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DOCKET
10-AFC-01
DATE JUL 19 2010
RECD. JUL 19 2010

MELISSA A. FOSTER
Direct (916) 319-4673
mafoster@stoel.com

July 19, 2010

VIA EMAIL AND HAND DELIVERY

Mr. Eric Solorio, Siting Project Manager
California Energy Commission
1516 Ninth Street
Sacramento, CA 95814

Re: Pio Pico Energy Center Project (10-AFC-01)
Application for Authority to Construct (San Diego Air Pollution Control District)

Dear Mr. Solorio:

On behalf of Pio Pico Energy Center, LLC ("Applicant"), please find enclosed for docketing the Application for Authority to Construct the Pio Pico Energy Center submitted to the San Diego Air Pollution Control District on Friday, July 16, 2010 and related air quality modeling files. Should you have any questions regarding these materials, please do not hesitate to contact Maggie Fitzgerald or me.

Respectfully submitted,

Melissa A. Foster

MAF:kjh
Enclosures
cc: David Jenkins, Pio Pico Energy Center, LLC (w/out enclosures)
Maggie Fitzgerald, URS Corp. (w/out enclosures)

Pio Pico Energy Center, LLC

July 8, 2010

Steven Moore
Senior Air Pollution Control Engineer
San Diego Air Pollution Control District
10124 Old Grove Rd.,
San Diego, CA 92131

Subject: *Authority to Construct/Permit to Operate* Application for the Pio Pico Energy Center

Dear Mr. Moore:

Accompanying this letter, please find an application for an *Authority to Construct/Permit to Operate* (PTO) the Pio Pico Energy Center (PPEC), a new simple cycle peaking power plant with nominal rating of 300 megawatt (MW). The plant will be owned and operated by Pio Pico Energy Center, LLC (PPEC LLC). PPEC will be located in Chula Vista immediately south of San Diego's Otay Water Treatment Plant. PPEC will consist of three combustion turbine generators, a partial dry cooling system, and ancillary equipment.

The *Application for Certification* (AFC) for this project was submitted to the California Energy Commission on June 30, 2010. Attachments provided in Appendix A of our application include:

- Three (3) Form APCD 116, Permit/Registration Application
- Three (3) Supplemental Form 20D, Gas

One check payable to the San Diego Air Pollution Control District in the amount of $100,000 is being provided with the application.

An external hard dive containing electronic copies of all air quality and public health input and output modeling files generated for the PTO impact analyses is being provided to you with this application.

According to CEC regulations, the CEC shall respond as to the completeness of the Project's AFC within 30 days of the AFC submittal date. Part of the CEC's determination of data adequacy relies on SDAPCD's determination that the application for this PTO is complete. As such, PPEC LLC respectfully requests that the SDAPCD devote resources to our application to make such a determination in a timely manner.

Thank you in advance for your review of our application. Please do not hesitate to contact Dave Jenkins (317.431.1004, djenkins@apexpowergroup.com) with questions or concerns regarding any aspect of this application, so that we can promptly make available the information you need to complete your evaluation. We look forward to working closely with you and your staff in this regard.

Sincerely,

Gary Chandler
President
Pio Pico Energy Center, LLC

cc: Anne Runnalls, URS Corporation
Dave Jenkins, Apex Power Group

SAN DIEGO COUNTY AIR POLLUTION CONTROL DISTRICT

APPLICATION FEE ESTIMATE

Applicant: Pio Pico Energh Center | Fee Schedule: 20F

Engineer: Steven Moore | Estimate Date: 6/30/2010

Application: Three new LMS100 turbines with a rated capacity of approximately 100 MW each.

ACTIVITY	FEE CODE	LABOR CODE	CLASSIFICATION	LABOR HOURS	LABOR RATE	COST	SUBTOTAL
A/C		EG3	Associate Engineer	200	$145	$29,000	
		EG4	Senior Engineer	80	$172	$13,760	
P/O		EG3	Associate Engineer	40	$145	$5,800	
		EG4	Senior Engineer	20	$172	$3,440	$52,000
NSR	NSR	EG3	Associate Engineer	100	$145	$14,500	
		EG4	Senior Engineer	50	$172	$8,600	$23,100
AQIA	NSR	EG3	Associate Engineer	15	$145	$2,175	
	AQA	MET3	Associate Meteorologist	60	$98	$5,880	$8,055
Health Risk Assessment	TNS	ES3	Associate Specialist	40	$125	$5,000	
		EG3	Associate Engineer	5	$145	$725	
		EG4	Senior Engineer	10	$172	$1,720	$7,445
Testing or Test Witness	96A	EG3	Associate Engineer		$145		
		CH3	Associate Chemist		$98		
		CH4	Senior Chemist		$114		
Other Fees	RNP		Renewal Fee	1	$2,652	$2,652	
	NBF		Administrative Fee	1	$95	$95	
	EMF		Emissions Fee	249	$116	$28,884	
	ITA		Database Replacement (app)	1	$13	$13	
	ITP		Database Replacement (rnp)		$13		
	ITE		Database Replacement (emf)	249	$3	$747	$32,391
Deficit		EG3	Associate Engineer		$145		
		CH3	Associate Chemist		$98		

Notes:
1. If actual costs are less than estimated, the difference shall be refunded. If actual costs are greater than estimated, additional fees shall be required. If tests are required, additional fees shall be required but may be deferred until the A/C is issued. Additional emissions fees may also be required. Work records are kept, which may result in a final fee more or less than this estimate.
2. A 2.2% surcharge will be assessed to all credit card payments (American Express and Discover only).
3. This fee estimate is valid until June 30, 2011.
4. Please submit a copy of this fee estimate with your application.

ESTIMATE TOTAL: $122,991

APCD 116 (Rev. 04/07)

SAN DIEGO AIR POLLUTION CONTROL DISTRICT
10124 OLD GROVE ROAD, SAN DIEGO CA 92131-1649
PHONE (858) 586-2600 • FAX (858) 586-2601

PERMIT / REGISTRATION APPLICATION

SUBMITTAL OF THIS APPLICATION DOES NOT GRANT PERMISSION TO CONSTRUCT OR TO OPERATE EQUIPMENT EXCEPT AS SPECIFIED IN RULE 24(d)

IMPORTANT REMINDERS: Read instructions on the reverse side of this form prior to completing this application. Please ensure that all of the following are included before you submit the application:
☒ Appropriate Permit Fee ☒ Completed Supplemental Form(s) ☒ Signature on Application

REASON FOR SUBMITTAL OF APPLICATION: (check the appropriate item and enter Application (AP) or Permit to Operate (PO) number if required)

1. ☒ New Installation 2. ☐ Existing Unpermitted Equipment or Rule 11 Change 3. ☐ Modification of Existing Permitted Equipment
4. ☐ Amendment to Existing Authority to Construct or AP 5. ☐ Change of Equipment Location 6. ☐ Change of Equipment Ownership
7. ☐ Change of Permit Conditions 8. ☐ Change Permit to Operate Status to Inactive 9. ☐ Banking Emissions
10. ☐ Registration of Portable Equipment 11. ☐ Other (Specify) ______
12. List affected AP/PO#(s): ______

APPLICANT INFORMATION

13. Name of Business (DBA) Pio Pico Energy Center, LLC
14. Nature of Business Power Utility
15. Does this organization own or operate any other APCD permitted equipment at this or any other adjacent locations in San Diego County? ☐Yes ☒No
If yes, list assigned location ID's listed on your PO's ______
16. Type of Ownership ☒ Corporation ☐ Partnership ☐ Individual Owner ☐ Government Agency ☐ Other ______
17. Name of Legal Owner (if different from DBA) ______

		A. Equipment Owner	**B. Authority to Construct (if different from A)**
18.	Name	Pio Pico Energy Center, LLC	
19.	Mailing Address	P.O. Box 95592	
20.	City	South Jordan	
21.	State	UT Zip 84095	Zip
22.	Phone	(801) 253-1278 FAX ( )	( ) FAX ( )
		C. Permit to Operate (if different from A)	**D. Billing Information (if different from A)**
23.	Name		
24.	Mailing Address		
25.	City		
26.	State	Zip	Zip
27.	Phone	( ) FAX ( )	( ) FAX ( )

EQUIPMENT/PROCESS INFORMATION: Type of Equipment: ☒ Stationary ☐ Portable.
If portable, will operation exceed 12 consecutive months at the same location ☐ Yes ☐ No

28. Equipment Location Address N/A yet. See the main application doc. City Chula Vista Parcel No. APN644-090-0400
29. State CA Zip ______ Phone ( ) FAX ( )
30. Site Contact David Jenkins Title Project Manager Phone (317) 431.1004
31. General Description of Equipment/Process Please see the main application document
32. Application Submitted by ☐ Owner ☐ Operator ☐ Contractor ☒ Consultant Affiliation URS Corporation

EXPEDITED APPLICATION PROCESSING: ☐ **I hereby request Expedited Application Processing and understand that:**

33. a) Expedited processing will incur additional fees and permits will not be issued until the additional fees are paid in full (see Rule 40(d)(8)(iv) for details).
b) Expedited processing is contingent on the availability of qualified staff. c) Once engineering review has begun this request cannot be cancelled.
d) Expedited processing does not guarantee action by any specific date nor does it guarantee permit approval.

I hereby certify that all information provided on this application is true and correct.

34. SIGNATURE [signature] Date July 8, 2010
35. Print Name Gary Chandler Title President
36. Company Pio Pico Energy Center, LLC Phone (801) 253-1278 E-mail Address grchandler@apexpowergroup

APCD USE ONLY

AP # ______ ID # ______ Cust. No. ______ Sector: ______ UTM's X ______ Y ______ SIC ______
Receipt # ______ Date ______ Amt Rec'd $ ______ Fee Code ______
Engineering Contact ______ Fee Code ______ AP Fee $ ______ T&M Renewal Fee $ ______
Refund Claim # ______ Date ______ Amt $ ______
Application Generated By NV# ______ NC # ______ Other ______ Date ______ Inspector ______

4.07 – TW/flm

APPLICATION FOR AUTHORITY TO CONSTRUCT/PERMIT TO OPERATE

PIO PICO ENERGY CENTER
CHULA VISTA, CALIFORNIA

PREPARED FOR:

PIO PICO ENERGY CENTER, LLC

URS PROJECT NO. 29874636.04000

JULY 8, 2010

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APPLICATION FOR AUTHORITY TO CONSTRUCT/PERMIT TO OPERATE

Prepared for

Pio Pico Energy Center, LLC
Chula Vista, California

URS Project No. 29874636.04000

July 8, 2010

URS

1615 Murray Canyon Road, Suite 1000
San Diego, CA 92108-4314
619.294.9400 Fax: 619.293.7920

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µg/m^3	Micrograms per cubic meter
%	Percent
ºF	Degrees Fahrenheit
AAQS	Ambient Air Quality Standards
AB32	Assembly Bill
acfm	Actual cubic feet per minute
acre-ft/yr	Acre feet per year
ADAM	Aerometric Data Analysis & Management
AERMOD	American Meteorological Society/Environmental Protection Agency Regulatory Model
AFC	Application for certification
APN	Assessor's parcel number
AQCR	Air Quality Control Regions
AQIA	Air Quality Impact Analysis
ARB	Air Resources Board
ATC	Authority to Construct
BACT	Best available control technology
BPIP	Building profile input program
BPIP-Prime	Building Parameter Input Program – Prime
Btu/kWh	British thermal units per kilowatt hour
CAA	Clean Air Act
CAAA	Clean Air Act Amendments
CAAQS	California Ambient Air Quality Standards
CAISO	California Independent System Operator
CARB	California Air Resources Board
CATEF	California Air Toxic Emissions Factors
CEC	California Energy Commission
CECP	Carlsbad Energy Center Project
CEMS	Continuous Emissions Monitoring System
CEQA	California Environmental Quality Act
CO	Carbon monoxide
$CO2_e$	Carbon dioxide equivalent
COOP	National Weather Service Cooperative Network
CPUC	California Public Utilities Commission
CT	Combustion turbine
CTG	Combustion turbine generator
DOC	Determination of compliance
dscf	Dry standard cubic feet
ERC	Emission reduction credit
FDOC	Final determination of compliance
FLAG	Federal Land Managers' Air Quality Related Values Workgroup
ft	Foot (feet)
g/s	Gram per second
gal	Gallon(s)
GE	General Electric

GHGs	Greenhouse Gases
gpd	Gallons per day
H_2S	Hydrogen sulfide
HARP	Hotspots analysis and reporting program
HHV	Higher heating value
HRA	Health risk assessment
in	Inch(es)
ISCST3	Industrial Source Complex Short Term 3rd version
klb/hr	Thousand pounds per hour
km	Kilometers
LAER	Lowest achievable emission rates
lb	Pounds
Lb/hr	Pounds per hour
LHV	Lower heating value
LORS	Laws, ordinances, regulations, and standards
m/s	Meters per second
MACT	Maximum Achievable Control Technology
Max	Maximum
MEIR	Maximally exposed individual resident
MEIW	Maximally exposed individual worker
mg/kg-day	Milligrams per kilogram per day
Min	Minimum
MMBTU/hr	Million British Thermal Unit per hour
MW	Megawatt
NA	Not applicable
NAAQS	National Ambient Air Quality Standards
NCDC	National Climatic Data Center
NESHAPS	National Emission Standards for Hazardous Air Pollutants
NH_3	Ammonia
NO	Nitric oxide
NOAA	National Oceanic and Atmospheric Administration
NO_2	Nitrogen dioxide
NO_x	Nitrogen oxides
NSR	New Source Review
NWS ASOS	National Weather Service Automated Surface Observation Station
O_2	Oxygen
O_3	Ozone
OEHHA	Office of Environmental Health Hazard Assessment
OLM	Ozone limiting method
PAH	Polycyclic Aromatic Hydrocarbons
Pb	Lead
PDCS	Partial dry-cooling system
PM_{10}	Particulate matter less than 10 μm in diameter
$PM_{2.5}$	Particulate matter less than 2.5 μm in diameter
PMI	Point of maximum impact

PPA	Power purchase agreement
ppb	parts per billion
PPEC LLC	Pio Pico Energy Center, LLC
ppm	parts per million
ppmvd	Part per million, volumetric dry
PSD	Prevention of significant deterioration
PTO	Permit to Operate
PV	Photovoltaic
PVMRM	Plume volume molar ratio method
RACT	Reasonably Available Control Technology
RBLC	RACT/BACT/LAER Clearinghouse
RE(s)	Reciprocating engine(s)
REL	Reference exposure levels
RFO	Request for Offers
RO	Reverse osmosis
ROC	Reactive organic compound
SCR	Selective catalytic reduction
SDAPCD	San Diego Air Pollution Control District
SDG&E	San Diego Gas and Electric
SIL	Significant Impact Level
SIP	State Implementation Plans
SJVAPCD	San Joaquin Valley Air Pollution Control District
SNCR	Selective non-catalytic reduction
SO_2	Sulfur dioxide
SO_x	Oxides of Sulfur
T-BACT	Best available control technology for toxics
TAC	Toxic air contaminants
THI	Total Hazard Index
TIBL	Thermal internal boundary layer
tpy	Tons per year
TQs	Threshold quantities
TSP	Total suspended particulate
UF	Ultra filtration
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
UTM	Universal Transverse Mercator
VOC	Volatile Organic Compounds
WSAC	Wet surface air condenser

SECTION 1 INTRODUCTION

Pio Pico Energy Center, LLC (PPEC LLC) is proposingto install a new nominally rated 300 megawatt (MW) electrical generating facility, the Pio Pico Energy Center (PPEC). The site encompasses approximately 13 acres located in San Diego County on the eastern boundary of the City of Chula Vista, (see Figure 1-1, Regional Location, and Figure 1-2, Site Vicinity). The proposed project consists of three natural gas-fired General Electric (GE) LMS100 combustion turbine generators (CTGs) operating in simple cycle mode. The project will constitute new sources of air pollutant emissions that will trigger the New Source Review (NSR) requirements under Regulation II of the San Diego Air Pollution Control District (SDAPCD), which has regulatory authority over the area including the proposed project site.

The pollutant emission sources associated with the project will meet all applicable Best Available Control Technology (BACT) requirements of the SDAPCD, as shown in Section 7 of this application. As a result of these strict emission limitations, the project will not cause or significantly contribute to an exceedance of any California and National Ambient Air Quality Standards (CAAQS and NAAQS) (see Section 5).

In addition to the SDAPCD permitting process, the proposed project is also undergoing environmental review pursuant to the California Environmental Quality Act (CEQA), with the California Energy Commission (CEC) as the lead agency. Nearly all of the information presented in this application has been provided to the CEC as part of the Application for Certification (AFC) submitted on June 30, 2010. The applicant understands that certification of the resulting CEQA document is a condition for issuing the Authority to Construct for this project.

1.1 GENERAL FACILITY INFORMATION

PPEC consists of the project site, linears, and a temporary laydown area. The project site is on a mesa that is approximately 13 acres immediately south of San Diego's Otay Water Treatment Plant and in the southeastern portion of the City of Chula Vista boundary. This location is approximately 3 miles south of Otay Lakes Road and 2 miles east of the South Bay Expressway (aka Highway 125).

PPEC is designed to directly satisfy the San Diego area's current and long-term requirements for peaking and load-shaping generation. As previously stated, the generating facility will consist of three GE LMS100 natural gas-fired CTGs. Each CTG will be equipped with water injection for reducing nitrogen oxides (NO_x) emissions, a selective catalytic reduction (SCR) system with 19 percent ammonia (NH_3) injection to further reduce NO_x, and an oxidation catalyst to reduce carbon monoxide (CO) and volatile organic compounds (VOC) emissions. The total net generating capacity will be approximately 300MW.

Each CTG will generate approximately 100MW at summer design ambient conditions. The project will have a maximum annual capacity factor of approximately 46 percent (4,000 hours per year), plus maximum 500 startup and shutdown events per CTG annually.

Associated equipment will include emission control systems necessary to meet the proposed emission limits. Stack emission NO_x in normal operation will be controlled to 2.5 parts per million, volumetric dry (ppmvd) corrected to 15 percent oxygen through a combination of water injection in the combustors and operation of the SCR system. The oxidation catalyst will limit normal operation CO stack emissions to 6 ppmvd adjusted to 15 percent oxygen.

PPEC will be owned and operated by Pio Pico Energy Center, LLC.

1.2 APPLICATION OVERVIEW

This application package has been designed to respond to the requirements of the SDAPCD New Source Review (NSR) and Title V Federal Operating Permits programs. Information to obtain approvals under these programs is contained in this application. It is understood that the current permit application supplies materials for permitting all of the following activities related to the proposed project:

- Addition of three 100-MW natural gas-fired GE LMS100 CTG's equipped with evaporative inlet air cooling, water injection, SCR, and oxidation catalyst systems;
- Addition of a partial dry cooling system;
- Addition of one 20,000-gallon aqueous ammonia storage tank, associated ammonia unloading station, in-plant distribution piping, and ammonia vaporizer(s);
- Addition of three 100-foot-tall stacks equipped with continuous emissions monitoring systems (CEMS), each discharging the exhaust from one CTG train; and
- Title V permit for the facility.

1.3 APPLICATION FORMS

Completed copies of the required SDAPCD Standard Permit Application Forms are included with this permit application as Appendix A. These include:

- Three SDAPCD Permit/Registration Application Form, FORM 116
- Three SDAPCD Supplemental Application Forms, FORM 20D-H, Gas Turbine

SECTION 2 FACILITY DESCRIPTION

2.1 FACILITY LOCATION

The project site is in the southeastern portion of the City of Chula Vista. The site is more specifically described as the Southwest Quarter of Section 5 Township 15 South, Range 13 East, on the United States Geological Survey (USGS) Quadrangle map. The assessor's parcel number (APN) is 644-090-0400. Other jurisdictions governing land immediately adjacent to the project site include the City of San Diego (southeast) and County of San Diego (northeast). The temporary laydown area is in the County of San Diego, and the access road is in the City of San Diego.

The project will be located on partially disturbed land, will encompass 12.95 acres of permanent improvement (8.20-acre plant site, 1.45-acre substation, 3.30-acre buffer area) and will temporarily utilize 6.90 acres of laydown area. The project also has several linear components comprising 4,050 feet of generally combined gas and sewer lines, a 1,600-foot access road, and two approximately 1,500-foot transmission lines. The project site is adjacent to or nearby all necessary supporting infrastructure. Specifically:

- Two 230-kilovolt (kV) transmission lines are located within 1,500 feet.
- An SDG&E gas transmission line is located within 3,500 feet.
- A recycled water supply line from Otay Water District traverses the project site.
- A sewer interceptor pipeline is located within 3,500 feet.
- The site is serviced by an existing access road that will be improved for the project.

Looking North at the Project Site

2.2 DESCRIPTION OF PROJECT COMPONENTS

The generating facility will consist of three GE LMS100 natural gas-fired CTGs, each equipped with water injection to the combustors for reducing production of NO_x, an SCR system with 19 percent NH_3 injection to further reduce NO_x emissions, and an oxidation catalyst to reduce CO and VOC emissions, see Figure 2-1. The total net generating capacity will be approximately 300MW. Table 2-1 provides a description of major equipment.

Table 2-1
Major Equipment Information

Description	Dimensions			
	Capacity	Length (ft)	Width (ft)	Height (ft)
Combustion Turbines (3)	103 MW	130	30	40
Intercooler Heat Exchangers (3)	120 MMBtu/hr	44	15	13.5
CTG Stacks (3)	--	--	14.5 diameter	100
Variable Bleed Vents, with Silencers (3)	--	--	12	53
Hot SCR	--	70	25	35
Partial Dry-cooling System	120 MMBtu/hr	395	40	23
Raw Water Storage Tank	750,000 gal	--	54.5 diameter	37
Demineralized Water Storage Tank	240,000 gal	--	38 diameter	30
Wastewater Collection Tank	240,000 gal	--	38 diameter	30
Gas Compressor Enclosure	--	50	17	15

Notes:
CTG = combustion turbine generator
ft = foot (feet)
gal = gallon(s)
MMBtu/hr = million British thermal units per hour
MW = megawatt
SCR = selective catalytic reduction

Each simple-cycle LMS100 CTG produces approximately 100MW of electricity. Output depends on inlet air ambient conditions and inlet evaporative cooling. The CTG design incorporates a compressor intercooler and increased firing temperatures to achieve high efficiency and optimum performance under high ambient temperatures. The CTGs are equipped with hot SCRs and oxidation catalyst to reduce NO_x, CO, and VOC emissions.

2.2.1 Combustion Turbine Generator

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

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

Turbine compressor inlet air is drawn through the air inlet ductwork above the combustion turbine. The inlet air filter removes dust and particulate from the intake air. During hot weather the filtered air is cooled by contact with water in the evaporative cooler section of the air inlet ductwork.

Filtered and cooled air drawn into the gas turbine low-pressure compressor section is compressed to an intermediate pressure. Compressing the air causes the air temperature to rise along with the increase in pressure. Cooling the intermediate pressure air before final compression improves the efficiency of the compression process. Hot intermediate pressure air is cooled in a water-cooled heat exchanger (intercooler), external to the compressor, before it enters the high-pressure compressor section.

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

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

The expander section of the turbine produces enough power to drive both the compressor and the electric generator. Integrating the intercooler between compressor stages in the LMS100, together with higher combustor firing temperatures, has resulted in gross turbine generator efficiency that is approximately 10 percent more efficient than similar simple-cycle combustion turbines.

The metal acoustical enclosure, which contains the CTGs and accessory equipment, will be located outdoors. The CTGs will be equipped with the following required accessories to provide safe, reliable operation:

- Evaporative coolers (enhance hot weather performance).
- Inlet air filters (remove dust and particulate from the air).
- Metal acoustical enclosure (reduce sound emissions).
- Duplex shell and tube lube oil coolers for the turbine and generator (cool lubricating oil).
- Annular standard combustor combustion system.
- Compressor wash system (cleans compressor blades and restores compressor performance).
- Fire detection and protection system.
- Compressor intercooler (improves the efficiency of the compressor).

- Hydraulic starting system.
- Combustor water injection system (for NO_x control and output enhancement).
- Compressor variable bleed valve vent (prevent compressor surge in off-design operation).
- The combustion gases exit the turbine at approximately 770ºF and then pass through the hot SCR system for NO_x emission control and an oxidizing catalyst for control of CO and VOC emissions. The SCR is used in conjunction with NH3 injection for the control of NO_x emissions. A 19 percent aqueous NH_3 solution is injected into the CTG exhaust gas stream that passes over a catalyst bed, which reduces the NO_x to inert nitrogen.
- The SCR equipment includes a reactor chamber, catalyst modules, NH_3 storage, vaporization and injection system, and monitoring equipment and sensors. The NH_3 unloading area will consist of a curbed concrete pad and containment vault. After passing through the SCR, the exhaust gases exit through the attached stack.

2.2.1.1 Performance Data

Each CTG will generate approximately 100MW under most ambient conditions. The PPEC plant will be limited to a maximum capacity factor of 46%, which is equivalent to 4,000 hours normal operation per year for each CTG.

The full-load performance of each CTG on a typical day in spring (evaporative cooling on, 72 ºF ambient dry bulb temperature and 29% relative humidity) is as follows:

- Power Output 103.5MW at the generator terminals
- Fuel Flow 816 million British thermal units (MMBtu/hr) low heating value (LHV), or 43,000 pounds per hour (lb/hr)
- Heat Rate 7,880 British thermal units per kilowatt hour (Btu/kWh) LHV

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

Seasonal and peak heat and mass balances are presented in Table 2-2.

Table 2-2
Seasonal Heat and Mass Balances

	Winter	Spring/Fall	Summer	Peak
Conditions				
Ambient Dry Bulb, ºF	47	72	88	93
Relative Humidity, %	41	29	41	39
Performance				
CTG Output (each), MW	102.7	103.5	100.0	98.3
Heat Rate, Btu/kWh, LHV	7,880	7,880	8,000	8,040
Fuel Flow, MMBtu/hr, LHV	809	816	800	790
NO_x Water Injection, lb/hr	29,250	27,360	26,680	26,120
CTG Exhaust Flow, klb/hr	1,730	1,720	1,664	1,643

Notes:
ºF = degrees Fahrenheit
lb/hr = pound per hour
klb/hr = thousand pounds per hour
LHV = lower heating value
MW = megawatts

2.2.1.2 Emissions Data

After commissioning of the CTG units, the emissions from the stack of each CTG at full-load conditions will be as follows:

- NO_x 2.5 ppmvd corrected to 15 percent oxygen (O2)
- CO 4.0 ppmvd corrected to 15 percent O2
- VOC 2.0 ppmvd corrected to 15 percent O2
- NH3 Slip 5.0 ppmvd corrected to 15 percent O2
- Particulate matter less than 10 micrometers in diameter (PM10) 5.5 lb/hr

2.2.2 Partial Dry Cooling System

Up to 120 MMBtu/hr of heat rejection is required for the intercooler and lube oil coolers connected to each of the facility's LMS100 CTGs. The plant will use a partial dry-cooling system (PDCS) in a closed-loop configuration. By doing this, heat will be rejected by first using ambient air, followed by an external water evaporation portion of the loop. This allows the plant water consumption to be dramatically decreased in two ways. First, the dry-cooling section will reduce the total amount of water evaporated during the cooling process. Second, the closed-loop cooling allows the contaminants in the evaporative water to be concentrated to a much greater extent than in a traditional open-loop cooling system because that water does not go into the combustion turbine equipment.

Compared to a typical open-loop system with no dry cooling, the PDCS described above will decrease the annual plant water consumption by approximately 40% and the wastewater production rate by 75%.

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SECTION 3 ENVIRONMENTAL SETTING

This section describes the regional climate and meteorological conditions that influence the transport and dispersion of air pollutants, as well as the existing air quality within the project region. The data presented in this section are representative of the project site.

PPEC will be located on a partially disturbed site with a municipal water treatment plant abutting to the north. The project site is at an elevation of approximately 375 feet (148 meters) above sea level. Terrain elevations are generally flat to the west and south of the site. Lower Otay Reservoir is an artificial lake to the north of the site. The Otay County Open Space Preserve area and Otay Mountain area have hilly terrain on the east side of the site. The terrain elevation rises quickly in this direction from about 350 feet (110 meters) around the Project site to as high as about 3,300 feet (1000 meter) in the Otay Mountain area. The nearest residence is the park ranger station within 1180 feet (360 meters) north of the site's northeast corner fence line.

3.1 METEOROLOGY AND CLIMATE

Consistent with the typical weather of coastal southern California, the City of Chula Vista and western San Diego County in general enjoy a mild Mediterranean and semi-arid climate characterized by low precipitation, warm summers, mild winters, and temperature inversions. The area's climatic conditions are strongly influenced by the large-scale sinking and warming of air in the semi-permanent subtropical high-pressure center over the eastern Pacific. This high-pressure system effectively blocks out most mid-latitude storms, except in winter when the ridge is weaker and farther south. The coastal mountains on the eastern edge of the county also have a major influence on climate, serving as a meteorological boundary that effectively removes moisture from the marine air flowing from the Pacific.

The nearest full-time meteorological monitoring station to the proposed Project site is maintained by the SDAPCD located at Otay Mesa on California State Route 905 at the U.S./Mexican border, approximately 3.5 miles south of the Project site. From 5 years of data collection in 2004-2008, the annual average temperature measured here is 64°F. Temperatures of 32°F or below rarely occur at this station, but temperatures of 90°F or above are more frequent, occurring from April through August. During the fall, Santa Ana winds can last for several days. These are strong, dry, easterly winds from the inland desert areas and are accompanied by high temperatures (greater than 90°F) and very low relative humidities (often below 20%) in the Project area.

San Diego County receives most of its annual rainfall from November to March when the semi-permanent high pressure system over the eastern Pacific Ocean moves south, allowing storms to move through the area. The average annual precipitation at the project site is about 11 inches.

Local wind circulations are driven by temperature differentials between the land and adjacent Pacific Ocean, creating a system of sea- and land-breezes. Winds are typically of light to moderate strength from the sector between northwest and southwest. An annual wind rose representing data collected during the years 2004 to 2008 is presented in Figure 3-1. Quarterly wind roses for the project area are provided in Appendix B.

During springtime, a local marine layer forms at night and can remain through the morning, causing considerable fogginess along the coastline and extending inland several miles. This fog typically dissipates during the late morning, and the afternoons are generally clear. Fog can also occur during the fall and winter months, lasting well into the day.

The nearest long-term meteorological station with available temperature and precipitation means and extremes is a National Weather Service Cooperative Network (COOP) station in Bonita. Data collected at this station over a 55-year period (1915-1970) are presented in Table 3-1. This weather station is located approximately 7.25 miles to the northwest of the PPEC facility at latitude 32°39.6'N, longitude 117°02.0'W. The hottest month, August, has an average maximum temperature of 80.8 degrees Fahrenheit (°F) and an average minimum temperature of 60.7°F. The coldest month, January, has an average maximum temperature of 66.4°F, and an average minimum temperature of 40.0°F.

Table 3-1
Average Temperatures and Precipitation
in BONITA, San Diego County (1915-1970)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Average Max Temperature (°F)	66.4	67.3	68.6	70.9	72.6	75.0	79.4	80.8	80.6	77.0	73.5	68.4	73.4
Average Min Temperature (°F)	40.0	42.2	44.2	48.2	52.6	55.9	59.6	60.7	57.5	51.6	44.3	40.9	49.8
Precipitation (in)	2.14	2.09	1.75	0.97	0.36	0.06	0.01	0.06	0.18	0.55	1.09	2.25	11.51

Notes:
°F = degrees Fahrenheit
in = inches
Max = maximum
Min = minimum
Source: Western Regional Climate Center

During winter, the semi-permanent, subtropical high pressure system over the Pacific Ocean moves south, allowing the passage of frontal systems that bring most of the area's annual precipitation, which totals about 11 inches on average. Monthly mean precipitation amounts at Bonita range from 2.25 inches in December to 0.01 inches in July. Relative humidity levels are generally moderate. In the summer, relative humidity averages 60 to 70 percent in the early morning and about 30 to 50 percent in the afternoon. In winter, relative humidity averages 70 to 80 percent in the early morning and 40 to 60 percent in the afternoon.

At the Otay Mesa station, the prevailing wind direction for most of the year is from the northwest. Wind direction is much more variable during winter months, which can often be associated with the passing of winter storm systems. Wind speeds are normally light or calm.

3.2 EXISTING AIR QUALITY

All ambient air quality data presented in this section were published by the California Air Resources Board (CARB) on the Aerometric Data Analysis & Management (ADAM) website and/or by U.S. Environmental Protection Agency (USEPA) on the AirData website. Ambient air concentrations of ozone (O_3), NO_2, SO_2, CO, PM_{10}, and Particulate matter less than 2.5 μm in diameter ($PM_{2.5}$) are recorded at monitoring stations throughout San Diego County. The immediate area surrounding the project site (within 1.5 to 2 miles) is an area with sparse population. Areas to the east, northeast, and southeast are all vacant, hilly terrain with very sparse population. However, areas more than 2 miles to the south (Otay Mesa), west (San Ysidro), northwest (Rancho Del Rey), and north (Eastlake Greens) are urban or suburban areas with moderate to high density residential areas. Most air quality monitoring stations in the region, only record measurements for one or two criteria pollutants, except for those stations located in urban areas. The monitoring stations were generally positioned to represent area-wide ambient conditions rather than the localized impacts of any particular emission source or group of sources. In rural areas of any county, pollutant concentrations are not expected to vary sharply from one location to the next, since the emission sources are few and widely distributed. Concentrations of pollutants emitted by industrial and vehicular sources are generally higher in the more populated areas of greater San Diego than in the rest of the county.

The closest air quality monitoring station to the PPEC site is located in Otay Mesa at the Otay Mesa-Paseo International border crossing, 1.2 miles south of the PPEC facility. However, the monitoring data recorded at this station are very heavily influenced by the emissions emitted from the hundreds of Mexican vehicles (burning fuels that do not meet stricter US and California standards) waiting each hour at the border entry point of Otay Mesa-Paseo International. San Diego Union Street and San Diego 1110 Beardsley Street stations are both more than 10 miles away from the PPEC facility and located in the coastal area. The data at these monitoring stations are not representative of the greater Lower Otay Lake area. Therefore, data from the Chula Vista monitoring station located eight miles northwest of the Project site will be used to represent appropriate background air pollutant concentrations for the PPEC facility. The three years (2006 through 2008) of background data that was available was used for the air modeling analysis of PPEC. This approach has been discussed with and deemed acceptable by the SDAPCD.

Ambient concentrations of O_3, NO_2, SO_2, CO, $PM_{2.5}$, and PM_{10} are recorded at the Chula Vista monitoring station located at 80 East J Street, approximately 8 miles northwest of the project site. The closest station that monitors ambient lead is in Imperial County (Calexico-Ethel Street).

3.2.1.1 Ozone (O_3)

Ozone is an end product of complex reactions between VOC and NO_x in the presence of ultraviolet solar radiation. VOC and NO_x emissions from vehicles and stationary sources, combined with daytime wind flow patterns, mountain barriers, temperature inversions, and intense sunlight, generally result in the highest O_3 concentrations. For purposes of both state and federal air quality planning, the entire San Diego air basin is classified as a nonattainment area with respect to both state and national ambient standards for ozone.

Table 3-2 shows the measured ozone levels at the Chula Vista station during the period from 2006 to 2008. The 1-hour ozone CAAQS of 0.09 ppm was exceeded once in two of the three years.

Table 3-2
Ozone Levels at Chula Vista (PPM)

Chula Vista Station, San Diego County	2006	2007	2008
Maximum 1-hour Average	0.08	0.11	0.11
Number of Days Exceeding California 1-hour Standard (0.09 ppm)	0	1	1
Number of Days Exceeding Old National 1-hour Standard (0.12 ppm) [1]	0	0	0
Maximum 8-hour Average	0.07	0.09	0.08
Number of Days Exceeding California 8-hour Standard (0.07 ppm)	0	2	4
Number of Days Exceeding National 8-hour Standard (0.075 ppm) [2]	0	1	0

Sources: CARB ADAM Website (www.arb.ca.gov/adam/welcome.html);
USEPA AIRS Website (www.epa.gov/air/data/index.html)

[1] EPA revoked the 1-hour ozone standard in all areas on June 15, 2005.
[2] To attain this standard, the 3-year average of the fourth-highest daily maximum 8-hour average ozone concentrations measured at each monitor within an area over each year must not exceed 0.075 ppm. (effective May 27, 2008)
ppm = parts per million

The federal 8-hour ozone NAAQS requires that the 3-year average of the fourth-highest values for individual years be maintained at or below 0.075 ppm. Therefore, the number of days in each year with maximum 8-hour concentrations above the standard concentration in Table 3-2 does not equate to the number of violations.

O_3 data completeness at the Chula Vista station was 97 percent for the period 2006 through 2008.

3.2.1.2 Nitrogen Dioxide (NO_2)

NO_2 is formed primarily from reactions in the atmosphere between NO (nitric oxide) and oxygen (O_2) or ozone. NO is formed during high-temperature combustion processes, when the nitrogen and oxygen in the combustion air combine. Although NO is much less harmful than NO_2, it can be converted to NO_2 in the atmosphere within a matter of hours, or even minutes, under certain conditions. The control of NO and NO_2 emissions is also important because of the role of both compounds in the atmospheric formation of ozone.

Table 3-3 shows NO_2 levels recorded at the Chula Vista station for the years 2006 through 2008.

Table 3-3
Nitrogen Dioxide Levels at Chula Vista Station (ppm)

Chula Vista Station, San Diego County	2006	2007	2008
Maximum 1-hour Average	0.074	0.082	0.072
Annual Average	0.017	0.015	0.015
Days Over State Standard (0.18 ppm, 1-hour)	0	0	0
Days Over Federal Standard (0.100 ppm, 1-hour)1	NA	NA	NA

Sources: CARB ADAM Website (www.arb.ca.gov/adam/welcome.html);
USEPA AIRS Website (www.epa.gov/air/data/index.html)
[1] The new federal 1-hour average NO_2 standard of 0.100 ppm was announced by USEPA on December 22, 2009 and became effective January 22, 2010.
ppm = parts per million

For purposes of both state and federal air quality planning, the San Diego air basin is in attainment with regard to NO_2. During the period from 2006 to 2008, there have been no violations of the CAAQS 1-hour standard (0.18 ppm) at any monitoring station in San Diego County. The highest 1-hour concentration recorded at the Chula Vista station during the years 2006 to 2008 was 0.082 ppm in 2007. A new federal 1-hour NO_2 standard of 0.100 ppm became effective on January 22, 2010. To attain this standard, the 3-year average of the 98th percentile of the daily maximum 1-hour average at each monitor within San Diego Air Basin must not exceed 0.100 ppm. Table 3-3 also shows that there were no violations of the annual NAAQS (0.053 ppm) or annual CAAQS (0.030 ppm) at the Chula Vista station during this period.

Data completeness for NO_2 concentrations at the Chula Vista station was 99 percent for 2006, 93 percent for 2007, and 99 percent for 2008.

3.2.1.3 Carbon Monoxide (CO)

Carbon monoxide is a product of incomplete combustion, and is emitted principally from automobiles and other mobile sources of pollution, although it is also a product of combustion from stationary sources (both industrial and residential) burning fossil fuels. Peak CO levels occur typically during winter months due to a combination of higher emission rates and stagnant weather conditions.

Table 3-4 shows the available data on maximum 1-hour and 8-hour average CO levels recorded at the Chula Vista station during the period from 2006 to 2008. As indicated by this table, the maximum measured 1-hour average CO levels comply with the NAAQS and CAAQS (35.0 ppm and 20.0 ppm, respectively) and the maximum 8-hour values comply with the NAAQS and CAAQS of 9.0 ppm. The highest individual 1-hour and 8-hour CO concentrations at this station during the period from 2006 to 2008 were 3.1 ppm in 2007 and 2.2 ppm in 2006 and 2007, respectively. Since ambient CO concentrations are generally highest in the immediate vicinity of large fuel-burning sources, the concentrations at the Chula Vista monitoring station almost certainly provide a conservative overestimate of actual concentrations in the project site area. For purposes of both state and federal air quality planning, the San Diego air basin is in attainment with regard to CO.

Table 3-4
Carbon Monoxide Levels at Chula Vista Station (PPM)

Chula Vista Station, San Diego County	2006	2007	2008
Maximum 1-hour Average	2.7	3.1	2.5
Maximum 8-hour Average	2.2	2.2	1.9
Days Over the 8-hour California Standard (9 ppm)	0	0	0
Days Over the 8-hour Federal Standard (9 ppm)	0	0	0

Sources: CARB ADAM Website (www.arb.ca.gov/adam/welcome.html);
USEPA AIRS Website (www.epa.gov/air/data/index.html)

ppm = parts per million

Data completeness for CO concentrations at the Chula Vista station was 98 percent for 2006, 97 percent for 2008, and 91 percent for 2007.

3.2.1.4 Sulfur Dioxide (SO_2)

SO_2 is produced by the combustion of any sulfur-containing fuel. It is also emitted by chemical plants that treat or refine sulfur or sulfur-containing chemicals. Natural gas contains nearly negligible sulfur, while fuel oils may contain much larger amounts. Because of the complexity of the chemical reactions that convert SO_2 to other compounds (such as sulfates), peak concentrations of SO_2 occur at different times of the year in different parts of California, depending on local fuel characteristics, weather, and topography. The San Diego air basin is considered to be in attainment for SO_2 for purposes of state and federal air quality planning.

Table 3-5 shows the available data on maximum 1-hour, 3-hour, 24-hour, and annual average SO_2 levels recorded at the Chula Vista station during the period from 2006 to 2008. As indicated by this table, the maximum measured 1-hour average SO_2 levels comply with the new NAAQS (75 ppb) and CAAQS (0.25 ppm), the maximum 3-hour average SO_2 levels comply with the NAAQS (0.5 ppm), and the maximum 24-hour values comply with the NAAQS and CAAQS of 0.14 ppm and 0.04 ppm, respectively. The table also demonstrates compliance with the annual SO_2 NAAQS of 0.03 ppm. Note that the 24-hour and annual NAAQS for SO_2 will be eliminated when the new 1-hour NAAQS becomes in effective on August 1, 2010.

Table 3-5
Sulfur Dioxide Levels at Chula Vista (PPM)

Chula Vista Station, San Diego County	2006	2007	2008
Highest 1-hour average	0.017	0.012	0.001
Highest 3-hour average	0.013	0.007	0.001
Highest 24-hour average	0.006	0.004	0.004
Annual Average	0.003	0.003	0.002

Table 3-5
Sulfur Dioxide Levels at Chula Vista (PPM)
(Continued)

Chula Vista Station, San Diego County	2006	2007	2008
Days Over 1-hour State Standard (0.25 ppm)	0	0	0
Days Over new 1-hour Federal Standard (75 ppb)[1]	0	0	0
Days Over 24-hour State Standard (0.04 ppm)	0	0	0
Days Over 3-hour Federal Standard (0.5 ppm)	0	0	0
Days Over 24-hour Federal Standard (0.14 ppm)	0	0	0
Days Over the Annual Federal Standard (0.03 ppm)	0	0	0

Notes:
1. Final rule signed June 2, 2010. To attain this standard, the 3-year average of the 99th percentile of the daily maximum 1-hour average at each monitor within an area must not exceed 75 ppb.

Sources: CARB ADAM Website (www.arb.ca.gov/adam/welcome.html); USEPA AIRS Website (www.epa.gov/air/data/index.html)

ppm = parts per million

SO_2 data completeness at the Chula Vista station was 98 percent for 2008 and 2006, and 94 percent for 2007.

3.2.1.5 Particulate Matter (PM_{10})

Particulates in the air are caused by a combination of windblown fugitive dust; particles emitted from combustion sources (usually carbon particles); and organic, sulfate, and nitrate aerosols formed by atmospheric chemical reactions involving emitted hydrocarbons, sulfur oxides, and nitrogen oxides. In 1984, CARB adopted standards for PM_{10}, and phased out the total suspended particulate (TSP) standards that had previously been in effect. PM_{10} standards were substituted for TSP standards because PM_{10} corresponds to the size range of respirable particulates related to human health effects. In 1987, USEPA also replaced national TSP standards with PM_{10} standards. The San Diego air basin is a designated nonattainment area with respect to state PM_{10} standards and is unclassified with respect to federal PM_{10} standards.

Table 3-6 shows the maximum PM_{10} levels recorded at the Chula Vista monitoring station during the period from 2006 through 2008 and the arithmetic annual average concentrations for the same period. (The arithmetic annual average is simply the arithmetic mean of the daily observations.) PM_{10} is monitored according to different protocols for evaluating compliance with the state and federal standards for this pollutant. Specifically, California uses a gravimetric or beta attenuation method, while compliance with federal standards is evaluated based on an inertial separation and gravimetric analysis. This accounts for the slightly differing 24-hour concentrations listed in Table 3-6 that represent data obtained by means of the state and federal samplers.

Table 3-6
Particulate Matter (PM_{10}) Levels at Chula Vista ($\mu g/m^3$)

Chula Vista Station, San Diego County	2006	2007	2008
Maximum 24-hour average (federal testing samplers)	51	51	53
Maximum 24-hour average (state testing samplers)	52	53	54
Annual Arithmetic Mean[1]	25.7	25.5	26.2
Estimated Number of Days Exceeding Federal Standard (150 $\mu g/m^3$)	0	0	0
Estimated Number of Days Exceeding California Standard (50 $\mu g/m^3$)	2	2	1

Notes:
[1] On December 17, 2006, the annual PM_{10} federal standard (50 $\mu g/m^3$) was revoked.
Sources: CARB ADAM Website (www.arb.ca.gov/adam/welcome.html);
USEPA AIRS Website (www.epa.gov/air/data/index.html)
$\mu g/m^3$ = micrograms per cubic meter

At the Chula Vista station, the maximum 24-hour PM_{10} levels exceed the CAAQS state standard of 50 micrograms per cubic meter ($\mu g/m^3$) a few times per year. The maximum daily concentration was 54 $\mu g/m^3$ (state samplers) in 2008. The maximum annual arithmetic mean concentration recorded at Chula Vista was 26.2 $\mu g/m^3$ in 2008, which is above the state standard of 20 $\mu g/m^3$. The federal annual PM_{10} standard was revoked by the USEPA in 2006 due to a lack of evidence linking health problems to long-term exposure to coarse particle pollution.

PM_{10} concentration data completeness at the Chula Vista station was 100 percent for 2006, 99 percent for 2008, and 98 percent for 2007.

3.2.1.6 Fine Particulates ($PM_{2.5}$)

Fine particulates result from fuel combustion in motor vehicles and industrial processes, residential and agricultural burning, and atmospheric reactions involving NO_x, SO_x, and organics. Fine particulates are referred to as $PM_{2.5}$ and have a diameter equal to or less than 2.5 microns. The potential health effects of $PM_{2.5}$ are considered more serious than those of PM_{10}. In 1997, USEPA established annual and 24-hour NAAQS for $PM_{2.5}$ for the first time. The most recent revision to the original standard regulating the 3-year average of the 98th percentile of 24-hour $PM_{2.5}$ concentrations (35 $\mu g/m^3$) became effective on 17 December 2006.

The $PM_{2.5}$ data in Table 3-7 show that the national 24-hour average NAAQS of 35 $\mu g/m^3$ has been exceeded several times in 2007 during the period from 2006 to 2008. The maximum recorded 24-hour average value was 45.7 $\mu g/m^3$ in 2007. The highest value recorded in 2007 (77.8 $\mu g/m^3$) was excluded as an exceptional event related to wild fires in the area. The annual $PM_{2.5}$ data are also presented in this table. The maximum recorded annual arithmetic mean was 12.5 $\mu g/m^3$ which is below both the national standard of 15 $\mu g/m^3$, but above the California standard of 12 $\mu g/m^3$.

Table 3-7
Particulate Matter ($PM_{2.5}$) Levels at Chula Vista ($\mu g/m^3$)

Chula Vista Station, San Diego County	2006	2007	2008
Maximum 24-hour average (federal only)[1]	30.2	45.7	32.9
Annual Arithmetic Mean	11.2	12.5	12.3
Estimated Number of Days Exceeding Federal Standard	0	10	0

Notes:
1 USEPA lowered the 24-hour standard from 65 $\mu g/m^3$ to 35 $\mu g/m^3$ on December 17, 2006
Sources: CARB ADAM Website (www.arb.ca.gov/adam/welcome.html);
USEPA AIRS Website (www.epa.gov/air/data/index.html)
$\mu g/m^3$ = micrograms per cubic meter

3.2.1.7 Airborne Lead (Pb)

Lead (Pb) pollution has historically been emitted predominantly from the combustion of fuels. However, legislation in the early 1970s required gradual reduction of the lead content of gasoline. Coupled with the introduction of unleaded gasoline in 1975, lead levels have been dramatically reduced throughout the U.S., and violations of the ambient standards for this pollutant have been virtually eliminated.

On October 15, 2008, USEPA revised the federal ambient air quality standard for lead, lowering it from 1.5 $\mu g/m^3$ to 0.15 $\mu g/m^3$ for both the primary and the secondary standard. USEPA determined that numerous health studies are now available that demonstrate health effects at much lower levels of lead than previously thought. USEPA subsequently published the final rule in the Federal Register on November 12, 2008. This is the first time that the federal lead standard has been revised since it was first issued in 1978.

