}$ preconstruction monitoring or a $PM_{2.5}$ increments analysis or AQIA. However, EPA's March 2013 interpretation of the Court's decision indicated that the SILs can be used as guidance.

APPENDIX F

SCREENING LEVEL HEALTH RISK ASSESSMENT

Screening Level Health Risk Assessment

Potential human health impacts associated with the project stem from exposure to air emissions from operation of the new CTG, routine testing of the new emergency Diesel generator engine, and continued operation of existing Unit 3. The non-criteria pollutants emitted from the proposed project include certain volatile organic compounds and polycyclic aromatic hydrocarbons (PAHs) from the combustion of natural gas, ammonia from the SCR NO_x control system, and DPM from combustion of Diesel fuel in the emergency engine. These pollutants are listed in Table F-1, and the detailed emission summaries and calculations are presented in Appendix D.

For criteria pollutants, the proposed project will include the use of Best Available Control Technology (BACT) as required under VCAPCD rules. Emissions of criteria pollutants will not cause or contribute significantly to violations of the national or California ambient air quality standards as discussed in Appendix E.

Table F-1
Pollutants Emitted to the Air from the P3

Criteria Pollutants	Non-criteria Pollutants (Continued)
Carbon monoxide	Formaldehyde
Oxides of nitrogen	Hexane
Particulate matter	Naphthalene
Oxides of sulfur	Propylene
Volatile organic compounds	Propylene oxide
	Toluene
Non-criteria (Toxic) Pollutants	Xylene
Ammonia	Hexane
Acetaldehyde	PAHs
Acrolein	Benzo(α)anthracene
1,3-Butadiene	Benzo(α)pyrene
Benzene	Benzo(β)fluoranthene
Dichlorobenzene	Benzo(k)fluoranthene
Diesel Exhaust Particulate Matter	Chrysene
Ethylbenzene	Dibenz(a,h)anthracene
	Indeno(1,2,3-cd)pyrene

Air dispersion modeling results (see Appendix E) indicate that the P3 will not cause or contribute to violations of state or federal air quality standards, with the exception of the 24-hr and annual state PM_{10} standards. For this pollutant and these averaging periods, existing background concentrations already exceed state/federal standards, and the incremental contributions from the project are not significant. These standards are intended to protect the general public with a wide margin of safety. Therefore, the proposed project will not have a significant impact on public health from emissions of criteria pollutants.

The screening HRA was prepared using the latest version (1.4f) of CARB's HARP model [1], the CARB July 2014 health database[2], and the OEHHA Hot Spots Program Guidance Manual[3]. As discussed previously, OEHHA has issued new guidance for screening health risk assessments. The revised OEHHA guidance is now final; however, the new health risk screening procedures have not yet been incorporated into a fully functional version of HARP as of the date the ATC/DOC application package and AFC were submitted. Therefore, the current guidance and software have been used in preparing this risk assessment.

Public Health Impact Study Method

Emissions of non-criteria pollutants from the project were analyzed using emission factors previously approved by CARB and the U.S. Environmental Protection Agency (EPA). Included in Appendix D are the detailed non-criteria pollutant emission calculations for the proposed new CTG and emergency engine and the existing units at the MGS. In addition to an analysis of the acute/chronic/cancer risk impacts during the normal operation of the new equipment (CTG/emergency engine), the District/CEC requires an analysis of the acute impacts during CTG startups/shutdowns and during the commissioning phase of a new CTG. Therefore, the detailed non-criteria pollutant calculations in Appendix D include separate non-criteria emission calculations for each of these three cases (normal operation, startups/shutdown, commissioning).

As shown in the calculations in Appendix D, compared to normal operating levels the hourly non-criteria pollutant emission levels will be higher during CTG startups/shutdowns and during the commissioning period. Hourly non-criteria pollutant emissions will be elevated during these two operating cases because the oxidation catalyst system (which controls organic compounds including non-criteria pollutants) may not be operating at all times during these periods. During a CTG startup/shutdown, the oxidation catalyst system may not be fully functional during the entire hour in question because the proper catalyst operating temperature was not reached for a portion of the hour. During the commissioning phase of a new CTG, there will be test runs performed prior to the installation/operation of the oxidation catalyst system. The health risk assessment performed for the proposed project includes an analysis of the impacts during gas CTG startups/shutdowns and the commissioning period. Because it will be necessary to continue to operate the existing Units 1-3 at the MGS during the commissioning period of the new CTG, the health risk assessment for the commissioning period also includes the impacts for the existing Unit 1-3.

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[1] California Air Resources Board. HARP Model, Version 1.4f, *www.arb.ca.gov/toxics/harp/harp.htm*.
[2] California Air Resources Board (2014). Consolidated table of OEHHA/ARB approved risk assessment health values. *www.arb.ca.gov/toxics/healthval/contable.pdf*. July 3, 2014.
[3] Office of Environmental Health Hazard Analysis (2003). "Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments," August 2003.

Air dispersion modeling combines the emissions with site-specific terrain and meteorological conditions to analyze short-term and long-term arithmetic mean concentrations in air for use in the HRA. The EPA-recommended air dispersion model, AERMOD, was used along with 5 years (2009–2013) of compatible meteorological data from the Oxnard airport meteorological station. Because HARP is built on a previous EPA-approved air dispersion model, Industrial Source Complex Short Term, Version 3 (ISCST3), the HARP On-Ramp[4] was used to integrate the air dispersion modeling output from the required air dispersion model, AERMOD, with the risk calculations in the HARP risk module. The HARP model was used to assess cancer risk as well as non-cancer chronic and acute health hazards. In addition to inhalation, the HARP modeling included the additional pathways for dermal absorption, soil ingestion, mother's milk ingestion, home-grown produce ingestion, and fish ingestion.

Risk Analysis Method

The highest annual, 8-hour and 1-hour average concentrations were used to determine cancer risk and chronic health hazard index, and acute 8-hour and 1-hour health hazard indices, as appropriate. Health risks potentially associated with the estimated concentrations of pollutants in air were characterized in terms of potential lifetime cancer risk (for carcinogenic substances), or comparison with RELs for non-cancer health effects (for non-carcinogenic substances).

Health risks were evaluated for a hypothetical Maximum Exposed Individual (MEI) located at the Point of Maximum Impact (PMI) as well as risks to the MEI at residential locations (MEIR). The cancer risk to the MEI at the PMI is referred to as the Maximum Incremental Cancer Risk, or MICR. Human health risks associated with emissions from the project are unlikely to be higher at any other location than at the PMI. If there is no significant impact associated with concentrations in air at the PMI location, it is unlikely that there would be significant impacts in any other location. Health risks were also evaluated at the nearest residence. The PMI (and thus the MICR) is not necessarily associated with actual exposure to a residential location because in many cases the PMI is in an uninhabited area. Therefore, the MICR is generally higher than the cancer risk to the nearest resident. Both risks are based on 24 hours per day, 365 days per year, 70 year lifetime exposure.

Health risks are also assessed for the hypothetical Maximally Exposed Individual Worker, or MEIW, at the PMI. This assessment reflects potential workplace risks, which have a shorter duration than residential risks. Workplace risks reflect 8 hour per day, 245 days per year, 40 year exposure.

Health risks potentially associated with concentrations of carcinogenic pollutants in air were calculated as estimated excess lifetime cancer risks. The total cancer risk at any specific location is found by summing the contributions from each carcinogen.
The inhalation cancer potency factors and RELs used to characterize health risks associated with modeled concentrations in air are taken from the *Consolidated Table of*

[4] California Air Resources Board (no date).

OEHHA/ARB Approved Risk Assessment Health Values (CARB, 2011) and are presented in Table F-2.

Table F-2
Toxicity Values Used to Characterize Health Risks

Toxic Air Contaminant	Inhalation Cancer Potency Factor $(mg/kg\text{-}d)^{-1}$	Chronic Inhalation REL $(\mu g/m^3)$	Acute Inhalation REL $(\mu g/m^3)$
Acetaldehyde	0.010	140	470
Acrolein	—	0.35	2.5
Ammonia	—	200	3,200
Benzene	0.10	3	270
1,3-Butadiene	0.60	2.0	660
Diesel PM	1.1	5.0	—
Ethylbenzene	0.0087	2,000	—
Formaldehyde	0.021	9.0	55
Hexane	—	7,000	—
Naphthalene	0.12	9.0	—
PAHs (as BaP for HRA)	3.9	—	—
Propylene	—	3,000	—
Propylene oxide	0.013	30	3,100
Toluene	—	300	37,000
Xylene	—	700	22,000
Source: CARB/OEHHA, July 3, 2014.			

Characterization of Risks from Toxic Air Pollutants

The estimated potential maximum cancer risks associated with the operation of the proposed project are shown in Table F-3. This table shows both the cancer risks calculated by the current version of the HARP model and cancer risks estimated by using the new draft OEHHA guidance. The new draft OEHHA guidance cancer risk results were based on increasing the HARP impacts by a factor of 2.2 to 3.5. This increase in the HARP cancer risk due to the use of the new draft OEHHA guidance is based on the results of a health risk assessment recently performed by the CEC Staff (that included impacts associated with the new draft OEHHA guidance) for the Carlsbad Energy Center Project Amendment[5]. The maximum carcinogenic risk is well below the CEC's 10–in-one-million threshold of significance used for recent projects.

Cancer risks potentially associated with the project also were assessed in terms of cancer burden. Cancer burden is a hypothetical upper-bound estimate of the additional number of cancer cases that could be associated with emissions from the project. Cancer burden is calculated as the maximum product of any potential carcinogenic risk greater than 1 in

[5] Final Staff Assessment for the Carlsbad Energy Center Project Amendment, Public Health Section, 2/17/2015 (http://docketpublic.energy.ca.gov/PublicDocuments/07-AFC-06C/TN203696_20150217T141737_CECP_Amendment_Final_Staff_Assessment.pdf)

one million and the number of individuals at that risk level. Because the maximum cancer risk at the MEI is below 1 in one million, the cancer burden is zero.

The maximum potential acute non-cancer health hazard index associated with operation of the proposed project is shown in Table F-3. The acute non-cancer health hazard index for all target organs falls below 1.0, the CEC threshold of significance used for recent projects.

Table F-3
Summary of Potential Health Risks

Receptor	Carcinogenic Risk (per million)	Cancer Burden	Acute Health Hazard Index	Chronic Health Hazard Index
New Equipment Normal Operation (CTG/emergency engine)				
Maximally Exposed Individual (MEI) at PMI	4.3×10^{-7} [a] (0.9 to 1.5×10^{-6} [e])	0[c]	1.5×10^{-2}	2.1×10^{-4}
Maximally Exposed Individual Resident (MEIR)	2.3×10^{-8} [a] (5.1 to 8.1×10^{-8} [e])		6.1×10^{-3}	9.0×10^{-5}
Maximally Exposed Individual Worker (MEIW)	6.5×10^{-8} [b]		1.5×10^{-2}	N/A[d]
New CTG Startups/Shutdowns				
MEI (acute impact only)	N/A	N/A	2.1×10^{-2}	N/A
New CTG Commissioning Period (includes impacts for existing MGS Units 1-3)				
MEI (acute impact only)	N/A	N/A	1.6×10^{-2}	N/A
Significance Level	10	1.0	1.0	1.0

Notes:
a. Based on High Point Method which results in the maximum cancer risk.
b. The worker is assumed to be exposed at the work location 8 hours per day, instead of 24, 245 days per year, instead of 365, and for 40 years, instead of 70.
c. Cancer burden is zero because maximum offsite cancer risk is less than 1.0 per million.
d. Because of the exposure correction discussed in footnote b, a 70-year-based chronic health hazard index is not applicable to a worker.
e. Increased by factors of 2.2 and 3.5 to account for new draft OEHHA guidance.