In addition to revising the level of the standard, USEPA changed the averaging time from a quarterly average to a rolling three-month average. The level of the standard is “not to be exceeded” and is evaluated over a three-year period. Lead levels are measured as lead in total suspended particulate, or TSP. The revised lead standard also includes new monitoring requirements.

As lead concentrations dropped dramatically and all areas of California attained the previous standard, most lead monitors were shut down by the early 1990s and resources deployed to other pollutants. As a result, there is insufficient monitoring data to determine designations, and most areas of the State will be unclassifiable for the revised standard. There are no monitoring stations in San Diego County that measure lead concentrations.

3.2.1.8 Particulate Sulfates

Sulfate compounds found in the lower atmosphere consist of both primary and secondary particles. Primary sulfate particles are directly emitted from open pit mines, dry lakebeds, and desert soils. Fuel combustion is another source of sulfates, both primary and secondary. Secondary sulfate particles are produced when oxides of sulfur (SO_x) emissions are transformed into particles through physical and chemical processes in the atmosphere. Particles can be transported long distances. The San Diego air basin is unclassified with respect to the state ambient standard for sulfates; there is no federal standard.

3.2.1.9 Other State-designated Criteria Pollutants

Along with sulfates, California has designated hydrogen sulfide, vinyl chloride and visibility-reducing particles as criteria pollutants, in addition to the federal criteria pollutants. The San Diego air basin remains unclassified for these pollutants.

SECTION 4 PROJECT EMISSIONS INFORMATION

This section describes the methodology used to quantify pollutant emissions associated with the proposed project.

4.1 EMISSIONS ESTIMATION METHODOLOGY

The three CTG trains will be the dominant sources of air pollutant emissions from the Project. Vendor guarantees have been provided specifying maximum emission levels for certain pollutants emitted by the proposed gas turbines. These levels will comply with the applicable BACT limits for such units, including maximum stack gas concentrations of 2.5 ppmvd NO_x, 4 ppmvd CO, and 2 ppmvd VOC, all referenced to 15% O_2. Estimated emissions of sulfur oxides by the turbines assumed full oxidation of all fuel sulfur to SO_2 and a natural gas sulfur content of 0.25 grains per 100 dry standard cubic feet (dscf). The PM_{10} emissions from the turbine were based on vendor guarantees. For gas turbines, BACT for these pollutants is universally considered to be the exclusive use of commercial quality natural gas fuel. Calculation sheets showing detailed criteria pollutant emission calculations are provided in Appendix C to this application.

4.2 ESTIMATED CRITERIA POLLUTANT EMISSIONS

4.2.1 Normal Turbine Operating Emissions

The most important emission sources of the project will be the three simple-cycle CTGs burning exclusively natural gas fuel. Annual operational emissions from each of the three project CTGs were estimated by summing the emissions corresponding to normal operating conditions and turbine startup/shutdown conditions. Estimated annual emissions of air pollutants have been calculated based on 4,000 hours of normal operation, plus up to 500 startup and shutdown events for each CTG.

The criteria pollutant emission rates provided by the turbine vendor (GE LMS 100) for three different load conditions (50 percent, 75 percent, and 100 percent) are presented in Table 4-1. These three scenarios represent the expected normal operating range of these turbines at the project facility.

The scenarios presented below are Cases 100 through 128 from left to right (Case 100 is 100 percent load, no evaporative cooling at 59°F ambient temperature; Case 101 is 75 percent load, no evaporative cooling at 59°F; Case 102 is 50 percent load, no evaporative cooling at 59°F, and so on). The maximum hourly emissions for all criteria pollutants during normal operation are expected to occur in Case 110 (100 percent load, no evaporative cooling at 72°F ambient temperature).

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Table 4-1
GE LMS Gas Turbine - Operating Emission Rates for Different Operating Scenarios

Case #	100 ISO	101 ISO	102 ISO	103 Min	104 Min	105 Min	106 Winter	107 Winter	108 Winter	109 Spring	110 Spring	111 Spring	112 Spring	113 Summer	114 Summer	115 Summer	116 Summer	117 Fall	118 Fall	119 Fall	120 Fall	121 Peak	122 Peak	123 Peak	124 Peak	125 Max	126 Max	127 Max	128 Max
Ambient Data and Turbine Setting																													
Ambient Temperature [Dry Bulb] (°F)	59	59	59	30	30	30	47	47	47	72	72	72	72	88	88	88	88	72	72	72	72	93	93	93	93	110	110	110	110
Relative Humidity (%)	60	60	60	60	60	60	41.3	41.3	41.3	29	29	29	29	41.1	41.1	41.1	41.1	29	29	29	29	38.9	38.9	38.9	38.9	16.5	16.5	16.5	16.5
CTG Load Level (%)	100	75	50	100	75	50	100	75	50	100	100	75	50	100	100	75	50	100	100	75	50	100	100	75	50	100	100	75	50
Evap. Cooler	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	EVAP	NONE	NONE	NONE	EVAP	NONE	NONE	NONE	EVAP	NONE	NONE	NONE	EVAP	NONE	NONE	NONE	EVAP	NONE	NONE	NONE
Stack Exhaust Parameters																													
Heat Consumed (MMBTU/hr) - LHV	817.3	653.7	495.2	798.8	643.0	488.6	809.1	649.3	492.5	816.2	818.2	653.6	494.6	800.1	779.9	623.7	473.5	816.2	818.2	653.6	494.6	789.7	769.5	615.8	468.0	786.5	751.1	604.0	459.8
Turbine Outlet Temperature (°F)	776.5	786.9	827.2	748.4	773.9	819.4	763.3	781.8	824.5	775.5	788.5	795.6	832.6	795.1	802.5	804.3	841.1	775.5	788.5	795.6	832.6	798.8	806.3	807.3	844.3	800	813.5	820.7	854.6
Turbine Outlet Temperature (°K)	686.8	692.5	714.9	671.2	685.3	710.6	679.4	689.7	713.4	686.2	693.4	697.4	717.9	697.1	701.2	702.2	722.7	686.2	693.4	697.4	717.9	699.2	703.3	703.9	724.4	699.8	707.3	711.3	730.2
Exhaust Flow (lb/hr)	1,719,263	1,462,443	1,175,966	1,743,744	1,467,074	1,176,583	1,730,830	1,464,022	1,175,917	1,719,845	1,699,503	1,449,276	1,168,633	1,663,590	1,622,231	1,391,885	1,125,217	1,719,845	1,699,503	1,449,276	1,168,633	1,642,681	1,600,987	1,376,647	1,112,970	1,636,163	1,562,823	1,341,854	1,089,598
Exhaust Flow (acfm)	894,492	767,276	636,921	886,607	761,679	633,393	890,895	764,962	635,558	894,071	892,795	765,675	635,605	878,550	861,761	740,451	616,017	894,071	892,795	765,675	635,605	870,066	853,036	734,083	610,811	867,440	837,437	723,097	602,708
Stack Exit Velocity (m/s)	27.5	23.6	19.6	27.3	23.4	19.5	27.4	23.5	19.6	27.5	27.5	23.6	19.6	27.0	26.5	22.8	19.0	27.5	27.5	23.6	19.6	26.8	26.2	22.6	18.8	26.7	25.8	22.2	18.5
Stack Exhaust Emissions (after all controls)																													
NO_x as NO_2 (lb/hr)	8.253	6.601	5.000	8.066	6.492	4.934	8.170	6.556	4.973	8.241	8.262	6.600	4.994	8.079	7.876	6.297	4.781	8.241	8.262	6.600	4.994	7.973	7.770	6.218	4.725	7.941	7.584	6.099	4.642
CO (lb/hr)	8.040	6.431	4.871	7.858	6.325	4.806	7.959	6.387	4.845	8.029	8.048	6.430	4.865	7.870	7.672	6.135	4.658	8.029	8.048	6.430	4.865	7.767	7.569	6.057	4.603	7.736	7.388	5.941	4.522
VOC (lb/hr)	2.302	1.842	1.395	2.250	1.811	1.376	2.279	1.829	1.387	2.299	2.305	1.841	1.393	2.254	2.197	1.757	1.334	2.299	2.305	1.841	1.393	2.224	2.168	1.735	1.318	2.215	2.116	1.701	1.295
NH_3 (lb/hr)	6.110	4.887	3.702	5.972	4.807	3.653	6.049	4.854	3.682	6.102	6.117	4.886	3.697	5.981	5.831	4.662	3.540	6.102	6.117	4.886	3.697	5.903	5.753	4.603	3.498	5.879	5.615	4.515	3.437
SO_X (lb/hr, based on 0.25 gr/SCF)	0.617	0.494	0.374	0.603	0.486	0.369	0.611	0.490	0.372	0.616	0.618	0.494	0.373	0.604	0.589	0.471	0.358	0.616	0.618	0.494	0.373	0.596	0.581	0.465	0.353	0.594	0.567	0.456	0.347
PM_{10} (lb/hr)[1]	5.500	5.000	5.000	5.500	5.000	5.000	5.500	5.000	5.000	5.500	5.500	5.000	5.000	5.500	5.500	5.000	5.000	5.500	5.500	5.000	5.000	5.500	5.500	5.000	5.000	5.500	5.500	5.000	5.000

Note:
Values presented are per turbine.
1. PM_{10} stack emission rates are equal to the GE turbine guaranteed emissions plus a contingency factor of 0.5 lb/hr.

°F	=	degrees Fahrenheit
%	=	percent
acfm	=	actual cubic feet per minute
CO	=	carbon monoxide
CTG	=	combustion turbine generator
lbs/hr	=	pounds per hour
m/s	=	meters per second
NO_x	=	nitrogen oxide(s)
PM_{10}	=	particulate matter less than 10 microns in diameter
VOC	=	volatile organic compounds
SO_2	=	sulfur dioxide

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4.2.2 Turbine Startup and Shutdown Emissions

The expected emissions and durations associated with individual turbine startup and shutdown events are summarized in Table 4-2. Based on vendor information, each turbine startup is expected to take 30 minutes; each turbine shutdown will be completed within 10.5 minutes. The 30-minute startup NO_x emission rate was calculated using GE vender data during the first nine minutes of the startup, and Panoche Energy Center data for minutes 10 thru 30. The Panoche Energy Center is comprised of four GE LMS100 turbines operating in service similar to the proposed PPEC. To be conservative, a 20 percent buffer of additional emissions for each minute was added to the Panoche Energy Center actual startup emission data. Because hours that include startup and shutdown events may have higher NO_x, CO, and VOC emissions than the normal operating condition with functioning SCR and CO catalyst, they were incorporated into the worst-case short and long-term turbine emissions estimates in the model simulations pertaining to these pollutants (see Section 5.2, 5.6 and 5.8).

Table 4-2
Criteria Pollutant Emissions for Each CTG during Startup and Shutdown

Pollutant	Startup 30 minutes	Shutdown 10.5 minutes
	Total lbs per Event	Total lbs per Event
NO_x	22.54	6.0
CO	17.86	47.0
VOC	4.67	3.0
SO_2	0.66	0.08
PM_{10}	2.5	0.88

Notes:
CO = carbon monoxide
CTG = combustion turbine generator
lbs = pounds
NO_x = nitrogen oxide(s)
PM_{10} = particulate matter less than 10 microns in diameter
VOC = volatile organic compounds
SO_2 = sulfur dioxide
* SO_2 emissions were estimated based on a gas sulfur content of 0.75 grains/100 scf

4.2.3 Turbine Commissioning Emissions

The commissioning of the GE model LMS100 natural gas-fired turbines will entail several relatively short periods of operation prior to and during installation and testing of the SCR and CO catalyst systems. During these test periods, emissions of NO_x and CO will be higher than the normal operating emissions scenarios previously discussed because these catalyst controls will be either partially or completely inoperative.

Turbine commissioning activities can be broken down into five separate test periods as described below. The first four tests occur prior to SCR system and oxidation catalyst installation, when the combustor is being tuned (mapping). For this testing phase, NO_x emissions will be higher, because the NO_x emissions control system will not be functioning and because the combustor burners will not be tuned for optimum performance. The next test occurs when the combustor has been tuned but the SCR and oxidation catalyst installation is not complete, and other parts of the turbine operating system are being checked out. Because the control system installation will not be complete, NO_x and CO emissions will be slightly higher than for normal operations.

Commissioning activities are discussed in more detail below. Emission estimates are based on vendor supplied emission rates for the various stages of commissioning. The estimated duration of each stage is based on the recent commissioning of the four GE LMS100 turbines at the Panoche Energy Center. To be conservative, the average duration of each stage during commissioning at Panoche was doubled for the expected commissioning of turbines at PPEC. Total commissioning at Panoche lasted 56 hours while the total commissioning for PPEC is conservatively estimated to be 112 hours. At the conclusion of the commissioning period, operational emissions rates will be at the controlled rates discussed previously in this section. The required CEMS for NO_x and CO will not be certified until after the commissioning period, so actual emissions data during this period will not be collected and certified.

Commissioning activities at PPEC are projected from actual commissioning experience at the Panoche Energy Center and from estimated emission data provided by General Electric. The five specific commissioning tests for each LMS100 turbine are likely to include:

- First Fire (operate unit at synchronous idle and perform a system check – 16 hours)
- Sync/AVR Testing (synchronize unit to the electrical grid and operate the unit at various loads to test the voltage regulator – 12 hours)
- SCR Burn out/AVR Testing (operate the unit at various loads to test the voltage regulator – 20 hours)
- Water Injection Mapping (commissioning of the NO_x water injection system – 32 hours)
- SCR Commissioning (unit operation to adjust SCR control – 32 hours)

During the commissioning tests the worst-case NO_x and CO emission rates for each turbine are expected to be 50.0 lb/hour and 75.0 lb/hour, respectively. Actual test durations will vary, but total commissioning emissions for each turbine are not expected to exceed totals based on these worst-case hourly rates over 112 hours of testing for each turbine (*i.e.*, 3,700 lbs of NO_x and 6,320 lbs of CO). The turbine commissioning emissions for all pollutants in each phase are presented in Table 4-3. In all likelihood, the commissioning of individual turbines will take place sequentially, but a worst-case emission scenario was modeled assuming all three turbines were commissioned at the same time (see modeling hard drive). A more realistic commissioning scenario was also modeled which included one turbine commissioning while two turbines run at normal operations. Modeling results from this commissioning scenario are presented in detail in Section 5.9.

Table 4-3
Durations and Criteria Pollutant Emissions for Commissioning of a Single CTG

Activity	Duration (hours)	Heat Input MMBtu/hr	Exhaust Temp (ºF)	Exhaust Flow Rate (lb/hr)	Pollutant Emission Rates				
					NO_x (lb/hr)	CO (lb/hr)	VOC (lb/hr)	SO_2 (lb/hr)	PM_{10} (lb/hr)
First Fire	16	75	859	295,200	11.25	45.00	1.13	0.17	5.0
Sync / AVR testing	12	500	760	126,3600	50.00	75.00	5.00	1.13	5.0
SCR burn out /AVR testing	20	500	760	126,3600	50.00	75.00	5.00	1.13	5.0
Water injection Mapping	32	500	760	126,3600	50.00	75.00	5.00	1.13	5.0
Ammonia Injection Tuning	32	500	760	126,3600	10.00	25.00	1.50	1.13	5.0

Notes:
1. CTG = combustion turbine generator
2. Emission estimates are based on vendor supplied emission rates for the various stages of commissioning.
3. The estimated duration of each stage is based on the recent commissioning of the three GE LMS100 turbines at the Panoche Energy Center, located in Fresno California. Total Panoche commissioning at Panoche lasted 56 hours, PPEC commissioning is estimated to be 112 hours.
4. PM emission rate is based on case 128 (5lb/hr) since commissioning is less than 75% load in heat input.
5. SO_2 emissions are based on a maximum gas sulfur content of 0.75 grains/100 scf for commissioning.

During the first year of operation when the turbines are commissioned, PPEC will reduce the hours of normal operations in order to keep annual NO_x emissions no higher than those for a year without commissioning. Annual Project emissions for the commissioning year are presented in Appendix C.

4.2.4 Additional Emission Sources

In addition to the three CTGs, the project will include a PDCS. This system will emit particulate matter in the form of drift droplets containing dissolved solids. Therefore, the PDCS annual emissions were estimated based on the design circulating water rate, cycles of concentration, total dissolved solids (TDS), drift eliminator control rate, and the annual operational hours. The detailed emission calculations for the PDCS are presented in Appendix C. There are no other operational emissions sources for criteria pollutants at the project site

4.2.5 Combined Annual Project Emissions

The estimated total combined annual emissions from all sources of the proposed project are shown in Table 4-4, including the three CTG units and the PDCS. Annual emissions of all pollutants were calculated assuming the CTG hours per year of operation described previously and the corresponding hours of PDCS operation.

Table 4-4
Annual PPEC Operational Emissions of Criteria Pollutants

Pollutant	Emissions (tons/year)[1]
NO_x	70.97
CO	96.95
VOC	19.55
SO_2	3.91
PM_{10}	37.47
Lead	Negligible

Notes:
[1] Includes emissions from three turbines and the cooling system

4.3 ESTIMATED TOXIC AIR CONTAMINANT EMISSIONS

Facility operations were evaluated to determine whether particular substances will be used or generated at the project site that could cause adverse health effects upon their release to the air. The only sources of toxic air contaminants (TAC) emissions associated with facility operations will be the three natural-gas–fired GE LMS100 CTGs and the partial dry cooling system. The substances that will be emitted from facility operations with potential toxicological impacts are shown in Table 4-5.

Table 4-5
Toxicity Values Used To Characterize Health Risks

Compound	Sources of Emissions	Inhalation Cancer Potency Factor $(mg/kg\text{-}day)^{-1}$	Chronic REL ($\mu g/m^3$)	Acute 1-hour REL ($\mu g/m^3$)	Acute 8-hour REL ($\mu g/m^3$)
Ammonia	Turbines	—	2.00E+02	3.20E+03	—
1,3-Butadiene	Turbines	6.00E-01	2.00E+01	—	—
Acetaldehyde	Turbines	1.00E-02	1.40E+02	4.70E+02	3.00E+02
Acrolein	Turbines	—	3.50E-01	2.50E+00	7.00E-01
Benzene	Turbines	1.00E-01	6.00E+01	1.30E+03	—
Ethylbenzene	Turbines	8.70E-03	2.00E+03	—	—
Formaldehyde	Turbines	2.10E-02	9.00E+00	5.50E+01	9.00E+00
Hexane	Turbines	—	7.00E+03	—	—
Propylene	Turbines	—	3.00E+03	—	—
Propylene oxide	Turbines	1.30E-02	3.00E+01	3.10E+03	—
Toluene	Turbines	—	3.00E+02	3.70E+04	—

Table 4-5
Toxicity Values Used To Characterize Health Risks
(Continued)

Compound	Sources of Emissions	Inhalation Cancer Potency Factor (mg/kg-day)$^{-1}$	Chronic REL (µg/m^3)	Acute 1-hour REL (µg/m^3)	Acute 8-hour REL (µg/m^3)
Xylenes	Turbines	—	7.00E+02	2.20E+04	—
Arsenic	Cooling System	1.20E+01	1.50E-02	2.00E-01	1.50E-02
Carbon Tetrachloride	Cooling System	1.50E-01	4.00E+01	1.90E+03	—
Chlorine	Cooling System	—	2.00E-01	2.10E+02	—
Chromium	Cooling System	5.10E+02	2.00E-01	—	—
Copper	Cooling System	—	—	1.00E+02	—
Fluoride	Cooling System	—	1.30E+01	2.40E+02	—
Lead	Cooling System	4.20E-02	—	—	—
Polycyclic Aromatic Hydrocarbons (PAHs)					
Naphthalene	Turbines	1.20E-01	9.00E+00	—	—
Benzo(a)anthracene	Turbines	3.90E-01	—	—	—
Benzo(a)pyrene	Turbines	3.90E+00	—	—	—
Benzo(b)fluoranthene	Turbines	3.90E-01	—	—	—
Benzo(k)fluoranthene	Turbines	3.90E-01	—	—	—
Chrysene	Turbines	3.90E-02	—	—	—
Dibenz(a,h)anthracene	Turbines	4.10E+00	—	—	—
Indeno(1,2,3-cd)pyrene	Turbines	3.90E-01	—	—	—
PAHs w/o individual toxicity factors[1]	Turbines	3.90E+00	—	—	—

Source: Cal-EPA/OEHHA, 2009
Notes:
— = not applicable
mg/kg-day = milligrams per kilogram per day
µg/m^3 = micrograms per cubic meter
REL = reference exposure levels
[1] Includes Acenaphthene, Acenaphthylene, Anthracene, Benzo(e)pyrene, Benzo(g,h,i)perylene, Fluoranthene, Fluorene, Phenanthrene and Pyrene.

Per SDAPCD recommendations, the TAC emissions from the turbines were estimated using a combination of emission factors from *California Air Toxics Emission Factor* (CATEF) (CARB, 1996), U.S. EPA AP-42 (U.S. EPA, 1995) and startup source tests from the Palomar Energy Center. These are the same emission factors that were used in the health risk assessment (HRA) for the Carlsbad Energy Center Project (CECP). In addition, potential emissions from ammonia slip from the turbine SCR systems were included.

Two emission scenarios were examined.

1. Normal operations - On an annual basis this scenario included for each turbine, 4,000 hours of normal full load operations plus the emissions from 500 startups and 500 shutdowns. The annual case also included 4,337.5 hours of operation from the cooling system. For the 1-hour acute analysis this scenario's emissions included 1 startup, lasting approximately 30 minutes, and the remainder of the hour in full load normal operations for each turbine plus emissions from the cooling system.

2. Commissioning plus normal operations – The annual emissions included all emissions from the first scenario plus 112 hours of commissioning for each turbine. For the acute 1-hour case, emissions included all 3 turbines emitting the maximum hourly commissioning emissions and emissions from the cooling system. This case is extremely conservative since PPEC plans to reduce the turbine normal operating hours during the year with commissioning.

The worst-case emission rate from each source for each TAC was used to determine the worst-case 8-hour acute health index. For acetaldehyde, acrolein and formaldehyde the maximum hourly emission rate occurs during turbine commissioning. For arsenic the maximum hourly emission rate is associated with full load operation of the cooling system.

The emissions from each turbine during normal full load operations are presented in Table 4-6.

Table 4-6
Toxic Air Contaminant Emissions from Each GE LMS 100 Simple Cycle Turbine during Normal Operations

Pollutant	CAS	Emission Factor (lb/MMBtu)	Emission Factor (lb/MMcf)	Emission factor source	Hourly Emission Rate (lb/hr)	Annual Emission Rate (lb/yr)
Ammonia	7664417			max TBACT level	6.117	2.45E+04
1,3-Butadiene	106990	2.15E-07	2.20E-04	AP-42 w CO catalyst 50% reduction	1.96E-04	7.84E-01
Acetaldehyde	75070	1.99E-05	2.04E-02	AP-42 w CO catalyst 50% reduction	1.82E-02	7.27E+01
Acrolein	107028	3.19E-06	3.27E-03	AP-42 w CO catalyst 50% reduction	2.91E-03	1.17E+01
Benzene	71432	5.96E-06	6.10E-03	AP-42 w CO catalyst 50% reduction	5.43E-03	2.17E+01
Ethylbenzene	100414	1.59E-06	1.63E-03	AP-42 w CO catalyst 50% reduction	1.45E-03	5.81E+00
Formaldehyde	50000	4.48E-04	4.59E-01	CATEF w 50% reduction	4.09E-01	1.64E+03
Hexane	110543	1.27E-04	1.30E-01	CATEF w 50% reduction	1.16E-01	4.63E+02
Propylene	115071	3.77E-04	3.86E-01	CATEF w 50% reduction	3.44E-01	1.38E+03
Propylene Oxide	75569	1.45E-05	1.48E-02	AP-42 w CO catalyst 50% reduction	1.32E-02	5.27E+01
Toluene	108883	6.49E-05	6.65E-02	AP-42 w CO catalyst 50% reduction	5.92E-02	2.37E+02
Xylenes	1330207	3.19E-05	3.27E-02	AP-42 w CO catalyst 50% reduction	2.91E-02	1.17E+02

Table 4-6
Toxic Air Contaminant Emissions from Each GE LMS 100 Simple Cycle Turbine during Normal Operations
(Continued)

Pollutant	CAS	Emission Factor (lb/MMBtu)	Emission Factor (lb/MMcf)	Emission factor source	Hourly Emission Rate (lb/hr)	Annual Emission Rate (lb/yr)
PAHs w toxicity factors						
Benzo(a)anthracene	56553	1.10E-08	1.13E-05	CATEF w 50% reduction	1.01E-05	4.03E-02
Benzo(a)pyrene	50328	6.79E-09	6.95E-06	CATEF w 50% reduction	3.98E-05	1.32E-01
Benzo(b)fluoranthene	205992	5.52E-09	5.65E-06	CATEF w 50% reduction	5.03E-06	2.01E-02
Benzo(k)fluoranthene	207089	5.37E-09	5.50E-06	CATEF w 50% reduction	4.90E-06	1.96E-02
Chrysene	218019	1.23E-08	1.26E-05	CATEF w 50% reduction	1.12E-05	4.49E-02
Dibenz(a,h)anthracene	53703	1.15E-08	1.18E-05	CATEF w 50% reduction	1.05E-05	4.21E-02
Indeno(1,2,3-cd)pyrene	193395	1.15E-08	1.18E-05	CATEF w 50% reduction	1.05E-05	4.21E-02
Naphthalene	91203	6.49E-07	6.65E-04	AP-42 w CO catalyst 50% reduction	5.92E-04	2.37E+00
				PAHs w toxicity factors	6.85E-04	2.71E+00
PAHs w/o individual toxicity factors	1150					
Acenaphthene		9.28E-09	9.50E-06	CATEF w 50% reduction	8.46E-06	3.39E-02
Acenaphthylene		7.17E-09	7.34E-06	CATEF w 50% reduction	6.54E-06	2.62E-02
Anthracene		1.65E-08	1.69E-05	CATEF w 50% reduction	1.51E-05	6.02E-02
Benzo(e)pyrene		2.66E-10	2.72E-07	CATEF w 50% reduction	2.42E-07	9.69E-04
Benzo(g,h,i)perylene		6.69E-09	6.85E-06	CATEF w 50% reduction	6.10E-06	2.44E-02
Fluoranthene		2.11E-08	2.16E-05	CATEF w 50% reduction	1.92E-05	7.70E-02
Fluorene		2.83E-08	2.90E-05	CATEF w 50% reduction	2.58E-05	1.03E-01
Phenanthrene		1.53E-07	1.57E-04	CATEF w 50% reduction	1.40E-04	5.59E-01
Pyrene		1.36E-08	1.39E-05	CATEF w 50% reduction	1.24E-05	4.95E-02
				PAHs w/o individual toxicity factors	2.34E-04	9.35E-01
				PAHs (other than naphthalene)	3.26E-04	1.28E+00

Notes:

a Emission factors obtained from the Rule 1200 Health Risk Assessment Report from SDAPCD for the Carlsbad Energy Center Project, Aug 3, 2009. Factors from the CATEF database for natural gas-fired combustion turbines with 50% reduction to account for CO catalyst; and AP-42 Section 3.1, Table 3.4-1 for a natural gas-fired combustion turbine with 50% reduction to account for CO catalyst

b Ammonia emission rate based on an exhaust NH3 limit of 5 ppmv @ 15% O2 provided by the turbine vendor.

c Used a HHV of 1024 Btu/scf.

To estimate turbine emissions at low load when the pollution control equipment is not fully functional, such as during startup, shutdown and commissioning, the emission factors presented in the CECP HRA were used. These emission factors were derived from stack testing of a GE 7FA natural gas combined cycle turbine during a cold start at the Palomar Energy Center. For pollutants that were not monitored during the stack test, the CECP HRA used AP-42 and CATEF emission factors. It should be noted that the stack test data are from a combined cycle turbine; however, because PPEC is proposing only simple cycle turbines, these data may not be representative. These emission factors are presented in Table 4-7 long with the peak hourly and total annual startup emissions from each turbine. As each turbine is expected to take approximately 30 minutes to startup, the hourly emissions presented in Table 4-7 are only for the 30 minutes of startup. The total time that each turbine is expected to startup in a given year is 250 hours (30 minutes times 500 startups).

Table 4-7
Toxic Air Contaminant Emissions from Each GE LMS 100 Simple Cycle Turbine During Startup

Pollutant	CAS	Emission Factor (lb/MMBtu)	Emission Factor (lb/MMcf)	Emission Factor Source	Max Startup Emissions in 1 hour (lb/hr)	Annual Emission Rate (lb/yr)
Ammonia	7664417			max TBACT level	3.0585	1.53E+03
1,3-Butadiene	106990	4.29E-07	4.39E-04	AP-42	1.38E-04	6.91E-02
Acetaldehyde	75070	1.25E-03	1.28E+00	Source test	4.03E-01	2.02E+02
Acrolein	107028	6.73E-05	6.89E-02	Source test	2.17E-02	1.09E+01
Benzene	71432	2.50E-05	2.56E-02	Source test	8.06E-03	4.03E+00
Ethylbenzene	100414	3.18E-05	3.26E-02	Source test	1.03E-02	5.13E+00
Formaldehyde	50000	4.52E-03	4.63E+00	Source test	1.46E+00	7.29E+02
Hexane	110543	2.53E-04	2.59E-01	CATEF	8.16E-02	4.08E+01
Propylene	115071	7.53E-04	7.71E-01	CATEF	2.43E-01	1.21E+02
Propylene Oxide	75569	2.89E-05	2.96E-02	AP-42	9.32E-03	4.66E+00
Toluene	108883	9.06E-05	9.28E-02	Source test	2.92E-02	1.46E+01
Xylenes	1330207	3.40E-06	3.48E-03	Source test	1.10E-03	5.48E-01
PAH						
Benzo(a)anthracene	56553	2.20E-08	2.25E-05	Source test (ND)	7.09E-06	3.54E-03
Benzo(a)pyrene	50328	1.36E-08	1.39E-05	Source test (ND)	4.38E-06	2.19E-03
Benzo(b)fluoranthene	205992	1.10E-08	1.13E-05	CATEF	3.56E-06	1.78E-03
Benzo(k)fluoranthene	207089	1.07E-08	1.10E-05	CATEF	3.46E-06	1.73E-03
Chrysene	218019	2.20E-08	2.25E-05	Source test (ND)	7.09E-06	3.54E-03
Dibenz(a,h)anthracene	53703	2.20E-08	2.25E-05	Source test (ND)	7.09E-06	3.54E-03
Indeno(1,2,3-cd)pyrene	193395	2.20E-08	2.25E-05	Source test (ND)	7.09E-06	3.54E-03
Naphthalene	91203	1.02E-06	1.04E-03	Source test	3.28E-04	1.64E-01
PAHs w/o individual toxicity factors	1150				1.65E-04	8.25E-02
Acenaphthene		1.86E-08	1.90E-05	CATEF	5.98E-06	2.99E-03
Acenaphthylene		1.44E-08	1.47E-05	CATEF	4.63E-06	2.32E-03
Anthracene		3.30E-08	3.38E-05	CATEF	1.06E-05	5.32E-03
Benzo(e)pyrene		5.31E-10	5.44E-07	CATEF	1.71E-07	8.57E-05

Table 4-7
Toxic Air Contaminant Emissions from Each GE LMS 100 Simple Cycle Turbine During Startup (Continued)

Pollutant	CAS	Emission Factor (lb/MMBtu)	Emission Factor (lb/MMcf)	Emission Factor Source	Max Startup Emissions in 1 hour (lb/hr)	Annual Emission Rate (lb/yr)
Benzo(g,h,i)perylene		1.34E-08	1.37E-05	CATEF	4.32E-06	2.16E-03
Fluoranthene		4.22E-08	4.32E-05	CATEF	1.36E-05	6.80E-03
Fluorene		5.66E-08	5.80E-05	CATEF	1.83E-05	9.13E-03
Phenanthrene		3.06E-07	3.13E-04	CATEF	9.86E-05	4.93E-02
Pyrene		2.71E-08	2.77E-05	CATEF	8.72E-06	4.36E-03
PAHs (other than naphthalene)					2.05E-04	1.02E-01

Notes:

a Emission factors obtained from the Rule 1200 Health Risk Assessment Report from SDAPCD for the Carlsbad Energy Center Project, Aug 3, 2009. Factors from the CATEF database for natural gas-fired combustion turbines; AP-42 Section 3.1, Table 3.4-1 for a natural gas-fired combustion turbine; and source tests from the Palomar Energy Center.

b Source test (ND) = These compounds were tested for but not detected during the source test. The emission factor is based on one half the detection limit.

c Ammonia emission rate based on an exhaust NH3 limit of 5 ppmv @ 15% O_2 provided by the turbine vendor.

d Used a HHV of 1024 Btu/scf.

e Maximum fuel flow during a startup was based on vendor supplied data.

The shutdown emissions are estimated in a similar manner, each turbine is expected to take approximately 10.5 minutes to shutdown and will shutdown a total of 87.5 hours per year (10.5 minutes times 500 shutdowns). Emissions from each turbine in shutdown mode are presented in Table 4-8.

Table 4-8
Toxic Air Contaminant Emissions from Each GE LMS 100 Simple Cycle Turbine During Shutdown

Pollutant	CAS	Emission Factor (lb/MMBtu)	Emission Factor (lb/MMcf)	Emission Factor Source	Max Shutdown Emissions in 1 hour (lb/hr)	Annual Emission Rate (lb/yr)
Ammonia	7664417			max TBACT level	1.07048	5.35E+02
1,3-Butadiene	106990	4.29E-07	4.39E-04	AP-42	3.42E-05	1.71E-02
Acetaldehyde	75070	1.25E-03	1.28E+00	Source test	9.98E-02	4.99E+01
Acrolein	107028	6.73E-05	6.89E-02	Source test	5.37E-03	2.69E+00
Benzene	71432	2.50E-05	2.56E-02	Source test	2.00E-03	9.98E-01
Ethylbenzene	100414	3.18E-05	3.26E-02	Source test	2.54E-03	1.27E+00
Formaldehyde	50000	4.52E-03	4.63E+00	Source test	3.61E-01	1.80E+02
Hexane	110543	2.53E-04	2.59E-01	CATEF	2.02E-02	1.01E+01
Propylene	115071	7.53E-04	7.71E-01	CATEF	6.01E-02	3.01E+01
Propylene Oxide	75569	2.89E-05	2.96E-02	AP-42	2.31E-03	1.15E+00

Table 4-8
Toxic Air Contaminant Emissions from Each GE LMS 100 Simple Cycle Turbine During Shutdown
(Continued)

Pollutant	CAS	Emission Factor (lb/MMBtu)	Emission Factor (lb/MMcf)	Emission Factor Source	Max Shutdown Emissions in 1 hour (lb/hr)	Annual Emission Rate (lb/yr)
Toluene	108883	9.06E-05	9.28E-02	Source test	7.23E-03	3.62E+00
Xylenes	1330207	3.40E-06	3.48E-03	Source test	2.71E-04	1.36E-01
PAH						
Benzo(a)anthracene	56553	2.20E-08	2.25E-05	Source test (ND)	1.75E-06	8.77E-04
Benzo(a)pyrene	50328	1.36E-08	1.39E-05	Source test (ND)	1.08E-06	5.42E-04
Benzo(b)fluoranthene	205992	1.10E-08	1.13E-05	CATEF	8.81E-07	4.40E-04
Benzo(k)fluoranthene	207089	1.07E-08	1.10E-05	CATEF	8.58E-07	4.29E-04
Chrysene	218019	2.20E-08	2.25E-05	Source test (ND)	1.75E-06	8.77E-04
Dibenz(a,h)anthracene	53703	2.20E-08	2.25E-05	Source test (ND)	1.75E-06	8.77E-04
Indeno(1,2,3-cd)pyrene	193395	2.20E-08	2.25E-05	Source test (ND)	1.75E-06	8.77E-04
Naphthalene	91203	1.02E-06	1.04E-03	Source test	8.11E-05	4.05E-02
PAHs w/o individual toxicity factors	1150				4.08E-05	2.04E-02
Acenaphthene		1.86E-08	1.90E-05	CATEF	1.48E-06	7.41E-04
Acenaphthylene		1.44E-08	1.47E-05	CATEF	1.15E-06	5.73E-04
Anthracene		3.30E-08	3.38E-05	CATEF	2.63E-06	1.32E-03
Benzo(e)pyrene		5.31E-10	5.44E-07	CATEF	4.24E-08	2.12E-05
Benzo(g,h,i)perylene		1.34E-08	1.37E-05	CATEF	1.07E-06	5.34E-04
Fluoranthene		4.22E-08	4.32E-05	CATEF	3.37E-06	1.68E-03
Fluorene		5.66E-08	5.80E-05	CATEF	4.52E-06	2.26E-03
Phenanthrene		3.06E-07	3.13E-04	CATEF	2.44E-05	1.22E-02
Pyrene		2.71E-08	2.77E-05	CATEF	2.16E-06	1.08E-03
PAHs (other than naphthalene)					5.07E-05	2.53E-02

Notes:

a Emission factors obtained from the Rule 1200 Health Risk Assessment Report from SDAPCD for the Carlsbad Energy Center Project, Aug 3, 2009. Factors from the CATEF database for natural gas-fired combustion turbines; AP-42 Section 3.1, Table 3.4-1 for a natural gas-fired combustion turbine; and source tests from the Palomar Energy Center.

b Source test (ND) = These compounds were tested for but not detected during the source test. The emission factor is based on one half the detection limit.

c Ammonia emission rate based on an exhaust NH_3 limit of 5 ppmv @ 15% O2 provided by the turbine vendor.

d Used a HHV of 1024 Btu/scf.

e Maximum fuel flow during a shutdown is based on half of the maximum fuel flow during normal full load operations.

Table 4-9 presents the maximum hourly and annual commissioning emissions from each turbine. Annual commissioning emissions are based on 112 hours of commissioning per turbine at various loads.

Table 4-9
Toxic Air Contaminant Emissions from Each GE LMS 100 Simple Cycle Turbine During Commissioning

Pollutant	CAS	Emission Factor (lb/MMBtu)	Emission Factor (lb/MMcf)	Emission factor source	Max Hourly Emission Rate (lb/hr)	Annual Emission Rate (lb/yr)
Ammonia	7664417			max TBACT level	6.117	6.85E+02
1,3-Butadiene	106990	4.29E-07	4.39E-04	AP-42	2.39E-04	2.11E-02
Acetaldehyde	75070	1.25E-03	1.28E+00	Source test	6.97E-01	6.15E+01
Acrolein	107028	6.73E-05	6.89E-02	Source test	3.75E-02	3.31E+00
Benzene	71432	2.50E-05	2.56E-02	Source test	1.39E-02	1.23E+00
Ethylbenzene	100414	3.18E-05	3.26E-02	Source test	1.77E-02	1.57E+00
Formaldehyde	50000	4.52E-03	4.63E+00	Source test	2.52E+00	2.22E+02
Hexane	110543	2.53E-04	2.59E-01	CATEF	1.41E-01	1.24E+01
Propylene	115071	7.53E-04	7.71E-01	CATEF	4.20E-01	3.70E+01
Propylene Oxide	75569	2.89E-05	2.96E-02	AP-42	1.61E-02	1.42E+00
Toluene	108883	9.06E-05	9.28E-02	Source test	5.05E-02	4.46E+00
Xylenes	1330207	3.40E-06	3.48E-03	Source test	1.89E-03	1.67E-01
PAH						
Benzo(a)anthracene	56553	2.20E-08	2.25E-05	Source test (ND)	1.22E-05	1.08E-03
Benzo(a)pyrene	50328	1.36E-08	1.39E-05	Source test (ND)	3.98E-05	6.68E-04
Benzo(b)fluoranthene	205992	1.10E-08	1.13E-05	CATEF	6.15E-06	5.43E-04
Benzo(k)fluoranthene	207089	1.07E-08	1.10E-05	CATEF	5.99E-06	5.29E-04
Chrysene	218019	2.20E-08	2.25E-05	Source test (ND)	1.22E-05	1.08E-03
Dibenz(a,h)anthracene	53703	2.20E-08	2.25E-05	Source test (ND)	1.22E-05	1.08E-03
Indeno(1,2,3-cd)pyrene	193395	2.20E-08	2.25E-05	Source test (ND)	1.22E-05	1.08E-03
Naphthalene	91203	1.02E-06	1.04E-03	Source test	5.66E-04	5.00E-02
PAHs w/o individual toxicity factors	1150				2.85E-04	2.52E-02
Acenaphthene		1.86E-08	1.90E-05	CATEF	1.03E-05	9.13E-04
Acenaphthylene		1.44E-08	1.47E-05	CATEF	8.00E-06	7.06E-04
Anthracene		3.30E-08	3.38E-05	CATEF	1.84E-05	1.62E-03
Benzo(e)pyrene		5.31E-10	5.44E-07	CATEF	2.96E-07	2.61E-05
Benzo(g,h,i)perylene		1.34E-08	1.37E-05	CATEF	7.46E-06	6.58E-04
Fluoranthene		4.22E-08	4.32E-05	CATEF	2.35E-05	2.08E-03
Fluorene		5.66E-08	5.80E-05	CATEF	3.16E-05	2.79E-03

Table 4-9
Toxic Air Contaminant Emissions from Each GE LMS 100 Simple Cycle Turbine During Commissioning (Continued)

Pollutant	CAS	Emission Factor (lb/MMBtu)	Emission Factor (lb/MMcf)	Emission factor source	Max Hourly Emission Rate (lb/hr)	Annual Emission Rate (lb/yr)
Phenanthrene		3.06E-07	3.13E-04	CATEF	1.70E-04	1.50E-02
Pyrene		2.71E-08	2.77E-05	CATEF	1.51E-05	1.33E-03
PAHs (other than naphthalene)					3.86E-04	3.12E-02

Notes:

a Emission factors obtained from the Rule 1200 Health Risk Assessment Report from SDAPCD for the Carlsbad Energy Center Project, Aug 3, 2009. Factors from the CATEF database for natural gas-fired combustion turbines; AP-42 Section 3.1, Table 3.4-1 for a natural gas-fired combustion turbine; and source tests from the Palomar Energy Center.

b Source test (ND) = These compounds were tested for but not detected during the source test. The emission factor is based on one half the detection limit.

c Ammonia emission rate based on an exhaust NH3 limit of 5 ppmv @ 15% O2 provided by the turbine vendor.

d Used a HHV of 1024 Btu/scf..

e Maximum fuel flow during each phase of commissioning based on turbine load data provided by project engineers.

Trace levels of inorganic particles and metals are indicated in the analysis of the source water for the cooling system and low-level emissions of these pollutants will therefore be contained in the particulate matter emitted in the drift droplets that escape with the plumes from the cooling system. The TACs in the drift particulate emissions from the cooling system emissions were calculated based on, the water circulation rate, drift elimination efficiency and the concentrations of TACs in the circulating water. These results served as the basis for estimating individual TAC emissions from the cooling system.

The maximum concentrations from the 2007-2009 water analyses collected from the Otay Water District's Ralph W. Chapman Water Recycling Facility were used to determine the concentrations of inorganic chemicals. These values were then used to estimate the maximum TAC emissions from the cooling system. For the annual emission calculations, it was assumed that the cooling system will operate for a maximum of 4,337.5 hours per year. Emission factors and estimated maximum hourly and annual emissions from the cooling system are summarized in Table 4-10.

Table 4-10
Toxic Air Contaminant Emissions from Cooling System

Toxic Air Contaminant	CAS	TAC Concentration in water[1]		Total Project cooling system emissions	
		µg/liter	lb/(1000 gallon)	lb/hr	lb/yr
Arsenic	7440382	1.8	0.000015	1.48E-06	6.44E-03
Carbon Tetrachloride	56235	2.1	0.000018	1.73E-06	7.51E-03

Table 4-10
Toxic Air Contaminant Emissions from Cooling System
(Continued)

Toxic Air Contaminant	CAS	TAC Concentration in water[1]		Total Project cooling system emissions	
		µg/liter	lb/(1000 gallon)	lb/hr	lb/yr
Chlorine	7782505	230000	1.919215	1.90E-01	8.23E+02
Chromium	18540299	2.8	0.000023	2.31E-06	1.00E-02
Copper*	7440508	6.5	0.000054	5.36E-06	2.33E-02
Fluoride*	1101	660	0.005507	5.44E-04	2.36E+00
Lead	7439921	0.86	0.000007	7.09E-07	3.08E-03
Total Annual HAP Emissions (ton/yr)					**4.11E-01**

Notes:

The maximum concentration for each TAC as determined from the highest water samples collected from RWCWRF effluent in 2007, 2008, and 2009.

* not a CAA112 HAP

Under the Clean Air Act, Section 112, a major source of hazardous air pollutants (HAPs) is a source that emits 10 tons per year or more of any HAP or 25 tons per year or more of any combination of HAPs. Therefore, the PPEC will not be a major source of HAPs. The detailed annual HAP emissions for all sources in each operational mode can be found in Appendix D.

4.4 ESTIMATED GREENHOUSE GAS EMISSIONS

In 2006, the California Assembly passed a law (AB32) directing CARB to develop regulations to reduce statewide greenhouse gas (GHG) emissions to 1990 levels by 2020 and requiring annual reporting of these emissions for large sources.

Potential maximum annual GHG emissions for the operational PPEC were calculated using the California Climate Action Registry power/utility protocol. Table 4-11 presents the estimated greenhouse gas emissions due to Project operations in carbon dioxide equivalent [CO_2e]. Methane and nitrous oxide emissions have been converted to carbon dioxide equivalents using greenhouse gas warming potentials of 21 and 310, respectively. The estimated emissions include the combustion emissions for the three turbines and the maximum potential SF_6 leakage from circuit breakers and transmissions system. Appendix C presents supporting technical information and calculation spreadsheets used to develop emissions data for the various scenarios of the operational project.

Table 4-11
Greenhouse Gas Emissions from the Project

Emission Rate (metric tons/year in CO2 equivalent)		
3 turbines	**circuit breakers and transmissions system**	**Total CO_2 Equivalent**
605,783.26	43.63	605,826.90

Notes:
CO_2 – carbon dioxide
Turbine emissions based on 4,000 hours of normal full-load operations for each turbine (no commissioning), plus 500 startups and shutdowns Events.

SECTION 5 AIR QUALITY IMPACT ANALYSIS

The purpose of the air quality impact analyses is to evaluate whether criteria pollutant emissions resulting from operations of the proposed project, would cause or contribute significantly to a violation of a California or national ambient air quality standard.

Mathematical models designed to simulate the atmospheric transport and dispersion of airborne pollutants are used to quantify the maximum expected impacts of project emissions on ambient air quality for comparison with applicable regulatory criteria. The air quality modeling methodology described in this section has been documented in a formal modeling protocol (URS 2007), which was submitted for comments to SDAPCD, as well as to the CEC. A copy of the modeling protocol and comments received from the SDAPCD and the CEC are presented in Appendix E.

5.1 MODEL AND MODEL OPTION SELECTIONS

The impacts of project operations on criteria pollutant concentrations in receptor areas within 10 kilometers from the PPEC site were evaluated using AERMOD (version 09292). AERMOD is appropriate for this Application because it has the ability to assess dispersion of emission plumes from multiple point, area, or volume sources in flat, simple, and complex terrain and to use sequential hourly meteorological input data. The regulatory default model options were used, including building and stack tip downwash, default wind speed profiles, exclusion of deposition and gravitational settling, consideration of buoyant plume rise, and complex terrain.

For the AERMOD simulations to evaluate operations impacts of NO_2 concentrations, the ozone-limiting method option of the model was used to take into account the role of ambient ozone in limiting the conversion of emitted NO_x (which occurs mostly in the form of nitric oxide) to NO_2, the pollutant regulated by ambient standards. A conversion ratio from NO_x to NO_2 was set to 0.10. The input data to the AERMOD-OLM model includes representative hourly ozone monitoring data for the same years corresponding to the meteorological input record. These simulations used the ozone data from the SDAPCD Chula Vista monitoring station for the years 2006 through 2008, obtained from the CARB website for Chula Vista, Station Number 2589. Any missing ozone data was filled in a manner similar to EPA approved meteorological data processing, *i.e.,* linear interpolation for 1-2 hours of missing data, or fill in longer missing periods with data from the previous day assuming that the previous day shows a similar pattern in ozone concentrations.

To evaluate whether urban or rural dispersion parameters should be used in the model simulations, an analysis of land use adjacent to the proposed project site was conducted in accordance with Section 8.2.8 of the *Guideline on Air Quality Models* (EPA-450/2-78-027R and Auer [1978]), EPA AERMOD implementation guide (2004), and its addendum (2006). Based on the Auer land use classification procedure, more than 50 percent of the area within a 1.86-mile (3-kilometer) radius of the proposed project site is appropriately classified as rural. Thus, in accordance with the EPA AERMOD implementation guide, the AERMOD rural option was selected. Land use parameter values when processing the Otay Mesa meteorological data are discussed in the Meteorological Data section.

5.2 REPRESENTATION OF PROJECT EMISSIONS FOR MODELING

Reasonable worst-case project emissions scenarios were developed for each combination of pollutant and averaging time corresponding to an air quality standard or significance limit. Table 5-1 presents the worst-case modeling scenarios selected for each averaging time. These scenarios form the basis for the air dispersion modeling analyses, the results of which are presented in Section 5.8. Some notes regarding the selection of these scenarios and the resulting emission calculations are provided below.

Under conditions of the power purchase agreement (PPA), the utility will not request the start of a turbine unless the turbine will operate for over 30 minutes. Additionally, to maintain good engineering practices, a turbine cannot be started again for at least 30 minutes after shut down while a purge of the system is performed. Thus, there will never be a start up and a shut down completely occurring within any rolling 60 minute period. Accordingly, the worst-case 1-hour NO_x emission rate for the three turbines corresponds to one 30-minute start up and the reminder of the hour at normal full-load operations. See Appendix C for details

The worst-case 1-hour CO emission rate for the three turbines corresponds to one 10.5-minute shutdown with the remainder of the hour at normal operations. Shutdown emissions for CO were provided in GE vendor data. Worst-case turbine SO_2 emission rates correspond to the maximum (100% load) normal operations because SO_2 emissions are solely a function of fuel consumption rate and are unaffected by the post-combustion controls. CO is the only criteria pollutant with an ambient air quality standard for the 8-hour averaging time. The worst-case 8-hour emission scenario used for modeling consists of all three turbines completing four startups and four shutdowns with remainder at normal 100 percent load operations. This is clearly an extreme worst-case assumption that would be highly unlikely to occur in practice, since start up and shut downs cannot sequentially occur immediately following each other, as explained above in the previous paragraph.

Similar to $SO_{2,}$ turbine particulate matter emissions are solely a function of fuel consumption rate and are unaffected by the post-combustion controls. The scenario selected to represent a conservative maximum potential 24-hour average emission rate for particulate matter assumes cooling system operation and all three turbines at normal operating mode for the entire period. Based on screening dispersion modeling, a 5 lb/hr PM emission rate during operation at 50% load will result in a higher predicted ground-level impact than a 5.5 lb/hr emission rate during operation at 100% load, due to differing stack parameters between the cases. Therefore, a 5 lb/hr rate was used as the "worst-case" emission rate for this pollutant. For more details see Sections 5.4 and 5.5. The scenario selected to represent a conservative maximum potential 24-hour average emission rate for SO_2 assumes normal full-load operating mode for all turbines.

Annual emissions of all pollutants were calculated for each turbine assuming total operations of 4,000 hours, plus 500 startup and shutdown cycles. Estimated maximum annual emissions for the project are presented in Table 5-1.

Table 5-1
Criteria Pollutant Sources and Emission Totals for Modeling the Worst-Case Plant-Wide Emissions Scenarios Corresponding To All Averaging Times

Averaging Time	Operating Equipment	Pollutant	Emissions in pounds – Entire Period	
			Each CTG	Cooling System
1-hour	**NO_X:** One startup (all turbines) with remainder at worst case normal operations (100% load, 72ºF, case 110);	NO_X	26.67	-
	CO: One shutdown (all turbines) with remainder at worst case normal operations (100% load, 72ºF, case 110);	CO	53.64	-
	SO_2: Full-load turbine at worst case normal operations (100% load, 72ºF, case 110);	SO_2[1]	1.85	-
3-hour	**SO_2:** Continuous full-load (all turbines) at worst case normal operations (100% load, 72ºF, case 110);	SO_2[1]	5.56	-
8-hour	**CO:** Four startups and four shutdowns (all turbines) with remainder at worst case normal operations (100% load, 72ºF, case 110);	CO	302.10	-
24-hour	**SO_2**, turbines operate at worst case normal operations (100% load, 72ºF, case 110);	SO_2[1]	44.48	-
	PM_{10}: worst case normal operations (case 128), plus cooling system.	PM_{10}	120.00	21.36
Annual	**All:** Each turbine operates for 4,000 hours at worst case normal operations (100% load, 72ºF, case 110) plus 500 startups, 500 shutdowns (4,337 total hours). Cooling System operates 4,000 hours	NO_x	51,784.11	-
		SO_2	2,592.86	-
		PM_{10}	21,687.50	3,862.94

Notes: 1. Emissions of SO_x for averaging times of 1 to 24 hours were modeled with values corresponding to the hypothetical maximum sulfur content of the supplied natural gas of 0.75 grain per 100 standard dry cubic feet (gr/100 dscf). Emissions of SO_x for averaging times greater than 24 hours were modeled with values corresponding to the expected maximum natural gas sulfur content of 0.25 gr/100 dscf.
2. PM emission rate is based on case 128 (5lb/hr) since this case gives the worst modeled impact.

CO = carbon monoxide
CTG = combustion turbine generators
°F = degrees Fahrenheit
NO_X = nitrogen oxide
PM_{10} = particulate matter 10 microns in diameter
SO_2 = sulfur dioxide
VOC = volatile organic compounds

Note that turbine commissioning impacts are evaluated separately in the modeling due to the temporary, one-time nature of that activity.

5.3 MODEL INPUT DATA

5.3.1 Building Wake Effects

The effects of building wakes (*i.e.*, downwash) on the plumes from the proposed project's CTGs and cooling system were evaluated in the modeling for operational emissions, in accordance with EPA guidance (EPA, 1985). Data on the buildings and other structures within the PPEC site that could potentially cause plume downwash effects for the new stacks were determined for different wind directions using the EPA Building Profile Input Program – Prime (BPIP-Prime) (Version 04274). The following structures were identified within the PPEC site to be included in the downwash analysis:

- Control Room
- Warehouse Building
- Waste Water Treatment Building
- Wet/Dry Air Cooler Building And Towers
- Combustion Turbine Generator Buildings
- Air Inlet Buildings
- Sound Wall
- SDG&E Switchyard Control Building
- Plant Switchyard Control Building
- Electric Firewater Pump Building
- Service Water Tank
- Demineralized Water Tank
- Waste Water Tank
- Variable Bleed Vent Silencers

The results of the BPIP-Prime analysis were included in the AERMOD input files to enable downwash effects to be simulated. Input and output electronic files for the BPIP-Prime analysis are included with those from all other dispersion modeling analyses on the external hard drive that is being submitted to accompany this Application.

5.3.2 Meteorological Data

Hourly surface data was obtained from SDAPCD for the Otay Mesa meteorological station for years 2006-2008. Data was also obtained from the National Climatic Data Center (NCDC) for the Brown Field Airport National Weather Service Automated Surface Observation Station (NWS ASOS) for the same years. Surface meteorological parameters included in the Otay Mesa station data set are temperature, wind speed, wind direction, and sigma theta (standard deviation of the horizontal wind direction variability). Other parameters needed for AERMET, including cloud cover, were obtained from the

Brown Field data. These data sets meet the U.S. EPA criteria for representativeness, and are suitable data based on close proximity and terrain similarities between the Project Site and the two meteorological surface stations. The 2006-2008 dataset represents a data collection over 3 years. Data quality at Otay and Brown field for these years was good, and the sites were maintained on a regular basis. Data capture were greater than 90 percent for 2006-2008.

Data on weather parameters aloft was obtained from the National Oceanic and Atmospheric Administration (NOAA) Radiosonde Database for Miramar Marine Corps Air Station for the same years as the surface station data sets. The Miramar MCAS upper air station is located approximately 22 miles north of the project site.

Figure 3-1 presents the annual windrose based on the 2004-2008 meteorological data from the Otay Mesa meteorological site. Seasonal windroses based on the five years of Otay Mesa data are provided as Appendix B. Winds for all seasons and all years blow predominantly from the northwest and west directions, although the directional pattern is more variable during the winter.

5.3.3 Receptor Locations

Ground-level receptors for the criteria pollutant modeling analysis were placed at off-property locations to evaluate the impacts of the project (see Figures 5-1 and 5-2). Receptor spacing varies according to distance from the project property boundary. To ensure that the locations of highest potential impact were identified, the receptor spacing was closest at the project property boundary and increased with distance from the boundary. Receptors were placed as far as 10 kilometers from the property boundary. The following receptor spacing was used in the modeling analysis:

- 25-meter spacing along the fence line and extending from the fence line out to 100 meters beyond the property line;
- 100-meter spacing from 100 meters to 1 km beyond the property line;
- 500-meter spacing between 1 and 5 km of project site boundary and
- 1,000-meter spacing between 5 and 10 km of project site boundary.

If a maximum predicted concentration value was located in the portions of the receptor field with 100-, 500-meter, or 1,000-meter spacing, the model was rerun using a dense receptor grid that was placed around the initial maximum concentration point. This dense receptor grid utilized 25-meter spacing and extended 500 meters in all directions from the point of initial maximum concentration.

The receptor locations were designated using Universal Transverse Mercator (UTM) coordinates (North American Datum 27). Receptor ground-level elevations were obtained from the USGS 1-arc second national elevation dataset.

Due to the large computation time required to run AERMOD, this receptor grid, with the additional dense nested grid points, was determined to best balance the need to predict maximum pollutant concentrations and allow the all operational modeling runs to be completed within a reasonable period of time.

5.4 TURBINE IMPACT SCREENING MODELING

As described previously, a screening modeling analysis was performed to determine which CTG operating mode and stack parameters would produce worst-case offsite impacts (*i.e.*, maximum ground-level concentrations) for each pollutant and averaging time. Only the emissions from the CTGs were considered in this preliminary modeling step. The screening modeling used AERMOD, as described in the previous sections. Building wake information and the receptor grid described previously in Section 5.3 were also used. Three years of meteorological data (2006-2008) were used in the screening analysis.

The AERMOD model simulated natural gas combustion emissions from the three 14.5-foot-diameter (4.42 meters), 100-foot-tall (30.48 meters) stacks for the CTG units. The stacks were modeled as point sources at their proposed locations within the PPEC site. Table 5-2 summarizes the combustion CTG screening results for the different CTG operating loads and ambient temperature conditions. First, the model was run with unit emissions (1.0 grams per second) from each stack to obtain normalized concentrations that are not specific to any pollutant. CTG vendor data used to derive the stack parameters for the different operating conditions evaluated in this screening analysis are included in Appendix C.

The maximum ground-level concentrations predicted to occur offsite with unit turbine emission rates for each of the 29 operating conditions shown in Table 5-2 were then multiplied by the corresponding turbine emission rates for specific pollutants. The highest resulting concentration values for each pollutant and averaging time were then identified (see bolded values in the table).

The stack parameters associated with these maximum predicted impacts were used in all subsequent simulations of the refined AERMOD analyses described in the next subsection. Note that the lower exhaust temperatures and flow rates at reduced turbine loads correspond to reduced plume rise, in some cases resulting in higher offsite pollutant concentrations than the higher base load emissions. Model input and output files for the screening modeling analysis are included with those from all other modeling tasks on the Air Quality and Public Health Modeling hard drive that is provided separately with this Application.

Table 5-2
CTG Screening Model Results – All Scenarios, All Years

	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128
Case #	**ISO**	**ISO**	**ISO**	**Min**	**Min**	**Min**	**Winter**	**Winter**	**Winter**	**Spring**	**Spring**	**Spring**	**Spring**	**Summer**	**Summer**	**Summer**	**Summer**	**Fall**	**Fall**	**Fall**	**Fall**	**Peak**	**Peak**	**Peak**	**Peak**	**Max**	**Max**	**Max**	**Max**
Maximum X/Q concentration (ug/m^3/(g/s)) predicted from AERMOD																													
1 hour	32.195	38.633	44.587	33.359	39.254	44.834	32.731	38.882	44.679	32.243	**31.966**	38.510	44.566	32.517	33.190	39.892	45.238	32.243	31.966	38.510	44.566	32.856	33.548	40.162	45.403	32.959	34.192	40.459	45.595
3 hour	23.878	28.927	33.921	24.794	29.432	34.136	24.299	29.130	34.001	23.915	23.695	28.825	33.901	24.117	24.635	29.772	34.482	23.915	23.695	28.825	33.901	24.378	24.911	30.170	34.625	24.457	25.408	30.406	34.791
8 hour	11.700	13.816	15.945	12.085	14.028	16.041	11.877	13.901	15.980	11.716	11.623	13.773	15.936	11.800	12.018	14.171	16.197	11.716	11.623	13.773	15.936	11.910	12.134	14.330	16.261	11.943	12.343	14.430	16.336
24 hour	5.598	6.600	7.650	5.779	6.702	7.701	5.681	6.641	7.669	5.605	5.562	6.580	7.645	5.645	5.748	6.771	7.808	5.605	5.562	6.580	7.645	5.697	5.802	6.844	7.860	5.713	5.901	6.892	7.922
annual	0.750	0.860	0.982	0.769	0.871	0.989	0.759	0.864	0.985	0.751	0.746	0.858	0.982	0.755	0.766	0.880	1.001	0.751	0.746	0.858	0.982	0.761	0.772	0.885	1.006	0.763	0.783	0.891	1.012
Maximum Concentration (ug/m^3) predicted per Pollutant Normal Operations																													
NOx 1 hour	33.508	32.161	28.115	**33.935**	32.139	27.895	33.723	32.147	28.021	33.512	33.306	32.054	28.068	33.128	32.965	31.681	27.278	33.512	33.306	32.054	28.068	33.037	32.874	31.491	27.055	33.007	32.704	31.117	26.693
NOx annual	0.780	0.716	0.619	**0.782**	0.713	0.615	0.782	0.715	0.618	0.780	0.777	0.714	0.618	0.769	0.761	0.699	0.604	0.780	0.777	0.714	0.618	0.765	0.757	0.694	0.599	0.764	0.749	0.685	0.592
CO 1 hour	32.642	31.330	27.388	**33.058**	31.308	27.174	32.852	31.316	27.297	32.646	32.445	31.226	27.343	32.272	32.113	30.863	26.573	32.646	32.445	31.226	27.343	32.183	32.025	30.677	26.356	32.155	31.859	30.313	26.003
CO 8 hour	11.862	11.204	9.794	**11.976**	11.189	9.723	11.921	11.196	9.763	11.862	11.797	11.168	9.777	11.712	11.628	10.963	9.514	11.862	11.797	11.168	9.777	11.666	11.583	10.946	9.440	11.652	11.500	10.811	9.317
SO_2 1 hour	2.506	2.405	2.102	**2.538**	2.403	2.086	2.522	2.404	2.095	2.506	2.490	2.397	2.099	2.477	2.465	2.369	2.040	2.506	2.490	2.397	2.099	2.470	2.458	2.355	2.023	2.468	2.445	2.327	1.996
SO_2 3 hour	1.858	1.801	1.599	**1.886**	1.802	1.588	1.872	1.801	1.595	1.859	1.846	1.794	1.597	1.837	1.830	1.768	1.555	1.859	1.846	1.794	1.597	1.833	1.825	1.769	1.543	1.832	1.817	1.749	1.523
SO_2 24 hour	0.436	0.411	0.361	**0.440**	0.410	0.358	0.438	0.411	0.360	0.436	0.433	0.410	0.360	0.430	0.427	0.402	0.352	0.436	0.433	0.410	0.360	0.428	0.425	0.401	0.350	0.428	0.422	0.396	0.347
SO_2 annual	0.058	0.054	0.046	**0.059**	0.053	0.046	0.058	0.053	0.046	0.058	0.058	0.053	0.046	0.058	0.057	0.052	0.045	0.058	0.058	0.053	0.046	0.057	0.057	0.052	0.045	0.057	0.056	0.051	0.044
PM_{10} 24 hour	3.883	4.162	4.824	4.009	4.226	4.856	3.941	4.188	4.835	3.888	3.858	4.149	4.821	3.916	3.987	4.270	4.923	3.888	3.858	4.149	4.821	3.951	4.025	4.315	4.956	3.962	4.093	4.346	**4.995**
PM_{10} annual	0.520	0.542	0.619	0.533	0.549	0.624	0.526	0.545	0.621	0.521	0.518	0.541	0.619	0.524	0.532	0.555	0.631	0.521	0.518	0.541	0.619	0.528	0.536	0.558	0.634	0.529	0.543	0.562	**0.638**

Note:
The screening model was run for 3 years (2006-2008) MET data.
The bolded values are the highest resulting concentration values for each pollutant and averaging time.
ug/m^3 = micrograms per cubic meter
g/s = grams per second.

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5.5 REFINED MODELING

A refined modeling analysis was performed to estimate offsite criteria pollutant impacts from operational emissions of the project. For particulate matter, two cases were run to confirm that the worst case impact scenario was evaluated. The turbine screening case that resulted in the greatest incremental impact from turbine emissions of $PM_{10}/PM_{2.5}$ was Case 128, which is 50% load at 110 ºF ambient conditions. Based on turbine vendor guarantees, the 50-75% load cases have a reduced particulate matter emission rate (5.0 lb/hr PM_{10}). Accordingly, a second refined model case was run using an emission rate of 5.5 lb/hr $PM_{10}/PM_{2.5}$ and the stack parameters from the turbine screening case that resulted in the greatest impact at 100% turbine load (Case 126). Comparison of the results from the two cases showed that the greatest impact of turbine PM emissions corresponds to the 50% case (Case 128) with a $PM_{10}/PM_{2.5}$ emission rate of 5.0 lb/hr; therefore, this case was used in all subsequent modeling analyses to evaluate 24-hour and annual impacts for these pollutants.

The refined modeling was performed according to the methodology described in the previous sections using a 3-year record of hourly meteorological data. The turbines were modeled at the worst-case emissions and with stack parameters determined in the screening analysis, except as noted for $PM_{10}/PM_{2.5}$. Emissions from the partial dry cooling system were also included in this modeling.

5.6 NO_2 1-HR NAAQS MODELING

URS Corporation has been working with San Joaquin Valley Air Pollution Control District (SJVAPCD) to conduct the NO_2 modeling in a manner consistent with the new U.S. EPA NO_2 1-hour standard. SJVAPCD has developed techniques to conduct the NO_2 modeling analyses that have been approved by U.S. EPA Region 9. On April 12, 2010 SJVAPCD published the draft guidance document "Modeling Procedure to Address the New Federal 1 Hour NO_2 Standard". This guidance discusses a three-tier modeling approach and outlines the U.S. EPA criteria for determining appropriate background data. The tiered approach was developed to streamline the modeling process, with each tier requiring more refined modeling techniques. The SJVAPCD recommends using the AERMOD model with either the ozone-limiting method (OLM) or plume volume molar ratio method (PVMRM) algorithm for all analyses. Similar to SJVAPCD's approach, a tiered method was described in the Modeling Protocol for this project, and was revised in accordance with SDAPCD comments on the Protocol (Appendix E).

The Tier I analysis consists of combining the maximum 1-hour predicted NO_2 concentration from AERMOD with the 98th percentile background concentration. URS has determined the 98th percentile background NO_2 concentration at the Chula Vista monitoring station for the years 2006-2008 from CARB data was 116.35 $\mu g/m^3$.

The Tier II analysis requires AERMOD to be run to predict the eighth highest 1-hour concentration for each year due to modeled sources. The highest eighth highest 1-hour concentration predicted for any year over the modeling period is then combined with the 98th percentile background NO_2 concentration (116.35 $\mu g/m^3$) to estimate the peak offsite NO_2 concentration.

The Tier III analysis requires that the modeling be conducted per the procedures outlined by U.S. EPA in "Notice Regarding Modeling for New Hourly NO_2 NAAQS", dated February 25, 2010. In this approach, AERMOD is run to produce an output file with NO_2 concentrations at every receptor for every hour in the meteorological data set using the hourly POSTFILE option. From the hourly AERMOD POSTFILE, the maximum predicted 1-hour concentration for each day of the data period at each receptor is determined using a FORTRAN post-processing program designed for this purpose. The post–processor then determines the eighth highest daily maximum 1-hour concentration from the daily 1-hour maximum concentrations at each receptor for each year modeled. The eighth highest concentration is representative of the 98th percentile concentration from the distribution of daily 1-hour maximum values. At each receptor, the eighth highest daily 1-hour maximum concentrations are averaged across the modeled years. The highest of the average eighth highest (98^{th} percentile) concentrations among the values for all receptors plus the 98^{th} percentile background NO_2 concentration from a representative monitoring location is used to represent the peak offsite NO_2 concentration for comparison with the NAAQS. It should be noted that SDAPCD does not agree with this approach since the methodology discussed in this tier may underestimate actual NO_2 impacts from the project and would therefore not protect the federal standard. Thus, a Tier III modeling approach was not performed for this project. See SDAPCD comments in Appendix E for more details.

Through discussions with SJVAPCD modeling staff, a fourth-tier modeling analysis technique was developed. The Tier IV AERMOD modeling is conducted in the same manner as the Tier III AERMOD modeling to produce an output file with NO_2 concentrations at every receptor for every hour in the meteorological data set using the hourly POSTFILE option. Concurrent hourly NO_2 background data from the most representative monitoring station are then added to the modeled NO_2 concentrations to obtain the total NO_2 concentration for each hour. Then the 98th percentile (eighth highest) of the daily maximum 1-hour concentrations for each year of meteorological data at each receptor are determined. Receptors with the maximum eighth highest daily 1-hour value from each modeled year are then averaged across all the modeled years and the resulting maximum averaged value is used to represent the peak predicted offsite NO2 design value concentration for comparison with the NAAQS.

SJVAPCD has developed a protocol for filling in missing data that involves linearly interpolating data when one hour of data is missing. If data for two or more sequential hours are missing, the missing values are filled in with the highest recorded 1-hour NO_2 concentration from the appropriate calendar quarter. Although this technique is conservative, it overly skews the total concentration as the highest quarterly background concentration dominates the total impact. It was found that for more than 95 percent of all receptors, the filled-in background data dominated the total NO_2 concentration, thus causing the predicted NO_2 concentration to be significantly higher than expected if actual data were available for that hour. URS recommends, and EPA agreed, to fill missing data in a manner similar to EPA approved meteorological data processing, *i.e.,* linear interpolation for 1-2 hours of missing data and fill in longer missing periods with data from the previous day assuming that the previous day shows a similar pattern in concentrations. Model write ups need to include a good explanation of NO_2 data processing (and O_3 processing if conducted in house).

A postprocessor program was developed by URS to process the Tier III and IV AERMOD POSTFILE output files. The postprocessor calculates the 98th percentile of the daily maximum 1-hour concentrations for each year of meteorological data at each receptor. The postprocessor has the option to add concurrent NO_2 background to the AERMOD output prior to calculating the 98th percentile concentrations, which is consistent with the Tier IV analysis described above.

PPEC has used the tiered analysis approach outlined above to show compliance with the new NO_2 1-hour federal standard. NO_2 1-hr federal modeling for normal operations with startups used a Tier IV analysis. The modeling files submitted with this AFC show more calculation details for the tier analysis performed for this scenario. Background hourly NO_2 data from the Chula Vista monitoring station, years 2006-2008 were obtained from CARB. Any missing hourly data were filled in a manner consistent with the methodology discussed above.

The maximum averaged 98th percentile NO_2 concentration predicted for offsite receptors using the tiered analyses will be compared with the federal NO_2 1-hour standard of 100 parts per billion (ppb), which is equivalent to 188.68 micrograms per cubic meter ($\mu g/m^3$), to determine whether compliance will be achieved.

5.7 FUMIGATION ANALYSIS

Fumigation may occur when a plume that was originally emitted into a stable layer of air is mixed rapidly to ground-level when unstable air below the plume reaches plume height. Fumigation can cause relatively high ground-level concentrations for some elevated point sources either during the breakup of the nocturnal radiation inversion by solar warming of the ground surface (inversion breakup fumigation), or by the transport of pollutants from a stable marine environment to an unstable inland environment (shoreline fumigation).

A fumigation analysis was performed using the USEPA model SCREEN3 (Version 96043). The SCREEN3 model was used to calculate concentrations from inversion breakup fumigation and shoreline fumigation. A unit emission rate was used (1 gram per second) in the fumigation modeling to represent the plant emissions and the model results were given in terms of predicted maximum concentrations that were then scaled to reflect plant emissions for each pollutant. To calculate the inversion and shoreline breakup fumigation, the default thermal internal boundary layer (TIBL) factor of 6 in the SCREEN3 model was used.

Since fumigation impacts can affect concentrations longer than 1 hour, the procedures described in Section 4.5.3 of "Screening Procedures for Estimating the Air Quality Impact of Stationary Sources" (USEPA, 1992a) were used to determine the 3-hour and 8-hour average concentrations.

All fumigation calculations may be found with the modeling files submitted separately with the AFC. See section 5.8.2 for fumigation modeling results.

5.8 AIR QUALITY IMPACTS – NORMAL OPERATIONS

Air dispersion modeling was performed according to the methodology described in previous subsections to evaluate the maximum increase in ground-level pollutant concentrations resulting from proposed project emissions, and to compare the maximum predicted impacts, including background pollutant levels, with applicable short-term and long-term CAAQS and NAAQS. The same three-year record of hourly meteorological data described in Section 3 was used in the AERMOD modeling to evaluate operational impacts.

In evaluating operational impacts, the AERMOD model was used to predict the increases in criteria pollutant concentrations at all receptor locations due to project emissions only. Next, the maximum modeled incremental increases for each pollutant and averaging time were added to the maximum background concentrations, based on air quality data collected at the most representative monitoring stations during the last three years (2006 through 2008). These background concentrations are presented and discussed in Section 3.2. The resulting total pollutant concentrations were then compared with the most stringent CAAQS or NAAQS.

As described previously, the emissions and stack parameters used in the AERMOD simulations for the operational sources of the Project were selected to ensure that the maximum potential impacts would be addressed for each pollutant and averaging time corresponding to an ambient air quality standard. The emissions used in the modeling for each pollutant and averaging time are explained and quantified in Table 5-1. This subsection describes the maximum predicted operational impacts of the proposed project for normal turbine operating conditions. Commissioning impacts, which will occur on a temporary, one-time basis and will not be representative of normal operations, were addressed separately, as described in the next subsection.

Table 5-3 summarizes the maximum predicted criteria pollutant concentrations due to the operational PPEC facility. This table also shows that the modeled impacts due to the project emissions, in combination with conservative background concentrations, will not cause a violation of any NAAQS, and will not significantly contribute to the existing violations of the federal and state PM_{10} and $PM_{2.5}$ standards.

AERMOD with OLM predicted maximum 1-hour and annual NO_2 concentration due to project operations emissions which, when added to conservative highest 1-hour background values in 2006 to 2008 from Chula Vista monitoring station, are below the 1-hour California standard. To demonstrate compliance with the federal 1 hour NO_2 standard, a Tier IV approach (see Section 5.6 and modeling files submitted separately with this AFC for details) was performed. The total concentration predicted by this approach is below the federal NO_2 1 hour standard. Predicted maximum impacts for CO and SO_2 are less than the most stringent ambient standards. Therefore, the operational impacts from the proposed PPEC project are predicted to be in compliance with both the NAAQS and CAAQS.

In addition, as described later, all of the proposed project's operational emissions of nonattainment pollutants and their precursors will be offset to ensure that there will be no net increase in annual ambient non-attainment pollutants.

Table 5-3
AERMOD Modeling Results for Project Operations (All Project Sources Combined)

Pollutant	Averaging Period		Maximum Predicted Impact[1,7] (µg/m³)	Background Concentration (µg/m³)[2]	Total Concentration (µg/m³)	NAAQS (µg/m³)	CAAQS (µg/m³)
NO_2	1 hour[3]	Federal Standard	See Note 10 (Turbines startup hour)	See Note 10	136.97 [10]	188.68	N/A
		CA Standard	125.00 [8] (Turbines startup hour)	154.72 [9]	279.72	N/A	339
	Annual[3]		0.61	31.96	32.57	100	57
SO_2	1 hour		8.69	44.37	53.06	196	655
	3 hour		7.00	33.93	40.93	1300	NA
	24 hour		1.61	15.66	17.27	365	105
	Annual		0.03	7.83	7.86	80	NA
CO	1 hour		251.44 (Turbines startup hour)	3,534	3,785	40,000	23,000
	8 hour		66.25 (Turbines startup hour)	2,508	2,574	10,000	10,000
PM_{10}	24 hour[4,5]		5.88	77.00	82.88	150	50
	Annual[4,5]		0.69	26.20	26.89	NA	20
$PM_{2.5}$	24 hour[4,5]		5.88	45.70	51.58	35	NA
	Annual[4,5]		0.69	12.50	13.19	15	12

Notes:

N/A = not applicable

1. Modeling analyses use 3 years of consecutive meteorological data, 2006-2008 data from SDAPCD Otay Mesa meteorological station, Brown field, and Miramar MCAS.
2. Background represents the maximum values measured at the monitoring stations, except where noted.
3. Results for NO_2 during operations used ozone limiting method (OLM) with ambient ozone data collected at the Chula Vista monitoring station for the years 2006-2008.
4. PM_{10} and $PM_{2.5}$ background levels exceed ambient standards.
5. All PM_{10} emissions from project sources were also considered to be $PM_{2.5}$.
6. Maximum Predicted Impact, except where noted.
7. First highest-high modeled concentration for three year period.
8. Background concentration for NO_2 of 154.72 µg/m3 is the maximum 1-hr monitoring value from the years of 2006-2008 at Chula Vista monitoring station data, to compare with the CAAQS NO2 standard.
9. NO_2 1-hr federal modeling uses a Tier IV analysis based on SJVAPCD and EPA draft modeling procedures that address the methodology of demonstrating compliance with the standard. A FORTRAN post-processing program adds maximum 1-hour modeled concentrations for every hour at every receptor to the corresponding hourly background data from the Chula Vista monitoring station to obtain total NO2 concentrations for each hour. The post-processor then calculates the 98th percentile of the daily maximum 1-hour concentrations for each year of meteorological data at each receptor. The highest 98th percentile 1-hour total concentrations at each receptor are averaged across the modeled years and the maximum value is used to represent the peak predicted offsite NO_2 design value for comparison to the NAAQS of 100 ppb. See modeling files submitted separately with this AFC for calculation details.

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The locations of predicted maximum impacts vary by pollutant and averaging time, but in all cases will be within 4,560 feet (1,400 m) from the PPEC facility fence line. Maximum predicted concentrations for all pollutants and averaging times, except annual PM_{10} and $PM_{2.5}$ are predicted to occur about 1,400 m southeast of the power plant boundary in the hills of Otay County Open Space Preserve. Annual peak particulate concentrations are predicted to occur along the southern fence line of the PPEC. Figure 5-3 shows the locations of the maximum predicted operational impacts for all pollutants and averaging times.

5.8.1 PM Modeling Analyses

In response to the modeling protocol written for PPEC in February 2010, SDAPCD requested the applicant perform additional analyses of PM_{10} and $PM_{2.5}$ project impacts along with the operational modeling PM analyses already presented in the AFC.

The following section describes the additional analyses conducted for PM_{10} 24-hour, PM_{10} annual, $PM_{2.5}$ 24-hour, and $PM_{2.5}$ annual California and Federal standards per SDAPCD request. Additional details, such as calculation spreadsheets supporting the following analyses, can be found with modeling files provided as an attachment to this permit application.

5.8.1.1 PM_{10} 24-hour CAAQS

SDAPCD requested an additional modeling analysis be conducted to address whether PPEC operational emissions will cause additional violations of the California PM_{10} 24-hour standard of 50 $\mu g/m^3$ [SDAPCD Rule 20.3(d)(2)(i)(C)]. From the previous modeling results the peak PM_{10} 24-hour concentration was predicted. This predicted concentration was then subtracted from the CAAQS standard of 50 $\mu g/m^3$ to determine the maximum background concentration when possible exceedances of the CAAQS could occur (exceedance background concentration). The SDAPCD methodology required additional modeling to be conducted for all days when the actual monitored PM_{10} concentration was at or above this exceedance background concentration and the model predicted concentrations would then be added to the actual background concentrations.

In the SDAPCD example, if the maximum predicted 24-Hour concentration from a project is 5 ug/m^3 then all days with a monitored concentration of 46 to 50 µg/m3 would be modeled, and the results for each day would then be added to the monitored concentration and compared with the California standard.

The first step taken was to look at daily PM_{10} data from Chula Vista monitoring station for the same years PPEC operational modeling was performed; 2006-2008. Monitoring data for this pollutant were obtained from the CARB Ambient Air Quality Data website. PM_{10} 24-hour monitoring data were found to be available approximately every 6 days. Per SDAPCD recommendation, no attempt was made to fill missing daily background data, and the violation analysis requested was performed with the available daily monitoring data.

The maximum modeled concentration predicted for PM_{10} 24-hour from PPEC operation emissions was 5.88 $\mu g/m^3$ for the years 2006-2008. Therefore, individual days were modeled for PPEC operations for any day where the background PM_{10} 24-hour monitoring concentration was between 44-50 $\mu g/m^3$ to obtain incremental impacts per day due to PPEC operations. Per SDAPCD, a violation of the standard occurs if the monitored background concentration plus the maximum modeled project impact on the same day adds to a total of 51 $\mu g/m^3$ or higher.

Four days of monitored background concentrations were found in 2006-2008 that exceeded the CAAQS, which can viewed in Table 5-4. Since violations of the standard already occurred on these dates, operational modeling was not performed for these days. Table 5-5 shows three days where monitored concentrations were between 44-50 µg/m^3. These days were modeled for PPEC operations to determine whether additional violations of the PM_{10} 24-hour CAAQS will occur after adding predicted PPEC impacts. After the maximum modeled impact for each day was added to each day's corresponding monitored concentration, additional violations of the CAAQS were found not to occur for any day. Therefore, PPEC is in compliance with SDAPCD Rule 20.3(d)(2)(i)(C), as shown in Table 5-5. It is important to note that emissions of PM_{10} from PPEC will be minimized by using only natural gas in the turbines and applying an efficient drift eliminator on the cooling system. The project will also offset all operational emissions at a ratio of at least 1 to 1 as required by CEC.

Table 5-4
Days in 2006-2008 where monitoring concentration exceeds PM10 24-hour CAAQS

Date	Monitoring Value (µg/m^3) PM_{10} 24-hour
10/26/2006	51.00
10/27/2007	57.00
11/20/2007	51.00
10/27/2008	53.00

Table 5-5
Days in 2006-2008 where PM_{10} 24-hour CAAQS violation analysis was conducted

Date	Monitoring Value (µg/m^3)	Maximum Predicted Modeling Concentration (µg/m^3)	Total Concentration (µg/m^3)	Greater than CAAQS?
1/11/2006	49.00	1.08	50	no
11/2/2007	47.00	1.31	48	no
11/26/2007	49.00	0.98	50	no

Note:
Concentrations less than or equal to 50 µg/m^3 show compliance with the CAAQS. The concentration should be rounded to remove all significant figures.

5.8.1.2 PM10 Annual CAAQS

For the California PM_{10} Annual standard of 20 µg/m^3, an analysis was requested by the SDAPCD to show whether the operational PPEC would be of significance to an exceedance of the standard based on a comparison between the project maximum modeled annual concentration and the PM_{10} Annual Federal PSD Class II Area Significant Impact Level (SIL) of 1 µg/m^3. The highest annual concentration from each year modeled (2006, 2007, 2008) for PM_{10} due to PPEC operations was predicted to be 0.69 µg/m^3 (occurring in 2006), which is under the SIL of 1 µg/m^3, as shown in Table 5-6.

Table 5-6
CAAQS PM_{10} Annual Analysis

First-high modeled concentration PM_{10} Annual (µg/m^3) 2006-2008	EPA SIL for PM_{10} Annual (µg/m^3)
0.69	1

5.8.1.3 PM2.5 24-hour NAAQS

For the federal 24-hour $PM_{2.5}$ standard of 35 µg/m^3, an analysis was requested by SDAPCD to combine the model predicted maximum 24-hour concentration from all project sources averaged over 3-years with the 3-year average 98th percentile monitored concentration for the years 2006-2008, and compare the total concentration with the standard. The 3-year average modeled first high concentration due to PPEC operations was predicted to be 4.87 µg/m^3. It was conservatively assumed that all emissions of PM_{10} from both the turbines and the cooling system were equal to the $PM_{2.5}$ emissions. The 3-year average 98th percentile background concentration for years 2006-2008 is 27.60 µg/m^3 from the US EPA - AirData Monitor Values Report - Criteria Air Pollutants website for Chula Vista monitoring station. Table 5-7 indicates that the total concentration is less than the federal $PM_{2.5}$ 24-hr standard.

Table 5-7
NAAQS $PM_{2.5}$ 24-hr Analysis

3-year average (2006-2008) of the 98th percentile of Chula Vista monitoring concentration for $PM_{2.5}$ 24hr (µg/m^3)	3-year average (2006-2008) modeled first high concentration for $PM_{2.5}$ 24hr (µg/m^3)	Total Concentration $PM_{2.5}$ 24hr (µg/m^3)	Federal $PM_{2.5}$ 24-hour Standard (µg/m^3)
27.60	4.87	32.47	35

5.8.1.4 PM2.5 Annual NAAQS

For the federal annual $PM_{2.5}$ standard of 15 µg/m^3, an analysis was requested by SDAPCD to combine the model predicted annual concentration from all project sources averaged over the 3-years of meteorological data with the 3-year average monitoring concentration for the years 2006-2008, and compare the total value with the standard. The 3-year average modeled first high concentration due to PPEC operations for $PM_{2.5}$ Annual was predicted to be 0.67 µg/m^3. It was conservatively assumed that all emissions of PM_{10} from both the turbines and the cooling system were equal to the $PM_{2.5}$ emissions. The 3-year average of the national annual average monitoring station concentrations at Chula Vista was 12.0 µg/m^3. Table 5-8 indicates that the total concentration is less than the federal $PM_{2.5}$ annual standard.

Table 5-8
NAAQS $PM_{2.5}$ Annual Analysis

3-year average annual monitored concentration at Chula Vista 2006-2008 for $PM_{2.5}$ Annual (µg/m^3)	3-year average annual modeled $PM_{2.5}$ concentration 2006-2008 (µg/m^3)	Total annual Concentration $PM_{2.5}$ (µg/m^3)	Federal $PM_{2.5}$ Annual standard (µg/m^3)
12	0.67	12.67	15

5.8.1.5 PM2.5 Annual CAAQS

Per SDAPCD, if the 3 year average annual monitored concentration for the years 2006-2008 exceeds the state annual $PM_{2.5}$ standard of 12 µg/m^3, then a significance analysis should be presented, similar to the analysis done for PM_{10} Annual CAAQS in Step 2. Because the 3-year average annual background monitored concentration as shown in Step 4 was 12 µg/m^3, a significance analysis was conducted as suggested. SDAPCD requested that preliminary Federal PSD Class II Area screening level SILs proposed on September 21, 2007 in 40CFR Parts 51 and 52 be used for this analysis. For a Class II impact area, the three SILs proposed are: 1.0 µg/m^3, 0.8 µg/m^3, and 0.3 µg/m^3. After discussion with SDAPCD, a SIL of 1.0 µg/m^3 was chosen to compare to the project maximum modeled annual $PM_{2.5}$ concentration. Because all emissions of PM_{10} were conservatively assumed to be equal to the $PM_{2.5}$ emissions, the highest annual concentration from each year modeled (2006, 2007, 2008) for this pollutant was predicted to be 0.69 µg/m^3, (estimated in the same manner as step 2), which is under the proposed SIL of 1 µg/m^3 as presented in Table 5-9.

Table 5-9
CAAQS $PM_{2.5}$ Annual Analysis

First-high modeled concentration $PM_{2.5}$ Annual (µg/m^3) 2006-2008	Proposed EPA SIL for $PM_{2.5}$ Annual (µg/m^3)
0.69	1

5.8.2 Fumigation Impacts

Potential worst-case fumigation impacts were modeled according to the method described in Section 5.7, Air Dispersion Modeling. The screening modeling results obtained with a unit emission rate were multiplied by the actual turbine emission rate to obtain the 1-hour values presented below. The 1-hour values are multiplied by the USEPA conversion factor to obtain 3-hour, and 8-hour concentration values. Peak concentration results from nocturnal inversion and shoreline fumigation are shown in Tables 5-10 and 5-11, respectively.

Since the SCREEN3 model can not compute the 98th percentile modeled concentration, the federal NO_x 1-hr standard of 100 ppb was not compared to the predicted fumigation impacts. However, the maximum predicted impact for NO_2 1-hr from normal operations for all turbines undergoing startup is greater than the maximum predicted impact due to both nocturnal inversion or shoreline fumigation modeling scenarios. Because the Tier IV analysis performed for normal operations with startups resulted in a NO_2 1-hour impact that is in compliance with the new federal standard (Table 5-3), then impacts due to fumigation will also be in compliance with the federal NO_2 1-hr standard.

Table 5-10
Peak Concentrations due to Nocturnal Inversion Breakup Fumigation (All Turbines)

Pollutant	Averaging Time	Maximum Predicted Impact (μg/m^3)	Background Concentration (μg/m^3)[1]	Total Concentration (μg/m^3)	Most Stringent AAQS (μg/m^3)
NO_x	1-hr	10.2	154.72	165	339
SO_2	1-hr	0.7	109.62	110	196
	3-hr	0.6	54.81	55	1300
CO	1-hr	20.5	4,446	4,466	23,000
	8-hr	8.2	2,850	2,858	10,000

Notes:

1 Background represents the maximum values measured at the monitoring stations in PPEC AFC.

2. Because the SCREEN3 model cannot compute the 98th percentile modeled concentration, the federal NO_2 1-hr standard of 100 ppb was not compared to the predicted fumigation impact.
Emission rates used for fumigation modeling:

NO_x 1-hr : 26.67 lb/hr/CTG
CO 1-hr: 53.64 lb/hr/CTG
CO 8-hr: 37.76 lb/hr/CTG
SO_2 1-hr and 3-hr: 1.85 lb/hr/CTG

Table 5-11
Peak Concentrations due to Shoreline Inversion Fumigation (All Turbines)

Pollutant	Averaging Time	Maximum Predicted Impact (µg/m³)	Background Concentration (µg/m³)¹	Total Concentration (µg/m³)	Most Stringent AAQS (µg/m³)
NO_x	1-hr	70.4	154.72	225	339
SO_2	1-hr	4.9	109.62	115	196
	3-hr	2.4	54.81	57	1300
CO	1-hr	141.6	4,446	4,588	23,000
	8-hr	19.4	2,850	2,869	10,000

Notes:

1 Background represents the maximum values measured at the monitoring stations in PPEC AFC

2. Because the SCREEN3 model cannot compute the 98th percentile modeled concentration, the federal NO2 1-hr standard of 100 ppb was not compared to the predicted fumigation impact

Emission rates used for fumigation modeling:
NOx 1-hr : 26.67 lb/hr/CTG
CO 1-hr: 53.64 lb/hr/CTG
CO 8-hr: 37.76 lb/hr/CTG
SO2 1-hr and 3-hr: 1.85 lb/hr/CTG

5.8.3 Impacts for Nonattainment Pollutants and their Precursors

The emission offset program described in the SDAPCD Rules and Regulations and CEC's policy for compliance with the California Environmental Quality Act were developed to facilitate net air quality improvement when new emissions sources are introduced. Project emissions of nonattainment pollutants (PM_{10} and $PM_{2.5}$) and precursors to nonattainment pollutants (SO_x, NO_x, and VOC) will be fully mitigated by emission offsets. The offsets have not been accounted for in the modeled impacts noted above. Thus, the impacts indicated in the foregoing presentation of model results for the project are significantly overestimated.

5.9 AIR QUALITY IMPACTS – TURBINE COMMISSIONING

Each natural gas turbine of the project could be operated for up to 112 hours for purposes of commissioning the turbine and emission control equipment. Emissions estimates for the five phases of commissioning described in Section 4.2.3 were provided by the turbine vendors and have been used to estimate maximum ground level pollutant concentrations associated with these activities.

Maximum potential short-term (1-hour, 8-hour) impacts due to NO_x and CO emissions during commissioning were evaluated by dispersion modeling with the extremely conservative assumption that all three turbines would be operating at the highest commissioning emission rates for a full one-hour or eight-hour period. Though SO_2 and PM_{10}/$PM_{2.5}$ emissions are unaffected by the operability or non-operability of catalytic control systems, the turbines have different stack parameters during commissioning events than during normal operations. Therefore, the maximum estimated impacts during commissioning may be higher than during normal operations due to varying stack parameters. Both the first-fire commissioning scenario and commissioning scenarios with the highest emission rates were compared in modeling because of varying stack parameters between these cases. See Appendix C and modeling files submitted separately with this application for more details. Maximum impacts from commissioning all turbines together, an extreme worst case, will exceed the state one hour NO_2 standards when added to background concentrations. However, per EPA and CEC guidance, commissioning scenarios are considered short-term, temporary emission events. Therefore, these scenarios do not need to comply with the new federal NO_2 1-hour standard.

A more realistic worst-case commissioning scenario was modeled with the assumption that one turbine will be operating at the highest commissioning emission rates while the remaining two turbines are operating normally at 100 percent load for a full one-hour or eight-hour period. The maximum 1-hour and 8-hour CO emission scenarios were predicted to result in maximum incremental hourly concentrations of 176.2 $\mu g/m^3$ and 69.6 $\mu g/m^3$ respectively, for all turbines combined. The maximum 1-hour NO_2 emission scenarios were predicted to result in maximum incremental hourly concentration of 122.6 $\mu g/m^3$ for all turbines combined.

Table 5-12 shows that when these incremental commissioning impacts are added to applicable background concentrations and compared with the most stringent state or national ambient standards, no violations of the ambient air quality standards for these pollutants are predicted to occur.

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Table 5-12
AERMOD Modeling Results for Project Turbine Commissioning Operations: One Turbine Commissioning and Two Turbines with Normal Operational Emissions at 100 Percent Load

Pollutant	Averaging Period	Maximum Predicted Impact[1,4] (µg/m³)	Background Concentration (µg/m³)[2]	Total Concentration (µg/m³)	NAAQS (µg/m³)	CAAQS (µg/m³)
NO_2	1 hour[3]	122.58 [5]	154.72 [6]	277.30	N/A[7]	339
CO	1 hour	176.21	3,534	3,710	40,000	23,000
	8 hour	69.59	2,508	2,578	10,000	10,000

Notes
N/A = not applicable
1. Modeling analyses use 3 years of consecutive meteorological data, 2006-2008 data from SDAPCD Otay Mesa meteorological station, Brown field, and Miramar MCAS.
2. Background represents the maximum values measured at the monitoring stations, except where noted.
3. Results for NO_2 during operations used ozone limiting method (OLM) with ambient ozone data collected at the Chula Vista monitoring station for the years 2006-2008.
4. Maximum Predicted Impact, except where noted.
5. First highest-high modeled concentration for three year period.
6. Background concentration for NO_2 of 154.72 µg/m3 is the maximum 1-hr monitoring value from the years of 2006-2008 of Chula Vista monitoring station data, to compare with the CAAQS NO_2 standard.
7. Per EPA and CEC guidance, commissioning is not required to comply with the NO_2 1-hr NAAQS of 100 ppb.

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SECTION 6 AIR TOXICS HEALTH RISK ASSESSMENT

6.1 PUBLIC HEALTH IMPACT ASSESSMENT APPROACH

The potential human health risks posed by the project's emissions were assessed using procedures consistent with the SDAPCD Supplemental Guidelines for Submission of Air Toxics "Hot Spots" Program Health Risk Assessments (SDAPCD, 2006), Office of Environmental Health Hazard Assessment (OEHHA) Air Toxics Hot Spots Program Risk Assessment Guidelines (Cal-EPA/OEHHA, 2002) and guidance from SDAPCD staff. The SDAPCD and OEHHA guidelines were developed to provide risk assessment procedures, as required under the Air Toxics Hot Spots Information and Assessment Act of 1987, Assembly Bill 2588 (Health and Safety Code Sections 44360 *et seq.*). The Hot Spots law established a statewide program to inventory air toxics emissions from individual facilities, as well as guidance for execution of risk assessments and requirements for public notification of potential health risks. Per SDAPCD recommendations, and in keeping with the OEHHA guidelines, the general approach to this HRA was developed based on the analyses presented in the CECP - final determination of compliance (FDOC) (SDAPCD, 2009).

As recommended by SDAPCD staff and OEHHA Guidelines, CARB Hotspots Analysis and Reporting Program (HARP) was used to perform an OEHHA Tier 1 HRA for the project. HARP includes two modules: a dispersion module and a risk module. The HARP dispersion module incorporates the USEPA ISCST3 air dispersion model, and the HARP risk module implements the latest Risk Assessment Guidelines developed by OEHHA. For consistency with the criteria pollutant modeling, the dispersion modeling was conducted with AERMOD. CARB has created a beta version software package, HARP On-Ramp, to convert AERMOD dispersion results into a format that can be read into the HARP risk module. Thus, HARP with AERMOD was used for this HRA.

The HRA was conducted in four steps using the HARP:

1. Hazard identification and emission quantification
2. Exposure assessment
3. Dose-response assessment
4. Risk characterization

First, hazard identification was performed to determine the potential health effects that could be associated with PPEC emissions. The purpose was to identify whether pollutants emitted during PPEC operation could be characterized as potential human carcinogens, or associated with other types of adverse health effects. Based on SDAPCD and OEHHA guidelines, a list of pollutants with potential cancer and noncancer health effects associated with the emissions from the project has been presented in Table 4-5 (Section 4). Note that the turbines and the cooling system are the only sources of TACs associated with normal PPEC operations.