Similarly, the maximum potential chronic non-cancer health hazard index associated with operation of the proposed project is also shown in Table F-3. The chronic non-cancer health hazard index falls below 1.0, the CEC threshold of significance used for recent project.

The estimates of cancer and non-cancer risks associated with chronic or acute exposures are below thresholds used for regulating emissions of toxic air contaminants to the air. Historically, exposure to any level of a carcinogen has been considered to have a finite risk of inducing cancer. There is no threshold for carcinogenicity. Because risks at low levels of exposure cannot be quantified directly by either animal or epidemiological studies, mathematical models have estimated such risks by extrapolation from high to low doses. This modeling procedure is designed to provide a highly conservative estimate of cancer risks based on the most sensitive species of laboratory animal for extrapolation to humans (i.e., the assumption being that humans are as sensitive as the most sensitive animal species). Therefore, the risk is not likely to be higher than risks estimated using inhalation cancer potency factors and is most likely lower, and could even be zero.[6]

The analysis of potential cancer risk described in this section employs methods and assumptions generally applied by regulatory agencies for this purpose. Given the importance of assuring public health, this analysis uses highly conservative methods and assumptions, meaning they tend to over-predict the potential for adverse effects.

Conservative methodology and assumptions include those summarized below.

- The analysis includes representative weather data over a period of five years to ensure that the least favorable conditions producing the highest ground-level concentration of power plant emissions are included. The analysis then assumes that these worst-case weather conditions, which in reality occurred only once in five years, will occur continuously for 70 years.

- The project is assumed to operate at hourly, daily, and annual emission conditions that produce the highest ground-level concentrations.

- The location of the highest ground-level concentration of project emissions is identified and the analysis then assumes that a sensitive individual resides at this location 24 hours a day, 7 days a week over the entire 70-year period, even though these assumptions are physically impossible.

Taken together, these methods and assumptions create a scenario that is more potentially adverse to human health than conditions than exist in the real world. For example, if the worst-case weather conditions could occur only on a winter evening but the worst-case emission rates could occur only on a summer afternoon, the analysis nonetheless assumes that these events occur at the same time. The point of using these conservative assumptions is to consciously overstate the potential impacts of the project. No one individual will experience exposures as great as those assumed for this analysis. By determining that even this highly overstated exposure will not be significant, the analysis provides a high degree of confidence that the much lower exposures that actual persons will experience will not result in any significant increase in cancer risk. In short, the analysis ensures that there will not be any significant public health impacts at any location, under any weather condition, under any operating condition.

[6] U.S. Environmental Protection Agency (1991).

APPENDIX G

AIR QUALITY MODELING PROTOCOL

February 19, 2015

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Kerby E. Zozula
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Subject: Revised Modeling Protocol for the Puente Power Project

Dear Mr. Zozula:

On behalf of NRG Oxnard Energy Center LLC (NRG), Sierra Research is pleased to submit the enclosed revised modeling protocol for the proposed Puente Power Project. This protocol was updated based on recent comments provided by the District. The following is a summary of the changes made to the modeling plan:

- The NO_2/NOx ratios for the new gas turbine have been updated to reflect information provided recently by the gas turbine vendor (30% ratio during normal operation, 40% ratio during startups/shutdowns/commissioning).
- The NO_2/NOx ratio for determining annual average NO_2 impacts was changed from a default of 75% to 80% based on guidance provided by the San Joaquin Valley APCD (providing technical support on this project).
- Because we do not expect any complex terrain modeling issues for this project, the references to the use of the CTDMPLUS model have been removed.
- While not required under the VCAPCD New Source Review (NSR) regulations, because the project will be undergoing a CEQA review as part of the CEC permitting process, we will perform air quality modeling on both the new units and existing Unit 3 at the facility (the existing emergency Diesel generator and firepump engines will be shutdown). We will show these modeled impacts separately.
- For the screening level risk assessment, we have included the fish water pathway option to the HARP modeling inputs (along with the options for home grown produce, dermal absorption, soil ingestion, and mother's milk).
- The reference to a hybrid partial dry cooling system has been removed from the document (the project will only use dry cooling).
- The maximum impacts on the proposed North Shore of Mandalay project will be included in the analysis.
- The NOx emission rates for the new and existing Unit 3 are summarized on the enclosed sheet.

If you have any questions or need any additional information, please do not hesitate to contact me at 916-273-5139 or George Piantka at 760-710-2156.

Sincerely,

Gabriel C. McAuliffe

for Tom Andrews

Enclosure

cc: Leland Villalvazo, SJVAPCD

Summary of NOx Emissions (for new/existing equipment)

1. New gas turbine: NOx emissions during normal operation based on a BACT NOx level of 2.5 ppmvd @ 15% O_2 (0.0091 lbs/MMBtu). At a maximum heat input of approximately 2,582 MMBtu/hr (HHV), this results in a maximum normal operation hourly NOx emission rate of approximately 23 lbs/hr. There are high NOx emissions during gas turbine startups/shutdowns/commissioning that will be discussed/analyzed in the permit application package submitted to the District.
2. New Diesel generator engine: NOx emissions based on an EPA Tier 4 (final) non-road engine (generator engines) certification standard of 0.50 g/bhp-hr. At a maximum engine rating of approximately 779 hp, this results in a maximum hourly NOx emission rate of approximately 0.9 lbs/hr.
3. Existing Unit 3 gas turbine: NOx emissions based on the Title V permit limit of 1104 lbs/hr.

Air Dispersion Modeling and Health Risk Assessment Protocol

Puente Power Project
Oxnard, California

Submitted to:

Ventura County Air Pollution Control District
(for an Application for an Authority to Construct/ Determination of Compliance)

California Energy Commission
(for an Application for Certification)

prepared for:

NRG Energy Center Oxnard LLC

February 2015

prepared by:

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Air Dispersion Modeling and Health Risk Assessment Protocol
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Air Dispersion Modeling and Health Risk Assessment Protocol
Puente Power Project

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1. INTRODUCTION

This protocol describes the modeling procedures that will be used to determine the ambient air impacts from the Puente Power Project (also referred to herein as "PPP" or "the Project"). These procedures will be used in the ambient air quality impact assessment and screening health risk assessment that will be submitted to the Ventura County Air Pollution Control District (VCAPCD, or District) as part of an application for Final Determination of Compliance and Authority to Construct, and to the California Energy Commission as part of an Application for Certification.

2. FACILITY DESCRIPTION AND SOURCE INFORMATION

The Puente Power Project ("PPP" or Project) will consist of replacing existing Units 1 and 2 (1,990 MMBtu/hr each, 215 MW each, natural gas fired boilers) with a new natural gas fired H-Class simple-cycle combustion turbine generator (approximately 2,500 MMBtu/hr, 275 MW), replacing the existing Diesel emergency generator will a new engine, and the shutdown of the existing Diesel emergency fire pump engine. The remainder of the facility will remain unchanged: one natural gas fired peaker combustion turbine (Unit 3), and ancillary facilities. PPP is located in the City of Oxnard, within Ventura County. Figure 1 shows the general location of the Project.

The proposed new combustion turbine generator will be equipped with Best Available Control Technology (BACT). BACT will include dry low-NOx combustion, selective catalytic reduction (SCR), oxidation catalysts, and use of clean-burning natural gas fuel. The operating schedule for the new unit will vary and may range from no operation during the winter months to potentially 24 hours of operation per day during the summer months. The modeling analysis will be performed for the worst-case (maximum expected equipment operation) operating hour, operating day, and operating year. The modeling analysis will include a complete description of the new equipment, including the worst-case hourly, daily, and annual operating schedules used for the analysis.

The Proposed Project is not expected to trigger Prevention of Significant Deterioration (PSD) review for criteria pollutants.

Figure 1
Location of the Proposed Project

3. DISPERSION MODELING PROCEDURES

The air quality modeling analysis will follow the March 2009 U.S. Environmental Protection Agency (USEPA) AERMOD Implementation Guide (USEPA, 2009) and USEPA's "Guideline on Air Quality Models" (USEPA, 2005).

3.1 AERMOD Modeling

The following USEPA air dispersion models are proposed for use to quantify pollutant impacts on the surrounding environment based on the emission sources' operating parameters and their locations:

- American Meteorological Society/Environmental Protection Agency Regulatory Model Improvement Committee (AERMIC) model, also known as AERMOD (Version 14134);
- Building Profile Input Program – Plume Rise Model Enhancements (BPIP-PRIME, Version 04274); and
- SCREEN3 (Version 13043).

The main air dispersion modeling will be conducted with the latest version of AERMOD, USEPA's preferred/recommended dispersion model for new source review and PSD air quality impact assessments. AERMOD can account for building downwash effects on dispersing plumes. Stack locations and heights and building locations and dimensions will be input to BPIP-PRIME. The first part of BPIP-PRIME determines and reports on whether a stack is being subjected to wake effects from a structure or structures; the second part calculates direction-specific building dimensions for each structure, which are used by AERMOD to evaluate wake effects. The BPIP-PRIME output is formatted for use in AERMOD input files.

AERMOD requires hourly meteorological data consisting of wind direction and speed (with reference height), temperature (with reference height), Monin-Obukhov length, surface roughness length, heights of the mechanically and convectively generated boundary layers, surface friction velocity, convective velocity scale, and vertical potential temperature gradient in the 500-meter layer above the planetary boundary layer.

Standard AERMOD control parameters will be used, including stack tip downwash, non-screening mode, non-flat terrain, and sequential meteorological data check. The stack-tip downwash algorithm will be used to adjust the effective stack height downward following the methods of Briggs (1972) for cases where the stack exit velocity is less than 1.5 times the wind speed at stack top. The rural option will be used by not invoking the URBANOPT option.[1]

3.1.1 Ambient Ratio Method and Ozone Limiting Method

Annual nitrogen dioxide (NO_2) concentrations will be calculated using the Ambient Ratio Method (ARM), originally adopted in Supplement C to the Guideline on Air Quality Models (USEPA, 1995) with a revision issued by USEPA in March 2011 (USEPA, 2011a). Based on guidance provided by the San Joaquin Valley Air Pollution Control District (will be providing technical and modeling support for this project), a default of 80% will be used for the conversion of nitric oxide (NO) to NO_2 on an annual basis and the calculation of NO_2/NOx (nitrogen oxide) ratios.