Second, an exposure assessment was conducted to estimate the extent of public exposure to the project emissions. Public exposure is quantified based on the predicted maximum short- and long-term ground-level concentrations resulting from project emissions, the exposure pathway(s), and the duration of exposure to those emissions. Dispersion modeling was performed using the AERMOD model to estimate the highest ground-level 1-hour, 8-hour and annual concentrations near the project site. The AERMOD model was run with unit emission rate (1 gram per second), for each source to calculate the concentration of TACs per unit emission rate from each source, known as "X/Q", for 1-hour and annual averaging times per receptor. AERMOD was run again to obtain the 8-hour concentrations per receptor. The 1-hour and annual X/Q values were processed in the HARP On-Ramp program for input into the HARP program. The methods used in the dispersion modeling were consistent with the approach described in Section 5, and the modeling protocol submitted for the project to CEC and SDAPCD (URS, 2010).

Third, a dose-response assessment was performed in HARP incorporating the maximum 1-hour and annual ground level concentrations predicted by AERMOD to characterize the relationship between pollutant exposure and the potential incidence of an adverse health effect in the exposed populations. The dose-response relationship is expressed in terms of potency factors for cancer risk and RELs for acute and chronic noncancer risks. The OEHHA guidelines provide potency factors and RELs for an extensive list of TACs, including those listed in Table 4-5. All exposure pathways were included in this analysis, except the beef/dairy pasture pathways, because no cattle exist within 10 km of the project site. For the drinking water and fish consumption pathways, the closest point of Lower Otay Lake was selected to calculate these pathways in the HRA. For the calculation of cancer risk, the duration of exposure to project emissions was assumed to be 24 hours per day for 70 years, at all receptors. The cancer risk was calculated in HARP using the Derived (Adjusted) Method, and the chronic THI was calculated in HARP using the Derived (OEHHA) Method.

Fourth, risk characterization was performed to integrate the health effects and public exposure information and provide qualitative estimates of health risks resulting from project emissions. Risk modeling was performed using HARP to estimate cancer and noncancer health risks due to project operational emissions. The HARP model uses OEHHA equations and algorithms to calculate health risks based on input parameters such as emissions, "unit" ground-level concentrations, and toxicological data.

Additional AERMOD modeling was conducted to determine the ground level 8-hour concentrations of acetaldehyde, acrolein, arsenic and formaldehyde. These concentrations were then divided by the appropriate REL and summed by target organ to determine the total acute health index for TACs with 8-hour RELs.

6.2 MODEL INPUT PARAMETERS

The HRA was conducted using worst-case turbine and cooling system emissions (short-term and long-term). Cancer and chronic noncancer health effects were evaluated using the HARP model with estimated annual average emission rates for the turbines and cooling system. Acute noncancer health effects were analyzed based on the maximum hourly emissions from all three turbines and the cooling system.

Dispersion modeling was performed using the AERMOD model and methods consistent with the approach described in Section 5.3 (*e.g.,* building downwash and meteorological input data), and the modeling protocol submitted for review to CEC and SDAPCD (URS, 2008). The AERMOD model is run with unit emission rates, 1 gram per second emissions, for each source to calculate the concentration of TACs per unit emission rate from each source. HARP then uses this information along with the estimated source emission rates for specific TAC compounds (as described above) to calculate ground-level concentrations for each chemical species. Meteorological data for the years 2006 through 2008 (the same years used in the air quality modeling analysis) were used in the HRA. Risk values were modeled for all sensitive receptors within 3 miles of the project site and at all grid receptors within 6 miles of the site. The same grid and refined grid receptors used in the air quality modeling were used in the HRA. Refined grid receptors were added in the hills to the east of the project to ensure accurate pollutant concentrations were estimated by AERMOD in this area of complex terrain. To be certain that the maximum potential risks resulting from project emissions would be addressed, all receptors were treated as sensitive receptors.

The stack parameters used for the normal full load operations, were from the ISO case for the turbines operating at 100% load. During startup, shutdown and commissioning periods the turbines will operate at a reduced load, thus stack parameters from the 50% load ISO case were used in the modeling.

Toxicological data, cancer potency factors, and RELs for specific chemicals are built into the CARB's HARP model. The pollutant-specific cancer potency factors and RELs used in the HRA are listed in Table 4-5. The HARP model uses the toxicological data in conjunction with the other input data described above to perform health risk estimates based on OEHHA equations and algorithms.

6.3 CALCULATION OF HEALTH EFFECTS

Adverse health effects are expressed in terms of cancer or noncancer health risks. Cancer risk is typically reported as "lifetime cancer risk," which is the estimated maximum increase in the risk of developing cancer caused by long-term exposure to a pollutant suspected of being a carcinogen. The calculation of cancer risk conservatively assumes an individual is exposed continuously to the maximum pollutant concentrations 24 hours per day for 70 years. Although such continuous lifetime exposure to maximum TAC emissions is unlikely, the goal of the approach is to produce a conservative worst-case estimate of potential cancer risk.

Noncancer risk is typically reported as a THI. The THI is calculated for each target organ as a fraction of the maximum acceptable exposure level or REL for an individual pollutant. The REL is generally the level at (or below) which no adverse health effects are expected. The THIs are calculated for both short-term (acute) and long-term (chronic) exposures to noncarcinogenic substances by adding the ratios of predicted concentrations to RELs for all pollutants.

Both cancer and noncancer risk estimates produced by the HRA represent incremental risks (*i.e.,* risks due to the modeled sources only) and do not include potential health risks posed by existing background concentrations. The HARP model performs all of the necessary calculations to estimate the potential lifetime cancer risk and the acute 1-hour and chronic noncancer THIs due to the project's TAC emissions. The acute 8-hour THI is calculated directly from the predicted concentrations of acetaldehyde, acrolein, arsenic and formaldehyde.

6.3.1 Health Effects Significance Criteria

Various state and local agencies provide different significance criteria for cancer and noncancer health effects. For the project, the SDAPCD guidelines provide the significance criteria for potential cancer and noncancer health effects due to project-related emissions. SDAPCD Regulation XII, Rule 1200 states that if a HRA for a project predicts a cancer risk of greater than 1.0 in one million (1.0×10^{-6}) then Toxic Best

Available Control Technology (TBACT) must be applied. For carcinogenic health effects, an exposure is considered significant when the predicted increase in lifetime cancer risk exceeds 10 in 1 million (1.0×10^{-5}). For noncarcinogenic acute and chronic health effects, an exposure that affects each target organ is considered significant when the corresponding THI exceeds a value of 1.0.

6.3.2 Uncertainty in the Public Health Impact Assessment

Sources of uncertainty in the results of HRAs include emissions estimates, dispersion modeling, exposure characteristics, and extrapolation of toxicity data in animals to humans. For this reason, assumptions used in HRAs are typically designed to provide sufficient health protection to avoid underestimation of risk to the public. Some sources of uncertainty applicable to this HRA and the procedures and assumptions used to ensure health-protective results are discussed below.

The turbine emission rates were derived using vendor data regarding ammonia slip rates and emission factors from CATEF, AP-42 and source testing for the other air toxics. Both the short- and long-term turbine emissions estimates were developed assuming that all turbines will operate continuously at the same time and at the maximum fuel energy input rate. Under actual operating conditions, the turbines will typically operate fewer hours per year and at lower loads. Consequently, the emissions used for this HRA are likely to be higher than what would be experienced under normal plant operation.

Dispersion models approved for regulatory applications contain assumptions that lead to over-prediction of ground-level concentrations. For example, the modeling performed in the HRA assumed a conservation of mass (*i.e.*, all of the pollutants emitted from the sources remained in the atmosphere while being transported downwind). During the transport of pollutants from sources toward receptors, none of the emitted material was assumed to be removed from the source plumes by means of chemical reactions or losses at the ground surface due to reactions, gravitational settling, or turbulent impaction. In reality, these mechanisms work to reduce the level of pollutants remaining in the atmosphere during plume travel.

The exposure characteristics assessed in the HRA included the assumption that residents will be exposed to project emissions continuously at the same location for 24 hours per day, for 70 years. It is extremely unlikely that any resident would actually experience such exposure to the maximum predicted concentrations of TACs over this period. The conservative exposure assumption leads to overpredicted risk estimates in the HRA modeling.

The toxicity data used in the HRA contain uncertainties due to the extrapolation of health effects data from animals to humans. Typically, safety factors are applied when doing the extrapolation. Furthermore, the human population is much more diverse, both genetically and culturally, than bred experimental animals. The intraspecies variability is expected to be much greater among humans than in laboratory animals. With all of the uncertainty in the assumptions used to extrapolate toxicity data, significant measures are taken to ensure that sufficient health protection is built into the available health effects data.

Conservative measures to compensate for all of these uncertainties and ensure that potential health risks are not underestimated are compounded in the final HRA predictions. Therefore, the actual risk numbers are expected to be well below the values presented in this analysis.

6.4 HEALTH RISK ASSESSMENT RESULTS

Table 6-1 presents the detailed cancer risk and noncancer THI results of the HRA for scenario 1, normal operations.

The maximum incremental cancer risk resulting from project emissions of normal operations was estimated to be 0.35 in 1 million, at a location approximately one kilometer east-southeast of the PPEC property boundary. The maximum chronic THI resulting from project's normal operational emissions was estimated to be 0.67 at a location approximately one kilometer east-southeast of the PPEC property boundary. The maximum acute THI resulting from normal project emissions was estimated to be 0.24 at a location approximately one kilometer east-southeast of the project.

The peak cancer risk, chronic and acute noncancer THI residential impacts occurred at the Otay Lake County Park Ranger Station. The peak cancer risk and chronic noncancer THI predicted at a sensitive receptor occurred at the Otay Lake County Park, and the peak acute THI at a sensitive receptor occurred on the southern edge of Lower Otay Lake. All peak worker impacts occurred at the Juvenile Detention Center.

Table 6-1
Estimated Cancer Risk, Acute and Chronic Non-Cancer Total Hazard Index
Due to PPEC Normal Operations

Location	Cancer Risk (excess risk in 1 million)	Chronic Hazard Index total hazard index	Acute Hazard Index total hazard index
Point of maximum impact (PMI)	0.35	0.67	0.24
Location of PMI in UTM NAD27 (m)	507,675	506,575	507,625
	3,606,600	3,607,050	3,606,750
Peak risk at MEIR	0.02	0.03	0.04
Location of MEIR	Otay Lake County Park Ranger Station	Otay Lake County Park Ranger Station	Otay Lake County Park Ranger Station
Peak risk at a Sensitive Receptor	0.27	0.55	0.04
Name of Sensitive Receptor	Otay Lake County Park	Otay Lake County Park	Lower Otay Lake
Peak risk at off-site worker (MEIW)	0.19	0.14	0.11
Location of MEIW	Juvenile Detention Facility	Juvenile Detention Facility	Juvenile Detention Facility
Significance threshold	10	1	1
Below significance?	Yes	Yes	Yes

Notes:
1. MEIW cancer risk is conservatively based on a residential risk calculation, *i.e.* a 70 year exposure.
m = meters
MEIR = maximally exposed individual resident.
MEIW = maximally exposed individual worker.
PMI = point of maximum impact
UTM = Universal Transverse Mercator

Table 6-2 presents the detailed cancer risk and noncancer THI results of the HRA for scenario 2, normal operations plus commissioning.

The maximum incremental cancer risk resulting from project emissions of normal operations plus commissioning activities was estimated to be 0.37 in 1 million, at a location approximately one kilometer east-southeast of the PPEC property boundary. The maximum chronic THI resulting from project's normal operational emissions plus commissioning was estimated to be 0.69 at a location approximately one kilometer east-southeast of the PPEC property boundary. The maximum acute THI resulting from commissioning emissions was estimated to be 0.38 at a location approximately one kilometer east-southeast of the project.

Peak impacts at residential, sensitive and worker receptors were predicted at the same receptors as scenario 1, normal operations, modeling.

Table 6-2
Estimated Cancer Risk and Chronic Non-Cancer Total Hazard Index Due to PPEC Normal Operations plus Commissioning and Acute Non-Cancer Total Hazard Index Due to Commissioning Activities

Location	Cancer Risk	Chronic Hazard Index	Acute Hazard Index
	(excess risk in 1 million)	total hazard index	total hazard index
Point of maximum impact (PMI)	0.37	0.69	0.38
Location of PMI in UTM NAD27 (m)	507,675	506,575	507,625
	3,606,600	3,607,050	3,606,775
Peak risk at MEIR	0.02	0.03	0.05
Location of MEIR	Otay Lake County Park Ranger Station	Otay Lake County Park Ranger Station	Otay Lake County Park Ranger Station
Peak risk at a Sensitive Receptor	0.28	0.56	0.06
Name of Sensitive Receptor	Otay Lake County Park	Otay Lake County Park	Lower Otay Lake
Peak risk at off-site worker (MEIW)	0.20	0.15	0.17
Location of MEIW	Juvenile Detention Facility	Juvenile Detention Facility	Juvenile Detention Facility
Significance threshold	10	1	1
Below significance?	Yes	Yes	Yes

Notes:
1. MEIW cancer risk is conservatively based on a residential risk calculation, *i.e.* a 70 year exposure.
m = meters
MEIR = maximally exposed individual resident.
MEIW = maximally exposed individual worker.
PMI = point of maximum impact.
UTM = Universal Transverse Mercator

The maximum acute 8-hour THI resulting from worst-case hourly emissions of acetaldehyde, acrolein, arsenic and formaldehyde was estimated to be 0.73 at a location approximately 1 km southeast of the project. Table 6-3 presents the maximum ground level concentration of each TAC and associated health index. The health indices were summed by target organ to obtain the 8-hour total health index per organ.

Table 6-3
Acute Health Index for TACs with 8-hour RELs Predicted from Peak PPEC Emissions

TAC	8-hr Inhalation Risk Value µg/m³	Acute Health Index	Hazard Index Target Organs
Acetaldehyde	300	0.0051	Respiratory system
Acrolein	0.7	0.1172	Respiratory system
Arsenic	0.015	0.0007	Development; cardiovascular system; nervous system; lung; skin
Formaldehyde	9	0.6123	Respiratory system
Total Health Index - Respiratory system		0.7345	Respiratory system
Total Health Index - Other organs		0.0007	Development; cardiovascular system; nervous system; lung; skin

The estimated cancer risks at all locations are well below the significance criterion of 10 in 1 million and the TBACT threshold of 1 in 1 million. Thus, the project emissions are expected to pose a less-than-significant increase in terms of carcinogenic health risk.

The estimated chronic and acute THIs are well below the significance criterion of 1.0. Thus, the project emissions of noncarcinogenic TACs will not be expected to pose a significant risk.

All HARP and AERMOD model files are provided electronically on a hard drive that is supplied with this application.

SECTION 7 BEST AVAILABLE CONTROL TECHNOLOGY

7.1 PROJECT TECHNOLOGY

In the AFC submitted to the CEC on June 30, 2010, PPEC defined the "basic objectives of the project" as required by the California Code of Regulations. These basic objectives are derived from a need for new electric power generation as projected and authorized by the California Public Utilities Commission (CPUC) and California Independent System Operator (CAISO). San Diego Gas and Electric (SDG&E), as authorized by the CPUC, issued a Request for Offers (RFO) in June 2009 and executed a Power Purchase Agreement with PPEC LLC in June 2010 under the RFO Product 2 category. Here is an excerpt from that offering:

> Product 2 - New Local Generation Projects, online in 2010 - 2014.
>
> SDG&E seeks a minimum of 100 MW of peaking or intermediate-class resources as new construction or expansion projects within SDG&E's territory. Any resulting contract will be a tolling agreement with a term of 20 years and online dates of May 1- or October 1 in either 2010, 2011, 2012, 2013 or 2014. The generation must be located physically within SDG&E's service territory (as more specifically described in the Addendum) or have its sole generator transmission system interconnection (gen-tie) directly interconnected to the electric network internal to SDG&E's local area as currently defined by the California Independent System Operator ("CAISO") such that the unit supports SDG&E's Local RA requirement. … Products offered in this category shall be capable of operating under all permits at annual capacity factors of a minimum of 30% with an availability of >98%. It is anticipated that heat rates will be no higher than 10,500 btu/kWh. For this product, SDG&E requires flexible resources that are capable of providing regulation during the morning and evening ramps and/or units that can be started and shut down as needed. In addition, SDG&E will include the additional value provided from projects that can provide quick start operations in the ranking of Offers. SDG&E also requires that each Offer contain pricing for, and an option to provide, black start capability.

These RFO requirements can be summarized as follows:

- Project online by 2014.
- Minimum of 100 MW of peaking and intermediate-class resources.
- Locate in SDG&E service territory.
- Operate under a fuel tolling agreement over a 20-year contract.
- Capable of operating under all permits at annual capacity factors of a minimum of 30% with an availability of >98%.
- Heat rates will no higher than 10,500 British thermal units per kilowatt hour (btu/kWh).
- Use flexible resources that can provide regulation during the morning and evening ramps and/or units that can be started and shut down as needed.

- Provide quick start operations.
- The RFO is a technology-driven power solicitation based on delivery performance, including high energy efficiency and low emissions. PPEC responded with a three-unit gas-fired GE LMS design on a location provided by the City of Chula Vista. The PPEC team chose this design after evaluating comparative merits of generation technology alternatives, as presented below.

7.1.1 Generation Technology Alternatives

As noted above, the RFO is a technology-driven solicitation that seeks power delivery performance with high energy efficiency and low emissions. With regard to technology selection, all of the above-noted objectives in the SDG&E RFO Product 2 request were evaluated in determining PPEC's technology choice. Comparative evaluation of the available power generation technologies revealed that PPEC will best meet the RFO objectives by employing GE LMS100 combustion turbines fueled by natural gas. To illustrate PPEC's analysis, each RFO objective is addressed separately below with comments on the alternative technology choices for each objective.

Be online by 2014: The equipment/technology of choice must be able to be designed, permitted, built, and commissioned by late 2013 to meet this calendar objective. This constraint effectively rules out any unproven, difficult to permit, difficult to finance, and/or lengthy construction technologies.

Be a minimum of 100MW and up to 400MW of peaking and intermediate-class resources: This range of power puts the permitting authority solely with the CEC. Many generating technologies can be effectively scaled up to meet this range of power output. However, assuming that new hydroelectric power and nuclear generation is unavailable in San Diego County, the nature and scale of this power output objective can only reasonably be met by combustion of fossil fuels. Thus, this was PPEC's assumption when considering the objectives that follow.

Locate in SDG&E service territory: San Diego County has generous photovoltaic (PV, or solar) and wind resources, and SDG&E and other entities are capitalizing on them. To adequately back up these varying resource outputs, peaking power is most effective when located near customer demand/grid deficit centers. These centers are generally located in coastal and other eastern portions of the County. The project site meets this objective because it is in the City of Chula Vista, within San Diego County.

Operate under a fuel tolling agreement over a 20-year contract: SDG&E has specified natural gas as the fuel source. Commerce aside, natural gas provides the best environmental performance compared to that of other fossil fuels.

Be capable of operating under all permits at annual capacity factors of a minimum of 30% with an availability of >98%: Few power generating technologies can meet this objective. Effectively, this class of performance can only be met with combustion turbine (CT) technology, Rankin-cycle steam systems (STs), and reciprocating engines (REs).

Heat rates will be no higher than 10,500 btu/kWh: The CT, ST, and RE technologies can meet this efficiency level, but STs can do so only when operated in a base-load/steady-state dispatch condition.

Use flexible resources that can provide regulation during the morning and evening ramps and/or units that can be started and shut down as needed: STs do not work well as fast-start/multiple daily start machines. REs cannot easily be economically scaled up for a suitable 300MW project. CTs can be reliably started several times per day and follow grid load swings attentively.

Provide quick start operations: CTs best meet this objective with their 10-minute starts, prompt emission compliance, and quick load-following characteristics.

Several proven CT configurations exist. Principal among these are simple-cycle, combined cycle, and cogeneration. Cogeneration requires a compatible steam host, which does not work within the realm of the RFO because the generation equipment must serve the steam host first and would not be sufficiently dispatchable. Combined-cycle facilities are efficient, but they cannot meet the multiple-fast startups required. SDG&E specifically asked for peaking generation in the RFO, and combined-cycle units would not qualify. Simple-cycle CTs can meet these demands, and do so relatively cleanly and reliably. Simple-cycle machines, however, are not as efficient as combined-cycle machines. Thus, a trade-off is made for quick startups and load following capability.

To partially off set the lower energy efficiency of conventional simple-cycle CTs, in 2005 GE introduced its latest evolution CT, called the LMS100. The LMS100 incorporates an internal cooling device called an "intercooler" that promotes higher energy efficiency than that of conventional CTs, especially in hot ambient conditions when electric demand is highest.

7.2 GAS TURBINE GENERATOR BACT

In accordance with the requirements of SDAPCD Rule 20.1, the proposed project will be required to use Best Available Control Technology (BACT) to minimize emissions from the proposed combustion turbines. To identify feasible emission limits for comparable turbine units, several information sources were consulted, including the EPA Reasonably Available Control Technology (RACT)/BACT/LAER Clearinghouse (RBLC), ARB BACT clearinghouse and recent projects that have undergone CEC licensing.

7.2.1 NO_x Control Technologies

There are two main categories of technologies used to effectively control NO_x emissions from simple cycle turbines: combustion controls that minimize the amount of NO_x created during combustion; and post-combustion controls that remove NO_x from the exhaust stream after combustion has occurred.

The following combustion control technologies are commonly used for reducing NO_x emissions from the combustion turbines: steam/water injection; dry low-NO_x burners; and catalytic combustors. The following post-combustion control technologies are available for reducing NO_x: selective catalytic reduction (SCR); selective non-catalytic reduction (SNCR); and EMx™ (formerly SCONOx™) which uses a two-stage catalyst/absorber system for emission control.

PPEC proposes to use the combination of water injection and SCR as BACT for this project. This combination can achieve NO_x emissions of 2.5 ppm for simple-cycle turbines, which is the most effective level of control that has been achieved in practice for simple cycle turbines burning natural gas fuel. A

NO_x emissions limit of 2.5 ppm is also consistent with the most stringent recent BACT determinations presented in the refernces listed above, as summarized in Table 7-1, below. Since PPEC proposes to achieve the most stringent emission levels of recent BACT determinations, a detailed BACT analysis for NO_x was not conducted.

7.2.2 VOC Control Technologies

A review of the VOC control technologies listed in the BACT determinations summarized in Table 7-1, show that good combustion practice and abatement using an oxidation catalyst are the best available technologies for controlling VOC emissions from the proposed simple-cycle combustion turbines at PPEC.

The proposed BACT level of 2 ppmvd (at 15 percent O_2) for VOC control with water injection, SCR, and an oxidation catalyst is consistent with the most stringent level found among recent BACT determinations for simple-cycle natural gas turbines, and is therefore considered to be BACT for the PPEC gas turbines.

7.2.3 CO Control Technologies

Natural gas turbine combustion technology has significantly improved over recent years with regard to lowering CO emissions. CO oxidizing catalysts have been used with natural gas-fired turbines for over a decade when uncontrolled CO emission levels are unacceptably high. Thus, similar to VOC emission control, good combustion practice and abatement using an oxidation catalyst are the BACT technologies for controlling CO emissions.

The proposed BACT level of 4.0 ppmvd (at 15 percent O_2) for CO control with water injection, SCR, and an oxidation catalyst is consistent with the most stringent level found among recent BACT determinations for simple-cycle natural gas turbines, and is therefore considered to be BACT for the PPEC gas turbines.

7.2.4 SO_2 and PM_{10} Control Technologies

Sulfur dioxide and PM_{10} emissions will be controlled through the exclusive use of clean-burning pipeline quality natural gas. This control technology has been widely and uniformly implemented for control of SO_2 and PM_{10} emissions from combustion turbines in California and throughout the United States, and is considered to be BACT for the PPEC facility.

7.2.5 Ammonia Slip Control Technologies

Ammonia emissions will be limited to 5 ppmvd (at 15 percent O_2). This proposed BACT is consistent with the most stringent emission limits recently proven in field applications of simple cycle turbines in California.

Table 7-1
Summary of Recent BACT Determinations for Simple Cycle Combustion Turbine Generators Rated at Greater Than 40 Mw

Name and Location	Source[1]	Date	Vendor, Model/Rating	NOx Emission Limit[2]/Control	VOC Emission Limit/Control	CO Emission Limit[2]/Control
Shady Hills Generating Station Pasco Co., FL	RBLC	1/10	GE Frame 7FA 2 turbines, 340 MW total	9.0 Dry low-Nox burners and water injection	No BACT determination listed	6.5 (3 hour)
Rawhide Energy Station Larimer Co., CA	RBLC	6/09	GE Frame 7FA 1 turbine, 150 MW total	9.0 Dry low-Nox burners	No BACT determination listed	No BACT determination listed
TEC/Polk Power Energy Station, Polk Co., FL	RBLC	10/07	Unspecified 2 turbines, 330 MW total	9.0 Dry low-Nox burners	No BACT determination listed	No BACT determination listed
CalPeak Power El Cajon San Diego County, CA	CARB	6/01	Pratt & Whitney FT-8 DLN Twin Pac 2 turbines 49.5 MW total	3.5 SCR and oxidation catalyst	2.0 SCR and oxidation catalyst	50 SCR and oxidation catalyst
Indigo Energy Facility Los Angeles Co., CA	CARB	7/01	LM6000 (Enhanced Sprint) 1 turbine, 45 MW total	5.0 SCR and oxidation catalyst	2.0 SCR and oxidation catalyst	6.0
El Colton, LLC San Bernardino Co., CA	CARB	1/03	LM6000 (Enhanced Sprint) 1 turbine, 48.7 MW total	3.5 SCR and oxidation catalyst	2.0 Oxidation catalyst	6.0 Oxidation catalyst
Lambie Energy Center Solano Co., CA	CARB	12/02	GE LM6000 Sprint PC 1 turbine, 49.9 MW total	2.5 SCR and oxidation catalyst	2.0 SCR and oxidation catalyst	6.0 SCR and oxidation catalyst
Los Angeles Dept. of Water and Power Los Angeles Co., CA	CARB	5/01	GE LM6000 1 turbine, 47.4 MW total	5.0 SCR and oxidation catalyst	2.0 SCR and oxidation catalyst	6.0 SCR and oxidation catalyst
Canyon Power Plant Orange County, CA	CEC	3/10	GE LM6000 Sprint PC 4 turbines, 200 MW total	2.5 Ultra-low NOx burners, Water injection and SCR	2.0 SCR and oxidation catalyst	4.0 (3 hour) SCR and oxidation catalyst
Starwood Power-Midway Fresno County, CA	CEC	1/08	Pratt & Whitney FT8-3 SwiftPac 2 turbines, 120 MW total	2.5 Water injection and SCR	2.0 SCR and oxidation catalyst	6.0 (3 hour) SCR and oxidation catalyst

Table 7-1
Summary of Recent BACT Determinations for Simple Cycle Combustion Turbine Generators Rated at Greater Than 40 Mw (Continued)

Name and Location	Source[1]	Date	Vendor, Model/Rating	NOx Emission Limit[2]/Control	VOC Emission Limit/Control	CO Emission Limit[2]/Control
Panoche Energy Project Fresno County, CA	CEC	9/07	GE LMS100 4 turbines, 400 MW total	2.5 Water injection and SCR	2.0 SCR and oxidation catalyst	6.0 (3 hour) SCR and oxidation catalyst
San Francisco Electric Reliability Project Power Plant San Francisco Cp., CA	CEC	10/06	GE LM6000 Sprint PC 3 turbines, 145 MW total	2.5 Water injection and SCR	2.0 SCR and oxidation catalyst	4.0 (3 hour) SCR and oxidation catalyst
Niland Power Plant Imperial County, CA	CEC	10/06	GE LM6000 Sprint PC 2 turbines, 93 MW total	2.5 Dry low-NOx burners and SCR	2.0 SCR and oxidation catalyst	6.0 (3 hour) SCR and oxidation catalyst

Notes:

1. RBLC = USEPA RACT/BACT/LAER Clearinghouse; CARB = California Air Resources Board BACT Clearinghouse, Gas Turbine: Simple Cycle >= 2 MW and < 50 MW; CEC = recently permitted CEC projects
2. California Air Resources Board BACT Clearinghouse, Gas Turbine: Simple Cycle >= 50 MW was consulted and no BACT determinations were found.
3. ppmvd, corrected to 15% O_2

GE = General Electric
MW = megawatt
ppm = Parts per million by volume, dry basis, at 15 percent oxygen
SCR = Selective catalytic reduction

7.3 PARTIAL DRY COOLING SYSTEM BACT

According to the SDAPCD rules, the PPEC cooling system is not a permitted unit and thus is not required to use BACT for drift. However, to comply with CEQA, the cooling system is required to have appropriate mitigation to minimize environmental impacts. The partial dry cooling system (PDCS) is similar to a wet surface air condenser (WSAC). Previous conversations with CEC staff confirmed that appropriate mitigation for a WSAC is to use a drift eliminator capable of limiting drift to no more than 0.001 percent of the cooling system circulating water. PPEC proposes to use a drift eliminator on the PDCS that will allow no more than 0.001 percent of circulating water to be released to the air as drift.

7.4 SUMMARY OF PROPOSED BACT

PPEC proposes to use the most stringent emission controls that have been achieved in practice for all pollutants as listed above in Table 7-1. Table 7-2, Summary of Proposed BACT, presents the proposed BACT emission levels for the PPEP facility, based on the assessment described in the preceding subsections.

Table 7-2
Summary of Proposed CGT BACT

Pollutant	Control Technology	Concentration
Combustion Turbines		
NOx	Water injection and SCR with ammonia injection	2.5 ppmvd at 15 percent O_2 (1-hour average)
CO	Catalytic oxidation	4.0 ppmvd at 15 percent O_2 (3-hour average)
VOC	Catalytic oxidation	2.0 ppmvd at 15 percent O_2 (1-hour average)
SO_2	Pipeline quality natural gas	NA
PM_{10}	Pipeline quality natural gas	NA
Ammonia slip	Operational limitation	5.0 ppmvd at 15 percent O_2

Notes:
1. Based on SDAPCD Rules, the Partial Dry Cooling System is not required to use BACT since it does not require a permit.
BACT = Best Available Control Technology
CO = carbon monoxide
NO_x = nitrogen oxides
O_2 = oxygen
PM_{10} = particulate matter less than or equal to 10 microns in diameter
ppm = parts per million
SCR = Selective catalytic reduction
VOC = volatile organic compounds
SO_2 = sulfur dioxide

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SECTION 8 EMISSION OFFSETS AND PROJECT MITIGATION

8.1 MITIGATION MEASURES – EMISSIONS OFFSETS

CEC policy requires PPEC to provide emissions offsets for maximum potential increases in emissions of nonattainment pollutants and precursor pollutants that would result from the operation of the proposed facility. SDAPCD Rule 20.1 requires that projects with operational emissions above 50 tons per year (tpy) of NO_x or VOC, 100 tpy of PM_{10} or SO_x provide emission offsets by emission reductions from other sources. Based on emissions data presented in Section 4.2 annual emissions of NO_x from the PPEC will exceed the District's offsets trigger of 50 tpy for the proposed operating year of 4,000 hours per turbine. According to Rule 20.3, NOx offsets need to be provided at a ratio of 1.2:1. Additionally, it is CEC's established policy to require offsets for the full amounts of all non-attainment pollutants and their precursors at a ratio of at least 1:1. Accordingly, the Applicant will commit to offsetting the full project emissions of NO_x, VOC, PM_{10}, and SO_2. Offsets for CO will not be required because of the current attainment designation of the San Diego Air Basin for this pollutant.

The actual mix of emission reduction credits (ERCs) and/or emission reduction projects that will be used to offset proposed project emissions will be determined based on availability and market conditions. The primary option is to purchase ERCs. SDAPCD regulations allow the use of interpollutant offsets in situations where one pollutant is a precursor to another or when two pollutants are both precursors to another nonattainment pollutant. For example, since NO_x and VOC both contribute to the formation of ozone, VOC ERCs could be used to offset some of the proposed project's NO_x emissions. PPEC will purchase ERCs sufficient to comply with SDAPCD and CEC requirements. Another option available to PPEC is to create new ERCs by supporting emission reductions at other facilities.

Note that the PPEC will be a major source as this term is defined in Rule 20.1 (50 tpy of NO_x or VOC, 100 tons of PM_{10}, SO_2, or CO). However, this designation differs from the major source definition for the federal PSD program, which the project does not trigger.

Table 8-1 lists the estimated offset requirements for the operational PPEC. PPEC has analyzed the current ERC marketplace, and discussions are ongoing with various ERC owners. Based on the estimated annual emissions, NO_x is the only pollutant for which offsets are required for compliance with SDAPCD requirements, but, as noted above at least 1:1 offsetting of VOC, PM_{10} and SO_2 will also be required to comply with CEC requirements.

The applicant will wait until after the CEC and SDAPCD applications are filed before starting our ERC purchase process. We believe that sufficient credits are available to cover the project's offset requirements as shown in Table 8-1. The following describes the information developed to date regarding the means by which the applicant intends to meet these requirements and the data obtained to date regarding the availability of credits in the SDAPCD bank.

NO_x: PPEC projects that 85.17 tons of NOx ERCs are needed to offset the Project emissions of 71 tons per year. The SDAPCD registry contains 178.08 tons of NOx ERCs and 373.35 tons of VOC ERCs. SDAPCD allows applicants to offset one ton of NO_x with 2 tons of VOC ERCs. According to the applicant's most recent market assessment, up to 50 tons of NO_x ERCs and 200 tons of VOC ERCs (or

100 tons of NOx equivalent) are presently available to be purchased. After subtracting the 5.83 tons of VOC ERCs needed to offset VOC, there is approximately 145 tons of NOx ERC (or equivalent) presently available to be purchased. At the time of this AFC submittal, PPEC has not secured any NO_x ERCs, but plans to buy or secure option contracts to buy the required credits prior to the SDAPCD's Final Determination of Compliance and CEC's Final Decision.

VOC: PPEC projects that 20 tons of VOC ERCs are needed. It is the intent of the project to use a portion of the excess NO_x ERCs purchased due to the SDAPCD offset requirement of 1.2:1 (equal to 14.17 tons) to satisfy a portion of the VOC ERC requirements on a one-to-one basis. The result of applying the excess NO_x ERCs against the VOC requirement will be a net VOC requirement of 5.83 tons. The SDAPCD registry contains 373.35 tons of VOC ERCs. According to the applicant's most recent market assessment, up to 100 tons of VOC ERCs are presently available to be purchased. At the time of this AFC submittal, PPEC has not secured any VOC ERCs, but plans to buy or secure option contracts to buy the required credits prior to CEC's Final Decision.

PM_{10}: PPEC estimates that 37.5 tons of PM10 ERCs will be required. The SDAPCD registry contains 157.31 tons of PM_{10}. The availability is high with more than 130 tons of PM_{10} ERCs currently available. At the time of this AFC submittal, PEC has not secured any PM_{10} ERCs, but plans to buy or secure option contracts to buy the required PM_{10} credits prior to CEC's Final Decision. Alternatively, PPEC can use the Carl Moyer Program to offset the PM_{10} emissions.

SO_x: PPEC estimates that 4.2 tons of SO_x ERCs will be required. The SDAPCD registry contains 16.7 tons of SOx ERCs. Currently there are enough SO_x ERCs available from the registry to satisfy the requirement. At the time of this AFC submittal, PPEC has not secured any SO_x ERCs, but plans to buy or secure option contracts to buy the required SO_x credits prior to CEC's Final Decision. Given the small margin of available of SO_x ERCs versus PPEC needs, PPEC will consider the option of using the Carl Moyer fund. In the event that additional SO_x ERCs are banked, PPEC reserves the right to purchase the ERCs directly from the market.

Table 8-1
Estimated Emissions Offsets Requirements

	Project Emissions (tons)	ERCs Required (tons)
NO_x	71.0	71.0- 85.16
VOC	19.6	5.83 - 19.6
PM_{10}	37.5	37.5
SO_x	4.2	4.2

Notes:
ERCs = emission reduction credits
NO_x = nitrogen oxide(s)
PM_{10} = particulate matter less than 10 microns in diameter
SO_x = sulfur oxides
VOC = volatile organic compounds

At the time of this AFC submittal, PPEC has not secured any of the required ERCs, but plans to buy or secure option contracts to buy the required credits prior to the SDAPCD's Final Determination of Compliance and CEC's Final Decision.

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SECTION 9 APPLICABLE REGULATORY REQUIREMENTS

The applicable LORS related to the potential air quality impacts from the project are described below. These LORS are administered (either independently or cooperatively) by USEPA Region IX (federal), CEC/CARB (state), and SDAPCD (local). Requirements of federal, state, and local agencies are discussed in the following subsections.

9.1 FEDERAL

The federal Clean Air Act (CAA) of 1970, 42 United States Code 7401 et seq., as amended in 1977 and 1990, is the basic federal statute governing air pollution and its control. The provisions of the CAA that are potentially relevant to this Project are listed below and their applicability is discussed in the following sections:

- Air Quality Control Regions (AQCR);
- National Ambient Air Quality Standards (NAAQS);
- Prevention of Significant Deterioration (PSD) Requirements;
- Acid Rain Program (Title IV) Requirements;
- New Source Review (NSR) Requirements;
- New Source Performance Standards (NSPS);
- National Emission Standards for Hazardous Air Pollutants/Maximum Achievable Control Technology (MACT) Standards;
- Federally Mandated Operating Permits (Title V);
- Risk Management Plan;
- Final PSD and Title V Greenhouse Gas Tailoring Rule (May 13, 2010); and
- General Conformity Rule.

Applicable requirements of the State of California and the local SDAPCD are discussed in Section 9.2 and 9.3.

9.1.1 Air Quality Control Regions (AQCR)

Because air pollution is a regional problem and not limited to political or state boundaries, the CAA established Air Quality Control Regions (AQCR). This is a method of dividing the country into regional air basins. The proposed project site is located in San Diego County and is part of the San Diego County Air Quality Control Region. (Title 40 CFR Part 81.164).

9.1.2 National Ambient Air Quality Standards (NAAQS)

EPA, in response to the federal CAA of 1970, established federal NAAQS in 40 CFR Part 50. The current federal NAAQS include primary and secondary standards for seven "criteria" pollutants. These criteria pollutants are O_3, CO, NO_2, SO_2, PM_{10}, $PM_{2.5}$ and Pb.

Primary standards were established to protect human health, and secondary standards were designed to protect property and natural ecosystems from the effects of air pollution.

The 1990 Clean Air Act Amendments (CAAA) established attainment deadlines for all designated areas that were not in attainment with the federal NAAQS. The short-term standards for CO and Pb are written terms of air concentrations that are not to be exceeded more than once per year. Hourly standards for NO_2 and SO_2 that took effect in 2010 have a statistical form and establish concentrations that may not be exceeded more than a certain percent of the time. The same is true of the NAAQS for O_3, PM_{10} and PM_2 Long-term (annual) NAAQS may never be exceeded.

The State of California has adopted CAAQS that are in some cases more stringent than the federal NAAQS and which regulate the allowable air concentrations of additional pollutants. The state and federal Ambient Air Quality Standard (AAQS) relevant to the Project are summarized in Table 9-1, National and California Ambient Air Quality Standards.

Table 9-1
National and California Ambient Air Quality Standards

Pollutant	Averaging Time	NAAQS[1] Primary[3,4]	NAAQS[1] Secondary[3,5]	CAAQS[2] Concentration[3]
Ozone (O_3)	1-Hour	Revoked[6]	Same as Primary Standard	0.09 ppm (180 μg/m^3)
	8-Hour	0.075 ppm (147 μg/m^3)[11]		0.07 ppm (137 μg/m^3)
Carbon Monoxide (CO)	8-Hour	9 ppm (10 mg/m^3)	None	9.0 ppm (10 mg/m^3)
	1-Hour	35 ppm (40 mg/m^3)		20 ppm (23 mg/m^3)
Nitrogen Dioxide (NO_2) [10]	Annual Average	0.053 ppm (100 μg/m^3)	Same as Primary Standard	0.03 ppm (57 μg/m^3)
	1-Hour	0.100 ppm (188 μg/m^3)[13]	0.053 ppm (100 μg/m^3)	0.18 ppm (339 μg/m^3)
Sulfur Oxides (SO_2)	Annual Average	0.030 ppm (80 μg/m^3)	-	-
	24-Hour	0.14 ppm (365 μg/m^3)	-	0.04 ppm (105 μg/m^3)
	3-Hour	-	0.5 ppm (1300 μg/m^3)	-
	1-Hour	75 ppb[14]	-	0.25 ppm (655 μg/m^3)
Suspended Particulate Matter (PM_{10})	24-Hour	150 μg/m^3	Same as Primary Standard	50 μg/m^3
	Annual Arithmetic Mean	Revoked[7]		20 μg/m^3
Fine Particulate Matter ($PM_{2.5}$)[8]	24-Hour	35 μg/m^3	Same as Primary Standard	-
	Annual Arithmetic Mean	15 μg/m^3		12 μg/m^3
Lead (Pb)[12]	30-Day Average	-	Same as Primary Standard	1.5 μg/m^3
	Rolling 3-Month Average	0.15 μg/m^3		
	Quarterly Average	1.5 μg/m^3		-
Hydrogen Sulfide (HS)	1-Hour	No Federal Standards		0.03 ppm (42 μg/m^3)
Sulfates (SO_4)	24-Hour			25 μg/m^3
Visibility Reducing Particles	8-Hour (10 am-6 pm, Pacific Standard Time)			In sufficient amount to produce an extinction coefficient of 0.23 per kilometer due to particles when the relative humidity is less than 70 percent.
Vinyl Chloride[9]	24-Hour			0.01 ppm (26 μg/m^3)

Table 9-1
National and California Ambient Air Quality Standards
(Continued)

Pollutant	Averaging Time	NAAQS[1]		CAAQS[2]
		Primary[3,4]	Secondary[3,5]	Concentration[3]

Reference: EPA-NAAQS (http://www.epa.gov/air/criteria.html); CARB-CAAQS (http://www.arb.ca.gov/aqs/aaqs2.pdf).

Notes:

μg/m³ = micrograms per cubic meter.

mg/m³ = milligram per cubic meter.

ppm = parts per million.

[1] National standards (other than ozone, particulate matter, and those based on annual averages or annual arithmetic mean) are not to be exceeded more than once a year. The ozone standard is attained when the fourth highest 8-hour concentration in a year, averaged over 3 years, is equal to or less than the standard. For PM_{10}, the 24-hour standard is attained when the expected number of days per calendar year with a 24-hour average concentration above 150 μg/m³ is equal to or less than one. For $PM_{2.5}$, the 24-hour standard is attained when 98 percent of the daily concentrations, averaged over 3 years, are equal to or less than the standard.

[2] California standards for ozone, carbon monoxide (except Lake Tahoe), sulfur dioxide (1 and 24 hour), nitrogen dioxide, suspended particulate matter—PM_{10}, $PM_{2.5}$, and visibility-reducing particles, are values that are not to be exceeded. All others are not to be equaled or exceeded. California ambient air quality standards are listed in the Table of Standards in Section 70200 of Title 17 of the California Code of Regulations.

[3] Concentration expressed first in units in which it was promulgated. Equivalent units given in parentheses are based upon a reference temperature of 25°C and a reference pressure of 760 torr. Most measurements of air quality are to be corrected to a reference temperature of 25°C and a reference pressure of 760 torr; ppm in this table refers to ppm by volume, or micromoles of pollutant per mole of gas.

[4] National Primary Standards: The levels of air quality necessary, with an adequate margin of safety to protect the public health.

[5] National Secondary Standards: The levels of air quality necessary to protect the public welfare from any known or anticipated adverse effects of a pollutant.

[6] On June 15, 2005, the 1-hour ozone standard (0.12 ppm) was revoked for all areas except the 8-hour ozone nonattainment Early Action Compact (EAC) Areas. The state of California currently does not have any EAC areas.

[7] Due to a lack of evidence linking health problems to long-term exposure to coarse particle pollution, the agency revoked the annual PM_{10} standard in 2006 (effective December 17, 2006).

[8] To attain this standard, the 3-year average of the 98th percentile of 24-hour concentrations at each population-oriented monitor within an area must not exceed 35 μg/m³ (effective December 17, 2006).

[9] California ARB has identified lead and vinyl chloride as 'toxic air contaminants' with no threshold level of exposure for adverse health effects determined. These actions allow for the implementation of control measures at levels below the ambient concentrations specified for these pollutants.

[10] On Tuesday, February 19, 2008, the California Office of Administrative Law approved amendments to the regulations for the State Ambient Air Quality Standard for nitrogen dioxide (NO_2). The new standards become effective on March 20, 2008.

[11] US EPA strengthened the new 8-hour average ozone standard from 0.08 ppm to 0.075 ppm on March 12, 2008 (effective May 27, 2008).

[12.] US EPA strengthened the lead standard from 1.5 μg/m³ to 0.15 μg/m³on October 15, 2008.

[13.] To attain this standard, the 3-year average of the 98th percentile of the daily maximum 1-hour average at each monitor within an area must not exceed 0.100 ppm (effective January 22, 2010) (from EPA NAAQS, http://epa.gov/air/criteria.html).

[14.] Final rule signed June 2, 2010. To attain this standard, the 3-year average of the 99th percentile of the daily maximum 1-hour average at each monitor within an area must not exceed 75 ppb.

EPA, CARB, and the local air pollution control districts determine air quality attainment status by comparing local ambient air quality measurements from the state or local ambient air monitoring stations with the federal and state AAQS. Those areas that meet ambient air quality standards are classified as "attainment" areas; areas that do not meet the standards are classified as "nonattainment" areas. Areas that have insufficient air quality data may be identified as unclassifiable areas. These attainment designations are determined on a pollutant-by-pollutant basis. The area containing the proposed project site is currently designated a federal nonattainment area for O_3 based on air quality monitoring data showing exceedances of the federal standards. The proposed project area is also designated a state nonattainment area for O_3, $PM_{2.5}$, and PM_{10}. Table 9-2 presents the attainment status of San Diego County with respect to both federal and state ambient standards.

As mentioned above, both EPA and CARB are involved with air quality management in the San Diego Air Basin, along with SDAPCD. The respective areas of responsibility for these agencies in this regard are described below.

Table 9-2
Attainment Status for San Diego County with respect to Federal and California Ambient Air Quality Standards

Pollutant	Federal Attainment Status	State Attainment Status
Ozone	Nonattainment	Nonattainment
CO	Unclassified/Attainment	Attainment
NO_2	Unclassified/Attainment	Attainment
SO_2	Attainment	Attainment
PM_{10}	Unclassified/Attainment	Nonattainment
$PM_{2.5}$	Unclassified/Attainment	Nonattainment
Sulfates	N/A	Attainment
Lead	N/A	Attainment
H_2S	N/A	Unclassified/Attainment
Visibility Reducing Particles	N/A	Unclassified/Attainment

Source: National Area Designations (February 2009) and 2006 State Area Designations, CARB (http://www.arb.ca.gov/desig/adm/adm.htm, last access on 2010/02/04)

Notes:
N/A = not applicable
CO = carbon monoxide
NO_2 = nitrogen dioxide
SO_2 = sulfur dioxide
PM_{10} = particulate matter less than 10 microns in diameter
$PM_{2.5}$ = particulate matter less than 2.5 microns in diameter
H_2S = hydrogen sulfide

EPA has ultimate responsibility for ensuring, pursuant to the CAA, that all areas of the United States meet, or are making progress toward meeting, the federal NAAQS. The State of California falls under the jurisdiction of EPA Region IX, which is headquartered in San Francisco. EPA requires that all states submit State Implementation Plans (SIPs) that describe how the federal NAAQS will be achieved and maintained in all federal nonattainment areas. Attainment plans must be approved by CARB before they are submitted to EPA.

Regional or local air quality management districts, such as SDAPCD are responsible for preparation of plans for attainment of federal and state standards. CARB is responsible for overseeing attainment of the CAAQS, implementation of nearly all phases of California's motor vehicle emissions program, and oversight of the operations and programs of the regional air districts. Each air district is responsible for establishing and implementing rules and control measures to achieve air quality attainment within its district boundaries. The air district also prepares an air quality attainment/maintenance plan that includes an inventory of all emission sources within the district (both man-made and natural), a projection of future emissions growth, an evaluation of current air quality trends, and an assessment of any rules or control measures needed to attain the federal and state AAQS. This plan is submitted to CARB, which then compiles all plans collected from all air districts within the state into the SIP. The air districts are responsible for maintaining an effective permitting system for existing, new, and modified stationary sources, to monitor local air quality trends, and to adopt and enforce such rules and regulations as may be necessary to achieve the federal and state AAQS.

9.1.3 Prevention of Significant Deterioration (PSD) Requirements

In addition to the ambient air quality standards described above, the federal PSD program has been established to protect deterioration of air quality in those areas that already meet national ambient air quality standards. Specifically, the PSD program specifies allowable concentration increases for attainment pollutants due to new emission sources. These increases allow economic growth while preserving the existing air quality, protecting public health and welfare, and protecting Class I areas (selected national parks and wilderness areas).

The PSD regulations require major stationary sources to undergo a preconstruction review that includes an analysis and implementation of BACT, a PSD increment consumption analysis, an ambient air quality impact analysis, and analysis of air quality related values. For PSD purposes, a major source is one with annual emissions that exceed threshold values. The trigger levels applicable to new sources of air pollutants, such as the PPEC, are shown in Table 9-3 along with the projected annual emissions for the project. The 250 tpy emission threshold is applicable to all new stationary sources that do not belong to one of 28 named source categories that trigger PSD at an annual emission level of 100 tpy. As a simple-cycle gas turbine plant, the PPEC does not belong to any of the named 28 source categories, and is thus subject to the 250 tpy trigger thresholds. Since emissions from the project will be less than 250 tpy for each criteria attainment pollutant, the PSD regulations are not applicable to the project.

Table 9-3
PSD Emission Threshold Triggers for New Stationary Sources

Pollutant**	PSD Triggered Thresholds (tpy)	Project Emissions (tpy)	PSD Triggered by Project?
CO	250	96.95	No
SO_2	250	3.91	No
NO_x	250	70.97	No
PM_{10}	250	37.47	No
$PM_{2.5}$	250	37.47	No
Ozone (VOC/NO_x)	250	19.55/70.97	No

Source: 40 CFR Part 51.166 - Prevention of significant deterioration of air quality

Notes:
tpy = tons per year
CO = carbon monoxide
SO_2 = sulfur dioxide
NO_x = nitrogen oxide(s)
PM_{10} = particulate matter less than 10 microns in diameter
VOCs = volatile organic compounds

9.1.4 Acid Rain Program (Title IV) Requirements

Title IV of the federal CAA applies to sources of air pollutants that contribute to acid rain formation, including sources of SO_2 and NO_x emissions. The SDAPCD has been delegated the authority by USEPA to administer the Title IV requirements under its Title V Operating Permit program in Regulation XIV. The Acid Rain Program provisions of Part 72, Chapter I, Title 40 of the Code of Federal Regulations (40 CFR Part 72), Subparts A through I are incorporated in SDAPCD Rule 1412. Allowances of SO_2 emissions are set aside according to the provisions of 40 CFR 73. Affected sources are required to obtain SO_2 allowances, monitor their emissions, and obtain SO_2 allowances when a new source is permitted. Sources such as the Project that use pipeline-quality natural gas as the exclusive fuel are exempt from many of the acid rain program requirements. However, PPEC will be required to estimate SO_2 and CO_2 emissions from the project and to monitor NO_x emissions with a certified CEMS.

9.1.5 New Source Review (NSR) Requirements

The Federal 40 CFR Part 51 and SDAPCD New Source Review (NSR) rule (Regulation II, Rule 20.1, 20.2, 20.3, 20.4, etc.) establish the criteria for siting new and modified emission sources, and are applicable to the Project. SDAPCD has been delegated authority by USEPA for NSR rule development and enforcement according to the terms of Regulation II. There are three basic requirements within the NSR rules. First, BACT must be applied to any new source with potential emissions above specified threshold quantities (TQs). Second, all potential emission increases of nonattainment pollutants or precursors from the proposed source above specified thresholds must be offset by real, quantifiable, surplus, permanent, and enforceable emission decreases in the form of ERCs. Third, an ambient air quality impact assessment must be conducted to confirm that the proposed project will not cause or contribute significantly to a violation of a NAAQS or CAAQS or jeopardize public health. Analysis of conformance of these three requirements is provided in Sections 5.8, 7.2, and 8.1.

9.1.6 New Source Performance Standards (NSPS)

New Source Performance Standards (NSPS) have been established by USEPA to limit air pollutant emissions from certain categories of new and modified stationary sources. The NSPS regulations are contained in 40 CFR Part 60 and cover many different industrial source categories. Stationary gas turbines are regulated under Subpart KKKK (71 FR 38497, July 6, 2006 and amended at 74 FR 11861, March 20, 2009). The enforcement of NSPS has been delegated to the SDAPCD, and the NSPS regulations are incorporated by reference into the District's entire Regulation X and Regulation II Rule 10.1 and 11. In general, local emission limitation rules or BACT requirements in California are far more restrictive than the NSPS requirements. For example, the controlled NO_x emission rate from the Project's gas turbines of less than 0.04 pound (lb) of NO_x per MW-hour will be well below the Subpart KKKK requirement of 0.43 lb of NO_x per MW-hour. Similarly, the projected maximum SO_2 emissions from the PPEC gas turbines will be less than 0.002 lb of SO_2 per MW-hour, which is substantially less than the Subpart KKKK requirement of 0.90 lb of SO_2 per MW-hour and fuel total potential sulfur emissions of 26 ng SO_2/J (0.060 lb SO_2/MMBtu) heat input. The only applicable NSPS for PPEC is this Subpart KKKK and the pollutants regulated by this subpart are NO_x and sulfur dioxide SO_2 only. Therefore, the proposed PPEC project complies with NSPS.

9.1.7 Maximum Achievable Control Technology

The CAAA of 1990, under revisions to Section 112, requires a project to list and promulgate National Emission Standards for Hazardous Air Pollutants (NESHAPS) to control, reduce, or otherwise limit the emissions of HAPs from major categories and area sources. As these standards are promulgated, they are published in 40 CFR 63.

Stationary gas turbines are on the list of 174 categories of major and area sources that would be henceforth subject to emission standards. The specific MACT standard potentially applicable to new stationary gas turbines is 40 CFR 63 Subpart YYYY. MACT standards are intended to reduce emissions of air toxics through the installation of control equipment rather than through risk-based emission limits. However, since the proposed facility will not be a major source of HAPs (10 tpy of one HAP or 25 tpy of all HAPs), no additional controls under these NESHAPS are required.

9.1.8 Federal Clean Air Act

The federal Clean Air Act of 1970, 42 USC 7401 *et seq*., as amended in 1977 and 1990, requires that the public be protected from unhealthful exposure to air pollutants. Based on the results of the risk assessment, health risks due to project emissions of air toxics would not exceed acceptable levels. Emissions of criteria pollutants will be minimized by applying BACT to the facility. Increases in emissions of criteria pollutants will be fully offset.

9.1.9 Other Federally Mandated Operating Permits

Title V of the CAAA Section 501 requires USEPA to develop a federal operating permit program that is implemented under 40 CFR Part 70. This program is administered by SDAPCD under Regulation XIV. Each major source, Phase II acid rain facility, and other source types designated by USEPA and required by SDAPCD Rule 1401 must obtain a Part 70 permit. Permits must contain emission estimates based on potential to emit, identification of all emissions sources and controls, a compliance plan, and a statement indicating each source's compliance status. The permits must also incorporate all applicable federal requirements. The project will be a Title V source according to the definition in the SDAPCD Rule 1401/1410 and will be subject to the Title V Operating Permit requirements. Therefore, Title V permit application will be submitted to the SDAPCD/EPA within 12 months of plant operation.

9.1.10 Prevention of Significant Deterioration and Title V Greenhouse Gas Tailoring Rule Requirements

On May 13, 2010, the EPA issued a final rule that addresses greenhouse gas (GHG) emissions from stationary sources under the CAA permitting programs. This final rule sets thresholds (75,000 and 100,000 tons per year CO_2e) for GHG emissions that define when permits under the New Source Review Prevention of Significant Deterioration (PSD) and Title V Operating Permit programs are required for new and existing industrial facilities. EPA will phase in the CAA permitting requirements for GHGs in two initial steps (*i.e.*, Step1: January 2, 2011 –June 30, 2011; and Step 2: July 1, 2011 to June 30, 2013). Under Step 1, only the sources currently subject to the PSD and Title V permitting program by virtue of their emissions of other pollutants would become subject to permitting requirements for their GHG emissions under PSD and Title V. The GHG threshold is 75,000 tons per year CO_2e. Step 2 will cover for the first time new construction projects that emit GHG emissions of at least 100,000 tons per year CO_2e whether or not permitting requirements are triggered for other pollutants. The proposed Project's operational GHG emissions will be above any of the thresholds in the final GHG tailoring rule and the Project is currently subject to Title V permitting requirements according to 40 CFR Part 70 and SDAPCD Rule 1401/1410. Therefore, the Project is subject to Title V under the GHG Tailoring Rule. However, the Project will not be a PSD source for any other pollutant and is expected to complete the permitting process within the Step 1 time frame. Therefore, the GHG Tailoring Rule for PSD is not applicable to this Project.

9.2 STATE

9.2.1 California Power Plant Siting Requirements

Under the Warren-Alquist Act, the CEC has been charged with assessing the environmental impacts of each new power plant over 50 MW and considering the implementation of feasible mitigation measures to prevent potential impacts. California Environmental Quality Act (CEQA) Guidelines (Title 14, California Administrative Code, Section 15002(a)(3)) state that the basic purpose of CEQA is to "prevent significant, avoidable damage to the environment by requiring changes in projects through the use of alternatives or mitigation measures when the governmental agency finds the changes to be feasible."

The CEC siting regulations require the evaluation of the project's compliance with all federal, state, and local air quality rules, regulations, standards, guidelines, and ordinances that govern the construction and operation of the project. A project must demonstrate that project emissions will be appropriately mitigated to ensure that the impacts from the project are less than significant and will not jeopardize attainment and maintenance of the NAAQS. Cumulative impacts, impacts due to pollutant interaction, and impacts from non-criteria pollutants must also be considered.

9.2.2 Toxic Air Contaminant Regulations

As required by the California Health & Safety Code Section 4430, all facilities with criteria air pollutant emissions in excess of 10 tons per year are required to submit air toxic "Hot Spots" emissions information. The operational PPEC will be required to provide quantitative information to SDAPCD on the facility's emissions of toxic air contaminants, but this requirement is applicable only after the start of operation. Section 6 of this Application demonstrates that the project's emissions of toxic air contaminants will not cause a significant health risk to the neighboring area.

California Public Resource Code § 25523(a); 20 CCR § 1752.5, 2300-2309, and Division 2 Chapter 5, Article 1, Appendix B, Part (1), requires that protection of environmental quality be ensured and that a quantitative HRA be performed. The HRA discussed in Section 6 of this Application satisfies this requirement.

The California Clean Air Act, TAC Program, HSC § 39650, et seq. requires quantification of TAC emissions, use of BACT, and preparation of an HRA. The project will not cause unsafe exposure to TACs based on results of the HRA discussed in Section 6 of this Application, and a BACT assessment for the project has been performed (see Section 7.2).

HSC, Part 6, § 44300 *et seq.* (Air Toxics "Hot Spots") requires inventorying of TACs and HRA, as well as public notification of predicted health risks. The HRA discussed in Section 6 of this Application satisfies this requirement.

HSC § 41700 prohibits emissions in quantities that adversely affect public health, other businesses, or property. Section 6 of this Application satisfies this requirement.

California Code of Regulations, Title 22, Section 60306 requires use of a drift eliminator and biocides to minimize the possibility of Legionella being transmitted from the cooling system.

9.3 LOCAL

9.3.1 Permits Required

Under Regulation II, Rule 10, Permits Required, and Rule 20.5, Power Plants, SDAPCD administers the air quality regulatory program for the alteration, replacement, and operation of new power plants. As part of the Application for Certification process, the Project will be required to obtain a preconstruction Determination of Compliance (DOC) from the SDAPCD. Regulation II, Rule 10 incorporates other SDAPCD rules that govern how sources may emit air contaminants through the issuance of air permits (*i.e.*, Authority to Construct [ATC] and Permit to Operate [PTO]). This permitting process allows the

SDAPCD to adequately review new and modified air pollution sources to ensure compliance with all applicable prohibitory rules and to ensure that appropriate emission controls are used. Projects that are reviewed under the CEC Application process must obtain a final DOC (equivalent under SDAPCD rules to an ATC upon issuance of a CEC Final Decision that includes all the conditions proposed in the DOC) from the local air district (in this case, SDAPCD) prior to construction of the new power plant. The ATC remains in effect until the PTO Application is granted, denied, or canceled. Once the project commences operations and demonstrates compliance with the ATC, SDAPCD will issue a PTO. The PTO specifies conditions that the facility must meet to comply with all applicable air quality rules, regulations, and standards.

9.3.2 New Source Review Requirements

The SDAPCD's New Source Review (NSR) rule (Regulation II, Rule 20.3 NSR – Major Stationary Sources & PSD Stationary) establishes the criteria for siting new and modified emission sources and this rule is applicable to the proposed Project. SDAPCD has been delegated authority for NSR rule development and enforcement according to the terms of Rule 20.3. There are three basic requirements within the NSR rules. First, BACT and Lowest Achievable Emission Rates (LAER) must be applied to any new source with potential emissions above specified threshold quantities. Second, all potential emission increases of nonattainment pollutants or precursors from the proposed source above specified thresholds must be offset by real, quantifiable, surplus, permanent, and enforceable emission decreases in the form of ERCs. Third, an ambient air quality impact analysis must be conducted to confirm that the project does not cause or contribute to a violation of a national or California AAQS or jeopardize public health.

9.3.3 New Source Review Requirements for Air Toxics

The SDAPCD's New Source Review rule for air toxics (Regulation XII, Rule 1200 (Toxic Air Contaminants - New Source Review) describes the requirements, procedures, and standards for evaluating the potential impact of TAC from new sources and modifications to existing sources. The rule also requires a demonstration that the source will not exceed the health risk thresholds summarized in its Tables I, II, and III. The PPEC will comply with the requirements of this rule. An air toxics health risk assessment consistent with SDAPCD requirements under Rule 1200 is provided in Section 6 of this application, Public Health and Safety.

9.3.4 New Source Performance Standards

The SDAPCD's New Source Performance Standards (Regulation X, Standards of Performance for New Stationary Sources) incorporates the federal NSPS from 40 CFR Part 60. The applicability and requirements of the New Source Performance Standards are discussed above under the federal regulations section.

9.3.5 Federal Programs and Permits

The federal Title IV acid rain program requirement and Title V operational permit requirements are in SDAPCD's Rule 1412 (Federal Acid Rain Program Requirements) and Regulation XIV Rule 1401/1410.

The applicability and requirements of these programs and permits are discussed above under the federal regulations section.

9.3.6 Public Notification

Since the proposed PPEC project emissions will exceed the Air Quality Impact Analysis (AQIA) trigger levels, public notice under this rule is required and the Project expects the SDAPCD Air Pollution Control Officer will provide this notice in a timely manner.

9.3.7 Permit Fees

The SDAPCD requirements regarding permit fees are specified in Regulation III. This regulation establishes the filing and permit review fees for specific types of new sources, as well as annual renewal fees and penalty fees for existing sources.

9.3.8 Prohibitions

The SDAPCD prohibitions for specific types of sources and pollutants are addressed in Regulation IV. The prohibition rules that apply to the proposed PPEC project are listed below:

- Rule 50 - Visible Emissions: This rule prohibits any source from discharging any emissions of any air contaminant which is darker in shade than that designated as Number 1 on the Ringelmann Chart, for a period or periods aggregating more than three minutes in any period of 60 consecutive minutes.
- Rule 51- Nuisance: This rule prohibits the discharge from a facility of air contaminants that cause injury, detriment, nuisance, or annoyance to the public, or cause damage to business or property.
- Rule 52 - Particulate Matter Emission Standards: This rule prohibits the discharge from any source of particulate matter in excess of 0.10 grain per dry standard cubic foot (0.23 grams per dry standard cubic meter) of gas. The proposed PPEC project will have particulate matter emissions less than 0.23 grams per dry standard cubic meter, and will thus comply with this rule.
- Rule 62 - Sulfur Content of Fuels: This rule prohibits any stationary source to use any gaseous fuel containing more than 10 grains of sulfur compounds per 100 cubic feet of dry gaseous fuel. The proposed PPEC project will have a range of 0.25 (long term) to 0.75 (short term) grains per 100 cubic feet of dry gaseous fuel, both of which are much less than the limit under this rule.

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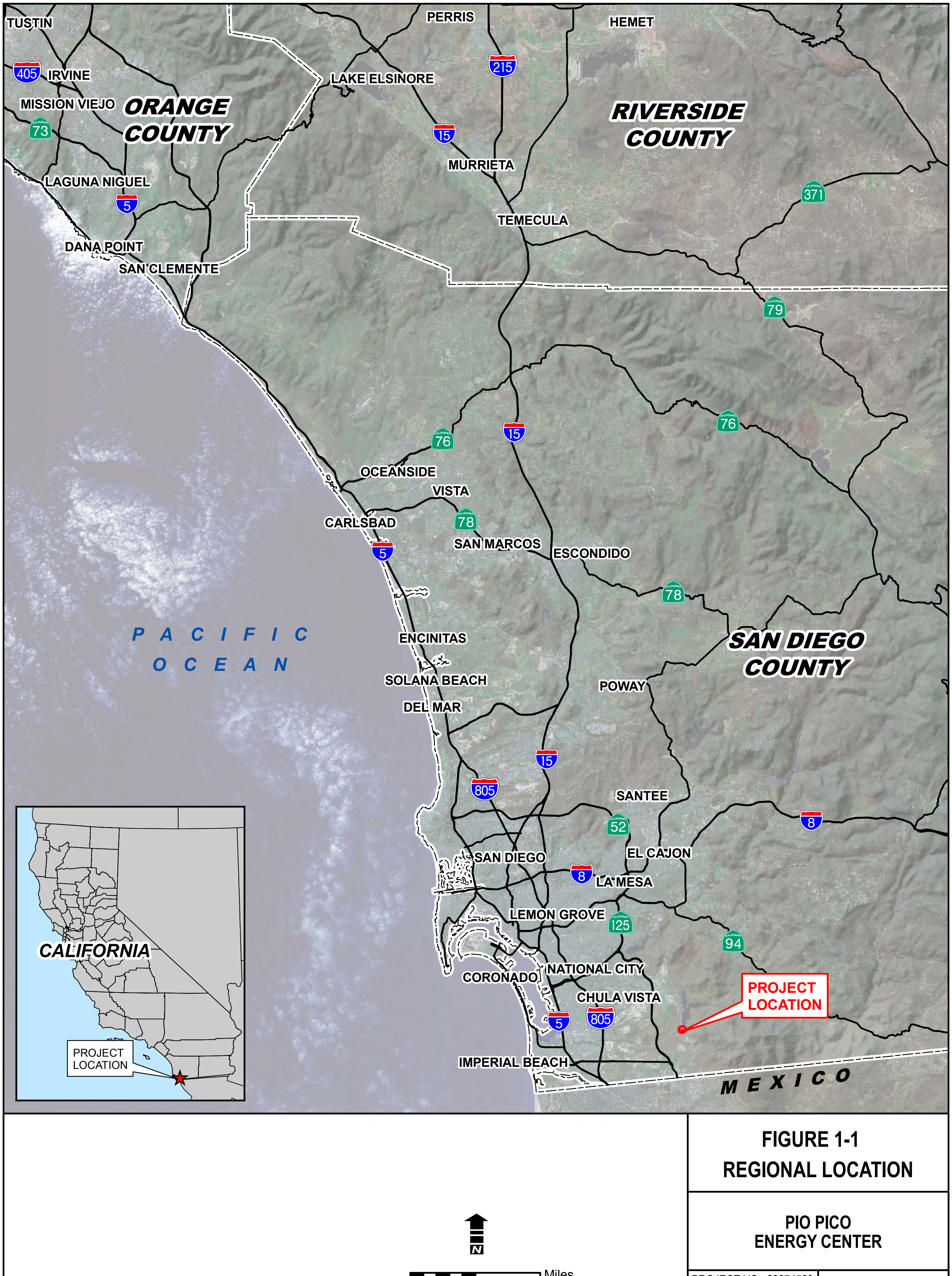

FIGURE 1-1
REGIONAL LOCATION

PIO PICO
ENERGY CENTER

PROJECT NO.: 29874569
DATE: MAY 2010

URS

LEGEND

— Potential Project Site, Linears, and Laydown Area

Project Site

N

0 2,000 4,000 Feet

FIGURE 1-2
SITE VICINITY

PIO PICO ENERGY CENTER

PROJECT NO.: 29874569

DATE: MAY 2010

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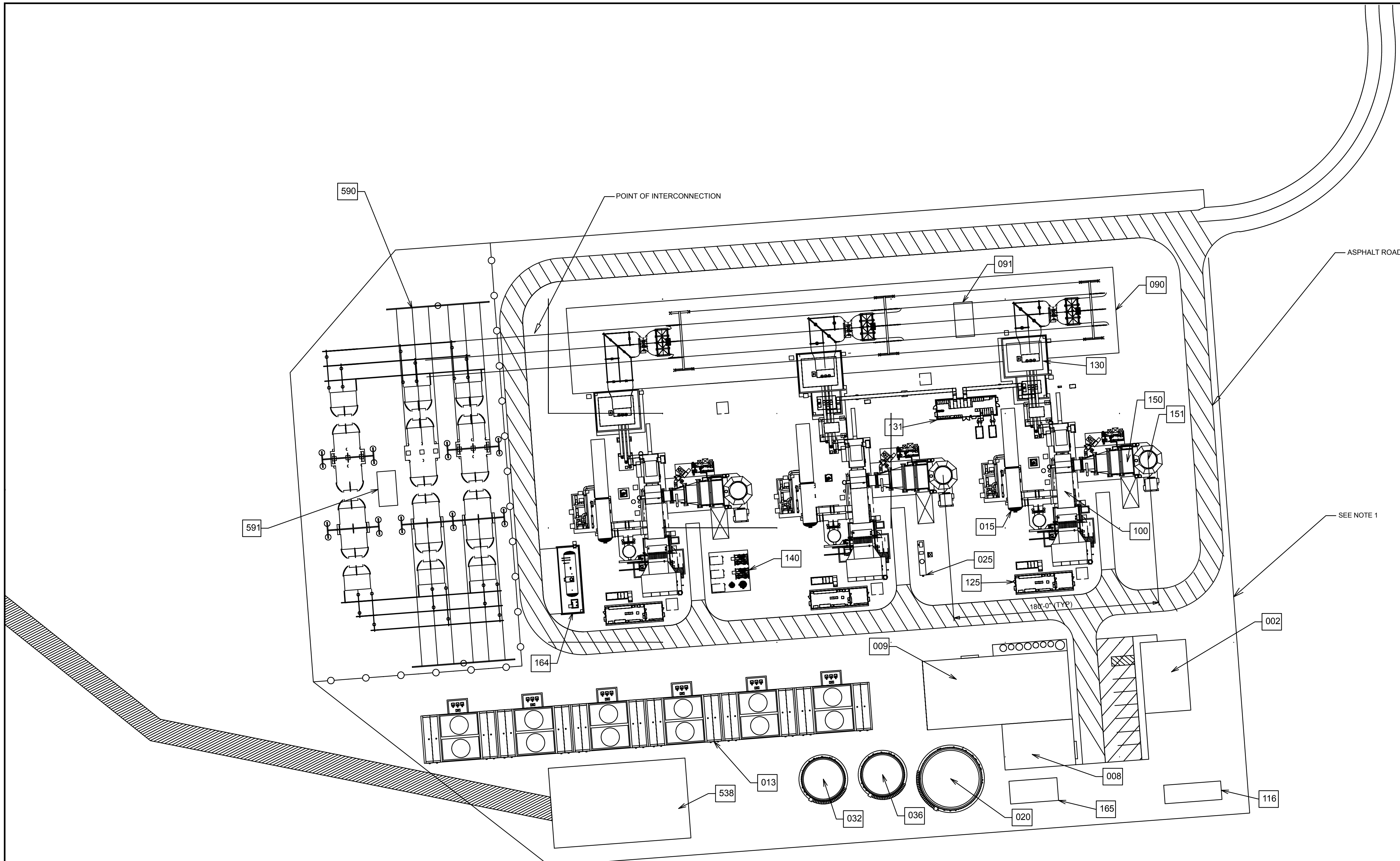


NO	EQUIPMENT TITLE
002	CONTROL ROOM
008	WAREHOUSE
009	WATER TREATMENT BUILDING
013	WET/DRY AIR COOLER
015	INTERCOOLER
020	SERVICE WATER TANK
025	OIL/WATER SEPERATOR
032	DEMINERALIZED WATER TANK
036	WASTE WATER TANK
090	PLANT SWITCHYARD
091	PLANT SWITCHYARD CONTROL BUILDING
100	COMBUSTION TURBINE
116	GAS COMPRESSOR
125	POWER/CONTROL MODULE
130	GENERATOR TRANSFORMER
131	5KV ELECTRICAL BUILDING
140	AIR COMPRESSOR
150	SCR
151	STACK
164	AMMONIA STORAGE
165	FIRE WATER PUMP BUILDING
538	SDG&E METERING STATION
590	SDG&E SWITCHYARD
591	SDG&E SWITCHYARD CONTROL BUILDING

%%UNOTE:
1. NOISE WALLS SHALL BE 30' TALL EXCEPT FOR EAST WALL, WHICH SHALL BE 40' TALL.

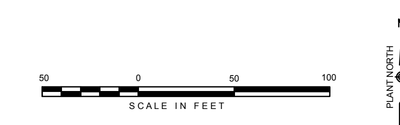
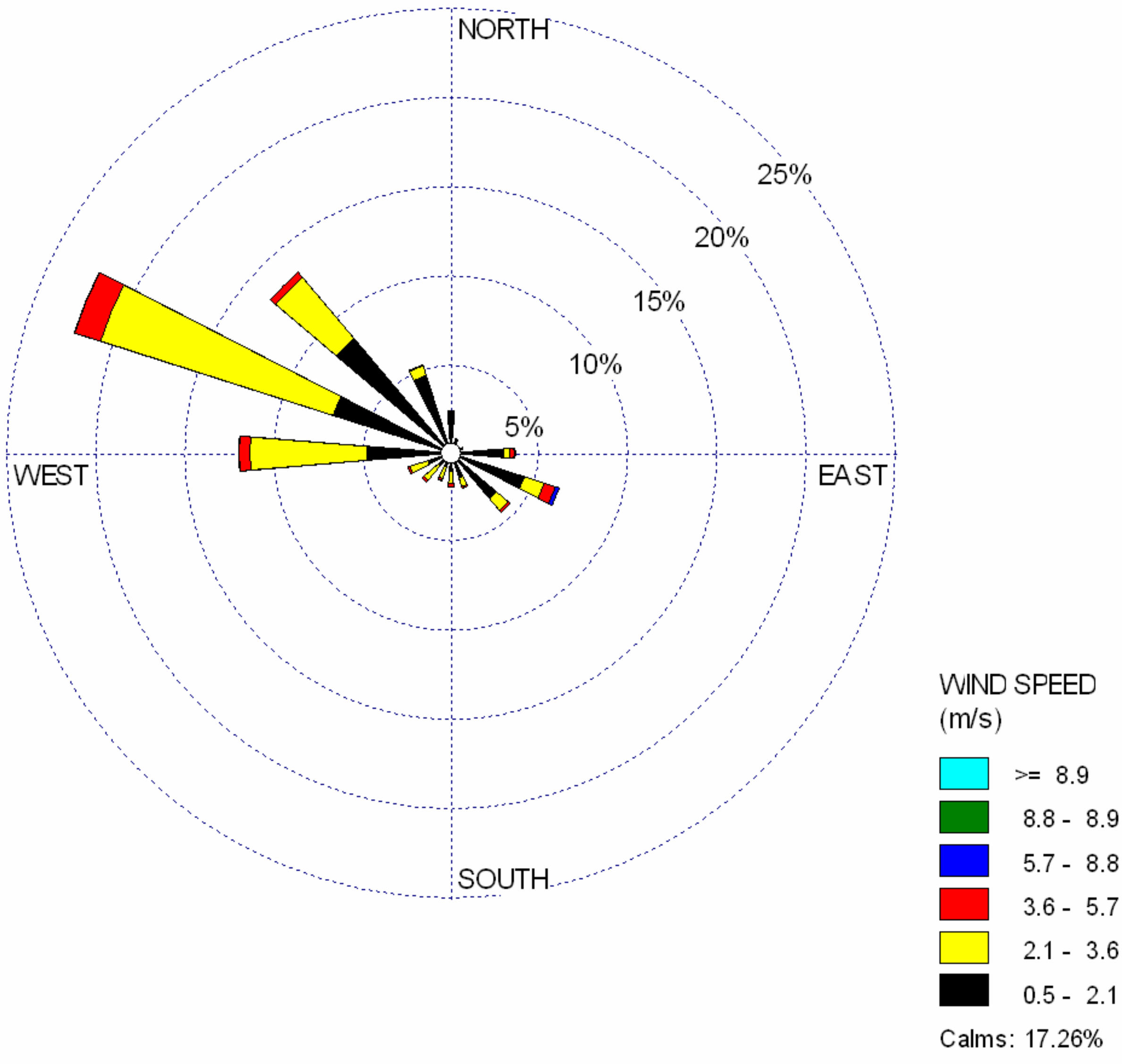


FIGURE 2-1
SITE ARRANGEMENT

PIO PICO ENERGY CENTER

PROJECT NO.: 29874569
DATE: MAY 2010

URS



Otay Mesa Annual Wind Rose 2004-2008 data
Mean wind speed 1.7 m/s

ANNUAL WIND ROSE
PIO PICO ENERGY CENTER

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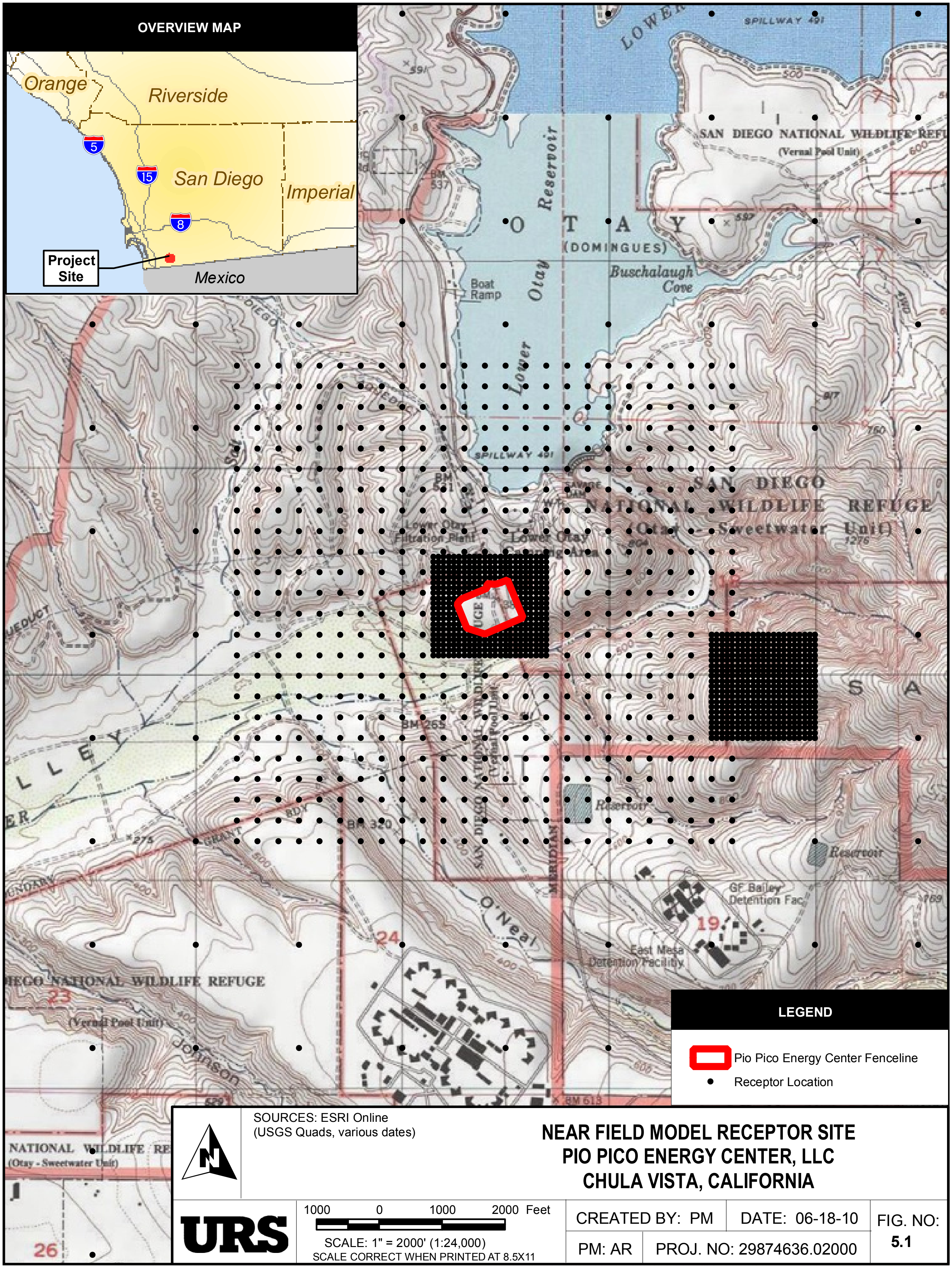

NEAR FIELD MODEL RECEPTOR SITE
PIO PICO ENERGY CENTER, LLC
CHULA VISTA, CALIFORNIA

CREATED BY: PM	DATE: 06-18-10	FIG. NO: 5.1
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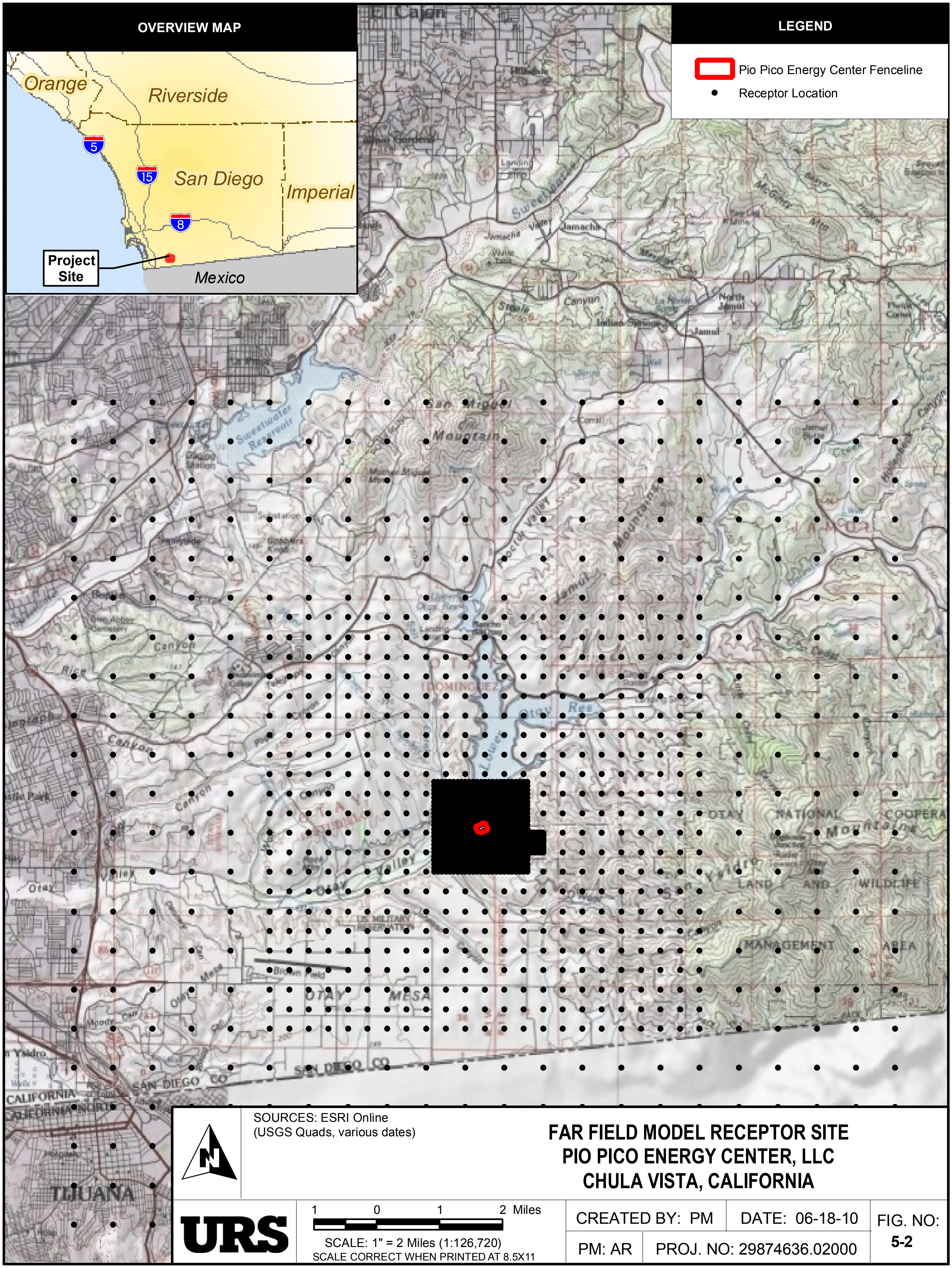

SOURCES: ESRI Online
(USGS Quads, various dates)

FAR FIELD MODEL RECEPTOR SITE
PIO PICO ENERGY CENTER, LLC
CHULA VISTA, CALIFORNIA

URS

1 0 1 2 Miles
SCALE: 1" = 2 Miles (1:126,720)
SCALE CORRECT WHEN PRINTED AT 8.5X11

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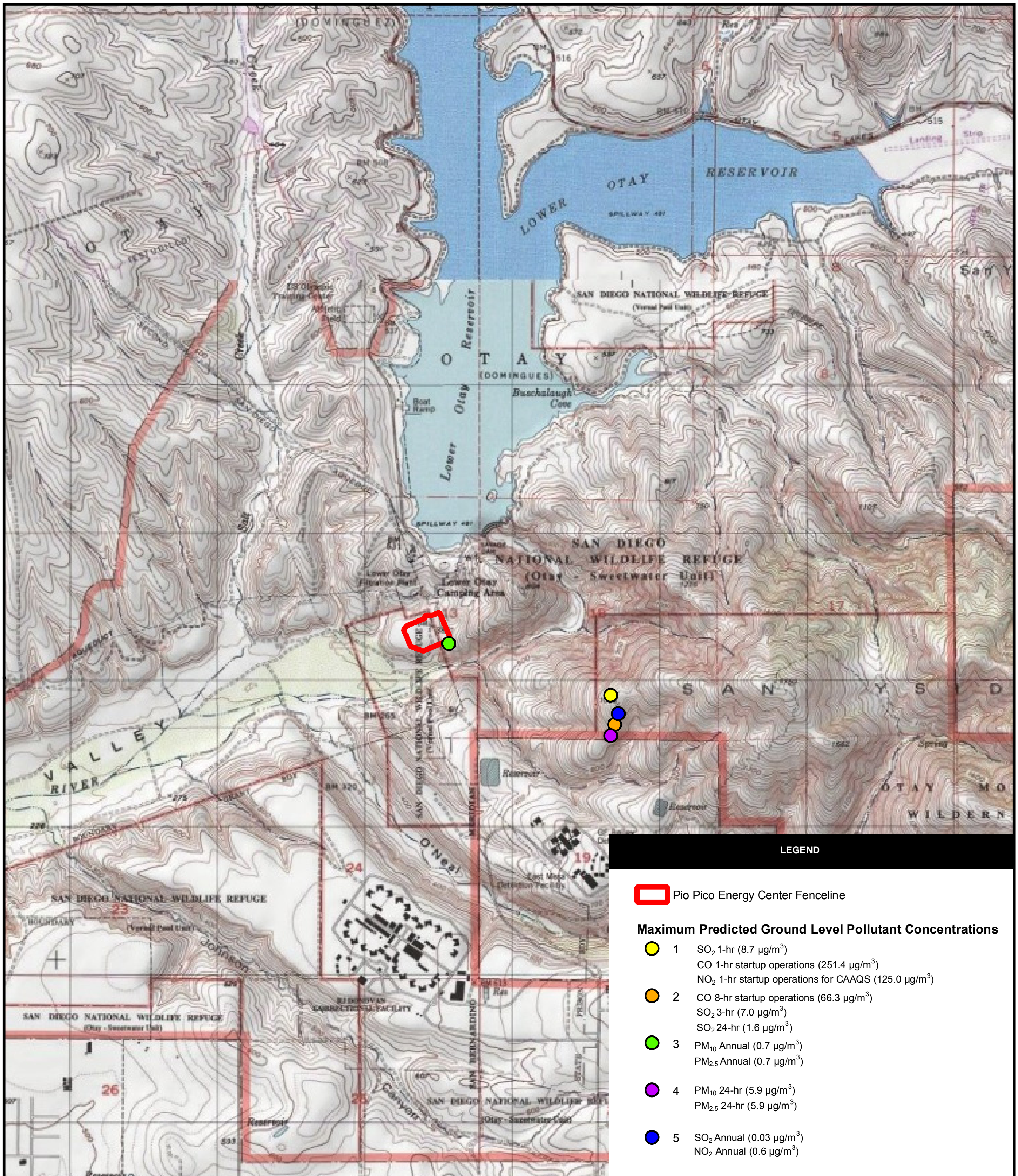

SOURCES: ESRI Online
(USGS Quads, various dates)

LOCATIONS OF MAXIMUM PREDICTED GROUND LEVEL POLLUTANT CONCENTRATIONS
PIO PICO ENERGY CENTER, LLC
CHULA VISTA, CALIFORNIA

URS

1500 0 1500 3000 Feet

SCALE: 1" = 3000' (1:36,000)
SCALE CORRECT WHEN PRINTED AT 8.5X11

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CGT 1

APCD 116 (Rev. 04/07)

SAN DIEGO AIR POLLUTION CONTROL DISTRICT
10124 OLD GROVE ROAD, SAN DIEGO CA 92131-1649
PHONE (858) 586-2600 • FAX (858) 586-2601

PERMIT / REGISTRATION APPLICATION

SUBMITTAL OF THIS APPLICATION DOES NOT GRANT PERMISSION TO CONSTRUCT OR TO OPERATE EQUIPMENT EXCEPT AS SPECIFIED IN RULE 24(d)

IMPORTANT REMINDERS: Read instructions on the reverse side of this form prior to completing this application. Please ensure that all of the following are included before you submit the application:
☒ Appropriate Permit Fee ☒ Completed Supplemental Form(s) ☒ Signature on Application

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1. ☒ New Installation 2. ☐ Existing Unpermitted Equipment or Rule 11 Change 3. ☐ Modification of Existing Permitted Equipment
4. ☐ Amendment to Existing Authority to Construct or AP 5. ☐ Change of Equipment Location 6. ☐ Change of Equipment Ownership
7. ☐ Change of Permit Conditions 8. ☐ Change Permit to Operate Status to Inactive 9. ☐ Banking Emissions
10. ☐ Registration of Portable Equipment 11. ☐ Other (Specify) ____
12. List affected AP/PO#(s): ____

APPLICANT INFORMATION

13. Name of Business (DBA) Pio Pico Energy Center, LLC
14. Nature of Business Power Utility
15. Does this organization own or operate any other APCD permitted equipment at this or any other adjacent locations in San Diego County? ☐Yes ☒No
If yes, list assigned location ID's listed on your PO's ____
16. Type of Ownership ☒ Corporation ☐ Partnership ☐ Individual Owner ☐ Government Agency ☐ Other ____
17. Name of Legal Owner (if different from DBA) ____

		A. Equipment Owner	**B. Authority to Construct (if different from A)**
18.	Name	Pio Pico Energy Center, LLC	
19.	Mailing Address	P.O. Box 95592	
20.	City	South Jordan	
21.	State	UT Zip 84095	Zip
22.	Phone	(801) 253-1278 FAX ( )	( ) FAX ( )
		C. Permit to Operate (if different from A)	**D. Billing Information (if different from A)**
23.	Name		
24.	Mailing Address		
25.	City		
26.	State	Zip	Zip
27.	Phone	( ) FAX ( )	( ) FAX ( )

EQUIPMENT/PROCESS INFORMATION: Type of Equipment: ☒ Stationary ☐ Portable.
If portable, will operation exceed 12 consecutive months at the same location ☐ Yes ☐ No

28. Equipment Location Address N/A yet. See the main application doc. City Chula Vista Parcel No. APN644-090-0400
29. State CA Zip____ Phone ( ) FAX ( )
30. Site Contact David Jenkins Title Project Manager Phone (317) 431.1004
31. General Description of Equipment/Process Please see the main application document
32. Application Submitted by ☐ Owner ☐ Operator ☐ Contractor ☒ Consultant Affiliation URS Corporation

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d) Expedited processing does not guarantee action by any specific date nor does it guarantee permit approval.

I hereby certify that all information provided on this application is true and correct.

34. SIGNATURE [signature] Date July 8, 2010
35. Print Name Gary Chandler Title President
36. Company Pio Pico Energy Center, LLC Phone (801) 253-1278 E-mail Address grchandler@apexpowergroup

APCD USE ONLY

AP #____ ID #____ Cust. No.____ Sector:____ UTM's X____ Y____ SIC____
Receipt #____ Date____ Amt Rec'd $____ Fee Code____
Engineering Contact____ Fee Code____ AP Fee $____ T&M Renewal Fee $____
Refund Claim #____ Date____ Amt $____
Application Generated By NV#____ NC #____ Other____ Date____ Inspector____

SAN DIEGO AIR POLLUTION CONTROL DISTRICT

SUPPLEMENTAL APPLICATION INFORMATION	San Diego APCD Use Only
FEE SCHEDULE 20 D, E, F, G, H	**Appl. No.:**
	ID No.:

GAS TURBINE

COMPANY NAME: Pio Pico Energy Center, LLC

ADDRESS: N/A yet. About 3 mi S. of Otay Lakes Rd. and 2 mi E. of Hwy 125 (APN 6440900400)

A. EQUIPMENT AND PROCESS DESCRIPTION

ENGINE USE: *(Check all that apply.)*

Power Generation: 300000 kw   Steam Generation: __________lbs/hr steam

Other (Specify capacity.): ____

ENGINE SPECIFICATIONS:

Manufacturer: General Electric (GE)   Model No.: LMS 100 PA   S/N: __________________

HP Rating: 134   Fuel Consumption Rate: 818.2 MM BTU/HR

1. Type of Liquid Fuel Used*: N/A   Fuel Rate(Specify Units): N/A

   Maximum %sulfur by wt. in fuel*: N/A %

2. Type of Gaseous Fuel Used*: Natural Gas   Fuel Rate: 53669538 cfh

   Maximum Grains PM/100DSCF @ 12% O_2: __________grains/100dscf

B. EMISSION CONTROL EQUIPMENT *(Check all that apply)*

☐ Low NOx burner ☒ Water injection ☒ SCR w/ Ammonia injection ☐ Hydrogenous ☒ Aqeuous

Describe the control equipment to be installed and submit its technical data:

Detailed data please see the main application document

C. EMISSION DATA

Provide the manufacturer's specifications and emission factors (lbs/1,000 lbs of fuel) for oxides of nitrogen (NOx), Carbon monoxide (CO), Hydrocarbons (HC), and particulate matter (PM) for the engine at different power settings with corresponding engine exhaust flow rates and temperatures.

25 **D.** **<u>EXHAUST STACK AND BLDG. DIMENSIONS</u>** *(if air quality modeling is required).*

26 Stack location: ground__________ (i.e., roof top, wall, ground), direction: ☒ vertical ☐ horizontal

27 Stack dimensions: internal 14.5______ft. diameter, or _________ ft. wide x _________ft. long

28 Stack dimensions: external _________ft. diameter, or _________ ft. wide x _________ft. long

(If other shape, then supply sketch of stack cross section)

29 Use an attached page to provide this information for each engine at each power setting.

30 Stack height: Above roof: _________ ft. Above ground level: 100_______ ft.

31 Site elevation above mean sea level (MSL) 370________ ft.

32 Building dimensions: length ________ ft.; width ________ ft.; height ________ ft.

(Supply sketch w/position of exhaust stack)

33 Supply a plot plan showing the test cell/stand location with respect to nearby streets, property lines, and buildings.

34 **E.** **<u>OTHER EMISSION PRODUCING EQUIPMENT AT THE SITE</u>**

35 APCD permitted ☐ Yes ☒ No

36 Non permitted ☒ Yes ☐ No

37 **F.** **<u>ADDITIONAL INFORMATION</u>** Detailed data Please see the main application document.

38 ____

39 ____

40 **G.** **<u>OPERATING SCHEDULE:</u>*** Hours/day: 24 (max)___ Days/yr: 4337.5h/yr__

* Emission calculations will be performed using these values and permit conditions may result to comply with applicable rules.

41 **Name of Preparer:** Anne Runnalls__________________________ **Title:** Air Quality Consultant____________

42 **Phone Number:** __(619) 243-2824______________ **Date:** July 2, 2010____________________

<u>NOTE TO APPLICANT:</u>

Before acting on an application for Authority to Construct or Permit to Operate, the District may require further information, plans, or specifications. Forms with insufficient information may be returned to the applicant for completion, which will cause a delay in application processing and may increase processing fees. The applicant should correspond with equipment and material manufacturers to obtain the information requested on this supplemental form.