If NO_2 concentrations need to be examined in more detail, the Ozone Limiting Method (OLM) (Cole and Summerhays, 1979), implemented through the "OLMGROUP ALL" option in AERMOD (USEPA, 2011a), will be used. AERMOD OLM will be used to calculate the NO_2 concentration based on the OLM method and hourly ozone data. Contemporaneous hourly ozone data collected at the nearby Oxnard (Rio Mesa School) monitoring station will be used in conjunction with OLM to calculate hourly NO_2 concentrations from modeled hourly NOx concentrations.

Part of the NOx in the gas turbine exhaust is converted to NO_2 during and immediately after combustion. The remainder of the NOx emissions is assumed to be in the form of NO. For the new gas turbine, we will use the NO_2/NOx ratios for the OLM analysis (discussed in more detail below) provided by the turbine vendor (30% during normal operating hours, 40% during startup/shutdown periods, and 40% during commissioning tests when SCR is not fully operational). These same ratios will be used for modeling the existing Unit 3 turbine. For the new emergency generator engine, we will use the NO_2/NOx ratios listed in the USEPA's In-Stack Ratio (ISR) database for the make/model engine in question (or similar make/model engine if the exact engine is not listed in the database).[2]

As the exhaust leaves the stack and mixes with the ambient air, the NO reacts with ambient ozone (O_3) to form NO_2 and molecular oxygen (O_2). The OLM assumes that at any given receptor location, the amount of NO that is converted to NO_2 by this oxidation reaction is proportional to the ambient O_3 concentration. If the O_3 concentration is less than the NO concentration, the amount of NO_2 formed by this reaction is limited. However, if the O_3 concentration is greater than or equal to the NO concentration, all of the NO are assumed to be converted to NO_2.

---

[1] The rural vs. urban option in AERMOD is primarily designed to set the fraction of incident heat flux that is transferred into the atmosphere. This fraction becomes important in urban areas having an appreciable "urban heat island" effect due to a large presence of land covered by concrete, asphalt, and buildings. This situation does not exist for the project site.

[2] USEPA's ISR database is at *http://www.epa.gov/ttn/scram/no2_isr_database.htm*.

A detailed discussion of OLM modeling and how OLM modeling results and monitored background NO_2 will be combined is provided in Sections 3.6.3 and 3.6.4.

3.1.2 $PM_{2.5}$

$PM_{2.5}$ impacts will be modeled in accordance with USEPA guidance (USEPA, 2010a)[3]. A detailed discussion of how modeled $PM_{2.5}$ impacts will be evaluated is provided in Section 3.6.

3.2 Fumigation Modeling

The SCREEN3 model will be used to evaluate inversion breakup fumigation and shoreline fumigation impacts for short-term averaging periods (24 hours or less), as appropriate. The methodology in "Screening Procedures for Estimating the Air Quality Impact of Stationary Sources, Revised" (USEPA, 1992b) will be followed for these analyses. Combined impacts for all sources under fumigation conditions will be evaluated, based on USEPA modeling guidelines.

3.3 Health Risk Assessment Modeling

A health risk assessment (HRA) will be performed according to California Air Resources Board (CARB) guidance. The HRA modeling will be prepared using CARB's Hotspots Analysis and Reporting Program (HARP) computer program (Version 1.4f, May 2012[4] using the latest HARP Health Database table updated in November 2013) and AERMOD with the CARB "on-ramp."[5] HARP will be used to assess cancer risk as well as non-cancer chronic and acute health hazards.

3.4 Meteorological Data

Meteorological data are required from two different types of monitoring locations: surface data that are representative of meteorological conditions near the earth, and upper air data that are representative of meteorological conditions well above the earth's surface.

A five-year meteorological dataset (2009–2013) will be processed in AERMET (Version 14134) to generate AERMOD-compatible meteorological data for air dispersion

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[3] While there is a May 20, 2014 EPA guidance regarding secondary $PM_{2.5}$ formation, this guidance was not cited because it is specific to projects that trigger PSD review which is not the case for the Proposed Project.
[4] OEHHA has issued new draft guidance for screening health risk assessments. If the draft guidance is finalized and the new health risk screening procedures are incorporated into a new version of HARP before the AFC is submitted, the new version of HARP will be used for the HRA.
[5] HARP has not yet been revised to utilize AERMOD, but CARB has developed "on-ramp" software that allows HARP to incorporate AERMOD output files. Therefore, HARP is now compatible with AERMOD.

modeling. VCAPCD has contracted with the San Joaquin Valley Air Pollution Control District (SJVAPCD) to provide technical and modeling support for this project, and the SJVAPCD will prepare the meteorological data that we will use for the modeling analysis. This data will be processed using the ADJ_U* option, and the AERMOD modeling will use the "beta" option to be compatible with the processed meteorological data.[6] The meteorological dataset will include surface meteorological data recorded at the nearby Oxnard Airport monitoring station and upper air data recorded at Vandenberg AFB. Figure 1 above shows the relative locations of the project site and the meteorological monitoring station at the Oxnard Airport. The Oxnard Airport monitoring station was chosen by the SJVAPCD and is less than 3 km (less than 2 miles) from the project site. USEPA defines the term "on-site data" to mean data that would be representative of atmospheric dispersion conditions at the source and at locations where the source may have a significant impact on air quality. Specifically, the meteorological data requirement originates in the Clean Air Act at Section 165(e)(1), which requires an analysis "of the ambient air quality at the proposed site and in areas which may be affected by emissions from such facility for each pollutant subject to regulation under [the Act] which will be emitted from such facility."

This requirement and USEPA's guidance on the use of on-site monitoring data are also outlined in the "On-Site Meteorological Program Guidance for Regulatory Modeling Applications" (USEPA, 1987a). The representativeness of the data depends on (a) the proximity of the meteorological monitoring site to the area under consideration, (b) the complexity of the topography of the area, (c) the exposure of the meteorological sensors, and (d) the period of time during which the data are collected.

Representativeness has also been defined in "The Workshop on the Representativeness of Meteorological Observations" (Nappo et. al., 1982) as "the extent to which a set of measurements taken in a space-time domain reflects the actual conditions in the same or different space-time domain taken on a scale appropriate for a specific application." Representativeness is best evaluated when sites are climatologically similar, as are the project site and the Oxnard Airport meteorological monitoring station.

Representativeness has additionally been defined in the PSD Monitoring Guideline (USEPA, 1987b) as data that characterize the air quality for the general area in which the Proposed Project would be constructed and operated. Because of the close proximity of the Oxnard Airport meteorological data site to the project site (the distance between the two locations is less than two miles), the same large-scale topographic features that influence the meteorological data monitoring station also influence the project site in the same manner.

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[6] According to the discussion at the following link, the default AERMET u* formulation under predicts surface friction velocity (u*) at low wind speeds by approximately a factor of 2.
http://www.cleanairinfo.com/regionalstatelocalmodelingworkshop/archive/2013/Files/Presentations/Tuesday/105-Review_of_AERMOD_Low_Wind_Speed_Options_Paine.pdf
The beta "ADJ_U*" option in AERMET adjusts the u* at low wind speeds based on the following methodology: Qian and Venkatram, "Performance of Steady-State Dispersion Models Under Low Wind-Speed Conditions**,**" Boundary-Layer Meteorology (2011) 138:475–491.

There are few locations where upper air data are available; when looking at the representativeness of upper air data, the most important factors are distances relative to large urbanized areas and coastal zones. The Vandenburg Air Force Base upper air monitoring station was selected because it is the nearest station with complete and representative upper air data for the five-year period. The Vandenburg monitoring station is located in the coastal zone, approximately 137 km (85 miles) from the project site, and in a relatively rural area.

Thus, we agree with the SJVAPCD that the meteorological data from these monitoring stations are representative of conditions at the Project site.

3.5 Receptor Grids

Receptor and source base elevations will be determined from USGS National Elevation Dataset (NED) data in the GeoTIFF format at a horizontal resolution of 1 arc-second (approximately 30 meters). All coordinates will be referenced to UTM North American Datum 1983 (NAD83), Zone 11. The AERMOD receptor elevations will be interpolated among the DEM nodes according to standard AERMAP procedure. For determining concentrations in elevated terrain, the AERMAP terrain preprocessor receptor-output (ROU) file option will be chosen.

Cartesian coordinate receptor grids will be used to provide adequate spatial coverage surrounding the project area for assessing ground-level pollution concentrations, to identify the extent of significant impacts, and to identify maximum impact locations. A 250-meter resolution coarse receptor grid will be developed and will extend outwards at least 10 km (or more if necessary to establish the significant impact area).

For the full impact analyses, a nested grid will be developed to fully represent the maximum impact area(s). The receptor grid will be constructed as follows:

1. One row of receptors spaced 25 meters apart along the facility’s fence line;

2. Four tiers of receptors spaced 25 meters apart, extending 100 meters from the fence line;

3. Additional tiers of receptors spaced 100 meters apart, extending from 100 meters to 1,000 meters from the fenceline; and

4. Additional tiers of receptors spaced 250 meters apart, out to at least 10 km from the most distant source modeled, not to exceed 50 km from the project site.

Additional refined receptor grids with 25-meter resolution will be placed around the maximum first-high or maximum second-high coarse grid impacts and extended out 1,000 meters in all directions. Concentrations within the facility fenceline will not be calculated.

3.6 Ambient Air Quality Impact Analyses (AQIA)

Emissions from the Proposed Project will result from combustion of fuel in the gas new turbine and new emergency generator engine. These emission sources will be modeled as point sources. The expected emission rates will be based on vendor data and additional conservative assumptions of equipment performance.

The purpose of the ambient air quality impact analysis is to demonstrate compliance with applicable ambient air quality standards. Both USEPA and the District have regulations that prohibit construction of a project that will cause or contribute to violations of applicable standards.

Based on USEPA guidance, if, for a given pollutant and averaging time, the project's impact is below the Significant Impact Levels (SILs) shown in Table 1, the project's impact is deemed to be de minimis, and no further analysis is required. However, if the modeled impacts exceed any of the significance thresholds displayed in Table 1, the project has the potential to cause or contribute to a violation of the ambient air quality standard at the times and locations where the threshold is exceeded. In that case, the analysis must consider the contribution of other sources to the ambient concentration. If the analysis indicates that there will be a violation of an ambient air quality standard, and the project's impact at the time and place of the violation is significant, then the project may not be approved unless the project's impact is reduced.

Table 1
Significant Impact Levels for Air Quality Impacts in Class II Areas (μg/m^3)

Pollutant	Averaging Period				
	Annual	24-hour	8-hour	3-hour	1-hour
NO_2	1	--	--	--	7.5[a]
SO_2	1	5	--	25	7.8[b]
CO	--	--	500	--	2000
PM_{10}	1	5	--	--	--
$PM_{2.5}$[c]	0.3	1.2	--	--	--

a. USEPA has not yet defined SILs for one-hour NO_2 and SO_2 impacts. However, USEPA has suggested that, until SILs have been promulgated, interim values of 4 ppb (7.5 μg/m^3) for NO_2 and 3 ppb (7.8 μg/m^3) for SO_2 may be used (USEPA (2010c); USEPA (2010d)). These values will be used in this analysis as interim SILs.

b. USEPA (2010e), p. 64891.

c. In January 2013, the D.C. Circuit Court of Appeals ruled that the $PM_{2.5}$ SILs could not be used as a definitive exemption from the requirements to perform $PM_{2.5}$ preconstruction monitoring or a $PM_{2.5}$ increments analysis or AQIA. However, USEPA's March 2013 interpretation of the Court's decision indicated that the SILs can be used as guidance.

An air quality impact analysis is required for certification by the CEC and to support the air quality impact analysis and screening HRA that are required by the District. Each agency has its own criteria for preparation of the air quality impact analysis; however, the criteria used by the CEC and the District are similar enough that the same basic analysis, with some variations, will satisfy both agencies.

3.6.1 Step 1: Project Impact

The first step in the compliance demonstration is to determine, for each pollutant and averaging period, whether the proposed new equipment for the project has the potential to cause a significant ambient impact at any location, under any operating or meteorological conditions. As indicated in the NSR Workshop Manual,[7] "[i]f the significant net emissions increase from a proposed source would not result in a significant ambient impact anywhere, the application is usually not required to go beyond a preliminary analysis in order to make the necessary showing of compliance for a particular pollutant." The USEPA significance levels for air quality impacts are shown in Table 1. If the maximum modeled impact for any pollutant and averaging period is below the appropriate significance level in this table, no further analysis is necessary.[8]

Based on the following USEPA (2010e) guidance, no further analysis is necessary for any location where the modeled impacts from the project alone are below the significance thresholds.

> *The primary purpose of the SILs is to identify a level of ambient impact that is sufficiently low relative to the NAAQS or increments that such impact can be considered trivial or de minimis. Hence, the EPA considers a source whose individual impact falls below a SIL to have a de minimis impact on air quality concentrations that already exist. Accordingly, a source that demonstrates that the projected ambient impact of its proposed emissions increase does not exceed the SIL for that pollutant at a location where a NAAQS or increment violation occurs is not considered to cause or contribute to that violation. In the same way, a source with a proposed emissions increase of a particular pollutant that will have a significant impact at some locations is not required to model at distances beyond the point where the impact of its proposed emissions is below the SILs for that pollutant. When a proposed source's impact by itself is not considered to be "significant," EPA has long maintained that any further effort on the part of the applicant to complete a cumulative source impact analysis involving other source impacts would only yield information of trivial or no value with respect to the required evaluation of the proposed source or modification.*[9]

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[7] USEPA (1990), p. C.51.
[8] With the potential exception of the $PM_{2.5}$ SILs. See USEPA (2010e), p. 64891.
[9] USEPA (2010e), p. 64891.

For $PM_{2.5}$, the highest average of the maximum annual averages and of the 24-hour averages modeled over the five years of meteorological data will be compared with the SILs in Table 1 to determine whether the modeled $PM_{2.5}$ project impacts are significant.[10] For other pollutants, the highest modeled concentrations will be compared with the SILs.

For pollutants with modeled project impacts below the significance thresholds, a summary table will show the maximum modeled project impacts plus background concentrations. Although this information is not required by federal modeling guidance, it will be provided as part of the CEQA analysis.

3.6.2 Step 2: Project Plus Background

Pollutants/averaging periods that are not screened out in Step 1 are required to undergo a full air quality impact analysis. In Step 2, the ambient impacts of the project are modeled and added to background concentrations. The results are compared to the relevant state and federal ambient standards.

The second step of the compliance demonstration is required to show that the proposed new project, in conjunction with existing sources, will not cause or contribute to a violation of any ambient air quality standard. As discussed in more detail below, the impacts of existing sources are represented by the existing ambient air quality data collected at the monitoring stations shown in Table 2. In accordance with Section 8.2.1 of Appendix W to 40 CFR Part 51:

> *Background concentrations are an essential part of the total air quality concentration to be considered in determining source impacts. Background air quality includes pollutant concentrations due to: (1) Natural sources; (2) nearby sources other than the one(s) currently under consideration; and (3) unidentified sources. Typically, air quality data should be used to establish background concentrations in the vicinity of the source(s) under consideration.*

If a Step 2 analysis is required, the modeled impacts from the Proposed Project along with the impacts from the continued operation of existing Unit 3 will be added to the representative background concentration for comparison with the California and National Ambient Air Quality Standards (CAAQS and NAAQS). In accordance with USEPA guidelines,[11] the highest second-highest modeled concentrations will be used to demonstrate compliance with the short-term federal standards (except for the statistically based federal one-hour NO_2 and SO_2, and 24-hour $PM_{2.5}$, standards) and the highest modeled concentration will be used to demonstrate compliance with the federal annual standards and all state standards. If the predicted total ground-level concentration is below the state or federal ambient air quality standard for each pollutant and averaging period, no further analysis is required for that pollutant and averaging period.

[10] USEPA (2010a), p. 6.
[11] USEPA (2005), 11.2.3.2 and 11.2.3.3

3.6.3 Compliance with Statistically Based Standards

For the one-hour average federal NO_2 standard for the District and CEC analyses, the comparison of impacts with the new federal one-hour standard will be done in accordance with Appendix W of Part 51 of Title 40 of the CFR "Guideline on Air Quality Models" and the tiered process presented in the CAPCOA guidance document "Modeling Compliance of the Federal 1-Hour NO_2 NAAQS" (CAPCOA, 2011), together with clarification as provided by the 2011 Tyler Fox memorandum (USEPA, 2011a) and the September 30, 2014 clarification memo (USEPA, 2014c). Appendix W of Part 51 of Title 40 of the CFR "Guideline on Air Quality Models" has codified three methods that can be used to estimate NO_2 concentration (Tier 1 - Total Conversion, Tier 2 - Ambient Ratio Method or ARM, Tier 3 - Ozone Limiting Method or OLM). According to USEPA guidance (USEPA, 2011a):

> *While the limited scope of the available field study data imposes limits on the ability to generalize conclusions regarding model performance, these preliminary results of hourly NO_2 predictions for Palau and New Mexico show generally good performance for the PVMRM and OLM/OLMGROUP ALL options in AERMOD. We believe that these additional model evaluation results lend further credence to the use of these Tier 3 options in AERMOD for estimating hourly NO_2 concentrations, and we recommend that their use should be generally accepted provided some reasonable demonstration can be made of the appropriateness of the key inputs for these options, the in-stack NO_2/NOx ratio and the background ozone concentrations.*[12]

As discussed above, for the new gas turbine the in-stack NO_2/NOx ratios will be based on information provided by the turbine vendor. Background ozone concentrations in the project area will be represented by five years of ozone data (2009–2013) collected at Oxnard concurrently with the meteorological data. Based on these factors, we propose to use the Tier 3, "OLMGROUP ALL," option for modeling 1-hour NO_2 concentrations.

For demonstrating compliance with the statistically based federal one-hour NO_2 standard, CAPCOA's 2011 guidance document (CAPCOA, 2011) provides 11 progressively more sophisticated methods for combining modeled NO_2 concentrations with background (or monitored) NO_2. These methods, outlined below, were developed to allow demonstration of compliance using the lowest amount of resources necessary. Each tier is a progressively more sophisticated and comprehensive analysis that reduces the level of conservatism without reducing the level of assurance of compliance.

1. Significant Impact Level (SIL) – no background required
2. Max modeled value + max monitored value

[12] The Plume Volume Molar Ratio Method (PVMRM) is considered by USEPA to be a Tier 3 screening method, similar to OLM. (USEPA, 2011a).

3. Max modeled value + 98th pctl monitored value
4. 8th highest modeled value + max monitored value
5. 8th highest modeled value + 98th pctl monitored value
6. (5 yr avg of 98th pctl modeled value) + max monitored value
7. (5 yr avg of 98th pctl of modeled value) + 98th pctl monitored value
8. 5 yr avg of 98th pctl of (modeled value + monthly hour-of-day – 1st high)
9. 5 yr avg of 98th pctl of (modeled value + seasonal hour-of-day – 3rd high)
10. 5 yr average of 98th pctl of (modeled value + annual hour-of-day - 8th high)
11. Paired-Sum: 5 yr avg of 98th pctl of (modeled value + background)

Applicable definitions are provided below.

- *Significant Impact Level (SIL)* is defined as a de minimis impact level below which a source is presumed not to cause or contribute to an exceedance of a NAAQS (see Table 1 above).

- *Max modeled value* is defined as the maximum concentration predicted by the model at any given receptor in any given year modeled.

- *8th highest modeled value* is defined as the highest 8th-highest concentration derived by the model at any given receptor in any given year modeled.

- *5 yr avg of the 98th pctl* is defined as the highest of the average 8th highest (98th percentile) concentrations derived by the model across all receptors based on the length of the meteorological data period or the X years average of 98th percentile of the annual distribution of daily maximum one-hour concentrations across all receptors, where X is the number of years modeled. (In Appendix W, USEPA recommends using five years of meteorological data from a representative National Weather Service site or one year of on-site data.)

- *Monthly hour-of-day* is defined as the three-year average of the 1st highest concentrations (Maximum Hourly) for each hour of the day.

- *Seasonal Hour-Of-Day* is defined as the three-year average of the 3rd highest concentrations for each hour of the day and season.

- *Annual hour-of-day* is defined as the three-year average of the 8th highest concentration for each hour of the day.

- *Paired-Sum* **(**5 yr avg of the 98th pctl) is the merging of the modeled concentration with the monitored values paired together by month, day, and hour. The sum of the paired values is then processed to determine the X-year average of the 98th percentile of the annual distribution of daily maximum one-hour concentrations across all receptors, where X is the number of years modeled.

For the demonstration of compliance with the federal one-hour NO_2 standard, we will perform analyses at as many of the following tiers as are needed to demonstrate compliance with the state and federal ambient air quality standards: Tier 1, Tier 2, Tier 7, Tier 8, Tier 9, Tier 10, and Tier 11. Hourly NO_2 background data (for the same five years of meteorological data used for the modeling—2009 to 2013) may also be used in order to refine the NAAQS analysis both spatially and temporally. Tiers 8 and 11 will be the two primary approaches used for this modeling. Tier 8 will be used first to assess project impacts (monthly hour of day approach using 5-year average (2009~2013) month hour of day ozone data and 3-year average (2011~2013) month hour of day NO_2 data). If the impacts from the Tier 8 approach are above regulatory thresholds, the Tier 11 will be applied using the 5-year (2009~2013) concurrent ozone and NO_2 data approach. This analysis will include both the proposed new unit/new emergency generator engine and continued operation of existing Unit 3. In addition, to account for recently permitted nearby stationary sources that are not reflected in the background NO_2 data, we will review the list of projects provided by the VCAPCD (the request for these projects is discussed in Section 3.10) and model the impacts from projects with a NOx net emission increase greater than 5 tons/year (excluding intermittently operated equipment per USEPA guidance).[13]

The demonstration of compliance with the federal one-hour SO_2 standard will follow the same steps, except that it will utilize the 99th percentile predicted one-hour average SO_2 concentrations instead of the 98th percentile.