CGT 2

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SAN DIEGO AIR POLLUTION CONTROL DISTRICT
10124 OLD GROVE ROAD, SAN DIEGO CA 92131-1649
PHONE (858) 586-2600 • FAX (858) 586-2601

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10. ☐ Registration of Portable Equipment 11. ☐ Other (Specify) ____
12. List affected AP/PO#(s): ____

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14. Nature of Business Power Utility
15. Does this organization own or operate any other APCD permitted equipment at this or any other adjacent locations in San Diego County? ☐Yes ☒No
If yes, list assigned location ID's listed on your PO's ____
16. Type of Ownership ☒ Corporation ☐ Partnership ☐ Individual Owner ☐ Government Agency ☐ Other ____
17. Name of Legal Owner (if different from DBA) ____

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19.	Mailing Address	P.O. Box 95592	
20.	City	South Jordan	
21.	State	UT Zip 84095	Zip
22.	Phone	(801) 253-1278 FAX ( )	( ) FAX ( )
		C. Permit to Operate (if different from A)	**D. Billing Information (if different from A)**
23.	Name		
24.	Mailing Address		
25.	City		
26.	State	Zip	Zip
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EQUIPMENT/PROCESS INFORMATION: Type of Equipment: ☒ **Stationary** ☐ **Portable.**
If portable, will operation exceed 12 consecutive months at the same location ☐ **Yes** ☐ **No**

28. Equipment Location Address N/A yet. See the main application doc. City Chula Vista Parcel No. APN644-090-0400
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	ID No.:

GAS TURBINE

COMPANY NAME: Pio Pico Energy Center, LLC

ADDRESS: N/A yet. About 3 mi S. of Otay Lakes Rd. and 2 mi E. of Hwy 125 (APN 6440900400)

A. EQUIPMENT AND PROCESS DESCRIPTION

ENGINE USE: *(Check all that apply.)*

Power Generation: 300000 kw Steam Generation: __________lbs/hr steam

Other (Specify capacity.): ____

ENGINE SPECIFICATIONS:

Manufacturer: General Electric (GE) Model No.: LMS 100 PA S/N: __________________

HP Rating: 134 Fuel Consumption Rate: 818.2 MM BTU/HR

1. Type of Liquid Fuel Used*: N/A Fuel Rate(Specify Units): N/A

   Maximum %sulfur by wt. in fuel*: N/A %

2. Type of Gaseous Fuel Used*: Natural Gas Fuel Rate: 53669538 cfh

   Maximum Grains PM/100DSCF @ 12% O_2: __________grains/100dscf

B. EMISSION CONTROL EQUIPMENT *(Check all that apply)*

☐ Low NOx burner ☒ Water injection ☒ SCR w/ Ammonia injection ☐ Hydrogenous ☒ Aqeuous

Describe the control equipment to be installed and submit its technical data:

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Other (Specify capacity.): ____________________

ENGINE SPECIFICATIONS:

Manufacturer: General Electric (GE)   Model No.: LMS 100 PA   S/N: __________

HP Rating: 134   Fuel Consumption Rate: 818.2 MM BTU/HR

1. Type of Liquid Fuel Used*: N/A   Fuel Rate(Specify Units): N/A

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Fall Wind Rose

Directions / Wind Classes (m/s)	0.5 - 2.1	2.1 - 3.6	3.6 - 5.7	5.7 - 8.8	8.8 - 8.9	>= 8.9	Total
348.75 - 11.25	0.0221	0.00064	0.00009	0	0	0	0.02284
11.25 - 33.75	0.00829	0.00018	0	0	0	0	0.00847
33.75 - 56.25	0.007	0.00074	0	0	0	0	0.00774
56.25 - 78.75	0.00783	0.00129	0.00009	0	0	0	0.00921
78.75 - 101.25	0.03343	0.00451	0.00166	0.00055	0	0.00009	0.04025
101.25 - 123.75	0.04642	0.01022	0.00663	0.00295	0	0.00046	0.06668
123.75 - 146.25	0.03804	0.00995	0.00157	0.00028	0	0	0.04983
146.25 - 168.75	0.01685	0.00414	0.00046	0	0	0	0.02146
168.75 - 191.25	0.01151	0.00645	0.00157	0.00009	0	0	0.01962
191.25 - 213.75	0.00884	0.00553	0.0012	0.00018	0	0	0.01575
213.75 - 236.25	0.00912	0.00939	0.00184	0	0	0	0.02035
236.25 - 258.75	0.01335	0.0082	0.00083	0.00009	0	0	0.02247
258.75 - 281.25	0.0396	0.05415	0.00543	0.00037	0	0	0.09956
281.25 - 303.75	0.06456	0.12682	0.01299	0.00009	0	0	0.20446
303.75 - 326.25	0.07561	0.04264	0.00184	0.00009	0	0	0.12019
326.25 - 348.75	0.04393	0.00534	0.00037	0	0	0	0.04964
Sub-Total	0.44649	0.2902	0.03656	0.0047	0	0.00055	0.76978
Calms							0.22
Missing/Incomplete							0.01
Total							1
Average Wind Speed							1.58 m/s

Winter Wind Rose

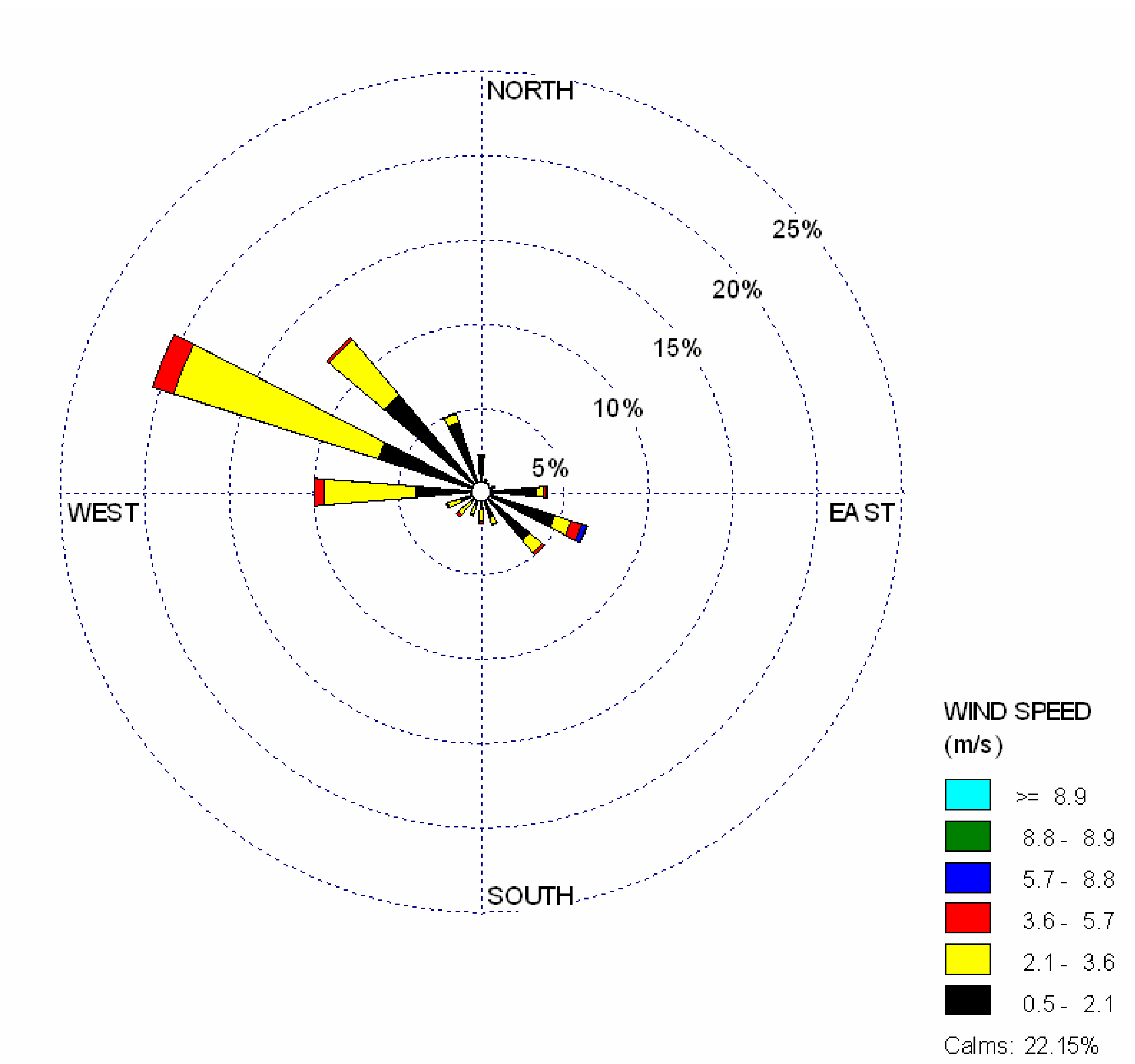
Directions / Wind Classes (m/s)	0.5 - 2.1	2.1 - 3.6	3.6 - 5.7	5.7 - 8.8	8.8 - 8.9	>= 8.9	Total
348.75 - 11.25	0.02026	0.00232	0.00019	0	0	0	0.02277
11.25 - 33.75	0.00976	0.00112	0.00028	0	0	0	0.01115
33.75 - 56.25	0.00725	0.00093	0.00019	0.00009	0	0	0.00846
56.25 - 78.75	0.01273	0.00223	0.00065	0.00046	0	0	0.01608
78.75 - 101.25	0.05882	0.00799	0.00567	0.0013	0	0	0.07378
101.25 - 123.75	0.08782	0.03243	0.01812	0.00493	0.00009	0	0.14339
123.75 - 146.25	0.06682	0.02007	0.00465	0.00028	0	0	0.09181
146.25 - 168.75	0.02481	0.01115	0.00251	0.00028	0	0	0.03875
168.75 - 191.25	0.01134	0.00836	0.00511	0.00046	0.00009	0.00009	0.02546
191.25 - 213.75	0.00827	0.00846	0.00204	0.00009	0	0	0.01886
213.75 - 236.25	0.00874	0.00957	0.00158	0.00009	0	0	0.01998
236.25 - 258.75	0.0131	0.01059	0.00177	0	0	0	0.02546
258.75 - 281.25	0.03327	0.03875	0.00465	0.00028	0	0	0.07694
281.25 - 303.75	0.04321	0.06152	0.00743	0.00065	0	0	0.11281
303.75 - 326.25	0.04117	0.0289	0.00139	0.00009	0	0	0.07155
326.25 - 348.75	0.02667	0.0066	0.00046	0	0	0	0.03373
Sub-Total	0.47403	0.251	0.05669	0.00901	0.00019	0.00009	0.78207
Calms							0.21
Missing/Incomplete							0.01
Total							1
Average Speed							1.6 m/s

Spring Wind Rose

Directions / Wind Classes (m/s)	0.5 - 2.1	2.1 - 3.6	3.6 - 5.7	5.7 - 8.8	8.8 - 8.9	>= 8.9	Total
348.75 - 11.25	0.02303	0.00082	0	0	0	0	0.02385
11.25 - 33.75	0.00843	0	0.00009	0	0	0	0.00852
33.75 - 56.25	0.00517	0.00009	0.00018	0	0	0	0.00544
56.25 - 78.75	0.00472	0.00009	0	0	0	0	0.00481
78.75 - 101.25	0.02693	0.00199	0.00181	0.00073	0	0	0.03147
101.25 - 123.75	0.03863	0.00481	0.00181	0.00082	0	0	0.04606
123.75 - 146.25	0.03083	0.00372	0.00036	0	0	0	0.03491
146.25 - 168.75	0.01786	0.00426	0.00009	0.00018	0	0	0.0224
168.75 - 191.25	0.01487	0.00943	0.00209	0.00027	0	0	0.02666
191.25 - 213.75	0.01324	0.01052	0.00163	0.00045	0	0	0.02584
213.75 - 236.25	0.01496	0.01723	0.00254	0	0	0	0.03473
236.25 - 258.75	0.01732	0.01759	0.00172	0.00009	0	0	0.03672
258.75 - 281.25	0.05604	0.09938	0.01242	0.00018	0	0	0.16803
281.25 - 303.75	0.06855	0.12931	0.0243	0.00054	0	0	0.22271
303.75 - 326.25	0.06801	0.03781	0.00326	0.00009	0	0	0.10918
326.25 - 348.75	0.04017	0.00444	0.00018	0	0	0	0.0448
Sub-Total	0.44877	0.34149	0.0525	0.00336	0	0	0.83679
Calms							0.15
Missing/Incomplete							0.01
Total							1
Average Wind Speed							1.79 m/s

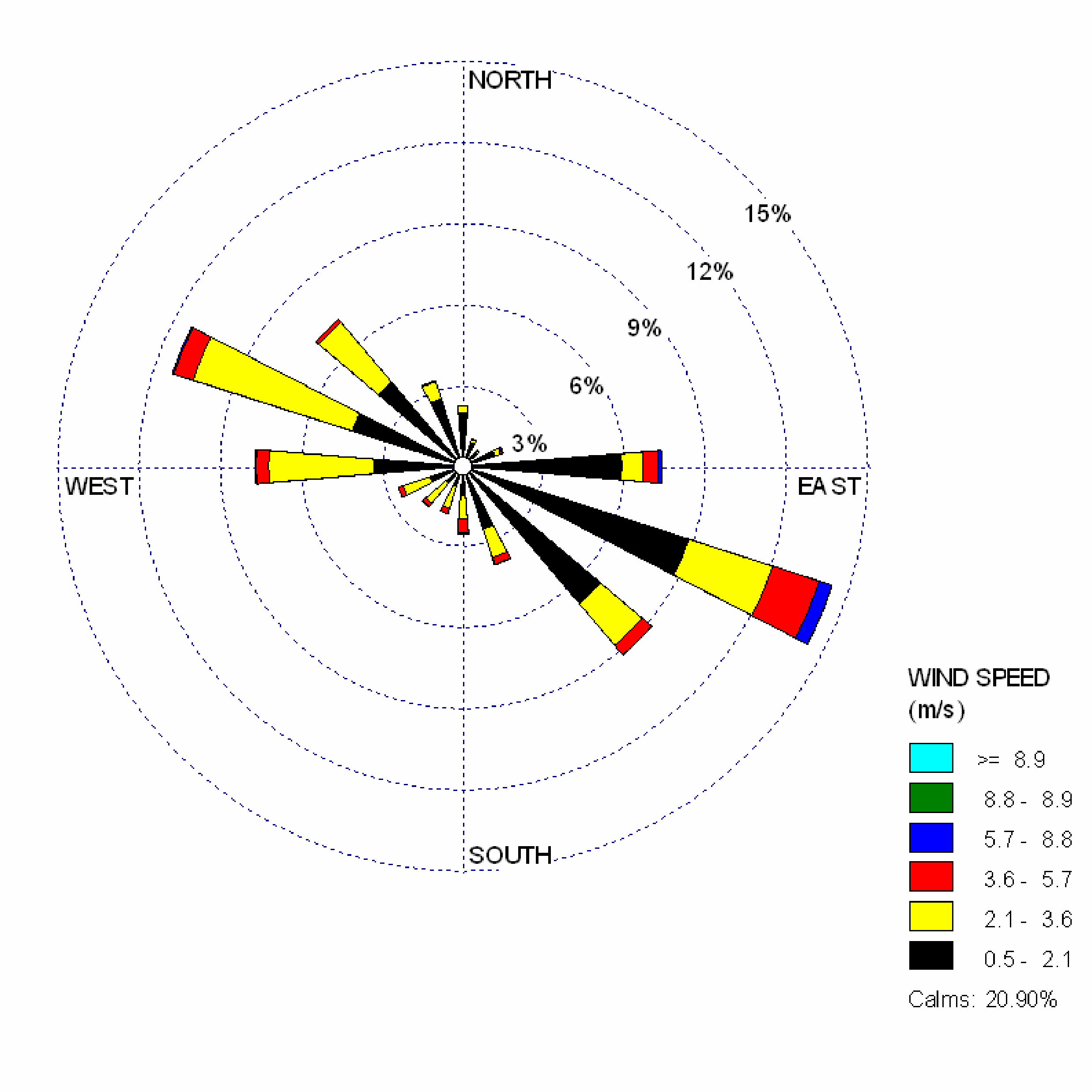
Summer Wind Rose

Directions / Wind Classes (m/s)	0.5 - 2.1	2.1 - 3.6	3.6 - 5.7	5.7 - 8.8	8.8 - 8.9	>= 8.9	Total
348.75 - 11.25	0.02883	0.00036	0	0	0	0	0.02919
11.25 - 33.75	0.00907	0	0	0	0	0	0.00907
33.75 - 56.25	0.00317	0	0	0	0	0	0.00317
56.25 - 78.75	0.00154	0	0	0	0	0	0.00154
78.75 - 101.25	0.00209	0.00009	0	0	0	0	0.00218
101.25 - 123.75	0.00372	0	0	0	0	0	0.00372
123.75 - 146.25	0.00218	0.00018	0	0	0	0	0.00236
146.25 - 168.75	0.00236	0.00082	0	0	0	0	0.00317
168.75 - 191.25	0.0058	0.00209	0	0	0	0	0.00789
191.25 - 213.75	0.00562	0.00263	0.00009	0	0	0	0.00834
213.75 - 236.25	0.00689	0.00617	0.00054	0	0	0	0.0136
236.25 - 258.75	0.01296	0.00635	0.00045	0	0	0	0.01976
258.75 - 281.25	0.06129	0.06881	0.00172	0	0	0	0.13182
281.25 - 303.75	0.10272	0.22711	0.01587	0	0	0	0.34569
303.75 - 326.25	0.15295	0.06791	0.00879	0	0	0	0.22965
326.25 - 348.75	0.07416	0.00626	0.00082	0	0	0	0.08123
Sub-Total	0.47534	0.38876	0.02829	0	0	0	0.88254
Calms							0.11
Missing/Incomplete							0.01
Total							1
Average Wind Speed							1.84 m/s



Otay Mesa Fall Wind Rose 2004-2008 data
Mean wind speed 1.58 m/s

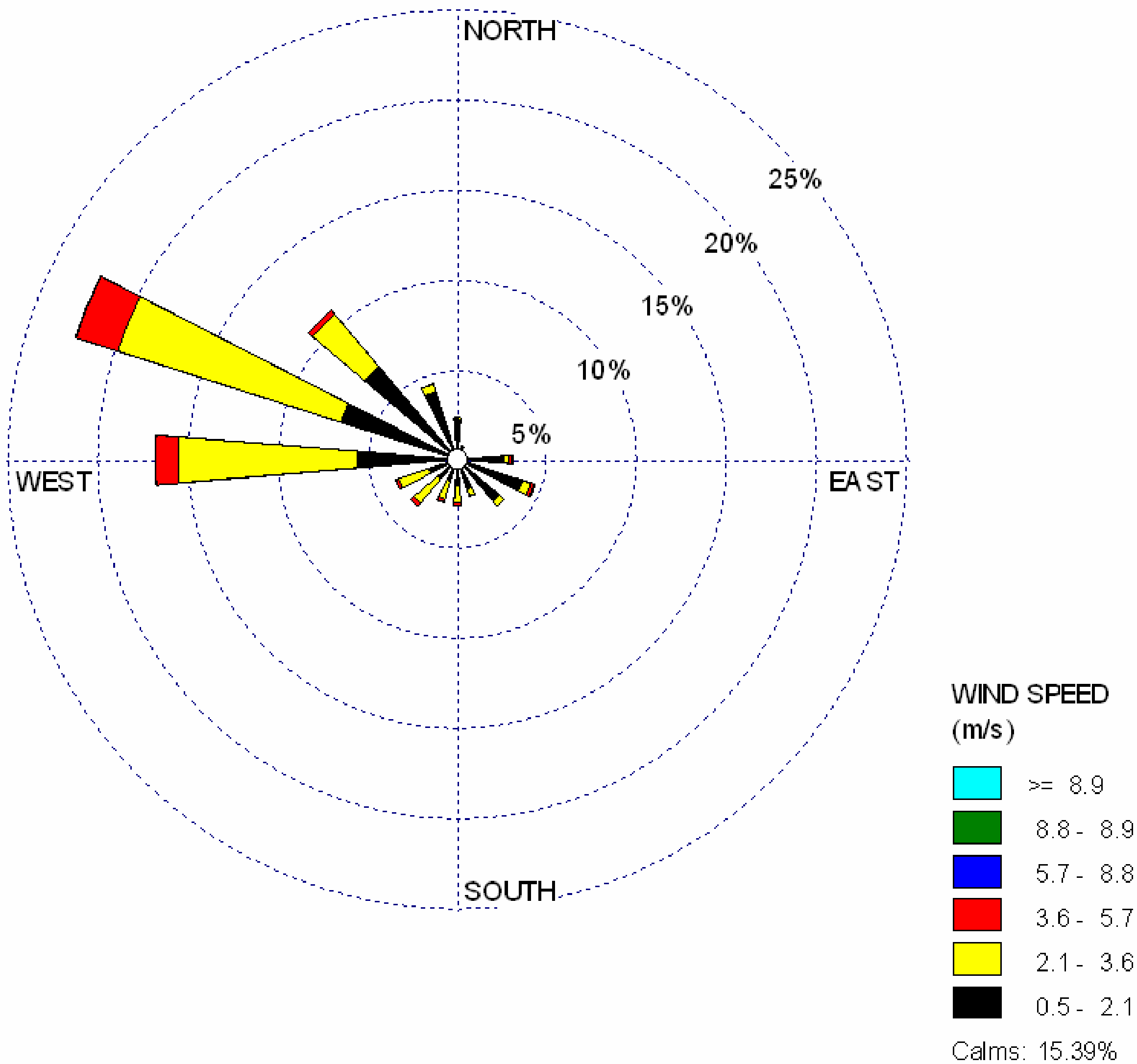
FALL WIND ROSE **PIO PICO ENERGY CENTER**			
URS	NO SCALE	CREATED BY: LB	DATE: 06-16-10
		PM: MF	PROJ. NO: 29874636.02000



Otay Mesa Winter Wind Rose 2004-2008 data
Mean wind speed 1.6 m/s

WINTER WIND ROSE
PIO PICO ENERGY CENTER

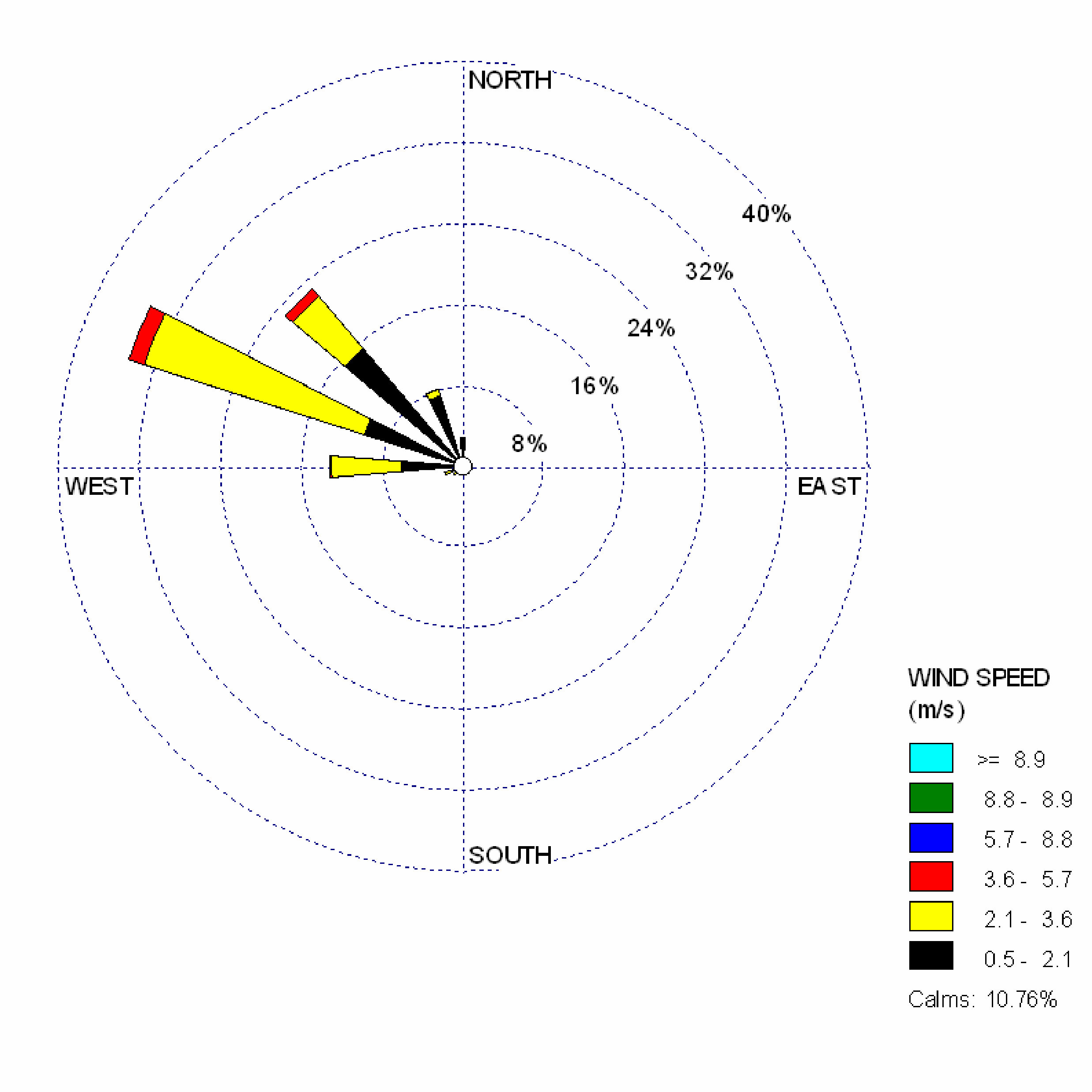
URS	NO SCALE	CREATED BY: LB	DATE: 06-16-10
		PM: MF	PROJ. NO: 29874636.02000



Otay Mesa Spring Wind Rose 2004-2008 data
Mean wind speed 1.79 m/s

SPRING WIND ROSE
PIO PICO ENERGY CENTER

URS	NO SCALE	CREATED BY: LB	DATE: 06-16-10
		PM: MF	PROJ. NO: 29874636.02000



Otay Mesa Summer Wind Rose 2004-2008 data
Mean wind speed 1.84 m/s

SUMMER WIND ROSE
PIO PICO ENERGY CENTER

URS	NO SCALE	CREATED BY: LB	DATE: 06-16-10
		PM: MF	PROJ. NO: 29874636.02000

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PIO PICO ENERGY CENTER
Emission Summary For Permit Application

Hourly Potential to Emit

Hourly Operational Emissions

	each turbine		Cooling system	each turbine
	normal operation (lb/hr)	Worst Hourly (lb/hr)	Hourly emissions (lb/hr)	Commissioning Hourly Emissions (lb/hr)
NO_X	8.26	26.67		50.00
CO	8.05	53.64		75.00
VOC	2.30	5.83		5.00
SO_2	1.85	1.85		1.13
PM_{10}	5.50	5.50	0.89	5.00

Note:
1. Worst 1hr emissions do not include any commissioning.
2. Worst 1hr NO_x and VOC emissions include one startup event (30-min startup) and the remaining 30 min at normal ops per turbine.
3. Worst 1hr emissions for CO includes one shutdown event and the remianing minutes at normal operations.
4. Worst 1hr emissions for SO2 is based on 0.75 grains/SCF sulfer content during normal operation.
5. Worst 1hr emissions for PM_{10} is based on 5.5 lb/hr (100% load during normal operation).

Daily Potential to Emit

Daily Operational Emissions

	each turbine		Cooling system	each turbine
	normal operation (lb/day)	Worst Daily (lb/day)	Daily emissions (lb/day)	Commissioning Daily Emissions (lb/day)
NO_X	198.24	290.13		1,200.00
CO	193.20	430.87		1,800.00
VOC	55.20	79.79		120.00
SO_2	44.40	44.40		27.18
PM_{10}	132.00	132.00	21.37	120.00

Note:
1. Worst daily emissions do not include any commissioning.
2. Worst daily emissions for NO_x, CO and VOC include four startup events (30-min), and four shutdown events (10.5-min), plus the remaining at normal ops.
3. Worst daily emissions for PM10 is based on 5.5 lb/hr (100% load during normal operation).
4. Worst daily emissions for SO2 is based on 0.75 grains/SCF sulfer content during normal operation.

Annual Emission For Non Commissioning Year

Operation Schedule (for none commissioning year)

normal operation	4,000	hours/year/turbine
startup/shutdown	500	event/year/turbine
startup takes	30	minutes/event/turbine
shutdown takes	10.5	minutes/event/turbine

Operation Emissions (for none commissioning year)

	each turbine				Cooling system		Project	
	startup emission	shutdown emission	normal operation	annual total emissions	annual total emissions		annual total emissions (3 Turbines and Partial Dry Cooling System)	
	(lb/event)	(lb/event)	(lb/hr)	(lb/yr)	(lb/yr)	(ton/yr)	(lb/yr)	(ton/yr)
NO_X	22.54	6.00	8.26	47,310.00			141,930.00	70.97
CO	17.86	47.00	8.05	64,630.00			193,890.00	96.95
VOC	4.67	3.00	2.30	13,035.00			39,105.00	19.55
SO_2	0.22	0.03	0.62	2,605.00			7,815.00	3.91
PM_{10}	2.50	0.88	5.50	23,690.00	3,862.94	1.93	74,932.94	37.47

Note:

1. Based on 4000 hours per turbine plus 500 startup/shut downs.
2. Startup and shutdown emissions for CO, NO2, and VOC integrated from data provided by GE and Kiewit.
3. Annual SO_2 emissions are based on a gas sulfur content of 0.25 grains/100 scf for normal operation, startup, and shutdown.
4. PM emission rate is 5.0 lb/hr for startup/shutdown and 5.5 lb/hr for normal operation.
5. Turbine emissions of CO, NO2, and VOC for normal operation all based on the worst case from turbine screening scenarios.

Annual Emission For Commissioning Year

Operation Schedule (commissioning year)

normal operation	3,552	hours/year/turbine
startup/shutdown	500	event/year/turbine
startup takes	30	minutes/event/turbine
shutdown takes	10.5	minutes/event/turbine

Operation Emissions (commissioning year)

	Each turbine					Cooling system		Project	
	commissioning emission	startup emission	shutdown emission	normal operation	annual total emissions	annual total emissions		annual total emissions (3 Turbines and Partial Dry Cooling System)	
	(lb/event)	(lb/event)	(lb/event)	(lb/hr)	(lb/yr)	(lb/yr)	(ton/yr)	(lb/yr)	(ton/yr)
NO_X	3700.00	22.54	6.00	8.26	47,309.52			141,928.56	70.96
CO	6320.00	17.86	47.00	8.05	67,343.60			202,030.80	101.02
VOC	386.00	4.67	3.00	2.30	12,390.60			37,171.80	18.59
SO_2	37.15	0.22	0.03	0.62	2,364.39			7,093.17	3.55
PM_{10}	560.00	2.50	0.88	5.50	21,786.00	3,862.94	1.93	69,220.94	34.61

Note:

1. Normal operation hours are reduced in commissioning year so that NOx emissions equal non-commisioning year.
2. In addition to 112 hours of commissioning, each turbine will have 500 start ups and shutdowns and 3552 hours of normal operation.
3. Startup and shutdown emissions for CO, NO2, and VOC integrated from data provided by GE and Kiewit.
4. Annual SO_2 emissions are based on a gas sulfur content of 0.25 grains/100 scf for normal operation, startup, and shutdown.
5. PM emission rate is 5.0 lb/hr for startup/shutdown and 5.5 lb/hr for normal operation.
6. Turbine emissions of CO, NO2, and VOC for normal operation all based on the worst case from turbine screening scenarios.

Estimated Average Engine Performance NOT FOR GUARANTEE, REFER TO PROJECT F&ID FOR DESIGN
Predicted Intercooler Performance not to be utilized for Balance of Plant design. Please contact GE.

GE Energy

Performance By: **Daniel.Short**
Project Info: **Pio Pico 3xLMS100**

Engine: **LMS100 PA**
Deck Info: **G0179D - 8lh.scp**
Generator: **BDAX 82-445ER 60Hz, 13.8kV, 0.9PF (35404)**
Fuel: **Gas Fuel #10-1, 19000 Btu/lb,LHV**

Date: **4/7/2010**
Time: **4:52:00 PM**
Version: **3.8.6**

Case #	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114
	ISO	ISO	ISO	Min	Min	Min	Winter	Winter	Winter	Spring	Spring	Spring	Spring	Summer	Summer
Ambient Conditions															
Dry Bulb, °F	59.0	59.0	59.0	30.0	30.0	30.0	47.0	47.0	47.0	72.0	72.0	72.0	72.0	88.0	88.0
Wet Bulb, °F	51.4	51.4	51.4	26.3	26.3	26.3	38.0	38.0	38.0	54.0	54.0	54.0	54.0	70.0	70.0
RH, %	60.0	60.0	60.0	60.0	60.0	60.0	41.3	41.3	41.3	29.0	29.0	29.0	29.0	41.1	41.1
Altitude, ft	300.0	300.0	300.0	300.0	300.0	300.0	300.0	300.0	300.0	300.0	300.0	300.0	300.0	300.0	300.0
Ambient Pressure, psia	14.538	14.537	14.537	14.537	14.537	14.537	14.537	14.537	14.538	14.537	14.538	14.537	14.537	14.537	14.537
Engine Inlet															
Comp Inlet Temp, °F	59.0	59.0	59.0	30.0	30.0	30.0	47.0	47.0	47.0	56.7	72.0	72.0	72.0	72.7	88.0
RH, %	60.0	60.0	60.0	60.0	60.0	60.0	41.3	41.3	41.3	84.5	29.0	29.0	29.0	87.7	41.1
Conditioning	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	EVAP	NONE	NONE	NONE	EVAP	NONE
Tons or kBtu/hr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pressure Losses															
Inlet Loss, inH20	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
Exhaust Loss, inH20	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00
Partload %	**100**	**75**	**50**	**100**	**75**	**50**	**100**	**75**	**50**	**100**	**100**	**75**	**50**	**100**	**100**
kW, Gen Terms	**103,539**	**77,670**	**51,790**	**101,816**	**76,378**	**50,929**	**102,693**	**77,035**	**51,368**	**103,540**	**102,922**	**77,207**	**51,482**	**100,007**	**96,526**
Est. Btu/kW-hr, LHV	**7894**	**8417**	**9561**	**7846**	**8418**	**9594**	**7879**	**8428**	**9588**	**7883**	**7950**	**8466**	**9607**	**8000**	**8080**
Fuel Flow															
MMBtu/hr, LHV	817.3	653.8	495.2	798.9	643.0	488.6	809.1	649.3	492.5	816.2	818.2	653.6	494.6	800.1	780.0
lb/hr	43,016	34,408	26,062	42,045	33,840	25,716	42,584	34,172	25,922	42,958	43,064	34,402	26,031	42,109	41,051
NOx Control	**Water**	**Water**	**Water**	**Water**	**Water**	**Water**	**Water**	**Water**	**Water**	**Water**	**Water**	**Water**	**Water**	**Water**	**Water**
Water Injection															
lb/hr	28,211	20,225	13,302	28,740	20,952	14,068	29,252	21,117	14,088	27,364	29,283	20,840	13,668	26,683	25,699
Temperature, °F	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Intercooler	**Wet Cooling**	**Wet Cooling**	**Wet Cooling**	**Wet Cooling**	**Wet Cooling**	**Wet Cooling**	**Wet Cooling**	**Wet Cooling**	**Wet Cooling**	**Wet Cooling**	**Wet Cooling**	**Wet Cooling**	**Wet Cooling**	**Wet Cooling**	**Wet Cooling**
Humidification	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
IC Heat Extraction, btu/s	28,272	21,143	14,100	24,316	17,264	10,992	26,611	19,483	12,762	28,203	29,707	22,451	15,243	32,376	31,577
KOD Water Extraction, lb/s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	3.1	1.4
Control Parameters															
HP Speed, RPM	9138	9000	8862	9050	8954	8834	9095	8979	8848	9138	9159	9016	8867	9164	9162
LP Speed, RPM	5275	5001	4876	5084	4866	4740	5190	4944	4819	5266	5332	5054	4930	5316	5358
PT Speed, RPM	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600
PS3 - CDP, psia	582.7	485.4	377.7	526.7	457.5	373.8	543.9	474.1	382.4	548.8	548.8	477.0	367.5	538.3	538.3
T23 - Intcrl Inlet Temp, °F	342.8	311.5	273.1	305.3	271.2	233.4	327.3	294.7	256.4	339.6	359.3	327.8	289.5	355.2	372.6
P23 - Intcrl Inlet Pressure, psia	57.9	51.3	43.5	59.6	51.7	43.7	58.6	51.4	43.5	58.0	57.1	50.7	43.1	56.2	55.0
W23 - Intcrl Inlet Flow, lb/s	460.4	417.8	377.5	467.5	431.8	392.5	463.5	424.0	384.4	461.1	454.6	412.2	371.5	448.6	436.0
T25 - HPC Inlet Temp, °F	90.0	90.0	90.0	90.0	90.0	90.0	90.0	90.0	90.0	90.0	90.0	90.0	90.0	90.0	90.0
T3CRF - CDT, °F	694	671	648	682	667	646	689	670	648	693	699	675	650	697	697
T48IN, °R	2029	1960	1897	1985	1938	1882	2008	1952	1892	2027	2044	1971	1903	2044	2044
T48IN, °F	1569	1501	1437	1525	1479	1423	1549	1492	1432	1567	1584	1511	1443	1584	1584
Exhaust Parameters															
Temperature, °F	776.5	786.9	827.2	748.4	773.9	819.4	763.3	781.8	824.5	775.5	788.5	795.6	832.6	795.1	802.5
lb/sec	477.6	406.2	326.7	484.4	407.5	326.8	480.8	406.7	326.6	477.7	472.1	402.6	324.6	462.1	450.6
lb/hr	1,719,263	1,462,443	1,175,966	1,743,744	1,467,074	1,176,583	1,730,830	1,464,022	1,175,917	1,719,845	1,699,503	1,449,276	1,168,633	1,663,590	1,622,231
Energy, Btu/s- Ref 0 °R	152,088	129,960	107,669	149,825	128,447	106,669	150,919	129199	107153	152108	151885	129689	107396	149758	146945
Cp, Btu/lb-R	0.2743	0.2733	0.2735	0.2719	0.2717	0.2722	0.2729	0.2724	0.2727	0.2745	0.2748	0.2735	0.2735	0.2755	0.2758
Emissions (ESTIMATED, NOT FOR GUARANTEE)															
NOx ppmvd Ref 15% O2	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25
NOx as NO2, lb/hr	83	66	50	81	65	49	82	66	50	83	83	66	50	81	79
CO ppmvd Ref 15% O2	12	13	16	13	14	17	13	14	16	12	13	14	16	12	12
CO, lb/hr	24.19	21.65	19.49	25.38	21.77	19.99	25.61	21.78	19.88	23.18	25.38	21.77	19.34	22.91	22.44
CO2, lb/hr	108,608	86,912	65,860	106,185	85,493	64,994	107,531	86323.09	65508.79	108462.80	108717.30	86892.22	65779.12	106308.80	103637.60
HC ppmvd Ref 15% O2	2	2	3	2	2	3	2	2	3	2	2	2	3	2	2
HC, lb/hr	2.64	2.16	1.73	2.61	2.12	1.73	2.67	2.14	1.74	2.59	2.73	2.17	1.73	2.56	2.50
SOX as SO2, lb/hr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Exh Wght % Wet (NOT FOR USE IN ENVIRONMENTAL PERMITS)															
AR	1.2268	1.2320	1.2370	1.2331	1.2373	1.2418	1.2311	1.2359	1.2407	1.2257	1.2272	1.2329	1.2382	1.2246	1.2247
N2	72.1520	72.4445	72.7240	72.5154	72.7509	73.0067	72.3995	72.6700	72.9404	72.0867	72.1800	72.5006	72.7995	72.0256	72.0293
O2	13.2686	13.8856	14.4538	13.7010	14.1426	14.6486	13.4917	14.0207	14.5621	13.2635	13.1644	13.8287	14.4373	13.1266	13.1302
CO2	6.3171	5.9430	5.6005	6.0895	5.8274	5.5239	6.2127	5.8963	5.5709	6.3065	6.3970	5.9956	5.6287	6.3903	6.3886
H20	7.0307	6.4902	5.9800	6.4562	6.0371	5.5742	6.6602	6.1724	5.6812	7.1127	7.0264	6.4374	5.8916	7.2280	7.2224
SO2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
CO	0.0014	0.0015	0.0017	0.0015	0.0015	0.0017	0.0015	0.0015	0.0017	0.0013	0.0015	0.0015	0.0017	0.0014	0.0014
HC	0.0002	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0001	0.0001	0.0002	0.0002	0.0001	0.0001	0.0002	0.0002
NOX	0.0033	0.0031	0.0029	0.0032	0.0030	0.0029	0.0032	0.0031	0.0029	0.0033	0.0033	0.0031	0.0029	0.0033	0.0033

Case #	115	116	117	118	119	120	121	122	123	124	125	126	127	128
	Summer	Summer	Fall	Fall	Fall	Fall	Peak	Peak	Peak	Peak	Max	Max	Max	Max
Ambient Conditions														
Dry Bulb, °F	88.0	88.0	72.0	72.0	72.0	72.0	93.0	93.0	93.0	93.0	110.0	110.0	110.0	110.0
Wet Bulb, °F	70.0	70.0	54.0	54.0	54.0	54.0	73.0	73.0	73.0	73.0	73.0	73.0	73.0	73.0
RH, %	41.1	41.1	29.0	29.0	29.0	29.0	38.9	38.9	38.9	38.9	16.5	16.5	16.5	16.5
Altitude, ft	300.0	300.0	300.0	300.0	300.0	300.0	300.0	300.0	300.0	300.0	300.0	300.0	300.0	300.0
Ambient Pressure, psia	14.537	14.537	14.537	14.538	14.537	14.537	14.537	14.537	14.537	14.537	14.537	14.537	14.537	14.537
Engine Inlet														
Comp Inlet Temp, °F	88.0	88.0	56.7	72.0	72.0	72.0	76.0	93.0	93.0	93.0	78.6	110.0	110.0	110.0
RH, %	41.1	41.1	84.5	29.0	29.0	29.0	87.0	38.9	38.9	38.9	77.2	16.5	16.5	16.5
Conditioning	NONE	NONE	EVAP	NONE	NONE	NONE	EVAP	NONE	NONE	NONE	EVAP	NONE	NONE	NONE
Tons or kBtu/hr	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pressure Losses														
Inlet Loss, inH20	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
Exhaust Loss, inH20	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00
Partload %	**75**	**50**	**100**	**100**	**75**	**50**	**100**	**100**	**75**	**50**	**100**	**100**	**75**	**50**
kW, Gen Terms	**72,410**	**48,283**	**103,540**	**102,922**	**77,207**	**51,482**	**98,252**	**94,747**	**71,075**	**47,397**	**97,696**	**91,566**	**68,688**	**45,806**
Est. Btu/kW-hr, LHV	**8613**	**9807**	**7883**	**7950**	**8466**	**9607**	**8037**	**8122**	**8664**	**9873**	**8050**	**8203**	**8793**	**10037**
Fuel Flow														
MMBtu/hr, LHV	623.7	473.5	816.2	818.2	653.6	494.6	789.6	769.5	615.8	468.0	786.5	751.1	604.0	459.7
lb/hr	32,825	24,922	42,958	43,064	34,402	26,031	41,559	40,502	32,409	24,629	41,392	39,533	31,789	24,197
NOx Control	**Water**	**Water**	**Water**	**Water**	**Water**	**Water**	**Water**	**Water**	**Water**	**Water**	**Water**	**Water**	**Water**	**Water**
Water Injection														
lb/hr	17,972	11,416	27,364	29,283	20,840	13,668	26,114	25,192	17,568	11,161	25,954	24,360	17,359	11,427
Temperature, °F	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Intercooler	**Wet Cooling**	**Wet Cooling**	**Wet Cooling**	**Wet Cooling**	**Wet Cooling**	**Wet Cooling**	**Wet Cooling**	**Wet Cooling**	**Wet Cooling**	**Wet Cooling**	**Wet Cooling**	**Wet Cooling**	**Wet Cooling**	**Wet Cooling**
Humidification	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
IC Heat Extraction, btu/s	23,985	16,231	28,203	29,707	22,451	15,243	32,924	32,110	24,573	16,744	32,794	31,358	24,186	17,167
KOD Water Extraction, lb/s	0.9	0.2	0.2	0.0	0.0	0.0	3.7	1.8	1.2	0.5	3.4	0.1	0.0	0.0
Control Parameters														
HP Speed, RPM	9002	8860	9138	9159	9016	8867	9165	9164	8999	8859	9165	9162	9009	8858
LP Speed, RPM	5105	4984	5266	5332	5054	4930	5316	5372	5122	5001	5324	5424	5181	5062
PT Speed, RPM	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600
PS3 - CDP, psia	453.7	356.6	548.8	548.8	477.0	367.5	533.8	533.8	448.2	354.6	530.3	530.3	436.9	344.3
T23 - Intcrl Inlet Temp, °F	341.7	305.9	339.6	359.3	327.8	289.5	357.6	377.1	346.6	311.1	360.6	396.5	365.4	330.0
P23 - Intcrl Inlet Pressure, psia	49.3	42.0	58.0	57.1	50.7	43.1	55.6	54.4	48.9	41.6	55.4	53.2	47.7	40.7
W23 - Intcrl Inlet Flow, lb/s	396.2	354.6	461.1	454.6	412.2	371.5	443.7	430.7	391.4	350.0	441.7	418.9	382.0	341.6
T25 - HPC Inlet Temp, °F	90.0	90.0	90.0	90.0	90.0	90.0	90.5	90.5	90.5	90.5	90.6	90.6	90.6	90.6
T3CRF - CDT, °F	670	645	693	699	675	650	697	697	669	645	697	697	672	646
T48IN, °R	1964	1896	2027	2044	1971	1903	2044	2044	1962	1895	2044	2044	1970	1900
T48IN, °F	1504	1436	1567	1584	1511	1443	1584	1584	1502	1436	1584	1584	1510	1440
Exhaust Parameters														
Temperature, °F	804.3	841.1	775.5	788.5	795.6	832.6	798.8	806.3	807.3	844.3	800.0	813.5	820.7	854.6
lb/sec	386.6	312.6	477.7	472.1	402.6	324.6	456.3	444.7	382.4	309.2	454.5	434.1	372.7	302.7
lb/hr	1,391,885	1,125,217	1,719,845	1,699,503	1,449,276	1,168,633	1,642,681	1,600,987	1,376,647	1,112,970	1,636,163	1,562,823	1,341,854	1,089,598
Energy, Btu/s- Ref 0 °R	125737	104487	152108	151885	129689	107396	148351	145513	124677	103639	147908	142902	122898	102189
Cp, Btu/lb-R	0.2745	0.2748	0.2745	0.2748	0.2735	0.2735	0.2757	0.2760	0.2746	0.2750	0.2757	0.2763	0.2751	0.2750
Emissions (ESTIMATED, NOT FOR GUARANTEE)														
NOx ppmvd Ref 15% O2	25	25	25	25	25	25	25	25	25	25	25	25	25	25
NOx as NO2, lb/hr	63	48	83	83	66	50	80	78	62	47	80	76	61	46
CO ppmvd Ref 15% O2	13	17	12	13	14	16	12	12	14	17	12	12	14	17
CO, lb/hr	20.63	19.48	23.18	25.38	21.77	19.34	22.57	22.42	20.44	19.43	22.48	22.33	20.50	19.59
CO2, lb/hr	82910.21	62976.51	108462.80	108717.30	86892.22	65779.12	104920.20	102250.20	81860.03	62236.08	104498.50	99803.75	80289.59	61142.33
HC ppmvd Ref 15% O2	2	3	2	2	2	3	2	2	2	3	2	2	2	3
HC, lb/hr	2.06	1.71	2.59	2.73	2.17	1.73	2.53	2.48	2.03	1.70	2.52	2.45	2.03	1.69
SOX as SO2, lb/hr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Exh Wght % Wet (NOT FOR USE IN ENVIRONMENTAL PERMITS)														
AR	1.2295	1.2328	1.2257	1.2272	1.2329	1.2382	1.2245	1.2245	1.2294	1.2326	1.2245	1.2245	1.2296	1.2346
N2	72.2964	72.4775	72.0867	72.1800	72.5006	72.7995	72.0194	72.0197	72.2928	72.4665	72.0198	72.0190	72.3059	72.5872
O2	13.8208	14.3831	13.2635	13.1644	13.8287	14.4373	13.1292	13.1299	13.8342	14.3867	13.1298	13.1304	13.7859	14.3962
CO2	5.9567	5.5968	6.3065	6.3970	5.9956	5.6287	6.3871	6.3867	5.9463	5.5919	6.3868	6.3861	5.9835	5.6115
H20	6.6919	6.3050	7.1127	7.0264	6.4374	5.8916	7.2349	7.2344	6.6925	6.3175	7.2343	7.2351	6.6903	6.1657
SO2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
CO	0.0015	0.0017	0.0013	0.0015	0.0015	0.0017	0.0014	0.0014	0.0015	0.0017	0.0014	0.0014	0.0015	0.0018
HC	0.0001	0.0002	0.0002	0.0002	0.0001	0.0001	0.0002	0.0002	0.0001	0.0002	0.0002	0.0002	0.0002	0.0002
NOX	0.0031	0.0029	0.0033	0.0033	0.0031	0.0029	0.0033	0.0033	0.0031	0.0029	0.0033	0.0033	0.0031	0.0029