For the 24-hour average federal $PM_{2.5}$ standard for the District and CEC analyses, the comparison of impacts with the federal 24-hour average standard will be done in accordance with USEPA March 23, 2010 guidance (USEPA, 2010a). This guidance calls for basing the initial determination of compliance with the standard on the five-year average of the highest modeled annual and 24-hour averages, combined with background concentrations based on the form of the standards (the three-year average of the annual $PM_{2.5}$ concentrations and the three-year average of the 98th percentile 24-hour averages).[14] If a more detailed assessment of $PM_{2.5}$ impacts is required, a Tier 2 analysis will be performed. USEPA's March 23, 2010 memo provides minimal guidance regarding this type of more detailed analysis, saying only "a Second Tier modeling analysis may be considered that would involve combining the monitored and modeled $PM_{2.5}$ concentrations on a seasonal or quarterly basis, and re-sorting the total impacts across the year to determine the cumulative design value."[15] Such an analysis would be discussed with the District and CEC staff prior to implementation.

[13] USEPA (2011a), p. 10.
[14] USEPA (2010a), p. 9.
[15] USEPA (2010a), p. 8.

3.6.4 State One-Hour NO_2 Standard

Compliance with the state one-hour NO_2 standard will be demonstrated using OLM and the paired-sum approach described above, except that the analysis will use highest, rather than 98th percentile concentrations, consistent with the form of the state standard.

3.7 Background Ambient Air Quality Data

Background ambient air quality data for the project area will be obtained from the monitoring sites most representative of the conditions that exist at the proposed project site. Modeled concentrations will be added to these representative background concentrations to demonstrate compliance with the CAAQS and NAAQS.

Table 2 shows the monitoring stations we propose to use as they provide the most representative ambient air quality background data. Where possible, recommended background concentration measurements should come from nearby monitoring stations with similar site characteristics. For this proposed project, the Oxnard (Rio Mesa School) monitoring station ($PM_{2.5}$, PM_{10}, O_3, and NO_2) is the closest monitoring station (approximately 7 miles from project site). The Santa Barbara monitoring station (SO_2) is located 29 miles northwest the project site; the University of California Santa Barbara (UCSB) monitoring station (CO) is located 39 miles northwest of the project site. In general, the Santa Barbara monitoring stations are considered to be representative of conditions at the project site due to their proximity to the coastline and to the project location.

Table 2
Representative Background Ambient Air Quality Monitoring Stations

Pollutant(s)	Monitoring Station	Distance to Project Site
$PM_{2.5}$, PM_{10}, O_3, and NO_2	Oxnard (Rio Mesa School)	7 miles
SO_2	Santa Barbara - UCSB	39 miles
CO	Santa Barbara	29 miles

For annual NO_2, 24-hour and annual SO_2, annual $PM_{2.5}$ (state standard) and all PM_{10} and CO averaging periods, the highest values monitored during the 2011–2013 period will be used to represent ambient background concentrations in the project area. The one-hour average NO_2 analyses will be performed as described above. For analyses of federal 24-hour and annual $PM_{2.5}$ impacts, the three-year average of the 98th percentile 24-hour monitored levels, and the maximum three-year annual average, for the period between 2009 and 2013, respectively, will be used to represent project area background because these values correspond to the method used for determining compliance with the federal $PM_{2.5}$ standards and are consistent with the guidance cited above.

3.7.1 Missing Data Protocol

Modeling project-generated one-hour NO_2 concentrations using the OLM method requires the use of ambient monitored O_3 concentrations. Because the OLM method uses the ambient ozone concentration for a particular hour to limit the conversion of NO to NO_2, it is important to have ozone concentrations for every hour. It is also important that any missing hourly ozone concentrations be filled in with a value that does not underestimate the ozone concentration for that hour, to avoid underestimating the resulting NO_2 concentration. In addition, computation of total hourly NO_2 concentrations requires use of the ambient monitored hourly NO_2 concentrations from the nearest monitoring station. As is the case for the hourly ozone data, it is important to have a background NO_2 value for every hour that does not underestimate actual background.

As discussed above, background ambient hourly O_3 and NO_2 concentrations for the project area will be provided by the SJVAPCD based on data collected at the monitoring station in Oxnard (Rio Mesa School). While these datasets are expected to exceed USEPA's 90% completeness criterion (that is, more than 90% of the data values are present for each month), there are still occasional missing values that must be filled in. It is our understanding that the SJVAPCD will perform the appropriate missing data substitutions based on guidance documents provided by the California Air Pollution Control Officers Association (CAPCOA, 2011).[16]

3.8 Health Risk Assessment

A health risk assessment will be performed according to the most current Office of Environmental Health Hazard Analysis (OEHHA) risk assessment guidance and software adopted and available at the time the risk assessment is prepared. OEHHA is currently in the process of revising its "Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments," and CARB is in the process of updating the Hotspots Analysis and Reporting Program (HARP) software to implement the updated OEHHA guidance; however, it is not clear when either revision will be released publicly. The HRA modeling will be executed using the most up-to-date version of CARB's HARP computer program with the latest available health database (the most recent version is dated July 3, 2014).[17] The HARP model will be used to assess cancer risk as well as non-cancer chronic and acute health hazards.

[16] USEPA's March 2011 guidance document on 1-hour NO_2 modeling does not address missing hourly NO_2 data. However, the CAPCOA guidance document indicates that the recommended technique for filling single missing hours of NO_2 is consistent with the gap filling technique established by USEPA for filling a single hour of missing met data. All missing data procedures are subject to approval by the reviewing agencies.

[17] CARB anticipates having the Air Dispersion and Risk Assessment Modules available when the OEHHA "Hot Spots" Guidance Manual is adopted. The new version of HARP will include the updates to the OEHHA "Hot Spots" Risk Assessment Guidelines.

Although the new version of HARP will include AERMOD, the current version of the HARP model incorporates the ISCST3 model previously approved by USEPA. CARB offers a software program that allows AERMOD data to be imported into the HARP model, called HARP On-Ramp. Unless the updated HARP software is available prior to filing, the on-ramp will be used with the most recent versions of AERMOD and HARP for the screening risk assessment. The following HARP default options will be used for the health risk assessment:

- Home grown produce selected (0.15 for the fraction for leafy, exposed, protected, and root vegetables);
- Fish water pathway selected;
- Dermal absorption selected (0.02 m/s deposition rate);
- Soil ingestion selected (0.02 m/s deposition rate); and
- Mother's milk selected (0.02 m/s deposition rate).

In addition to the grid receptors identified above, discrete receptors will also be placed at the following locations:

- Any sensitive locations (e.g., child care facilities, schools, hospitals, prisons, libraries, etc.) at a distance of up to one mile from the project site; and
- Nearby residences and off-site workers.

3.9 Construction Air Quality Impact Assessment for the CEQA Analysis

The potential ambient impacts from air pollutant emissions during the construction activities associated with the proposed project will be evaluated by air quality modeling that will account for the project site location and the surrounding topography; the sources of emissions during construction, including vehicle and equipment exhaust emissions; and fugitive dust.

<u>Types of Emission Sources</u> – Construction of the proposed project will include phases such as site preparation; construction of foundations; and installation of the new gas turbine/associated equipment. The construction impacts analysis will include a schedule for the various construction phases.

Fugitive dust emissions from the construction of the Proposed Project result from the following activities:

- Excavation and grading at the project site;
- Onsite travel on paved and unpaved roads and across the unpaved construction areas;
- Aggregate and soil loading and unloading operations;
- Raw material transfer to and from material stockpiles; and
- Wind erosion of areas disturbed during construction activities.

Engine exhaust will be emitted from the following sources:

- Heavy equipment used for excavation, grading, and construction of new structures;
- Water trucks used to control construction dust emissions;
- Diesel- and gasoline-fueled welding machines, generators, air compressors, and water pumps;
- Gasoline-fueled pickup trucks and Diesel-fueled flatbed trucks used onsite to transport workers and materials around the construction site;
- Transport of mechanical and electrical equipment to the project site; and
- Transport of raw materials to and from stockpiles.

Emissions from a peak activity day will be modeled. Annual average emissions over the construction period will also be calculated and modeled for comparison with annual standards.

<u>Existing Ambient Levels</u> – The background data discussed earlier will be used to represent existing ambient levels for the construction analysis as well as the analysis of the impacts of project operations.

<u>Model Options</u> – The AERMOD "OLMGROUP ALL" option will be used to estimate ambient impacts from construction emissions. The modeling options and meteorological data described above will be used for the modeling analysis. An NO_2/NOx ratio of 11% will be used for modeling Diesel construction equipment, as specified in CAPCOA's 2011 guidance document (CAPCOA, 2011).

The construction site will be represented as both a set of volume sources and a separate set of area sources in the modeling analysis. Emissions will be divided into three categories: exhaust emissions, mechanically generated fugitive dust emissions, and wind-blown fugitive dust emissions. Exhaust emissions and mechanically generated fugitive dust emissions (e.g., dust from wheels of a scraper) will be modeled as volume sources with heights of 6 meters (for exhaust emissions) and 3 meters (for mechanically generated dust). Wind-blown fugitive dust emissions and sources at or near the ground that are at ambient temperature and have negligible vertical velocity will be modeled as area sources with a vertical dimension of 1 meter.

Combustion Diesel PM_{10} emission impacts from construction equipment will be evaluated to demonstrate that the cancer risk from construction activities will be below ten in one million at all receptors.

For the construction modeling analysis, the receptor grid will begin at the property boundary and will extend approximately one kilometer in all directions. The receptor grid will be laid out as follows:

1. One row of receptors spaced 25 meters apart along the facility's fence line;

2. Four tiers of receptors spaced 25 meters apart, extending 100 meters from the fence line; and

3. Additional tiers of receptors spaced 60 meters apart, extending from 100 meters to 1,000 meters from the fenceline.

It is unlikely that maximum construction impacts will occur more than one kilometer away from the project boundary. However, we will ensure that the maximum impacts are captured in our modeling analysis.

3.10 Cumulative Air Quality Impact Analysis

To address CEC requirements, a cumulative air quality modeling impacts analysis of the project's typical operating mode will be performed in combination with other stationary emissions sources within a six-mile radius that have received Authorities to Construct since June 1, 2013, or are in the permitting process. For each criteria pollutant, facilities having an emission increase of less than five tons per year are generally considered to be de minimis, and these facilities may be excluded from the cumulative impacts analysis. Information on any recently constructed/permitted sources that might be appropriate for a cumulative air quality impact analysis (as defined above) will be requested from the VCAPCD.

Upon receipt of sufficient information from the local air agencies to allow air dispersion modeling of the recently constructed/permitted non-project sources to be included in the cumulative air quality impact analysis, AERMOD will be used in a procedure similar to that described earlier in this protocol. As discussed above, the existing Unit 3 at the Mandalay Generating Station will also be modeled as part of the cumulative air quality impact analysis.

3.11 Nitrogen Deposition Analysis

As part of the Application for Certification filed with the CEC, it will be necessary to include a nitrogen deposition analysis. Nitrogen deposition is the input of NOx and ammonia (NH_3) derived pollutants, primarily nitric acid (HNO_3), from the atmosphere to the biosphere. Nitrogen deposition can lead to adverse impacts on sensitive species including direct toxicity, changes in species composition among native plants, and enhancement of invasive species.

We will perform a nitrogen deposition modeling analysis examining the impacts on nearby areas classified as critical habitat and/or areas containing sensitive biological resources. The analysis will compare the nitrogen deposition associated with the nitrogen emissions from the project with established nitrogen disposition significance thresholds. The AERMOD model will be used for this analysis. However, as discussed in the CEC staff's assessment of nitrogen deposition impacts for the Huntington Beach Energy Project, AERMOD tends to produce conservatively high predictions of nitrogen deposition rates (CEC, 2014). The assessment of significance for nitrogen deposition impacts will consider appropriate adjustments to background nitrate concentrations as well as emissions offsets provided for the project. If the maximum modeled nitrogen deposition impacts are determined to be significant, the Applicant will work with Staff to evaluate whether additional mitigation measures are needed.

4. REPORTING

The results of the criteria pollutant and TAC modeling will be integrated into the application documents, and will include the information listed below.

- Project Description – Site map and site plan along with descriptions of the emitting equipment and air pollution control systems.

- Model Options and Input – Model options, screening and refined source parameters, criteria pollutant and TAC emission rates, meteorological data, and receptor grids used for the modeling analyses.

- Air Dispersion Modeling – Dispersion modeling results will include the following:

  - Plot plan showing emission points, nearby buildings (including dimensions), cross-section lines, property lines, fence lines, roads, and UTM coordinates;

  - A table showing building heights used in the modeling analysis;

  - Summaries of maximum modeled impacts; and

  - Model input and output files, including BPIP-PRIME and meteorological files as well as hourly ozone and NO_2 files used in demonstrating compliance with the 1-hour NO_2 standard, in electronic format on a compact disc, together with a description (README file) of all filenames.

- HRA – The HRA will include the following:

  - Descriptions of the methodology and inputs to the construction and operation AERMOD runs;

  - Tables of TAC emission rates and health impacts;

  - Figures showing sensitive receptor locations; and

  - Model input and output files in electronic format on a compact disc, together with a description (README file) of all filenames.

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APPENDIX H

AMBIENT AIR QUALITY ANALYSIS MODELING INPUTS AND SCREENING ANALYSIS

Table H-1 Equipment Dimensions

Structure	Quantity	Size, L×W×H (feet)	Service/Remarks
New Structures			
Natural gas compressor enclosure[1]	1	35 × 12 × 10	Single compressor train
CTG	1	107 × 52 × 79 (top of air filter)	GE Frame 7HA.01 w/evap coolers
SCR	1	87 × 25 × 106	Nitrogen oxide removal equipment
SCR stack	1	22 feet diameter × 188 feet high	
Cooling fan module	1	65 × 38 × 18	Heat exchanger
Transmission structure	1	100-foot-high A-Frame	
Transmission structure	3	100-foot-high single-circuit monopole	
Existing MGS Structures to Be Reused			
Water treatment building	1	68 × 86 × 15	
Demineralized water storage tank	2	28 feet diameter × 32 feet	144,000 gallons
Service water storage tank	1	40 feet diameter × 48 feet	445,000-gallon capacity
Outfall structure	1		
Administration building	1	43 × 142 × 12	No modifications anticipated
Aqueous ammonia storage tanks	1	30 feet × 9 feet diameter	NO_X control (29 wt percent ammonia solution)
Warehouse building, portion to be reconfigured as control center	1		Remainder of building will continue to be used for storage

Table H-2
Puente Power Project
Screening Modeling Inputs

Case	Amb Temp deg F	Stack height feet	Stack Height meters	Stack Diam feet	Stack Diam meters	Stack flow wacfm	Stack flow m3/sec	Stack Vel ft/sec	Stack Vel m/sec	Stack Temp deg F	Stack Temp deg K
Winter/Maximum	38.9	188.0	57.30	22.0	6.71	3,551,197	1676.20	155.70	47.46	900.0	755.37
Winter/Minimum	38.9	188.0	57.30	22.0	6.71	2,026,942	956.74	88.87	27.09	900.0	755.37
ISO/Maximum	59.0	188.0	57.30	22.0	6.71	3,631,025	1713.88	159.20	48.52	900.0	755.37
ISO/Minimum	59.0	188.0	57.30	22.0	6.71	2,037,434	961.69	89.33	27.23	900.0	755.37
Summer Avg. Temp./Maximum w/cooling	77.8	188.0	57.30	22.0	6.71	3,601,374	1699.88	157.90	48.13	900.0	755.37
Summer Avg. Temp./Maximum w/o cooling	77.8	188.0	57.30	22.0	6.71	3,485,054	1644.98	152.80	46.57	900.0	755.37
Summer Avg. Temp./Minimum	77.8	188.0	57.30	22.0	6.71	2,087,611	985.37	91.53	27.90	900.0	755.37
Summer High Temp./Maximum w/cooling	82.0	188.0	57.30	22.0	6.71	3,626,463	1711.73	159.00	48.46	900.0	755.37
Summer High Temp./Maximum w/o cooling	82.0	188.0	57.30	22.0	6.71	3,450,842	1628.83	151.30	46.12	900.0	755.37
Summer High Temp./Minimum	82.0	188.0	57.30	22.0	6.71	2,111,787	996.78	92.59	28.22	900.0	755.37
Startup	38.9	188.0	57.30	22.0	6.71	2,026,942	956.74	88.87	27.09	900.0	755.37
Commissioning	38.9	188.0	57.30	22.0	6.71	2,026,942	956.74	88.87	27.09	900.0	755.37
	NOx lb/hr	**CO lb/hr**	**PM10 lb/hr**	**SOx lb/hr**		**NOx g/sec**	**CO g/sec**	**PM10 g/sec**	**SOx g/sec**		
Winter/Maximum	23.36	22.76	10.60	5.44		2.943	2.868	1.336	0.686		
Winter/Minimum	10.64	10.37	10.60	2.48		1.341	1.307	1.336	0.313		
ISO/Maximum	23.26	22.66	10.60	5.42		2.931	2.855	1.336	0.683		
ISO/Minimum	10.49	10.22	10.60	2.45		1.322	1.288	1.336	0.308		
Summer Avg. Temp./Maximum w/cooling	22.77	22.18	10.60	5.30		2.869	2.795	1.336	0.668		
Summer Avg. Temp./Maximum w/o cooling	21.66	21.10	10.60	5.05		2.729	2.659	1.336	0.636		
Summer Avg. Temp./Minimum	10.71	10.43	10.60	2.49		1.349	1.314	1.336	0.313		
Summer High Temp./Maximum w/cooling	22.97	22.37	10.60	5.35		2.894	2.819	1.336	0.674		
Summer High Temp./Maximum w/o cooling	21.28	20.73	10.60	4.95		2.681	2.612	1.336	0.624		
Summer High Temp./Minimum	10.82	10.54	10.60	2.51		1.363	1.328	1.336	0.317		
Startup/Shutdown/Restart	143.20	412.20	7.42	5.44		18.043	51.937	0.935	0.686		
Commissioning	246.35	1972.96	10.60	5.44		31.040	248.593	1.336	0.686		

Table H-3
Puente Power Project
Screening Level Modeling Impacts

Operating Mode	Conc. (ug/m3) NO2 1-hr	Conc. (ug/m3) SO2 1-hr	Conc. (ug/m3) CO 1-hr	Conc. (ug/m3) SO2 3-hr	Conc. (ug/m3) CO 8-hr	Conc. (ug/m3) SO2 24-hr	Conc. (ug/m3) PM10 24-hr	Conc. (ug/m3) NO2 Annual	Conc. (ug/m3) SO2 Annual	Conc. (ug/m3) PM10 Annual
Winter/Maximum	1.450	0.338	1.413	0.182	0.359	0.032	0.063	0.022	0.005	0.010
Winter/Minimum	0.840	0.196	0.819	0.113	0.261	0.029	0.126	0.020	0.005	0.020
ISO/Maximum	1.427	0.332	1.390	0.178	0.350	0.031	0.061	0.022	0.005	0.010
ISO/Minimum	0.827	0.193	0.805	0.111	0.256	0.029	0.125	0.020	0.005	0.020
Summer Avg. Temp./Maximum w/cooling	1.403	0.327	1.367	0.175	0.346	0.031	0.062	0.022	0.005	0.010
Summer Avg. Temp./Maximum w/o cooling	1.357	0.316	1.322	0.171	0.339	0.031	0.065	0.021	0.005	0.010
Summer Avg. Temp./Minimum	0.834	0.194	0.812	0.112	0.257	0.028	0.121	0.020	0.005	0.020
Summer High Temp./Maximum w/cooling	1.410	0.328	1.373	0.176	0.346	0.031	0.061	0.022	0.005	0.010
Summer High Temp./Maximum w/o cooling	1.339	0.312	1.305	0.170	0.337	0.031	0.065	0.021	0.005	0.011
Summer High Temp./Minimum	0.837	0.195	0.816	0.112	0.257	0.028	0.120	0.020	0.005	0.019
Startup/Shutdown/Restart	11.311	0.430	32.558	0.248	10.372	0.064	0.088	0.273	0.010	0.014
Commissioning	19.458	0.430	155.835	0.248	49.644	0.064	0.126	0.470	0.010	0.020

Table H-4
Puente Power Project
Emission Rates and Stack Parameters for Refined Modeling