Case #	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114
	ISO	**ISO**	**ISO**	**Min**	**Min**	**Min**	**Winter**	**Winter**	**Winter**	**Spring**	**Spring**	**Spring**	**Spring**	**Summer**	**Summer**
Exh Mole % Dry (NOT FOR USE IN ENVIRONMENTAL PERMITS)															
AR	0.9704	0.9680	0.9658	0.9688	0.9671	0.9652	0.9696	0.9676	0.9655	0.9704	0.9709	0.9683	0.9659	0.9709	0.9709
N2	81.3855	81.1678	80.9707	81.2442	81.0918	80.9180	81.3167	81.1326	80.9459	81.3828	81.4280	81.1939	80.9827	81.4318	81.4307
O2	13.1031	13.6206	14.0892	13.4390	13.8013	14.2145	13.2667	13.7045	14.1482	13.1096	13.0020	13.5586	14.0605	12.9931	12.9958
CO2	4.5358	4.2385	3.9693	4.3429	4.1348	3.8973	4.4418	4.1904	3.9353	4.5321	4.5938	4.2741	3.9857	4.5990	4.5975
H20	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
SO2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
CO	0.0016	0.0017	0.0018	0.0016	0.0017	0.0019	0.0017	0.0017	0.0019	0.0015	0.0017	0.0017	0.0018	0.0016	0.0016
HC	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003
NOX	0.0033	0.0031	0.0029	0.0032	0.0030	0.0028	0.0032	0.0030	0.0029	0.0033	0.0033	0.0031	0.0029	0.0034	0.0033
Exh Mole % Wet (NOT FOR USE IN ENVIRONMENTAL PERMITS)															
AR	0.8639	0.8697	0.8752	0.8709	0.8755	0.8806	0.8686	0.8739	0.8793	0.8627	0.8643	0.8707	0.8766	0.8614	0.8615
N2	72.4508	72.9220	73.3739	73.0298	73.4100	73.8253	72.8432	73.2798	73.7184	72.3487	72.4924	73.0091	73.4928	72.2504	72.2563
O2	11.6646	12.2369	12.7673	12.0802	12.4939	12.9685	11.8843	12.3780	12.8850	11.6543	11.5752	12.1918	12.7601	11.5281	11.5316
CO2	4.0378	3.8079	3.5969	3.9038	3.7431	3.5557	3.9789	3.7848	3.5840	4.0290	4.0897	3.8432	3.6171	4.0805	4.0795
H20	10.9782	10.1591	9.3822	10.1108	9.4730	8.7653	10.4203	9.6789	8.9288	11.1007	10.9736	10.0806	9.2489	11.2749	11.2665
SO2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
CO	0.0014	0.0015	0.0017	0.0015	0.0015	0.0017	0.0015	0.0015	0.0017	0.0014	0.0015	0.0015	0.0017	0.0014	0.0014
HC	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003
NOX	0.0029	0.0028	0.0026	0.0028	0.0027	0.0026	0.0029	0.0028	0.0026	0.0029	0.0030	0.0028	0.0026	0.0030	0.0030
O2 Correction Factor	0.7583	0.8118	0.8672	0.7922	0.8323	0.8834	0.7744	0.8212	0.8748	0.7589	0.7486	0.8050	0.8636	0.7478	0.7480
Exhaust Molecular Weight	28.130	28.199	28.264	28.213	28.268	28.328	28.186	28.249	28.313	28.116	28.135	28.211	28.281	28.102	28.102
Stack Emissions (after SCR/oxcat)															
NOx ppmvd Ref 15% O2	**2.5**	**2.5**	**2.5**	**2.5**	**2.5**	**2.5**	**2.5**	**2.5**	**2.5**	**2.5**	**2.5**	**2.5**	**2.5**	**2.5**	**2.5**
CO ppmvd Ref 15% O2	**4.0**	**4.0**	**4.0**	**4.0**	**4.0**	**4.0**	**4.0**	**4.0**	**4.0**	**4.0**	**4.0**	**4.0**	**4.0**	**4.0**	**4.0**
VOC ppmvd Ref 15% O2	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**
NH3 ppmvd Ref 15% O2	**5.0**	**5.0**	**5.0**	**5.0**	**5.0**	**5.0**	**5.0**	**5.0**	**5.0**	**5.0**	**5.0**	**5.0**	**5.0**	**5.0**	**5.0**
NOx as NO2, lb/hr	**8.253**	**6.601**	**5.000**	**8.066**	**6.492**	**4.934**	**8.170**	**6.556**	**4.973**	**8.241**	**8.262**	**6.600**	**4.994**	**8.079**	**7.876**
CO, lb/hr	**8.040**	**6.431**	**4.871**	**7.858**	**6.325**	**4.806**	**7.959**	**6.387**	**4.845**	**8.029**	**8.048**	**6.430**	**4.865**	**7.870**	**7.672**
VOC, lb/hr	**2.302**	**1.842**	**1.395**	**2.250**	**1.811**	**1.376**	**2.279**	**1.829**	**1.387**	**2.299**	**2.305**	**1.841**	**1.393**	**2.254**	**2.197**
NH3, lb/hr	**6.110**	**4.887**	**3.702**	**5.972**	**4.807**	**3.653**	**6.049**	**4.854**	**3.682**	**6.102**	**6.117**	**4.886**	**3.697**	**5.981**	**5.831**
SOX, lb/hr (based on 0.25 gr/100 SCF)	**0.617**	**0.494**	**0.374**	**0.603**	**0.486**	**0.369**	**0.611**	**0.490**	**0.372**	**0.616**	**0.618**	**0.494**	**0.373**	**0.604**	**0.589**
PM10, lb/hr	**5.500**	**5.000**	**5.000**	**5.500**	**5.000**	**5.000**	**5.500**	**5.000**	**5.000**	**5.500**	**5.500**	**5.000**	**5.000**	**5.500**	**5.500**

Case #	115	116	117	118	119	120	121	122	123	124	125	126	127	128
	Summer	**Summer**	**Fall**	**Fall**	**Fall**	**Fall**	**Peak**	**Peak**	**Peak**	**Peak**	**Max**	**Max**	**Max**	**Max**
Exh Mole % Dry (NOT FOR USE IN ENVIRONMENTAL PERMITS)														
AR	0.9681	0.9659	0.9704	0.9709	0.9683	0.9659	0.9709	0.9709	0.9681	0.9659	0.9709	0.9709	0.9683	0.9659
N2	81.1819	80.9790	81.3828	81.4280	81.1939	80.9827	81.4304	81.4301	81.1764	80.9768	81.4302	81.4298	81.1961	80.9823
O2	13.5871	14.0694	13.1096	13.0020	13.5586	14.0605	12.9965	12.9971	13.6001	14.0746	12.9970	12.9977	13.5534	14.0614
CO2	4.2578	3.9806	4.5321	4.5938	4.2741	3.9857	4.5970	4.5967	4.2503	3.9775	4.5967	4.5963	4.2771	3.9851
H20	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
SO2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
CO	0.0017	0.0019	0.0015	0.0017	0.0017	0.0018	0.0016	0.0016	0.0017	0.0020	0.0016	0.0016	0.0017	0.0020
HC	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003
NOX	0.0031	0.0029	0.0033	0.0033	0.0031	0.0029	0.0033	0.0033	0.0031	0.0029	0.0033	0.0033	0.0031	0.0029
Exh Mole % Wet (NOT FOR USE IN ENVIRONMENTAL PERMITS)														
AR	0.8669	0.8705	0.8627	0.8643	0.8707	0.8766	0.8613	0.8613	0.8668	0.8703	0.8613	0.8613	0.8670	0.8726
N2	72.6882	72.9839	72.3487	72.4924	73.0091	73.4928	72.2409	72.2413	72.6828	72.9668	72.2414	72.2401	72.7024	73.1570
O2	12.1656	12.6803	11.6543	11.5752	12.1918	12.7601	11.5299	11.5305	12.1771	12.6824	11.5304	11.5309	12.1356	12.7026
CO2	3.8123	3.5876	4.0290	4.0897	3.8432	3.6171	4.0782	4.0780	3.8056	3.5841	4.0780	4.0776	3.8297	3.6000
H20	10.4625	9.8730	11.1007	10.9736	10.0806	9.2489	11.2851	11.2843	10.4632	9.8917	11.2842	11.2854	10.4607	9.6631
SO2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
CO	0.0015	0.0017	0.0014	0.0015	0.0015	0.0017	0.0014	0.0014	0.0015	0.0018	0.0014	0.0014	0.0015	0.0018
HC	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003
NOX	0.0028	0.0026	0.0029	0.0030	0.0028	0.0026	0.0030	0.0030	0.0028	0.0026	0.0030	0.0030	0.0028	0.0026
O2 Correction Factor	0.8081	0.8648	0.7589	0.7486	0.8050	0.8636	0.7481	0.7482	0.8095	0.8654	0.7481	0.7482	0.8044	0.8637
Exhaust Molecular Weight	28.166	28.210	28.116	28.135	28.211	28.281	28.100	28.100	28.165	28.207	28.100	28.100	28.168	28.234
Stack Emissions (after SCR/oxcat)														
NOx ppmvd Ref 15% O2	**2.5**	**2.5**	**2.5**	**2.5**	**2.5**	**2.5**	**2.5**	**2.5**	**2.5**	**2.5**	**2.5**	**2.5**	**2.5**	**2.5**
CO ppmvd Ref 15% O2	**4.0**	**4.0**	**4.0**	**4.0**	**4.0**	**4.0**	**4.0**	**4.0**	**4.0**	**4.0**	**4.0**	**4.0**	**4.0**	**4.0**
VOC ppmvd Ref 15% O2	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**
NH3 ppmvd Ref 15% O2	**5.0**	**5.0**	**5.0**	**5.0**	**5.0**	**5.0**	**5.0**	**5.0**	**5.0**	**5.0**	**5.0**	**5.0**	**5.0**	**5.0**
NOx as NO2, lb/hr	**6.297**	**4.781**	**8.241**	**8.262**	**6.600**	**4.994**	**7.973**	**7.770**	**6.218**	**4.725**	**7.941**	**7.584**	**6.099**	**4.642**
CO, lb/hr	**6.135**	**4.658**	**8.029**	**8.048**	**6.430**	**4.865**	**7.767**	**7.569**	**6.057**	**4.603**	**7.736**	**7.388**	**5.941**	**4.522**
VOC, lb/hr	**1.757**	**1.334**	**2.299**	**2.305**	**1.841**	**1.393**	**2.224**	**2.168**	**1.735**	**1.318**	**2.215**	**2.116**	**1.701**	**1.295**
NH3, lb/hr	**4.662**	**3.540**	**6.102**	**6.117**	**4.886**	**3.697**	**5.903**	**5.753**	**4.603**	**3.498**	**5.879**	**5.615**	**4.515**	**3.437**
SOX, lb/hr (based on 0.25 gr/100 SCF)	**0.471**	**0.358**	**0.616**	**0.618**	**0.494**	**0.373**	**0.596**	**0.581**	**0.465**	**0.353**	**0.594**	**0.567**	**0.456**	**0.347**
PM10, lb/hr	**5.000**	**5.000**	**5.500**	**5.500**	**5.000**	**5.000**	**5.500**	**5.500**	**5.000**	**5.000**	**5.500**	**5.500**	**5.000**	**5.000**

For 76-100% load Cases the guaranteed PM10 emission rate is 5.0 lb/hr, adding 0.5 lb/hr margin: stack emissions = 5.0 lb/hr

For 50-75% load Cases the guaranteed PM10 emission rate is 4.5 lb/hr, adding 0.5 lb/hr margin: stack emissions = 5.5 lb/hr

Aero Energy Fuel Number	**10-1 (GEDEF)**	
	Volume %	**Weight %**
Hydrogen	0.0000	0.0000
Methane	84.5000	71.8447
Ethane	5.5800	8.8924
Ethylene	0.0000	0.0000
Propane	2.0500	4.7909
Propylene	0.0000	0.0000
Butane	0.7800	2.4027
Butylene	0.0000	0.0000
Butadiene	0.0000	0.0000
Pentane	0.1800	0.6883
Cyclopentane	0.0000	0.0000
Hexane	0.1700	0.7764
Heptane	0.0000	0.0000
Carbon Monoxide	0.0000	0.0000
Carbon Dioxide	0.6700	1.5628
Nitrogen	5.9300	8.8044
Water Vapor	0.0000	0.0000
Oxygen	0.1400	0.2374
Hydrogen Sulfide	0.0000	0.0000
Ammonia	0.0000	0.0000
Btu/lb, LHV	19000	
Btu/scf, LHV	946.0	
Btu/scf, HHV	1047.0	
Btu/lb, HHV	20996	
Fuel Temp, °F	77.0	
NOx Scalar	0.998	
Specific Gravity	0.65	

Case #	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114
Wobbe	50.657	50.657	50.657	50.657	50.657	50.657	50.657	50.657	50.657	50.657	50.657	50.657	50.657	50.657	50.657

Case #	115	116	117	118	119	120	121	122	123	124	125	126	127	128
Wobbe	50.657	50.657	50.657	50.657	50.657	50.657	50.657	50.657	50.657	50.657	50.657	50.657	50.657	50.657

Case #	100	101	102	103	104	105	106	107	108	109	110	111	112
	ISO	ISO	ISO	Min	Min	Min	Winter	Winter	Winter	Spring	Spring	Spring	Spring
Engine Exhaust													
Exhaust Avg. Mol. Wt., Wet Basis	28.1	28.2	28.3	28.2	28.3	28.3	28.2	28.2	28.3	28.1	28.1	28.2	28.3
Inlet Flow Wet, pps	460.7	418.0	377.7	467.7	432.1	392.7	463.8	424.2	384.6	461.3	454.8	412.4	371.7
Inlet Flow Dry, pps	457.7	415.3	375.2	466.7	431.2	391.9	462.4	423.0	383.5	457.4	452.6	410.4	369.9
Shaft HP	140762	105840	70978	138434	104100	69819	139612	104986	70406	140764	139924	105220	70563
Generator Information													
Capacity kW	179,842	179,842	179,842	179,842	195,942	195,942	195,942	187233	187233	187233	170534	170534	170534
Efficiency	0.9864	0.9841	0.9785	0.9837	0.9839	0.9782	0.9838	0.9840	0.9784	0.9839	0.9864	0.9840	0.9784
Inlet Temp, °F	59.0	59.0	59.0	30.0	30.0	30.0	47.0	47.0	47.0	72.0	72.0	72.0	72.0
Gear Box Loss	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
8th Stage Bleed													
Flow, pps	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pressure, psia	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Temperature, °R	0	0	0	0	0	0	0	0	0	0	0	0	0
CDP Bleed													
Flow, pps	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pressure, psia	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Est. Gas Pressure at Baseplate, psig	**842.1**	**694.0**	**543.3**	**835.3**	**688.1**	**539.3**	**839.0**	691.3	541.6	841.7	838.8	691.3	541.5
WAR36 - Combustor Water to Air Ratio	0.0306	0.0267	0.0229	0.0263	0.0229	0.0195	0.0277	0.0239	0.0202	0.0314	0.0303	0.0259	0.0219
CardPack	**8ih**	**8ih**	**8ih**	**8ih**	**8ih**	**8ih**	**8ih**	8ih	8ih	8ih	8ih	8ih	8ih
Intercooler CardPack													
NSI	**332**	**0**	**0**	**332**	**0**	**0**	**332**	0	0	332	304	0	0
NSI	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0	0	0	0	0	0
NSI	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0	0	0	0	0	0

Case #	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128
	Summer	Summer	Summer	Summer	Fall	Fall	Fall	Fall	Peak	Peak	Peak	Peak	Max	Max	Max	Max
Engine Exhaust																
Exhaust Avg. Mol. Wt., Wet Basis	28.1	28.1	28.2	28.2	28.1	28.1	28.2	28.3	28.1	28.1	28.2	28.2	28.1	28.1	28.2	28.2
Inlet Flow Wet, pps	448.8	436.2	396.4	354.8	461.3	454.8	412.4	371.7	443.9	431.0	391.6	350.2	441.9	419.1	382.2	341.7
Inlet Flow Dry, pps	442.0	431.1	391.7	350.6	457.4	452.6	410.4	369.9	436.4	425.3	386.5	345.6	434.6	415.2	378.7	338.6
Shaft HP	135988	131281	98752	66259	140764	139924	105220	70563	133615	128888	96951	65064	132873	124586	93734	62925
Generator Information																
Capacity kW	181340	170534	157130	157130	170534	170534	170534	170534	152498	157130	152498	152498	135236	152498	135236	135236
Efficiency	0.9835	0.9831	0.9833	0.9772	0.9864	0.9864	0.9840	0.9784	0.9861	0.9829	0.9831	0.9769	0.9860	0.9825	0.9827	0.9762
Inlet Temp, °F	88.0	88.0	88.0	88.0	72.0	72.0	72.0	72.0	93.0	93.0	93.0	93.0	110.0	110.0	110.0	110.0
Gear Box Loss	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	N/A	N/A	N/A
8th Stage Bleed																
Flow, pps	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pressure, psia	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Temperature, °R	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CDP Bleed																
Flow, pps	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pressure, psia	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Est. Gas Pressure at Baseplate, psig	821.2	801.1	662.4	520.7	841.7	838.8	691.3	541.5	810.9	790.8	654.8	515.1	807.8	772.4	640.9	505.5
WAR36 - Combustor Water to Air Ratio	0.0320	0.0319	0.0283	0.0259	0.0314	0.0303	0.0259	0.0219	0.0320	0.0320	0.0284	0.0260	0.0320	0.0319	0.0281	0.0244
CardPack	8ih	8ih	8ih	8ih	8ih	8ih	8ih	8ih	8ih	8ih	8ih	8ih	8ih	8ih	8ih	8ih
Intercooler CardPack																
NSI	304	304	0	0	332	304	0	0	304	304	0	0	304	304	0	0
NSI	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NSI	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

PPEC

Turbine Scenarios

Case #	100 ISO	101 ISO	102 ISO	103 Min	104 Min	105 Min	106 Winter	107 Winter	108 Winter	109 Spring	110 Spring	111 Spring	112 Spring	113 Summer	114 Summer	115 Summer	116 Summer	117 Fall	118 Fall	119 Fall	120 Fall	121 Peak	122 Peak	123 Peak	124 Peak	125 Max	126 Max	127 Max	128 Max
Ambient Data and Turbine Setting																													
Ambient Temperature [Dry Bulb) (°F)	59	59	59	30	30	30	47	47	47	72	72	72	72	88	88	88	88	72	72	72	72	93	93	93	93	110	110	110	110
Relative Humidity (%)	60	60	60	60	60	60	41.3	41.3	41.3	29	29	29	29	41.1	41.1	41.1	41.1	29	29	29	29	38.9	38.9	38.9	38.9	16.5	16.5	16.5	16.5
CTG Load Level (%)	100	75	50	100	75	50	100	75	50	100	100	75	50	100	100	75	50	100	100	75	50	100	100	75	50	100	100	75	50
Evap. Cooler	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	EVAP	NONE	NONE	NONE	EVAP	NONE	NONE	NONE	EVAP	NONE	NONE	NONE	EVAP	NONE	NONE	NONE	EVAP	NONE	NONE	NONE
Stack Exhaust Parameters																													
Heat Consumed (MMBTU/hr) - LHV	817.3	653.7	495.2	798.8	643.0	488.6	809.1	649.3	492.5	816.2	818.2	653.6	494.6	800.1	779.9	623.7	473.5	816.2	818.2	653.6	494.6	789.7	769.5	615.8	468.0	786.5	751.1	604.0	459.8
Turbine Outlet Temperature (°F)	776.5	786.9	827.2	748.4	773.9	819.4	763.3	781.8	824.5	775.5	788.5	795.6	832.6	795.1	802.5	804.3	841.1	775.5	788.5	795.6	832.6	798.8	806.3	807.3	844.3	800	813.5	820.7	854.6
Turbine Outlet Temperature (°K)	686.8	692.5	714.9	671.2	685.3	710.6	679.4	689.7	713.4	686.2	693.4	697.4	717.9	697.1	701.2	702.2	722.7	686.2	693.4	697.4	717.9	699.2	703.3	703.9	724.4	699.8	707.3	711.3	730.2
Exhaust Flow (lb/hr)	1,719,263	1,462,443	1,175,966	1,743,744	1,467,074	1,176,583	1,730,830	1,464,022	1,175,917	1,719,845	1,699,503	1,449,276	1,168,633	1,663,590	1,622,231	1,391,885	1,125,217	1,719,845	1,699,503	1,449,276	1,168,633	1,642,681	1,600,987	1,376,647	1,112,970	1,636,163	1,562,823	1,341,854	1,089,598
Exhaust Flow (acfm)	894,492	767,276	636,921	886,607	761,679	633,393	890,895	764,962	635,558	894,071	892,795	765,675	635,605	878,550	861,761	740,451	616,017	894,071	892,795	765,675	635,605	870,066	853,036	734,083	610,811	867,440	837,437	723,097	602,708
Stack Exit Velocity (m/s)	27.5	23.6	19.6	27.3	23.4	19.5	27.4	23.5	19.6	27.5	27.5	23.6	19.6	27.0	26.5	22.8	19.0	27.5	27.5	23.6	19.6	26.8	26.2	22.6	18.8	26.7	25.8	22.2	18.5
Stack Exhaust Emissions (after all controls)																													
NO_x as NO_2 (lb/hr)	8.253	6.601	5.000	8.066	6.492	4.934	8.170	6.556	4.973	8.241	8.262	6.600	4.994	8.079	7.876	6.297	4.781	8.241	8.262	6.600	4.994	7.973	7.770	6.218	4.725	7.941	7.584	6.099	4.642
CO (lb/hr)	8.040	6.431	4.871	7.858	6.325	4.806	7.959	6.387	4.845	8.029	8.048	6.430	4.865	7.870	7.672	6.135	4.658	8.029	8.048	6.430	4.865	7.767	7.569	6.057	4.603	7.736	7.388	5.941	4.522
VOC (lb/hr)	2.302	1.842	1.395	2.250	1.811	1.376	2.279	1.829	1.387	2.299	2.305	1.841	1.393	2.254	2.197	1.757	1.334	2.299	2.305	1.841	1.393	2.224	2.168	1.735	1.318	2.215	2.116	1.701	1.295
NH_3 (lb/hr)	6.110	4.887	3.702	5.972	4.807	3.653	6.049	4.854	3.682	6.102	6.117	4.886	3.697	5.981	5.831	4.662	3.540	6.102	6.117	4.886	3.697	5.903	5.753	4.603	3.498	5.879	5.615	4.515	3.437
SO_X (lb/hr, based on 0.25 gr/SCF)	0.617	0.494	0.374	0.603	0.486	0.369	0.611	0.490	0.372	0.616	0.618	0.494	0.373	0.604	0.589	0.471	0.358	0.616	0.618	0.494	0.373	0.596	0.581	0.465	0.353	0.594	0.567	0.456	0.347
PM_{10} (lb/hr)	5.500	5.000	5.000	5.500	5.000	5.000	5.500	5.000	5.000	5.500	5.500	5.000	5.000	5.500	5.500	5.000	5.000	5.500	5.500	5.000	5.000	5.500	5.500	5.000	5.000	5.500	5.500	5.000	5.000

Note:

1. Data is for each turbine and is from turbine vendor (GE LMS100 PA turbine, test version 3.8.6, 04/07/2010).
2. SO_x emissions here in this table are based on 0.25 gr/100 SCF sulfer content in the natural gas fuel.
3. SO_x emissions for the modeling use 0.75 gr/100 SCF sulfer content in the natural gas fuel for all the short-term runs and 0.25 gr/SCF for annual run.

Other Turbine Stack Parameters

Stack Diameter =	14.5	(ft)	
Stack Exit Area (cross-section) =	165.13	(ft^2)	
Stack Height =	100	(ft)	
Altitude =	300	(ft)	
Site elevation for all turbine stacks=	370	(ft)	
Ambient Pressure =	14.537	~	14.538 (psia)
Stack Emissions - NO_x =	2.5	(ppmvd Ref 15% O2)	
Stack Emissions - CO =	4.0	(ppmvd Ref 15% O2)	
Stack Emissions - VOC =	2.0	(ppmvd Ref 15% O2)	
Stack Emissions - NH_3 =	5.0	(ppmvd Ref 15% O2)	

Model Results -

Maximum X/Q concentration (ug/m³/(g/s)) predicted from AERMOD

	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128
1 hour	32.195	38.633	44.587	33.359	39.254	44.834	32.731	38.882	44.679	32.243	31.966	38.510	44.566	32.517	33.190	39.892	45.238	32.243	31.966	38.510	44.566	32.856	33.548	40.162	45.403	32.959	34.192	40.459	45.595
3 hour	23.878	28.927	33.921	24.794	29.432	34.136	24.299	29.130	34.001	23.915	23.695	28.825	33.901	24.117	24.635	29.772	34.482	23.915	23.695	28.825	33.901	24.378	24.911	30.170	34.625	24.457	25.408	30.406	34.791
8 hour	11.700	13.816	15.945	12.085	14.028	16.041	11.877	13.901	15.980	11.716	11.623	13.773	15.936	11.800	12.018	14.171	16.197	11.716	11.623	13.773	15.936	11.910	12.134	14.330	16.261	11.943	12.343	14.430	16.336
24 hour	5.598	6.600	7.650	5.779	6.702	7.701	5.681	6.641	7.669	5.605	5.562	6.580	7.645	5.645	5.748	6.771	7.808	5.605	5.562	6.580	7.645	5.697	5.802	6.844	7.860	5.713	5.901	6.892	7.922
annual	0.750	0.860	0.982	0.769	0.871	0.989	0.759	0.864	0.985	0.751	0.746	0.858	0.982	0.755	0.766	0.880	1.001	0.751	0.746	0.858	0.982	0.761	0.772	0.885	1.006	0.763	0.783	0.891	1.012

Maximum Concentration (ug/m³) predicted per Pollutant Normal Operations

	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128
NO_x 1 hour	33.508	32.161	28.115	33.935	32.139	27.895	33.723	32.147	28.021	33.512	33.306	32.054	28.068	33.128	32.965	31.681	27.278	33.512	33.306	32.054	28.068	33.037	32.874	31.491	27.055	33.007	32.704	31.117	26.693
NO_x annual	0.780	0.716	0.619	0.782	0.713	0.615	0.782	0.715	0.618	0.780	0.777	0.714	0.618	0.769	0.761	0.699	0.604	0.780	0.777	0.714	0.618	0.765	0.757	0.694	0.599	0.764	0.749	0.685	0.592
CO 1 hour	32.642	31.330	27.388	33.058	31.308	27.174	32.852	31.316	27.297	32.646	32.445	31.226	27.343	32.272	32.113	30.863	26.573	32.646	32.445	31.226	27.343	32.183	32.025	30.677	26.356	32.155	31.859	30.313	26.003
CO 8 hour	11.862	11.204	9.794	11.976	11.189	9.723	11.921	11.196	9.763	11.862	11.797	11.168	9.777	11.712	11.628	10.963	9.514	11.862	11.797	11.168	9.777	11.666	11.583	10.946	9.440	11.652	11.500	10.811	9.317
SO_2 1 hour	2.506	2.405	2.102	2.538	2.403	2.086	2.522	2.404	2.095	2.506	2.490	2.397	2.099	2.477	2.465	2.369	2.040	2.506	2.490	2.397	2.099	2.470	2.458	2.355	2.023	2.468	2.445	2.327	1.996
SO_2 3 hour	1.858	1.801	1.599	1.886	1.802	1.588	1.872	1.801	1.595	1.859	1.846	1.794	1.597	1.837	1.830	1.768	1.555	1.859	1.846	1.794	1.597	1.833	1.825	1.769	1.543	1.832	1.817	1.749	1.523
SO_2 24 hour	0.436	0.411	0.361	0.440	0.410	0.358	0.438	0.411	0.360	0.436	0.433	0.410	0.360	0.430	0.427	0.402	0.352	0.436	0.433	0.410	0.360	0.428	0.425	0.401	0.350	0.428	0.422	0.396	0.347
SO_2 annual	0.058	0.054	0.046	0.059	0.053	0.046	0.058	0.053	0.046	0.058	0.058	0.053	0.046	0.058	0.057	0.052	0.045	0.058	0.058	0.053	0.046	0.057	0.057	0.052	0.045	0.057	0.056	0.051	0.044
PM_{10} 24 hour	3.883	4.162	4.824	4.009	4.226	4.856	3.941	4.188	4.835	3.888	3.858	4.149	4.821	3.916	3.987	4.270	4.923	3.888	3.858	4.149	4.821	3.951	4.025	4.315	4.956	3.962	4.093	4.346	4.995
PM_{10} annual	0.520	0.542	0.619	0.533	0.549	0.624	0.526	0.545	0.621	0.521	0.518	0.541	0.619	0.524	0.532	0.555	0.631	0.521	0.518	0.541	0.619	0.528	0.536	0.558	0.634	0.529	0.543	0.562	0.638

PPEC
Startup Emissions

Transient Emissions Summary

LMS100 PA Estimated Startup / Shutdown Emissions at Package Exit

T2 (°F / °C)		CO (lb)*	NOx (lb)*	VOC (lb)*	PM10 (lb)*
-30 / -34.4	Start	15	5	3	11
	Shutdown	59	6	3	11
59 / 15	Start	13	5	3	11
	Shutdown	35	6	3	11
78 / 25.5	Start	13	5	3	11
	Shutdown	29	6	3	11
90 / 32.2	Start	13	5	3	11
	Shutdown	29	6	3	11

* Margined average engine emissions - NOT A GUARANTEE

Assumptions: Natural gas, sea level, 4"/6" losses, water injection to 25 PPM NOx @ 15% O2

May 22, 2006

Notes:

1. The table shown above was provided by GE (and confirmed on 4/27/07).
2. PM_{10} emissions are limited to 5 pounds per hour, not 11 as presented in the table.

Complete Start Emissions
(Ignition to full compliance)

			CO lb	VOC lb	PM10 lb	SO2** lb	Fuel MMBtu
Cold Day	10	minutes, Initial	14.00	3.00	0.83	0.06	26.00
	20	minutes, Final *	3.86	1.67	1.67	0.60	263.27
	30	minutes, Total	17.86	4.67	2.50	0.66	289.27
Avg Day	10	minutes, Initial	13.00	3.00	0.83	0.06	26.00
	20	minutes, Final *	3.86	1.29	1.67	0.60	263.20
	30	minutes, Total	16.86	4.29	2.50	0.66	289.20
Hot Day	10	minutes, Initial	13.00	3.00	0.83	0.06	26.00
	20	minutes, Final *	3.67	1.01	1.67	0.57	250.00
	30	minutes, Total	16.67	4.01	2.50	0.63	276.00
Max	**30**	**minutes, Total**	**17.86**	**4.67**	**2.50**	**0.66**	**289.27**

Notes:

* Oxidation catalyst expected to be fully effective at end of GE 10 minute start interval.

Other emissions during start-up and all emissions during transient assumed to be unabated.

** Based on a gas sulfur content of 0.75 grains/100 scf = 0.002 lb/MMBtu SO2

Startup emission calculations for NOx
NOx

Panoche Energy Center CeDAR Data			Average NOx lb/hr from CeDAR Data[1, 2]	First 9 min Data provided by GE
minute	CeDar 1-min Data for NOx lb/hr	Cedar NOx value plus 20% contingency lb/minute		
1	0	0		0.55556
2	0	0		0.55556
3	0	0		0.55556
4	0	0		0.55556
5	0	0		0.55556
6	0	0		0.55556
7	0	0		0.55556
8	0	0		0.55556
9	0	0		0.55556
10	0	0	0.8351	
11	0	0	0.8351	
12	0	0	0.8351	
13	0	0	0.8351	
14	0	0	0.8351	
15	0	0	0.8351	
16	0	0	0.8351	
17	0	0	0.8351	
18	8.01	0.1602		
19	9.35	0.1870		
20	7.53	0.1506		
21	20.74	0.4148		
22	63.85	1.2770		
23	84.86	1.6972		
24	87.01	1.7402		
25	87.97	1.7594		
26	87.99	1.7598		
27	66.34	1.3268		
28	8.47	0.1694		
29	5.45	0.1090		
30	5.27	0.1054		
			Total	**22.538** lb NOx/30 min startup

Ave Nox lb/hr, minutes 18-30	41.757
Average NOx lb/minute	0.696
Average plus 20% contingency	0.835

Notes:

1. LMS100 1-minute start up emissions data for NOx was provided from the Panoche Energy Center CeDAR system. Data for the first 17 minutes of start up are missing; a contingency of 20% was added to actual data to be conservative.
2. The first nine minutes of start up emissions are based on GE provided emission data for first 10 minutes.
3. Emission rates for minutes 10 - 17 are equal to the average emission rate of minutes 18-30 (plus the 20% contingency).
4. Emission rates for minutes 18-30 equal actual start up emissions from Panoche plus 20% contingency.

Shutdown Emissions

		CO lb	NOx lb	VOC lb	PM10 lb	SO2* lb
Shutdown	10.5 minutes, Total	47.00	6.00	3.00	0.88	0.08

Notes:

* Based on a gas sulfur content of 0.75 grains/100 scf = 0.002 lb/MMBtu SO2

1. Shutdown Emissions for CO, NO2, PM10, and VOC integrated from data provided by GE and Panoche Energy Center data.

2. Shutdown Emissions for SO2 is from Panoche Energy Center data which is 0.05 lbs for entire 10.5 minutes event with 0.5 grains/100 SCF sulfer content.

Startup/shutdown Events and Schedules

Duration	number of startup and shutdown events per turbine
1 hour[1]	1
3 hour	3
8 hour	4
24 hour	4
annual	500

1. In any rolling 60 minutes, a turbine may either have one start up or one shutdown. Per PPA , a turbine will run at least 30 minutes after a start up. Per engineering practices, a turbine must be purged after shoutdown and cannot start for at least 20 minutes.

PPEC
LMS100 Commissioning Data

	Starts	Total Hours	Heat Input MMBtu/hr	Emission Rates (lb/MMBtu) NOx	CO	VOC	SOx*	PM10 (lb/hr)	Total Estimated Emissions per Event (lbs) NOx	CO	VOC	SOx	PM10	Hourly Emission Rates (lbs/hr) NOx	CO	VOC	SOx	PM10
Dry Fire	0	0	0															
First Fire	2	16	75	0.150	0.600	0.015	0.0023	5.000	180.0	720.0	18.0	2.7	80.0	11.25	45.00	1.13	0.17	**5.00**
Sync / AVR testing	3	12	500	0.100	0.150	0.010	0.0023	5.000	600.0	900.0	60.0	13.6	60.0	**50.00**	**75.00**	**5.00**	**1.13**	**5.00**
SCR burn out / AVR testing	2	20	500	0.100	0.150	0.010	0.0023	5.000	1,000.0	1,500.0	100.0	22.7	100.0	**50.00**	**75.00**	**5.00**	**1.13**	**5.00**
Water injection Mapping	2	32	500	0.100	0.150	0.010	0.0023	5.000	1,600.0	2,400.0	160.0	36.2	160.0	**50.00**	**75.00**	**5.00**	**1.13**	**5.00**
Load Catalyst	0		0															
Ammonia Injection Tuning	2	32	500	0.020	0.050	0.003	0.0023	5.000	320.0	800.0	48.0	36.2	160.0	10.00	25.00	1.50	**1.13**	**5.00**
Total	11	112	2075	0.470	1.100	0.048	0.0113	25.000	3,700.0	6,320.0	386.0	111.4	560.0					

Total hours for each stage are based on actually commisioning durations for LMS100 at Panoche Energy Center. TO be conservative actual stage durations were doubled for Pio Pico evaluation.
Emission rates and fuel usage are based on average values for each stage of commissioning as provided by GE.
Commissioning data presented in the above table was provided by Kiewit.

Stack Parameters

	Exhaust Temperature (degree F)	Exhaust Temperature (degree K)	Exhaust Flow (lb/hr)	Exhaust Flow (m/s)
First Fire	859	732.5944	295200	5.0402
All the other phases	760	677.5944	1263600	19.9547

NOTE:

* Based on a gas sulfur content of 0.75 grains/100 scf = 0.002 lb/MMBtu SO2

PPEC

Cooling System Drift Calculation

Emission Calculation

number of cells	12							
design circulating water rate	35,280	gallons/min						
cycles of concentration	4.67							
TDS (after circulated)	5042	mg/liter						
	42.07	lb/1000 gallons						
Drift Eliminator Control	0.00001							
Operating hours per year	4337.5	includes normal operating hours + startups & shutdown hours						
PM_{10}/Total PM ratio	100%							
Drift PM emissions (total)	0.89	lb/hr	, per cell (12) =	0.07	lb/hr	=	0.01	g/s
	3,862.94	lb/yr						
	1.93	**tpy**						

Cycles of concetration and TDS were taken from worst case water balance provided by Kiewit
Design circulation rate and drift eliminator control based on typical vendor specification sheets provided by Kiewit

Stack Parameters

Exit Temperature	302.59	degree K
Exit Velocity	8.86	m/s
Stack Diameter	4.50	m
Stack Height	7.01	m
Base Elevation	112.78	m

PPEC

Turbine Emission Calculation For Normal Operation Modeling

Pollutant	Averaging time	total lb	lb/hr	g/s	Case # From Screening Model Result
NOx	1hr	8.26	8.26	1.0419	case 103
	annual	47,316.40	5.40	0.6812	
CO	1hr	8.05	8.05	1.0150	
	8hr	64.39	8.05	1.0150	
SO2	1hr	1.85	1.85	0.2337	
	3hr	5.56	1.85	0.2337	
	24hr	44.48	1.85	0.2337	
	annual	2,592.86	0.30	0.0373	
PM	24hr	120.00	5.00	0.6306	case 128
	annual	21,687.50	2.48	0.3122	case 128

NOTE:

1. Emission rate for every averaging time use the maximum hourly emission rate from all screening cases.
2. Only emissions for the annual averaging time includes the startup and shutdown.
3. The annual averaging time emissions were calculated based on 4000 hours annually of turbines operating.
4. SO_x emissions for the modeling use 0.75 gr/SCF sulfer content in the natural gas fuel for all the short-term runs and 0.25 gr/SCF for annual run (normal operation only).
5. PM emission rate is based on case 128 (5lb/hr) since this case gives the worst model impact.

Turbine Emission Calculation For Startup Modeling

Pollutant	Averaging time	total lb	lb/hr	g/s	Case # From Screening Model Result
NOx	1hr	26.67	26.67	3.3632	case 103
CO	1hr	53.64	53.64	6.7646	case 103
	8hr	302.10	37.76	4.7622	

NOTE:

1. The PM model run for startup is not needed since PM emission rate during commissioning is identical as it is during normal operation.
2. SO_x emissions for the modeling use 0.75 gr/SCF sulfer content in the natural gas fuel for all the short-term runs.
3. NOx 1 hr scenario calculated with 1 30-min startup, the remaining time at normal ops
4. 1 hr scenarios for CO emissions calculated with 1 10.5-min shutdown, and the remaining time at normal ops
5. 8 hr scenarios for CO emissions calculated with 4 startup and 4 shutdown events, and the remaining time at normal ops
6. PM emission rate is identical as the one in normal operation, so to model PM startup/shutdown is non-necessary.

Turbine Emission Calculation For Commissioning (first fire)

Pollutant	Averaging time	total lb	lb/hr	g/s
NOx	1hr	11.25	11.25	1.4188
CO	1hr	45.00	45.00	5.6750
	8hr	360.00	45.00	5.6750
SO2	1hr	0.17	0.17	0.0214
	3hr	0.51	0.17	0.0214
	24hr	11.78	0.49	0.0619
PM	24hr	120.00	5.00	0.6306

NOTE:

Turbine Emission Calculation For Commissioning (all the other phases)

Pollutant	Averaging time	total lb	lb/hr	g/s
NOx	1hr	50.00	50.00	6.3056
CO	1hr	75.00	75.00	9.4583
	8hr	600.00	75.00	9.4583
SO2	1hr	1.13	1.13	0.1428
	3hr	3.40	1.13	0.1428
	24hr	27.18	1.13	0.1428
PM	24hr	120.00	5.00	0.6306

NOTE:

AERMOD/BEEST Model Input

Normal Operations (Case 103)

StackID	Stack Release Type	FLAT	Description	UTM x (m)	UTM y (m)	Elevation (m)	stack ht (m)	temp (K)	exit velocity (m/s)	diameter (m)	Short-term Emission Rate (g/s) 1hour NO_X	1,8hour CO	1,3,24hour SO_2	24hour PM_{10}	Annual Emission Rate (g/s) NO_X	SO_2	PM_{10}
CTG1				506419.5500	3607141.9900	112.7760	30.4800	671.1500	27.2753	4.4196	1.0419	1.0150	0.2337		0.6812	0.0373	
CTG2				506470.2100	3607163.0200	112.7760	30.4800	671.1500	27.2753	4.4196	1.0419	1.0150	0.2337		0.6812	0.0373	
CTG3				506520.9100	3607184.1400	112.7760	30.4800	671.1500	27.2753	4.4196	1.0419	1.0150	0.2337		0.6812	0.0373	
CTWER01				506368.5118	3607059.3962	112.7760	7.0104	302.5944	8.8639	4.4958							
CTWER02				506370.9065	3607053.6858	112.7760	7.0104	302.5944	8.8639	4.4958							
CTWER03				506386.8166	3607067.0588	112.7760	7.0104	302.5944	8.8639	4.4958							
CTWER04				506389.3273	3607061.2383	112.7760	7.0104	302.5944	8.8639	4.4958							
CTWER05				506405.4456	3607074.6548	112.7760	7.0104	302.5944	8.8639	4.4958							
CTWER06				506407.6561	3607069.0058	112.7760	7.0104	302.5944	8.8639	4.4958							
CTWER07				506423.8517	3607082.3018	112.7760	7.0104	302.5944	8.8639	4.4958							
CTWER08				506426.1440	3607076.6528	112.7760	7.0104	302.5944	8.8639	4.4958							
CTWER09				506442.3544	3607090.0795	112.7760	7.0104	302.5944	8.8639	4.4958							
CTWER10				506444.7286	3607084.4304	112.7760	7.0104	302.5944	8.8639	4.4958							
CTWER11				506460.7452	3607097.6329	112.7760	7.0104	302.5944	8.8639	4.4958							
CTWER12				506463.1495	3607092.0444	112.7760	7.0104	302.5944	8.8639	4.4958							

Normal Operations (Case 128)

StackID	Stack Release Type	FLAT	Description	UTM x (m)	UTM y (m)	Elevation (m)	stack ht (m)	temp (K)	exit velocity (m/s)	diameter (m)	Short-term Emission Rate (g/s) 1hour NO_X	1,8hour CO	1,3,24hour SO_2	24hour PM_{10}	Annual Emission Rate (g/s) NO_X	SO_2	PM_{10}
CTG1				506419.5500	3607141.9900	112.7760	30.4800	730.1500	18.5415	4.4196				0.6306			0.3122
CTG2				506470.2100	3607163.0200	112.7760	30.4800	730.1500	18.5415	4.4196				0.6306			0.3122
CTG3				506520.9100	3607184.1400	112.7760	30.4800	730.1500	18.5415	4.4196				0.6306			0.3122
CTWER01				506368.5118	3607059.3962	112.7760	7.0104	302.5944	8.8639	4.4958				0.0094			0.0046
CTWER02				506370.9065	3607053.6858	112.7760	7.0104	302.5944	8.8639	4.4958				0.0094			0.0046
CTWER03				506386.8166	3607067.0588	112.7760	7.0104	302.5944	8.8639	4.4958				0.0094			0.0046
CTWER04				506389.3273	3607061.2383	112.7760	7.0104	302.5944	8.8639	4.4958				0.0094			0.0046
CTWER05				506405.4456	3607074.6548	112.7760	7.0104	302.5944	8.8639	4.4958				0.0094			0.0046
CTWER06				506407.6561	3607069.0058	112.7760	7.0104	302.5944	8.8639	4.4958				0.0094			0.0046
CTWER07				506423.8517	3607082.3018	112.7760	7.0104	302.5944	8.8639	4.4958				0.0094			0.0046
CTWER08				506426.1440	3607076.6528	112.7760	7.0104	302.5944	8.8639	4.4958				0.0094			0.0046
CTWER09				506442.3544	3607090.0795	112.7760	7.0104	302.5944	8.8639	4.4958				0.0094			0.0046
CTWER10				506444.7286	3607084.4304	112.7760	7.0104	302.5944	8.8639	4.4958				0.0094			0.0046
CTWER11				506460.7452	3607097.6329	112.7760	7.0104	302.5944	8.8639	4.4958				0.0094			0.0046
CTWER12				506463.1495	3607092.0444	112.7760	7.0104	302.5944	8.8639	4.4958				0.0094			0.0046

Startup (all in Case 103)

StackID	Stack Release Type	FLAT	Description	UTM x (m)	UTM y (m)	Elevation (m)	stack ht (m)	temp (K)	exit velocity (m/s)	diameter (m)	Short-term Emission Rate (g/s) 1hour NO_X	1hour CO	8hour CO
CTG1				506419.55	3607141.99	112.7760	30.4800	671.1500	27.2753	4.4196	3.3632	6.7646	4.7622
CTG2				506470.21	3607163.02	112.7760	30.4800	671.1500	27.2753	4.4196	3.3632	6.7646	4.7622
CTG3				506520.91	3607184.14	112.7760	30.4800	671.1500	27.2753	4.4196	3.3632	6.7646	4.7622
CTWER01				506368.5118	3607059.396	112.7760	7.0104	302.5944	8.8639	4.4958			
CTWER02				506370.9065	3607053.686	112.7760	7.0104	302.5944	8.8639	4.4958			
CTWER03				506386.8166	3607067.059	112.7760	7.0104	302.5944	8.8639	4.4958			
CTWER04				506389.3273	3607061.238	112.7760	7.0104	302.5944	8.8639	4.4958			
CTWER05				506405.4456	3607074.655	112.7760	7.0104	302.5944	8.8639	4.4958			
CTWER06				506407.6561	3607069.006	112.7760	7.0104	302.5944	8.8639	4.4958			
CTWER07				506423.8517	3607082.302	112.7760	7.0104	302.5944	8.8639	4.4958			
CTWER08				506426.144	3607076.653	112.7760	7.0104	302.5944	8.8639	4.4958			
CTWER09				506442.3544	3607090.08	112.7760	7.0104	302.5944	8.8639	4.4958			
CTWER10				506444.7286	3607084.43	112.7760	7.0104	302.5944	8.8639	4.4958			
CTWER11				506460.7452	3607097.633	112.7760	7.0104	302.5944	8.8639	4.4958			
CTWER12				506463.1495	3607092.044	112.7760	7.0104	302.5944	8.8639	4.4958			

Commissioning (First Fire) (stack parameters are in commissioning tab)

StackID	Stack Release Type	FLAT	Description	UTM x (m)	UTM y (m)	Elevation (m)	stack ht (m)	temp (K)	exit velocity (m/s)	diameter (m)	Short-term Emission Rate (g/s) 1hour NOx	1,8hour CO	1,3hour SO_2	24hour SO_2	24hour PM_{10}
CTG1				506419.55	3607141.99	112.7760	30.4800	732.5944	5.0402	4.4196	1.4188	5.6750	0.0214	0.0619	0.6306
CTG2				506470.21	3607163.02	112.7760	30.4800	732.5944	5.0402	4.4196	1.4188	5.6750	0.0214	0.0619	0.6306
CTG3				506520.91	3607184.14	112.7760	30.4800	732.5944	5.0402	4.4196	1.4188	5.6750	0.0214	0.0619	0.6306
CTWER01				506368.5118	3607059.396	112.7760	7.0104	302.5944	8.8639	4.4958					
CTWER02				506370.9065	3607053.686	112.7760	7.0104	302.5944	8.8639	4.4958					
CTWER03				506386.8166	3607067.059	112.7760	7.0104	302.5944	8.8639	4.4958					
CTWER04				506389.3273	3607061.238	112.7760	7.0104	302.5944	8.8639	4.4958					
CTWER05				506405.4456	3607074.655	112.7760	7.0104	302.5944	8.8639	4.4958					
CTWER06				506407.6561	3607069.006	112.7760	7.0104	302.5944	8.8639	4.4958					
CTWER07				506423.8517	3607082.302	112.7760	7.0104	302.5944	8.8639	4.4958					
CTWER08				506426.144	3607076.653	112.7760	7.0104	302.5944	8.8639	4.4958					
CTWER09				506442.3544	3607090.08	112.7760	7.0104	302.5944	8.8639	4.4958					
CTWER10				506444.7286	3607084.43	112.7760	7.0104	302.5944	8.8639	4.4958					
CTWER11				506460.7452	3607097.633	112.7760	7.0104	302.5944	8.8639	4.4958					
CTWER12				506463.1495	3607092.044	112.7760	7.0104	302.5944	8.8639	4.4958					

Commissioning (all the other phases) (stack parameters are in commissioning tab)

StackID	Stack Release Type	FLAT	Description	UTM x (m)	UTM y (m)	Elevation (m)	stack ht (m)	temp (K)	exit velocity (m/s)	diameter (m)	Short-term Emission Rate (g/s) 1hour NOx	1,8hour CO	1,3,24hour SO_2	24hour PM_{10}
CTG1				506419.55	3607141.99	112.7760	30.4800	677.5944	19.9547	4.4196	6.3056	9.4583	0.1428	0.6306
CTG2				506470.21	3607163.02	112.7760	30.4800	677.5944	19.9547	4.4196	6.3056	9.4583	0.1428	0.6306
CTG3				506520.91	3607184.14	112.7760	30.4800	677.5944	19.9547	4.4196	6.3056	9.4583	0.1428	0.6306
CTWER01				506368.5118	3607059.396	112.7760	7.0104	302.5944	8.8639	4.4958				
CTWER02				506370.9065	3607053.686	112.7760	7.0104	302.5944	8.8639	4.4958				
CTWER03				506386.8166	3607067.059	112.7760	7.0104	302.5944	8.8639	4.4958				
CTWER04				506389.3273	3607061.238	112.7760	7.0104	302.5944	8.8639	4.4958				
CTWER05				506405.4456	3607074.655	112.7760	7.0104	302.5944	8.8639	4.4958				
CTWER06				506407.6561	3607069.006	112.7760	7.0104	302.5944	8.8639	4.4958				
CTWER07				506423.8517	3607082.302	112.7760	7.0104	302.5944	8.8639	4.4958				
CTWER08				506426.144	3607076.653	112.7760	7.0104	302.5944	8.8639	4.4958				
CTWER09				506442.3544	3607090.08	112.7760	7.0104	302.5944	8.8639	4.4958				
CTWER10				506444.7286	3607084.43	112.7760	7.0104	302.5944	8.8639	4.4958				
CTWER11				506460.7452	3607097.633	112.7760	7.0104	302.5944	8.8639	4.4958				
CTWER12				506463.1495	3607092.044	112.7760	7.0104	302.5944	8.8639	4.4958				

PPEC

Greenhouse Gases Emission Estimations

1. Estimated maximum potential sulfur hexafluoride (SF_6) emissions leakage emissions from proposed circuit breakers and other transmissions system equipment

Breaker	Qty	Typical Make	Typical Model	SF6 Usage (Lbs/Bkr /year)	Leakage Rate (%)	Leakage Lbs/Yr (per Bkr)	Leakage Lbs/Yr (All Bkrs)	CO_2e emissions (metric tons/Yr)
switchyard breakers	3	To be decided		161	0.5%	0.805	2.415	26.18
generator breakers	2			161	0.5%	0.805	1.61	17.45
							CO_2e emissions (metric tons/Yr)	43.63

Note:

Greenhouse Gas Global Warming Potentials (GWPs) - Intergovernmental Panel on Climate Change, Second Assessment Report (1996)

Greenhouse Gas	GWP (SAR, 1996)
SF_6	23,900

2. Estimated maximum potential CO2e emissions from stationary sources

The calculation below is referred to the "*Power/Utility Reporting Protocol Version 1.1 May 2009*", California Climate Action Registry
5.2.2 Fuel Use Calculation-Based Methodology

Step 1. Identify the annual consumption of each fossil and non-fossil fuel type combusted in your operations

Step 2. Apply a heat content factor to convert fuel use from physical units to energy units

	Operation mode	Max Fuel Flow HHV (MMBtu/hr)	Hours of Operation (hr/yr)	Total Annual Fuel Consumed (MMBtu)
One Turbine (LMS100 simple cycle)	normal op	912.33	4,000.00	3,649,305
	startup	322.53	250.00	80,633
	shutdown	456.16	87.50	39,914
			Total	**3,769,853**

Step 3. Calculate or select the appropriate emission factor for each fuel

Find the emission factors for natural gas and diesel

Natural gas	Unit
53.06	(kg CO2/MMBtu)
0.003901	(kg CH4/MMBtu)
0.001361	(kg N2O/MMBtu)

Step 4. Calculate each fuel's CO2 emissions and convert to metric tons

(1) One Turbine

Total Emissions (metric tons) = Adjusted Emission Factor (kg CO_2/MMBtu) x Fuel Consumed (MMBtu) x 0.001 metric tons/kg

= 200,028.39 metric tons

Step 5 . Calculate each fuel's CH4 and N2O emissions, if any, and convert to metric tons

(1) One Turbine

Total CH_4 Emissions (metric tons) = Adjusted Emission Factor (kg CH_4/MMBtu) x Fuel Consumed (MMBtu) x 0.001 metric tons/kg

= 14.70619544 metric tons

Total N_2O Emissions (metric tons) = Adjusted Emission Factor (kg N_2O/MMBtu) x Fuel Consumed (MMBtu) x 0.001 metric tons/kg

= 5.130769545 metric tons

Step 6. Convert CH4 and N2O emissions to CO2 equivalent and sum all subtotals

Greenhouse Gas GWP (SAR, 1996)

Source: Intergovernmental Panel on Climate Change, Second Assessment Report (1996)

Greenhouse Gas	GWP (SAR, 1996)
CO2	1
CH4	21
N2O	310

RESULTS

One Turbine : Total Metric Tons of CO_2e = Total Metric Tons of CO_2 + CH_4 Tons of CO_2e + N_2O Tons of CO_2e

= 201,927.75

3. Total Project GHG Emissions

Sources	3 Turbine	CO_2e leakage emissions from circuit breakers and transmissions system	Total Project
Metric Tons of CO_2e per year	605,783.26	43.63	605,826.90

1,301,250	MW-hr per year
1,301,250,000	kW-hr per year
0.000465573	metric tonnes/kW-hour
1.026588515	lb/kW-hour

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Annual Hazardous Air Pollutant Emissions from Pio Pico Energy Center
Including One Time Commissioning Emissions

Federal HAP	Annual HAP Emissions (Tons/year)					
	3 CTGs normal full load operation	3 CTGs startup	3 CTGs shutdown	3 CTGs commissioning	Cooling System	Total PPEC
1,3-Butadiene	0.001	0.000	0.000	0.000		0.001
Acetaldehyde	0.109	0.302	0.075	0.092		0.579
Acrolein	0.017	0.016	0.004	0.005		0.043
Arsenic					3.22E-06	0.000
Benzene	0.033	0.006	0.001	0.002		0.042
Carbon Tetrachloride					3.76E-06	0.000
Chlorine					4.11E-01	0.411
Chromium					5.01E-06	0.000
Ethylbenzene	0.009	0.008	0.002	0.002		0.021
Formaldehyde	2.454	1.094	0.271	0.334		4.152
Hexane	0.695	0.061	0.015	0.019		0.790
Lead					1.54E-06	0.000
Propylene Oxide	0.079	0.007	0.002	0.002		0.090
Toluene	0.355	0.022	0.005	0.007		0.390
Xylenes	0.175	0.001	0.000	0.000		0.176
Naphthalene	0.004	0.000	0.000	0.000		0.004
PAHs (other than naphthalene)	0.002	0.000	0.000	0.000		0.002
Total HAP emissions (ton/yr)						**6.700**

Note: Ammonia, propylene, copper, fluoride and diesel particulate are not federally regulated HAPs.
For the CAA112 requirements the combination of all Polyaromatic Hydrocarbons (PAH) will be considered Polycylic Organic Matter (POM), each individual PAH is not a HAP.