	Stack Diam., m	Stack Height, m	Temp, deg K	Exhaust Flow, m3/s	Exhaust Velocity, m/s	Emission Rates, g/s NOx	Emission Rates, g/s SO2	Emission Rates, g/s CO	Emission Rates, g/s PM10	Stack Diam., ft	Stack Height, ft	Exh Temp, Deg F	Exh Flow Rate, ft3/m	Exhaust Velocity, ft/s	Emission Rates, lb/hr NOx	Emission Rates, lb/hr SO2	Emission Rates, lb/hr CO	Emission Rates, lb/hr PM10
Averaging Period: One hour NOx																		
New GT	6.7	57.3	755	1676.0	47.5	2.9434	n/a	n/a	n/a	22	188	900	3,551,197	156	23.36	n/a	n/a	n/a
New Generator Engine	0.2	21.3	957	1.5	82.4	0.1081	n/a	n/a	n/a	0.5	70	1263	3,185	270	0.86	n/a	n/a	n/a
Existing Unit 3 - Stack 1	3.9	16.5	651	604.3	50.0	34.7889	n/a	n/a	n/a	12.9	54	712	1,280,536	164	276.10	n/a	n/a	n/a
Existing Unit 3 - Stack 2	3.9	16.5	651	604.3	50.0	34.7889	n/a	n/a	n/a	12.9	54	712	1,280,536	164	276.10	n/a	n/a	n/a
Existing Unit 3 - Stack 3	3.9	16.5	651	604.3	50.0	34.7889	n/a	n/a	n/a	12.9	54	712	1,280,536	164	276.10	n/a	n/a	n/a
Existing Unit 3 - Stack 4	3.9	16.5	651	604.3	50.0	34.7889	n/a	n/a	n/a	12.9	54	712	1,280,536	164	276.10	n/a	n/a	n/a
Averaging Period: One hour CO and SOx																		
New GT	6.7	57.3	755	1676.0	47.5	n/a	0.6857	2.8678	n/a	22	188	900	3,551,197	156	n/a	5.44	22.76	n/a
New Generator Engine	0.2	21.3	957	1.5	82.4	n/a	0.0011	0.5648	n/a	0.5	70	1263	3,185	270	n/a	0.01	4.48	n/a
Existing Unit 3 - Stack 1	3.9	16.5	651	604.3	50.0	n/a	0.0450	8.6972	n/a	12.9	54	712	1,280,536	164	n/a	0.36	69.03	n/a
Existing Unit 3 - Stack 2	3.9	16.5	651	604.3	50.0	n/a	0.0450	8.6972	n/a	12.9	54	712	1,280,536	164	n/a	0.36	69.03	n/a
Existing Unit 3 - Stack 3	3.9	16.5	651	604.3	50.0	n/a	0.0450	8.6972	n/a	12.9	54	712	1,280,536	164	n/a	0.36	69.03	n/a
Existing Unit 3 - Stack 4	3.9	16.5	651	604.3	50.0	n/a	0.0450	8.6972	n/a	12.9	54	712	1,280,536	164	n/a	0.36	69.03	n/a
Averaging Period: Three hours SOx																		
New GT	6.7	57.3	755	1676.0	47.5	n/a	0.6857	n/a	n/a	22	188	900	3,551,197	156	n/a	5.44	n/a	n/a
New Generator Engine	0.2	21.3	957	1.5	82.4	n/a	0.0004	n/a	n/a	0.5	70	1,263	3,185	270	n/a	2.81E-03	n/a	n/a
Existing Unit 3 - Stack 1	3.9	16.5	651	604.3	50.0	n/a	0.0450	n/a	n/a	12.9	54	712	1,280,536	164	n/a	0.36	n/a	n/a
Existing Unit 3 - Stack 2	3.9	16.5	651	604.3	50.0	n/a	0.0450	n/a	n/a	12.9	54	712	1,280,536	164	n/a	0.36	n/a	n/a
Existing Unit 3 - Stack 3	3.9	16.5	651	604.3	50.0	n/a	0.0450	n/a	n/a	12.9	54	712	1,280,536	164	n/a	0.36	n/a	n/a
Existing Unit 3 - Stack 4	3.9	16.5	651	604.3	50.0	n/a	0.0450	n/a	n/a	12.9	54	712	1,280,536	164	n/a	0.36	n/a	n/a

Table H-4
Emission Rates and Stack Parameters for Refined Modeling (cont.)

	Stack Diam, m	Stack Height, m	Temp, deg K	Exhaust Flow, m3/s	Exhaust Velocity, m/s	Emission Rates, g/s NOx	SO2	CO	PM10	Stack Diam, ft	Stack Height, ft	Exh Temp, Deg F	Exh Flow Rate, ft3/m	Exhaust Velocity, ft/s	Emission Rates, lb/hr NOx	SO2	CO	PM10
Averaging Period: Eight hours CO																		
New GT	6.7	57.3	755	1676.0	47.5	n/a	n/a	2.8678	n/a	22	188	900	3,551,197	156	n/a	n/a	22.76	n/a
New Generator Engine	0.2	21.3	957	1.5	82.4	n/a	n/a	0.0706	n/a	0.5	70	1,263	3,185	270	n/a	n/a	0.56	n/a
Existing Unit 3 - Stack 1	3.9	16.5	651	604.3	50.0	n/a	n/a	8.6972	n/a	12.9	54	712	1,280,536	164	n/a	n/a	69.03	n/a
Existing Unit 3 - Stack 2	3.9	16.5	651	604.3	50.0	n/a	n/a	8.6972	n/a	12.9	54	712	1,280,536	164	n/a	n/a	69.03	n/a
Existing Unit 3 - Stack 3	3.9	16.5	651	604.3	50.0	n/a	n/a	8.6972	n/a	12.9	54	712	1,280,536	164	n/a	n/a	69.03	n/a
Existing Unit 3 - Stack 4	3.9	16.5	651	604.3	50.0	n/a	n/a	8.6972	n/a	12.9	54	712	1,280,536	164	n/a	n/a	69.03	n/a
Averaging Period: 24-hour SOx																		
New GT	6.7	57.3	755	1676.0	47.5	n/a	0.6857	n/a	n/a	22	188	900	3,551,197	156	n/a	5.44	n/a	n/a
New Generator Engine	0.2	21.3	957	1.5	82.4	n/a	0.0000	n/a	n/a	0.5	70	1,263	3,185	270	n/a	3.51E-04	n/a	n/a
Existing Unit 3 - Stack 1	3.9	16.5	651	604.3	50.0	n/a	0.0188	n/a	n/a	12.9	54	712	1,280,536	164	n/a	0.15	n/a	n/a
Existing Unit 3 - Stack 2	3.9	16.5	651	604.3	50.0	n/a	0.0188	n/a	n/a	12.9	54	712	1,280,536	164	n/a	0.15	n/a	n/a
Existing Unit 3 - Stack 3	3.9	16.5	651	604.3	50.0	n/a	0.0188	n/a	n/a	12.9	54	712	1,280,536	164	n/a	0.15	n/a	n/a
Existing Unit 3 - Stack 4	3.9	16.5	651	604.3	50.0	n/a	0.0188	n/a	n/a	12.9	54	712	1,280,536	164	n/a	0.15	n/a	n/a
Averaging Period: 24-hour PM10																		
New GT	6.7	57.3	755	956.6	27.1	n/a	n/a	n/a	1.3356	22	188	900	2,026,942	89	n/a	n/a	n/a	10.60
New Generator Engine	0.2	21.3	957	1.5	82.4	n/a	n/a	n/a	0.0002	0.5	70	1,263	3,185	270	n/a	n/a	n/a	1.60E-03
Existing Unit 3 - Stack 1	3.9	16.5	651	604.3	50.0	n/a	n/a	n/a	0.6370	12.9	54	712	1,280,536	164	n/a	n/a	n/a	5.06
Existing Unit 3 - Stack 2	3.9	16.5	651	604.3	50.0	n/a	n/a	n/a	0.6370	12.9	54	712	1,280,536	164	n/a	n/a	n/a	5.06
Existing Unit 3 - Stack 3	3.9	16.5	651	604.3	50.0	n/a	n/a	n/a	0.6370	12.9	54	712	1,280,536	164	n/a	n/a	n/a	5.06
Existing Unit 3 - Stack 4	3.9	16.5	651	604.3	50.0	n/a	n/a	n/a	0.6370	12.9	54	712	1,280,536	164	n/a	n/a	n/a	5.06

Table H-4
Emission Rates and Stack Parameters for Refined Modeling (cont.)

	Stack Diam, m		Temp, deg K	Exhaust Flow, m3/s	Exhaust Velocity, m/s	Emission Rates, g/s NOx	SO2	CO	PM10	Stack Diam, ft	Stack Height, ft	Exh Temp, Deg F	Exh Flow Rate, ft3/m	Exhaust Velocity, ft/s	Emission Rates, lb/hr NOx	SO2	CO	PM10
Averaging Period: Annual NOx and SOx																		
New GT	6.7	57.3	755	1676.0	47.5	1.0360	0.0637	n/a	n/a	22	188	900	3,551,197	156	8.22	0.51	n/a	n/a
New Generator Engine	0.2	21.3	957	1.5	82.4	0.0025	0.0000	n/a	n/a	0.5	70	1,263	3,185	270	0.02	1.92E-04	n/a	n/a
Existing Unit 3 - Stack 1	3.9	16.5	651	604.3	50.0	0.0148	0.0002	n/a	n/a	12.9	54	712	1,280,536	164	0.12	0.00	n/a	n/a
Existing Unit 3 - Stack 2	3.9	16.5	651	604.3	50.0	0.0148	0.0002	n/a	n/a	12.9	54	712	1,280,536	164	0.12	0.00	n/a	n/a
Existing Unit 3 - Stack 3	3.9	16.5	651	604.3	50.0	0.0148	0.0002	n/a	n/a	12.9	54	712	1,280,536	164	0.12	0.00	n/a	n/a
Existing Unit 3 - Stack 4	3.9	16.5	651	604.3	50.0	0.0148	0.0002	n/a	n/a	12.9	54	712	1,280,536	164	0.12	0.00	n/a	n/a
Averaging Period: Annual PM10																		
New GT	6.7	57.3	755	956.6	27.1	n/a	n/a	n/a	0.3676	22	188	900	2,026,942	89	n/a	n/a	n/a	2.92
New Generator Engine	0.2	21.3	957	1.5	82.4	n/a	n/a	n/a	0.0001	0.5	70	1,263	3,185	270	n/a	n/a	n/a	8.77E-04
Existing Unit 3 - Stack 1	3.9	16.5	651	604.3	50.0	n/a	n/a	n/a	0.0065	12.9	54	712	1,280,536	164	n/a	n/a	n/a	0.05
Existing Unit 3 - Stack 2	3.9	16.5	651	604.3	50.0	n/a	n/a	n/a	0.0065	12.9	54	712	1,280,536	164	n/a	n/a	n/a	0.05
Existing Unit 3 - Stack 3	3.9	16.5	651	604.3	50.0	n/a	n/a	n/a	0.0065	12.9	54	712	1,280,536	164	n/a	n/a	n/a	0.05
Existing Unit 3 - Stack 4	3.9	16.5	651	604.3	50.0	n/a	n/a	n/a	0.0065	12.9	54	712	1,280,536	164	n/a	n/a	n/a	0.05

Table H-5
Puente Power Project
Startup/Shutdown Modeling Inputs

Operating Case	Stack Ht. feet	Stack Dia. ft	Stack flow wacfm	Stack flow m3/sec	Stack Vel ft/sec	Stack Vel m/sec	Stack Temp deg F	Stack Temp deg K	NOx lb/hr	CO lb/hr	NOx g/sec	CO g/sec
New GT - Startup/Shutdown/Restart	188	22	2,026,942	956.74	88.87	27.09	900.00	755.37	143.20	412.20	18.04	51.94
Existing Unit 3 - Stack 1	54	12.9	1,280,536	604	164	50	712	651	276.10	69.03	34.79	8.70
Existing Unit 3 - Stack 2	54	12.9	1,280,536	604	164	50	712	651	276.10	69.03	34.79	8.70
Existing Unit 3 - Stack 3	54	12.9	1,280,536	604	164	50	712	651	276.10	69.03	34.79	8.70
Existing Unit 3 - Stack 4	54	12.9	1,280,536	604	164	50	712	651	276.10	69.03	34.79	8.70

Table H-6
Puente Power Project
Commissioning Modeling Inputs

Operating Case	Stack Ht. feet	Stack Dia. ft	Stack flow wacfm	Stack flow m3/sec	Stack Vel ft/sec	Stack Vel m/sec	Stack Temp deg F	Stack Temp deg K	NOx lb/hr	CO lb/hr	PM10 lb/hr	SOx lb/hr	NOx g/sec	CO g/sec	PM10 g/sec	SOx g/sec
New GT - Commissioning	188	22	2,026,942	957	89	27	900	755	246.35	1972.96	10.60	5.44	31.04	248.59	1.34	0.69
Existing Unit 1 - normal operation			673,202						6.35	75.81	4.74	1.14	0.80	9.55	0.60	0.14
Existing Unit 2 - normal operation			595,313						8.71	75.81	4.74	1.14	1.10	9.55	0.60	0.14
Existing Units 1 and 2 - combined stack =	200	17.25	1,268,515	599	90	28	181	356	15.06	151.62	9.48	2.27	1.90	19.10	1.19	0.29
Existing Unit 3 - Stack 1	54	12.9	1,280,536	604	164	50	712	651	276.10	69.03	5.06	0.36	34.79	8.70	0.64	0.05
Existing Unit 3 - Stack 2	54	12.9	1,280,536	604	164	50	712	651	276.10	69.03	5.06	0.36	34.79	8.70	0.64	0.05
Existing Unit 3 - Stack 3	54	12.9	1,280,536	604	164	50	712	651	276.10	69.03	5.06	0.36	34.79	8.70	0.64	0.05
Existing Unit 3 - Stack 4	54	12.9	1,280,536	604	164	50	712	651	276.10	69.03	5.06	0.36	34.79	8.70	0.64	0.05

Table H-7

SCREEN3 – Fumigation Impacts

Screen 3 Simple Terrain Impacts (1-hr avg.) (µg/m3)

Case	Unit Impacts	Distance to Maximum (m)
Winter/Maximum	0.1702	1645
Winter/Minimum	0.2851	1410
ISO/Maximum	0.1704	1644
ISO/Minimum	0.2899	1403
Summer/Average w/cooling	0.1754	1631
Summer/Average w/o cooling	0.1809	1616
Summer/Average	0.2895	1403
Summer/High w/cooling	0.1751	1631
Summer/High w/o cooling	0.1834	1609
Summer/High	0.2878	1406
Startup	0.2851	1410
Commissioning	0.2851	1410
Unit 1 and2	0.9685	1075

Inversion Breakup Fumigation Impacts (1-hr avg.) (µg/m3)

Case	Unit Impacts	Distance to Maximum (m)
Winter/Maximum	0.23	55718
Winter/Minimum	0.338	41900
ISO/Maximum	0.224	56833
ISO/Minimum	0.3333	42341
Summer/Average w/cooling	0.2232	56975
Summer/Average w/o cooling	0.2284	56010
Summer/Average	0.325	43137
Summer/High w/cooling	0.2217	57261
Summer/High w/o cooling	0.2296	55801
Summer/High	0.3219	43443
Startup	0.338	41900
Commissioning	0.338	41900
Unit 1 and2	0.9261	19842

Unit Impacts – Inversion Breakup Fumigation (µg/m3)

Case	1-hr unit	3-hr unit	8-hr unit	24-hr unit
Winter/Maximum	0.2300	0.1801	0.1270	0.0696
Winter/Minimum	0.3380	0.2804	0.2065	0.1154
ISO/Maximum	0.2240	0.1775	0.1263	0.0695
ISO/Minimum	0.3333	0.2804	0.2086	0.1170
Summer/Average w/cooling	0.2232	0.1794	0.1291	0.0714
Summer/Average w/o cooling	0.2284	0.1842	0.1329	0.0735
Summer/Average	0.3250	0.2765	0.2073	0.1167
Summer/High w/cooling	0.2217	0.1786	0.1287	0.0712
Summer/High w/o cooling	0.2296	0.1859	0.1344	0.0745
Summer/High	0.3219	0.2744	0.2059	0.1160
Startup	0.3380	0.2804	0.2065	0.1154
Commissioning	0.3380	0.2804	0.2065	0.1154
Unit 1 and2	0.9685	0.8717	0.6780	0.3874

Notes:
1-hr: maximum of flat terrain or Inversion Breakup.
3-hr: 1.5 hrs of maximum (flat vs. Inversion Fum.) + 1.5 hrs of flat terrain, multiple by 0.9 conversion factor
8-hr: 1.5 hrs of maximum (flat vs. Inversion Fum.) + 6.5 hrs of flat terrain, multiple by 0.7 conversion factor
24-hr: 1.5 hrs of maximum (flat vs. Inversion Fum.) + 22.5 hrs of flat terrain, multiple by 0.4 conversion factor

Table H-7 (cont.)

SCREEN3 – Fumigation Impacts

Emission Rates

	NOx	CO	PM10	SOx
Case	g/sec	g/sec	g/sec	g/sec
Winter/Maximum	2.943	2.868	1.336	0.686
Winter/Minimum	1.341	1.307	1.336	0.313
ISO/Maximum	2.931	2.855	1.336	0.683
ISO/Minimum	1.322	1.288	1.336	0.308
Summer/Average w/cooling	2.869	2.795	1.336	0.668
Summer/average w/o cooling	2.729	2.659	1.336	0.636
Summer/Average	1.349	1.314	1.336	0.313
Summer/High w/cooling	2.894	2.819	1.336	0.674
Summer/High w/o cooling	2.681	2.612	1.336	0.624
Summer/High	1.363	1.328	1.336	0.317
Startup	18.043	51.937	0.935	0.686
Commissioning	31.040	248.593	1.336	0.686
Unit 1 and 2	1.860	16.078	1.194	0.242

Inversion Breakup Fumigation Impacts (final) (µg/m3)

Case	Nox_1_HR	SO2_1_HR	CO_1_HR	SO2_3_HR	CO_8_HR	SO2_24 HR	PM_24_Hr
Winter/Maximum	0.68	0.16	0.66	0.1	0.4	0.0	0.09
Winter/Minimum	0.45	0.11	0.44	0.1	0.3	0.0	0.15
ISO/Maximum	0.66	0.15	0.64	0.1	0.4	0.0	0.09
ISO/Minimum	0.44	0.10	0.43	0.1	0.3	0.0	0.16
Summer/Average w/cooling	0.64	0.15	0.62	0.1	0.4	0.0	0.10
Summer/average w/o cooling	0.62	0.15	0.61	0.1	0.4	0.0	0.10
Summer/Average	0.44	0.10	0.43	0.1	0.3	0.0	0.16
Summer/High w/cooling	0.64	0.15	0.62	0.1	0.4	0.0	0.10
Summer/High w/o cooling	0.62	0.14	0.60	0.1	0.4	0.0	0.10
Summer/High	0.44	0.10	0.43	0.1	0.3	0.0	0.15
Startup	6.10	0.23	17.55	0.2	10.7	0.1	0.11
Maximum (Normal Operation/Startup)	6.10	0.23	17.55	0.19	10.73	0.05	0.16
Commissioning	10.49	0.23	84.02	0.2	51.3	0.1	0.15
Unit 1 and 2	1.80	0.23	15.57	0.2	10.9	0.1	0.46
Total Commissioning*	12.29	0.47	99.60	0.40	62.24	0.17	0.62

* Assuming New Turbine in commissioning and Unit 1 and 2 in operation

Table H-8

Screen3 – Shoreline Fumigation Impacts

Shoreline Fumigation Unit Impacts (1-hr avg.) (µg/m3)

Case	Unit Impacts	Distance to Maximum (m)
Winter/Maximum	1.353	6467
Winter/Minimum	2.066	4601
ISO/Maximum	1.314	6619
ISO/Minimum	2.034	4660
Summer/Average w/cooling	1.309	6639
Summer/Average w/o cooling	1.342	6507
Summer/Average	1.978	4767
Summer/High w/cooling	1.299	6678
Summer/High w/o cooling	1.35	6479
Summer/High	1.957	4808
Startup	2.066	4601
Commissioning	2.066	4601
Unit 1 and2	6.431	1760

Unit Impacts – Shoreline Fumigation (µg/m3)

Case	1-hr unit	3-hr unit	8-hr unit	24-hr unit
Winter/Maximum	1.3530	0.6854	0.2744	0.0977
Winter/Minimum	2.0660	1.0580	0.4333	0.1586
ISO/Maximum	1.3140	0.6680	0.2694	0.0968
ISO/Minimum	2.0340	1.0458	0.4318	0.1596
Summer/Average w/cooling	1.3090	0.6680	0.2716	0.0985
Summer/Average w/o cooling	1.3420	0.6853	0.2790	0.1014
Summer/Average	1.9780	1.0204	0.4243	0.1580
Summer/High w/cooling	1.2990	0.6633	0.2701	0.0981
Summer/High w/o cooling	1.3500	0.6900	0.2815	0.1025
Summer/High	1.9570	1.0102	0.4205	0.1569
Startup	2.0660	1.0580	0.4333	0.1586
Commissioning	2.0660	1.0580	0.4333	0.1586
Unit 1 and2	6.4310	3.3298	1.3949	0.5240

Note:
1-hr: maximum of flat terrain or Shoreline Fumigation.
3-hr: 1.5 hrs of maximum (flat vs. Shoreline Fum.) + 1.5 hrs of flat terrain, multiple by 0.9 conversion factor
8-hr: 1.5 hrs of maximum (flat vs. Shoreline Fum.) + 6.5 hrs of flat terrain, multiple by 0.7 conversion factor
24-hr: 1.5 hrs of maximum (flat vs. Shoreline Fum.) + 22.5 hrs of flat terrain, multiple by 0.4 conversion factor

Shoreline Fumigation Impacts (final) (µg/m3)

Case	Nox_1_HR	SO2_1_HR	CO_1_HR	SO2_3_HR	CO_8_HR	SO2_24 HR	PM_24_Hr
Winter/Maximum	3.98	0.93	3.88	0.47	0.79	0.07	0.13
Winter/Minimum	2.77	0.65	2.70	0.33	0.57	0.05	0.21
ISO/Maximum	3.85	0.90	3.75	0.46	0.77	0.07	0.13
ISO/Minimum	2.69	0.63	2.62	0.32	0.56	0.05	0.21
Summer/Average w/cooling	3.76	0.87	3.66	0.45	0.76	0.07	0.13
Summer/Average w/o cooling	3.66	0.85	3.57	0.44	0.74	0.06	0.14
Summer/Average	2.67	0.62	2.60	0.32	0.56	0.05	0.21
Summer/High w/cooling	3.76	0.87	3.66	0.45	0.76	0.07	0.13
Summer/High w/o cooling	3.62	0.84	3.53	0.43	0.74	0.06	0.14
Summer/High	2.67	0.62	2.60	0.32	0.56	0.05	0.21
Startup	37.28	1.42	107.30	0.73	22.51	0.11	0.15
Maximum (Normal Operation/Startup)	37.28	1.42	107.30	0.73	22.51	0.07	0.21
Commissioning	64.13	1.42	513.59	0.73	107.72	0.11	0.21
Unit 1 and 2	11.96	1.56	103.40	0.81	22.43	0.13	0.63
Total Commissioning*	76.09	2.98	616.99	1.53	130.15	0.24	0.84

* Assuming New Turbine in commissioning and Unit 1 and 2 in operation