Toxic Air Contaminant Emissions from Each GE LMS 100 Simple Cycle Turbine During Normal Operations

Max Fuel Flow (HHV) **912.3** **MMBtu/hr**
Maximum annual hours of operation **4000** **hr/yr**
Normal operational hour in a non commissioning year and without including any startup/shutdown time
Maximum operations fuel flow based on spring/fall temperature operation scenario (72°F; 100% load, no EVAP)
There are 3 turbines for the entire Project

					Per turbine			
Pollutant	**CAS**	**Emission Factor (lb/MMBtu)**	**Emission Factor (lb/MMcf)**	**Emission factor source**	**Hourly Emission Rate (lb/hr)**	**Annual Emission Rate (lb/yr)**	**Max Normal Emissions in 1 hour w startup (lb/hr)**	**Total Turbines Annual Emission Rate (ton/yr)**
Ammonia	7664417			max TBACT level	6.117	2.45E+04	3.059	3.67E+01
1,3-Butadiene	106990	2.15E-07	2.20E-04	AP-42 w CO catalyst 50% reduction	1.96E-04	7.84E-01	9.80E-05	1.18E-03
Acetaldehyde	75070	1.99E-05	2.04E-02	AP-42 w CO catalyst 50% reduction	1.82E-02	7.27E+01	9.09E-03	1.09E-01
Acrolein	107028	3.19E-06	3.27E-03	AP-42 w CO catalyst 50% reduction	2.91E-03	1.17E+01	1.46E-03	1.75E-02
Benzene	71432	5.96E-06	6.10E-03	AP-42 w CO catalyst 50% reduction	5.43E-03	2.17E+01	2.72E-03	3.26E-02
Ethylbenzene	100414	1.59E-06	1.63E-03	AP-42 w CO catalyst 50% reduction	1.45E-03	5.81E+00	7.26E-04	8.71E-03
Formaldehyde	50000	4.48E-04	4.59E-01	CATEF w 50% reduction	4.09E-01	1.64E+03	2.04E-01	2.45E+00
Hexane	110543	1.27E-04	1.30E-01	CATEF w 50% reduction	1.16E-01	4.63E+02	5.79E-02	6.95E-01
Propylene	115071	3.77E-04	3.86E-01	CATEF w 50% reduction	3.44E-01	1.38E+03	1.72E-01	2.06E+00
Propylene Oxide	75569	1.45E-05	1.48E-02	AP-42 w CO catalyst 50% reduction	1.32E-02	5.27E+01	6.59E-03	7.91E-02
Toluene	108883	6.49E-05	6.65E-02	AP-42 w CO catalyst 50% reduction	5.92E-02	2.37E+02	2.96E-02	3.55E-01
Xylenes	1330207	3.19E-05	3.27E-02	AP-42 w CO catalyst 50% reduction	2.91E-02	1.17E+02	1.46E-02	1.75E-01
PAHs w toxicity factors								
Benzo(a)anthracene	56553	1.10E-08	1.13E-05	CATEF w 50% reduction	1.01E-05	4.03E-02	5.03E-06	6.04E-05
Benzo(a)pyrene	50328	6.79E-09	6.95E-06	CATEF w 50% reduction	3.98E-05	1.32E-01	1.99E-05	1.98E-04
Benzo(b)fluoranthene	205992	5.52E-09	5.65E-06	CATEF w 50% reduction	5.03E-06	2.01E-02	2.52E-06	3.02E-05
Benzo(k)fluoranthene	207089	5.37E-09	5.50E-06	CATEF w 50% reduction	4.90E-06	1.96E-02	2.45E-06	2.94E-05
Chrysene	218019	1.23E-08	1.26E-05	CATEF w 50% reduction	1.12E-05	4.49E-02	5.61E-06	6.74E-05
Dibenz(a,h)anthracene	53703	1.15E-08	1.18E-05	CATEF w 50% reduction	1.05E-05	4.21E-02	5.26E-06	6.31E-05
Indeno(1,2,3-cd)pyrene	193395	1.15E-08	1.18E-05	CATEF w 50% reduction	1.05E-05	4.21E-02	5.26E-06	6.31E-05
Naphthalene	91203	6.49E-07	6.65E-04	AP-42 w CO catalyst 50% reduction	5.92E-04	2.37E+00	2.96E-04	3.55E-03
				PAHs w toxicity factors	**6.85E-04**	**2.71E+00**	**3.42E-04**	**4.07E-03**
PAHs w/o individual toxicity factors	1150							
Acenaphthene		9.28E-09	9.50E-06	CATEF w 50% reduction	8.46E-06	3.39E-02	4.23E-06	5.08E-05
Acenaphthylene		7.17E-09	7.34E-06	CATEF w 50% reduction	6.54E-06	2.62E-02	3.27E-06	3.92E-05
Anthracene		1.65E-08	1.69E-05	CATEF w 50% reduction	1.51E-05	6.02E-02	7.53E-06	9.03E-05
Benzo(e)pyrene		2.66E-10	2.72E-07	CATEF w 50% reduction	2.42E-07	9.69E-04	1.21E-07	1.45E-06
Benzo(g,h,i)perylene		6.69E-09	6.85E-06	CATEF w 50% reduction	6.10E-06	2.44E-02	3.05E-06	3.66E-05
Fluoranthene		2.11E-08	2.16E-05	CATEF w 50% reduction	1.92E-05	7.70E-02	9.62E-06	1.15E-04
Fluorene		2.83E-08	2.90E-05	CATEF w 50% reduction	2.58E-05	1.03E-01	1.29E-05	1.55E-04
Phenanthrene		1.53E-07	1.57E-04	CATEF w 50% reduction	1.40E-04	5.59E-01	6.99E-05	8.39E-04
Pyrene		1.36E-08	1.39E-05	CATEF w 50% reduction	1.24E-05	4.95E-02	6.19E-06	7.43E-05
				PAHs w/o individual toxicity factors	**2.34E-04**	**9.35E-01**	**7.60E-05**	**1.40E-03**
				PAHs (other than naphthalene)	**3.26E-04**	**1.28E+00**	**1.22E-04**	**1.91E-03**

Notes:

a Emission factors obtained from the Rule 1200 Health Risk Assessment Report from SDAPCD for the Carlsbad Energy Center Project, Aug 3, 2009. Factors from the CATEF database for natural gas-fired combustion turbines with 50% reduction to account for CO catalyst; and AP-42 Section 3.1, Table 3.4-1 for a natural gas-fired combustion turbine with 50% reduction to account for CO catalyst

b Ammonia emission rate based on an exhaust NH3 limit of 5 ppmv @ 15% O2 provided by the turbine vendor.

c Used a HHV of 1024 Btu/scf. 1024 Btu/cf

Toxic Air Contaminant Emissions from Each LMS100 Simple Cycle Turbine During Startup

Max Fuel Flow (HHV)	**645**	**MMBtu/hr**	**startup**
Maximum annual hours of operation	**250.00**	**hr/yr**	
Maximum number of startups per year	**500**	**starts/yr**	
minutes per startup	**30**	**minutes**	

Maximum 1 startup per hour

There are 3 turbines for the entire Project

Pollutant	**CAS**	**Emission Factor (lb/MMBtu)**	**Emission Factor (lb/MMcf)**	**Emission factor source**	**Per turbine** Max Startup Emissions in 1 hour (lb/hr)	**Per turbine** Annual Emission Rate (lb/yr)	**Total Project Annual Emission Rate (ton/yr)**
Ammonia	7664417			max TBACT level	3.0585	1.53E+03	2.29E+00
1,3-Butadiene	106990	4.29E-07	4.39E-04	AP-42	1.38E-04	6.91E-02	1.04E-04
Acetaldehyde	75070	1.25E-03	1.28E+00	Source test	4.03E-01	2.02E+02	3.02E-01
Acrolein	107028	6.73E-05	6.89E-02	Source test	2.17E-02	1.09E+01	1.63E-02
Benzene	71432	2.50E-05	2.56E-02	Source test	8.06E-03	4.03E+00	6.05E-03
Ethylbenzene	100414	3.18E-05	3.26E-02	Source test	1.03E-02	5.13E+00	7.70E-03
Formaldehyde	50000	4.52E-03	4.63E+00	Source test	1.46E+00	7.29E+02	1.09E+00
Hexane	110543	2.53E-04	2.59E-01	CATEF	8.16E-02	4.08E+01	6.12E-02
Propylene	115071	7.53E-04	7.71E-01	CATEF	2.43E-01	1.21E+02	1.82E-01
Propylene Oxide	75569	2.89E-05	2.96E-02	AP-42	9.32E-03	4.66E+00	6.99E-03
Toluene	108883	9.06E-05	9.28E-02	Source test	2.92E-02	1.46E+01	2.19E-02
Xylenes	1330207	3.40E-06	3.48E-03	Source test	1.10E-03	5.48E-01	8.22E-04
PAH							
Benzo(a)anthracene	56553	2.20E-08	2.25E-05	Source test (ND)	7.09E-06	3.54E-03	5.32E-06
Benzo(a)pyrene	50328	1.36E-08	1.39E-05	Source test (ND)	4.38E-06	2.19E-03	3.28E-06
Benzo(b)fluoranthene	205992	1.10E-08	1.13E-05	CATEF	3.56E-06	1.78E-03	2.67E-06
Benzo(k)fluoranthene	207089	1.07E-08	1.10E-05	CATEF	3.46E-06	1.73E-03	2.60E-06
Chrysene	218019	2.20E-08	2.25E-05	Source test (ND)	7.09E-06	3.54E-03	5.32E-06
Dibenz(a,h)anthracene	53703	2.20E-08	2.25E-05	Source test (ND)	7.09E-06	3.54E-03	5.32E-06
Indeno(1,2,3-cd)pyrene	193395	2.20E-08	2.25E-05	Source test (ND)	7.09E-06	3.54E-03	5.32E-06
Naphthalene	91203	1.02E-06	1.04E-03	Source test	3.28E-04	1.64E-01	2.46E-04
PAHs w/o individual toxicity factors	1150				1.65E-04	8.25E-02	1.24E-04
Acenaphthene		1.86E-08	1.90E-05	CATEF	5.98E-06	2.99E-03	4.49E-06
Acenaphthylene		1.44E-08	1.47E-05	CATEF	4.63E-06	2.32E-03	3.47E-06
Anthracene		3.30E-08	3.38E-05	CATEF	1.06E-05	5.32E-03	7.98E-06
Benzo(e)pyrene		5.31E-10	5.44E-07	CATEF	1.71E-07	8.57E-05	1.29E-07
Benzo(g,h,i)perylene		1.34E-08	1.37E-05	CATEF	4.32E-06	2.16E-03	3.24E-06
Fluoranthene		4.22E-08	4.32E-05	CATEF	1.36E-05	6.80E-03	1.02E-05
Fluorene		5.66E-08	5.80E-05	CATEF	1.83E-05	9.13E-03	1.37E-05
Phenanthrene		3.06E-07	3.13E-04	CATEF	9.86E-05	4.93E-02	7.39E-05
Pyrene		2.71E-08	2.77E-05	CATEF	8.72E-06	4.36E-03	6.54E-06
PAHs (other than naphthalene)					2.05E-04	1.02E-01	1.54E-04

Notes:

a Emission factors obtained from the Rule 1200 Health Risk Assessment Report from SDAPCD for the Carlsbad Energy Center Project, Aug 3, 2009. Factors from the CATEF database for natural gas-fired combustion turbines; AP-42 Section 3.1, Table 3.4-1 for a natural gas-fired combustion turbine; and source tests from the Palomar Energy Center.

b Source test (ND) = These compounds were tested for but not detected during the source test. The emission factor is based on one half the detection limit.

c Ammonia emission rate based on an exhaust NH_3 limit of 5 ppmv @ 15% O_2 provided by the turbine vendor.

d Used a HHV of 1024 Btu/scf. 1024 Btu/cf

e Maximum fuel flow during a startup was based on vendor supplied data

f Duration of startup/shutdown times assumed to be the same as Panoche Energy Center

Toxic Air Contaminant Emissions from Each LMS100 Simple Cycle Turbine During Shutdown

Max Fuel Flow (HHV)	**456**	**MMBtu/hr**	**shutdown**
Maximum annual hours of operation	**87.50**	**hr/yr**	
Maximum number of shutdowns per year	**500**	**shutdowns/yr**	
minutes per shutdown	**10.5**	**minutes**	

The worst-case modeled 1 hour emissions do not include any shutdown event.

There are 3 turbines for the entire Project

					Per turbine		
Pollutant	**CAS**	**Emission Factor (lb/MMBtu)**	**Emission Factor (lb/MMcf)**	**Emission factor source**	**Max Shutdown Emissions in 1 hour (lb/hr)**	**Annual Emission Rate (lb/yr)**	**Total Project Annual Emission Rate (ton/yr)**
Ammonia	7664417			max TBACT level	1.07048	5.35E+02	8.03E-01
1,3-Butadiene	106990	4.29E-07	4.39E-04	AP-42	3.42E-05	1.71E-02	2.57E-05
Acetaldehyde	75070	1.25E-03	1.28E+00	Source test	9.98E-02	4.99E+01	7.48E-02
Acrolein	107028	6.73E-05	6.89E-02	Source test	5.37E-03	2.69E+00	4.03E-03
Benzene	71432	2.50E-05	2.56E-02	Source test	2.00E-03	9.98E-01	1.50E-03
Ethylbenzene	100414	3.18E-05	3.26E-02	Source test	2.54E-03	1.27E+00	1.91E-03
Formaldehyde	50000	4.52E-03	4.63E+00	Source test	3.61E-01	1.80E+02	2.71E-01
Hexane	110543	2.53E-04	2.59E-01	CATEF	2.02E-02	1.01E+01	1.51E-02
Propylene	115071	7.53E-04	7.71E-01	CATEF	6.01E-02	3.01E+01	4.51E-02
Propylene Oxide	75569	2.89E-05	2.96E-02	AP-42	2.31E-03	1.15E+00	1.73E-03
Toluene	108883	9.06E-05	9.28E-02	Source test	7.23E-03	3.62E+00	5.43E-03
Xylenes	1330207	3.40E-06	3.48E-03	Source test	2.71E-04	1.36E-01	2.03E-04
PAH							
Benzo(a)anthracene	56553	2.20E-08	2.25E-05	Source test (ND)	1.75E-06	8.77E-04	1.32E-06
Benzo(a)pyrene	50328	1.36E-08	1.39E-05	Source test (ND)	1.08E-06	5.42E-04	8.13E-07
Benzo(b)fluoranthene	205992	1.10E-08	1.13E-05	CATEF	8.81E-07	4.40E-04	6.61E-07
Benzo(k)fluoranthene	207089	1.07E-08	1.10E-05	CATEF	8.58E-07	4.29E-04	6.43E-07
Chrysene	218019	2.20E-08	2.25E-05	Source test (ND)	1.75E-06	8.77E-04	1.32E-06
Dibenz(a,h)anthracene	53703	2.20E-08	2.25E-05	Source test (ND)	1.75E-06	8.77E-04	1.32E-06
Indeno(1,2,3-cd)pyrene	193395	2.20E-08	2.25E-05	Source test (ND)	1.75E-06	8.77E-04	1.32E-06
Naphthalene	91203	1.02E-06	1.04E-03	Source test	8.11E-05	4.05E-02	6.08E-05
PAHs w/o individual toxicity factors	1150				4.08E-05	2.04E-02	3.06E-05
Acenaphthene		1.86E-08	1.90E-05	CATEF	1.48E-06	7.41E-04	1.11E-06
Acenaphthylene		1.44E-08	1.47E-05	CATEF	1.15E-06	5.73E-04	8.59E-07
Anthracene		3.30E-08	3.38E-05	CATEF	2.63E-06	1.32E-03	1.98E-06
Benzo(e)pyrene		5.31E-10	5.44E-07	CATEF	4.24E-08	2.12E-05	3.18E-08
Benzo(g,h,i)perylene		1.34E-08	1.37E-05	CATEF	1.07E-06	5.34E-04	8.01E-07
Fluoranthene		4.22E-08	4.32E-05	CATEF	3.37E-06	1.68E-03	2.53E-06
Fluorene		5.66E-08	5.80E-05	CATEF	4.52E-06	2.26E-03	3.39E-06
Phenanthrene		3.06E-07	3.13E-04	CATEF	2.44E-05	1.22E-02	1.83E-05
Pyrene		2.71E-08	2.77E-05	CATEF	2.16E-06	1.08E-03	1.62E-06
PAHs (other than naphthalene)					5.07E-05	2.53E-02	3.80E-05

Notes:

a Emission factors obtained from the Rule 1200 Health Risk Assessment Report from SDAPCD for the Carlsbad Energy Center Project, Aug 3, 2009. Factors from the CATEF database for natural gas-fired combustion turbines; AP-42 Section 3.1, Table 3.4-1 for a natural gas-fired combustion turbine; and source tests from the Palomar Energy Center.

b Source test (ND) = These compounds were tested for but not detected during the source test. The emission factor is based on one half the detection limit.

c Ammonia emission rate based on an exhaust NH3 limit of 5 ppmv @ 15% O2 provided by the turbine vendor.

d Used a HHV of 1024 Btu/scf. 1024 Btu/cf

e Maximum fuel flow during a shutdown is based on half of the maximum fuel flow during normal full load operations.

f Duration of startup/shutdown times assumed to be the same as Panoche Energy Center

Toxic Air Contaminant Emissions from Each LMS100 Simple Cycle Turbine During Commissioning

Max Fuel Flow (HHV)	**558**	**MMBtu/hr**
Total Commissioning period Fuel Flow (HHV)	**49200**	**MMBtu/year**
Maximum annual hours of operation	**112.00**	**hr/yr**

There are 3 turbines for the entire Project

Pollutant	CAS	Emission Factor (lb/MMBtu)	Emission Factor (lb/MMcf)	Emission factor source	Per turbine: Max Hourly Emission Rate (lb/hr)	Per turbine: Annual Emission Rate (lb/yr)	Total Project Annual Emission Rate (ton/yr)
Ammonia	7664417			max TBACT level	6.117	6.85E+02	1.03E+00
1,3-Butadiene	106990	4.29E-07	4.39E-04	AP-42	2.39E-04	2.11E-02	3.16E-05
Acetaldehyde	75070	1.25E-03	1.28E+00	Source test	6.97E-01	6.15E+01	9.23E-02
Acrolein	107028	6.73E-05	6.89E-02	Source test	3.75E-02	3.31E+00	4.97E-03
Benzene	71432	2.50E-05	2.56E-02	Source test	1.39E-02	1.23E+00	1.85E-03
Ethylbenzene	100414	3.18E-05	3.26E-02	Source test	1.77E-02	1.57E+00	2.35E-03
Formaldehyde	50000	4.52E-03	4.63E+00	Source test	2.52E+00	2.22E+02	3.34E-01
Hexane	110543	2.53E-04	2.59E-01	CATEF	1.41E-01	1.24E+01	1.87E-02
Propylene	115071	7.53E-04	7.71E-01	CATEF	4.20E-01	3.70E+01	5.56E-02
Propylene Oxide	75569	2.89E-05	2.96E-02	AP-42	1.61E-02	1.42E+00	2.13E-03
Toluene	108883	9.06E-05	9.28E-02	Source test	5.05E-02	4.46E+00	6.69E-03
Xylenes	1330207	3.40E-06	3.48E-03	Source test	1.89E-03	1.67E-01	2.51E-04
PAH							
Benzo(a)anthracene	56553	2.20E-08	2.25E-05	Source test (ND)	1.22E-05	1.08E-03	1.62E-06
Benzo(a)pyrene	50328	1.36E-08	1.39E-05	Source test (ND)	3.98E-05	6.68E-04	1.00E-06
Benzo(b)fluoranthene	205992	1.10E-08	1.13E-05	CATEF	6.15E-06	5.43E-04	8.14E-07
Benzo(k)fluoranthene	207089	1.07E-08	1.10E-05	CATEF	5.99E-06	5.29E-04	7.93E-07
Chrysene	218019	2.20E-08	2.25E-05	Source test (ND)	1.22E-05	1.08E-03	1.62E-06
Dibenz(a,h)anthracene	53703	2.20E-08	2.25E-05	Source test (ND)	1.22E-05	1.08E-03	1.62E-06
Indeno(1,2,3-cd)pyrene	193395	2.20E-08	2.25E-05	Source test (ND)	1.22E-05	1.08E-03	1.62E-06
Naphthalene	91203	1.02E-06	1.04E-03	Source test	5.66E-04	5.00E-02	7.50E-05
PAHs w/o individual toxicity factors	1150				2.85E-04	2.52E-02	3.77E-05
Acenaphthene		1.86E-08	1.90E-05	CATEF	1.03E-05	9.13E-04	1.37E-06
Acenaphthylene		1.44E-08	1.47E-05	CATEF	8.00E-06	7.06E-04	1.06E-06
Anthracene		3.30E-08	3.38E-05	CATEF	1.84E-05	1.62E-03	2.44E-06
Benzo(e)pyrene		5.31E-10	5.44E-07	CATEF	2.96E-07	2.61E-05	3.92E-08
Benzo(g,h,i)perylene		1.34E-08	1.37E-05	CATEF	7.46E-06	6.58E-04	9.87E-07
Fluoranthene		4.22E-08	4.32E-05	CATEF	2.35E-05	2.08E-03	3.11E-06
Fluorene		5.66E-08	5.80E-05	CATEF	3.16E-05	2.79E-03	4.18E-06
Phenanthrene		3.06E-07	3.13E-04	CATEF	1.70E-04	1.50E-02	2.26E-05
Pyrene		2.71E-08	2.77E-05	CATEF	1.51E-05	1.33E-03	2.00E-06
PAHs (other than naphthalene)					3.86E-04	3.12E-02	4.68E-05

Notes:

a Emission factors obtained from the Rule 1200 Health Risk Assessment Report from SDAPCD for the Carlsbad Energy Center Project, Aug 3, 2009. Factors from the CATEF database for natural gas-fired combustion turbines; AP-42 Section 3.1, Table 3.4-1 for a natural gas-fired combustion turbine; and source tests from the Palomar Energy Center.

b Source test (ND) = These compounds were tested for but not detected during the source test. The emission factor is based on one half the detection limit.

c Ammonia emission rate based on an exhaust NH_3 limit of 5 ppmv @ 15% O_2 provided by the turbine vendor.

d Used a HHV of 1024 Btu/scf. 1024 Btu/cf

c Maximum fuel flow during each phase of commissioining based on turbine load data provided by project engineers.

Pio Pico Energy Center
Peak Emission Rates for 8-hour Acute Health Index Analysis

Pollutant	Source	Maximum Emission Rate (lb/hr)	Maximum Emission Rate (g/s)	Stack Parameters Used in Analysis
Acetaldehyde	Each Turbine	6.97E-01	8.79E-02	50% load ISO conditions
Acrolein	Each Turbine	3.75E-02	4.73E-03	50% load ISO conditions
Formaldehyde	Each Turbine	2.52E+00	3.18E-01	50% load ISO conditions
Arsenic	Each Cooling System Cell	1.24E-07	1.56E-08	full load operations

Maximum short-term turbine emissions occur during a commissioning hour

Toxic Air Contaminant Emissions from Cooling System

Total Project Pio Pico

Total Project Maximum design circulating water rate	35,280	gallons/min	
Cycles of concentration	4.67		
Drift Eliminator Control	0.000010	=	0.001
Operating hours per year	4337.5	hr/yr	
Number of cells in each cooling system	4		
Total number of cooling system	3		

Toxic Air Contaminant	CAS	TAC Concentration in water[1]		Total Project cooling system emissions		Emissions per cooling system		Emissions per cell		Emissions per cell during commissioning
		ug/liter	lb/(1000 gallon)	lb/hr	lb/yr	lb/hr	lb/yr	lb/hr	lb/yr	lb/yr
Arsenic	7440382	1.8	0.000015	1.48E-06	6.44E-03	4.95E-07	2.15E-03	1.24E-07	5.37E-04	1.39E-05
Carbon Tetrachloride	56235	2.1	0.000018	1.73E-06	7.51E-03	5.77E-07	2.50E-03	1.44E-07	6.26E-04	1.62E-05
Chlorine	7782505	230000	1.919215	1.90E-01	8.23E+02	6.32E-02	2.74E+02	1.58E-02	6.86E+01	1.77E+00
Chromium	18540299	2.8	0.000023	2.31E-06	1.00E-02	7.70E-07	3.34E-03	1.92E-07	8.35E-04	2.16E-05
Copper*	7440508	6.5	0.000054	5.36E-06	2.33E-02	1.79E-06	7.75E-03	4.47E-07	1.94E-03	5.00E-05
Fluoride*	1101	660	0.005507	5.44E-04	2.36E+00	1.81E-04	7.87E-01	4.54E-05	1.97E-01	5.08E-03
Lead	7439921	0.86	0.000007	7.09E-07	3.08E-03	2.36E-07	1.03E-03	5.91E-08	2.56E-04	6.62E-06
Total Annual HAP Emissions (ton/yr)					**4.11E-01**					

Note:

The maximum concentration for each TAC as determined from the highest water samples collected from RWCWRF effluent in 2007, 2008, and 2009.

* not a CAA112 HAP

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AIR QUALITY MODELING PROTOCOL FOR THE PIO PICO ENERGY CENTER PROJECT CHULA VISTA, CALIFORNIA

Prepared For:

- San Diego Air Pollution Control District

- California Energy Commission

Prepared on behalf of

APEX Power Group

February 17, 2010

URS

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Tables

Figures

$\mu g/m^3$	Micrograms per cubic meter
AAQS	Ambient Air Quality Standards
AERMOD	American Meteorological Society/Environmental Protection Agency regulatory model
AFC	Application for certification
AQIA	Air Quality Impact Assessment
ARB	Air Resource Board
ATC	Authority to Construct
BACT	Best available control technology
BPIP	Building profile input program
CAAQS	California Ambient Air Quality Standards
CARB	California Air Resources Board
CATEF	California Air Toxic Emission Factor
CEC	California Energy Commission
CECP	Carlsbad Energy Center Project
CO	Carbon monoxide
CTG	Combustion turbine generator
DOC	Determination of compliance
DPM	Diesel particulate matter
g/s	Gram per second
GE	General Electric
GEP	Good engineering practice
HARP	Hotspots analysis and reporting program
HI	Hazard indices
HRA	Health risk assessment
ISCST3	Industrial source complex short term model 3rd version
km	kilometers
LORS	Laws, ordinances, regulations, and standards
MEI	Maximally exposed individual
MEIR	Maximally exposed individual resident
MEIW	Maximally exposed individual worker
mg/kg	milligrams per kilogram per day
MICR	Maximum individual cancer risk
MW	Megawatt
NAAQS	National Ambient Air Quality Standards
NO_2	Nitrogen dioxide
NO_x	Nitrogen oxides
NSR	New source review
O_3	Ozone
OEHHA	Office of Environmental Health Hazard Assessment
OLM	Ozone limiting method
P_b	Lead
PM_{10}	Particulate matter less than 10 microns in diameter
$PM_{2.5}$	Particulate matter less than 2.5 microns in diameter
PPEC	Pio Pico Energy Center

ppm	Parts per million
PSD	Prevention of Significant Deterioration
PTO	Permit to Operate
REL	Recommended Exposure Level
ROC	Reactive organic compounds
SCR	Selective catalytic reduction
SDAPCD	San Diego County Air Pollution Control District
SO_2	Sulfur dioxide
TAC	Toxic air contaminants
TPY	Tons per year
USEPA	U.S. Environmental Protection Agency
X/Q	Per unit concentration

SECTION 1 INTRODUCTION

1.1 BACKGROUND

The Pio Pico Energy Center (PPEC) Project will be a nominal 300 megawatt (MW) simple cycle peaker power plant to be constructed in the city of Chula Vista, California. The Project will be owned and operated by APEX Power Group. The PPEC site is located approximately 15 miles southeast of downtown San Diego. The PPEC will occupy approximately fourteen (14) acres adjacent the Otay Lake County Park in south-central San Diego County. The PPEC will be permitted as a peaker plant consisting of three (3) General Electric (GE) LMS100 natural gas-fired combustion turbine-electrical generators (CTGs).

To support operation of the CTGs, a hybrid dry/wet cooling system is proposed, using reclaimed water from the nearby water district facility located immediately north of the proposed PPEC site. Two natural gas-fired reciprocating engines will be installed to provide black start capabilities and one diesel firewater pump will be installed. Figure 1 and Figure 2 show the regional vicinity and the site location of the Pio Pico site, respectively.

The project is subject to the site licensing requirements of the California Energy Commission (CEC). The CEC will coordinate its independent air quality evaluations with the San Diego Air Pollution Control District (SDAPCD) through the Determination of Compliance (DOC) process.

Annual emissions of all criteria pollutants will be below the emission level thresholds specified by the United States Environmental Protection Agency's (USEPA) Prevention of Significant Deterioration (PSD) regulations for Major Sources. Specifically, the PPEC Facility will emit less than: 250 tons per year (tpy) of nitrogen oxides (NO_x), carbon monoxide (CO), reactive organic compounds (ROC) and sulfur dioxide (SO_2); less than 0.6 tons per year of lead (Pb); and less than 7.0 tons per year of sulfuric acid mist. Thus, no PSD related analyses will be conducted.

San Diego County is currently designated unclassified for federal PM_{10} and $PM_{2.5}$ (particulate matter of sizes 10 and 2.5 microns, respectively) standards and non-attainment with respect to the California ambient air quality standards (CAAQS) for these pollutants. The county is also non-attainment with respect to the California and national ambient air quality standards (NAAQS) for ozone (O_3). Project emissions of non-attainment pollutants and their precursors will be offset to satisfy CEC and SDAPCD requirements.

1.2 PURPOSE

This document summarizes the procedures that will be used for the air dispersion modeling that will be conducted in support of project certification and permitting. The CEC, SDAPCD and the USEPA require the use of atmospheric dispersion modeling to demonstrate compliance with applicable air quality standards. In addition, CEC power plant siting regulations require modeling to evaluate the cumulative impacts of the proposed project with other new and reasonably foreseeable projects within 6 miles of the project site.

Both CEC and SDAPCD require modeling to determine the potential impacts on human health from emissions of toxic air contaminants.

This protocol is being submitted to the CEC and SDAPCD for their review and comment prior to completion of the applicable permit applications for the PPEC project. The proposed model selection and modeling approach is based on review of applicable regulations and agency guidance documents, and recent discussions with staffs of the responsible agencies.

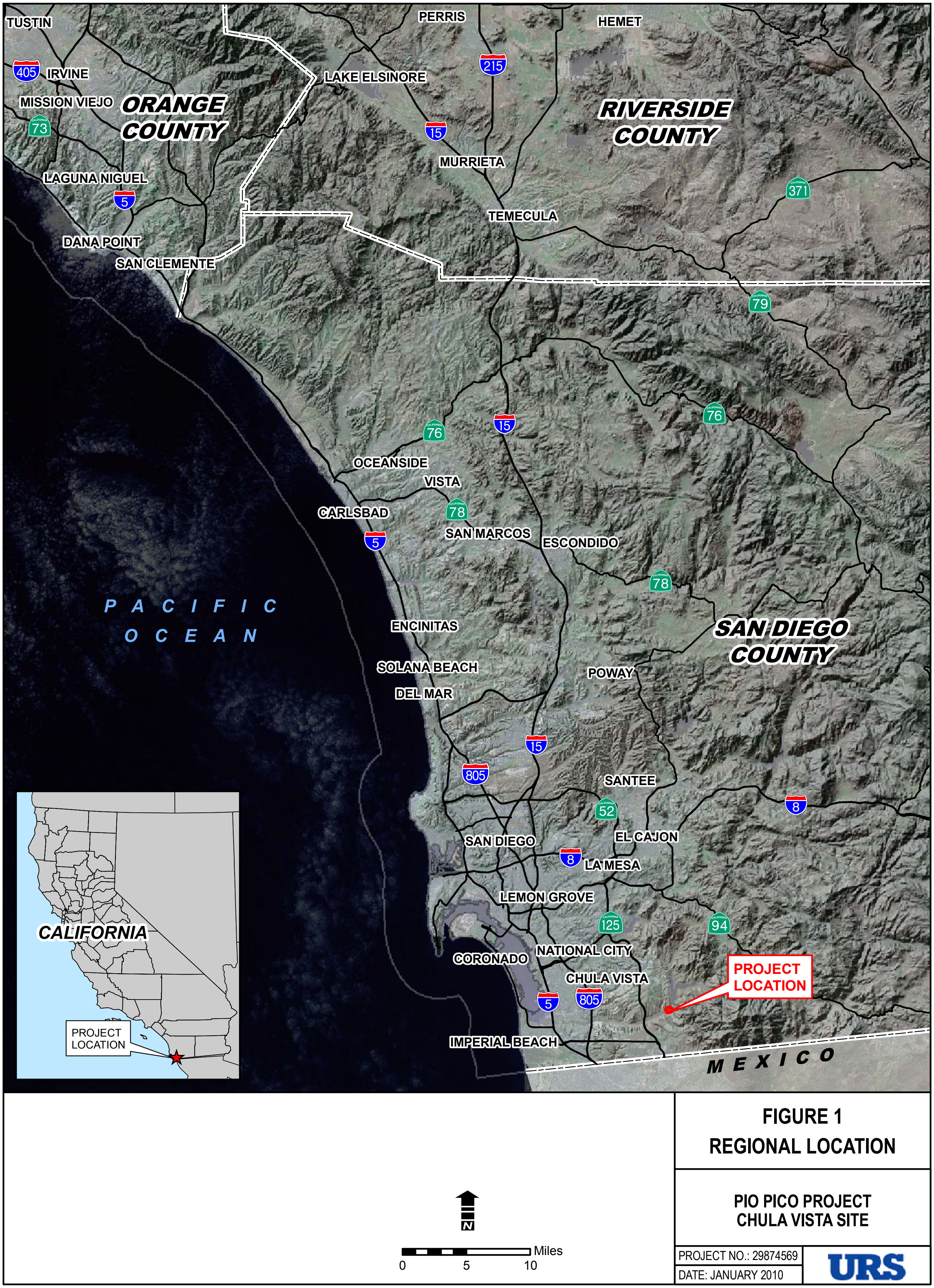

FIGURE 1
REGIONAL LOCATION

PIO PICO PROJECT
CHULA VISTA SITE

PROJECT NO.: 29874569

DATE: JANUARY 2010

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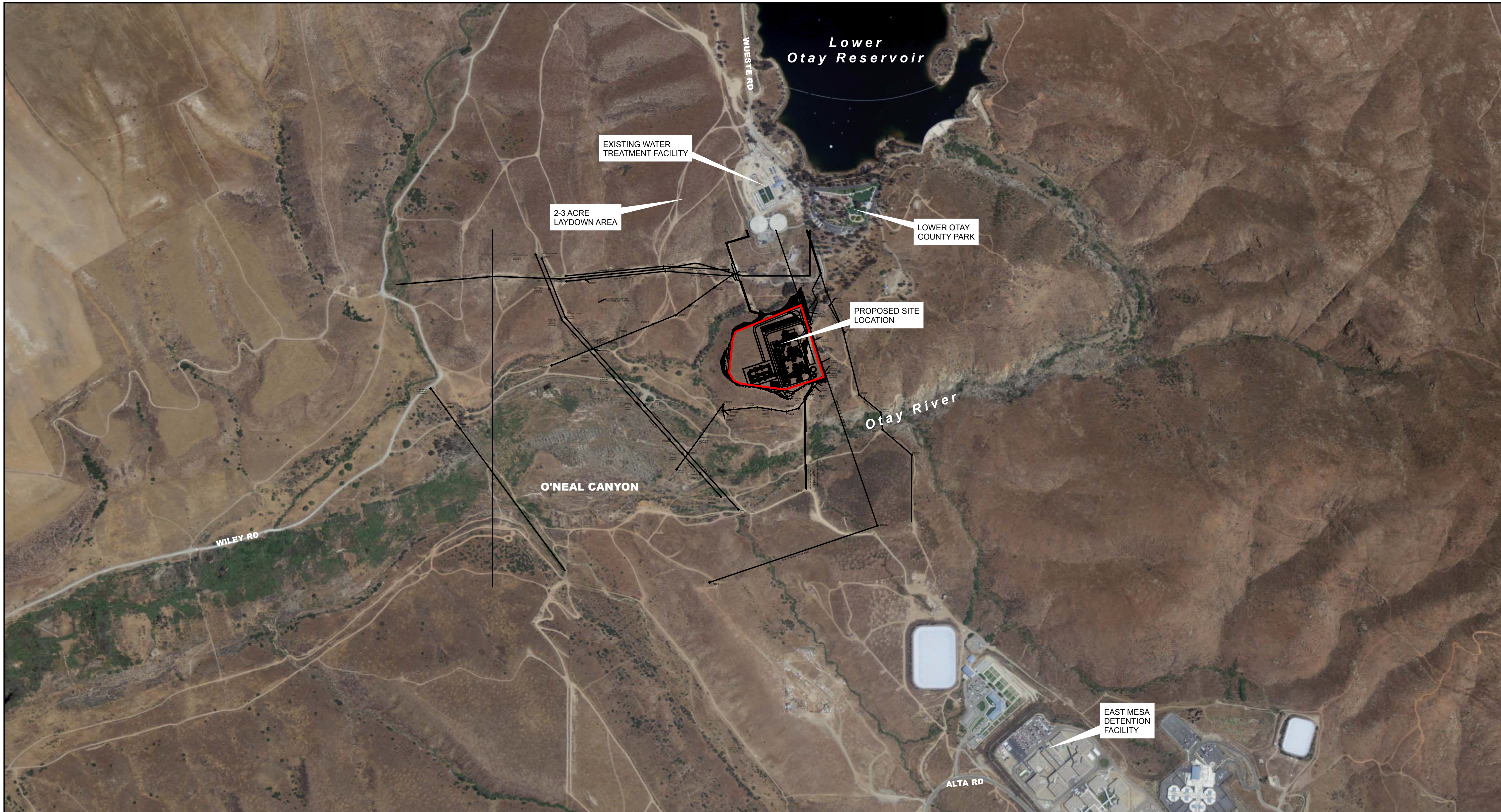

Legend

Proposed Site Location

N

0 500 1,000 Feet

FIGURE 2
SITE VICINITY

PIO PICO PROJECT
CHULA VISTA SITE

PROJECT NO.: 29874569
DATE: FEBRUARY 2010

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SECTION 2 PROJECT DESCRIPTION

2.1 PROJECT LOCATION

Pio Pico Energy Center will be located on approximately 14 acres of Parcel 6440900400 in Chula Vista, CA. The site is immediately south of San Diego's Otay Water treatment facility and on the eastern city boundary of Chula Vista. This location is approximately 3 miles south of Otay Lakes Road and 2 miles east of the SouthBay Expressway.

The site is an ideal location for a power plant. It is a greenfield site with an industrial water treatment plant abutting to the North and no visible residences nearby. The city of Chula Vista is committed to locating a large power plant at this site. The City will zone the property to be compatible with a power plant and provide a 20 year lease with renewal options.

All appropriate infrastructure is nearby:

- 230kV power lines to Miguel Substation – 1,000 feet
- 36" 800 psig intrastate gas pipeline – 2,500 feet
- Reclaim water from Otay Water – Available at site in 2011
- Salt Creek Sewer – 2,500 feet west

2.2 DESCRIPTION OF THE PROPOSED SOURCES

The new emission sources associated with the PPEC Project will include three simple-cycle gas turbine generators, a hybrid dry/wet cooling system, two natural-gas fired black start engines, and a firewater pump. The turbines will be fired exclusively on natural gas, and will be equipped with water injection and selective catalytic reduction (SCR) for the control of NO_x emissions and an oxidation catalyst for control of CO emissions and ROCs. The CTGs will be nominally rated at 100 MW each, and two natural gas-fired reciprocating engines will be included to enable black start capabilities required for plant startups during losses of grid power. Typically the black start engines will only be operated for short periods to test its operability in the event of an emergency. The new CTGs will operate in simple cycle mode approximately 4,000 hours each and will each have an exhaust stack with a height of 90 feet. Ammonia reagent for the PPEC facility SCR systems will be provided by an aqueous ammonia storage tank. Plant cooling will be supplied by a hybrid dry/wet cooling system, with a closed loop system for the dry component, and an open evaporation portion for the wet component. The system will use reclaim water from the Otay water district facility. A firewater pump will be included to provide emergency fire suppression in the event of a fire emergency. The firewater pump will be tested weekly to ensure its operability in the event of an emergency. A preliminary plot plan of the PPEC facility is provided in Figure 3.

Legend

Proposed Site Location

N

0 60 120 Feet

FIGURE 3
SITE PLOT PLAN

PIO PICO PROJECT
CHULA VISTA SITE

PROJECT NO.: 29874569
DATE: FEBRUARY 2010

URS

SECTION 3 REGULATORY SETTING

3.1 CALIFORNIA ENERGY COMMISSION REQUIREMENTS

For projects with electrical power generation capacity greater than 50 MW, CEC requires that applicants prepare a comprehensive application for certification (AFC) document addressing the proposed project's environmental and engineering features. An AFC must include the following air quality information (CEC 2008):

- A description of the project, including project emissions of air pollutants and greenhouse gases, fuel type(s), control technologies and stack characteristics;
- The basis for all emission estimates and/or calculations;
- An analysis of Best Available Control Technology (BACT) according to SDAPCD Rules;
- Existing baseline air quality data for all regulated pollutants;
- Existing meteorological data, including temperature, wind speed and direction;
- A listing of applicable laws, ordinances, regulations, standards (LORS), and a determination of compliance with all applicable LORS;
- An emissions offset strategy;
- An air quality impact assessment (*i.e.,* national and state ambient air quality standards [AAQS]) and protocol for the assessment of cumulative impacts of the proposed project along with permitted projects, reasonably foreseeable projects and projects under construction within a 10 kilometer (km) radius; and
- An analysis of human exposure to air toxics (*i.e.,* health risk assessment [HRA]).

For the PPEC project, the air quality impact assessment, the cumulative impacts assessment, and the HRA will be performed using dispersion models.

3.2 SAN DIEGO COUNTY AIR POLLUTION CONTROL DISTRICT REQUIREMENTS

The SDAPCD has promulgated New Source Review (NSR) requirements under Rules 20.1 through 20.3. Based on a preliminary evaluation of the potential to emit for the proposed new CTGs, it is expected that the PPEC project may require permitting as a major source, as this term is defined in SDAPCD rules. It would then be subject to the modeling requirements of Rule 20.3. In general, all equipment with the potential to emit air pollutants is subject to SDAPCD NSR requirements. NSR has four major requirements that potentially apply to new sources:

- Installation of BACT;
- Ambient air quality impact modeling to demonstrate compliance with the NAAQS and CAAQS;
- Certification of statewide compliance with air quality requirements; and

- Emissions offsets.

The PPEC project will trigger the need to perform an air quality impact assessment (AQIA) as NO_x and PM_{10} emissions are expected to be greater than the values presented in Rule 20.2 Table 20.2-1.

Assembly Bill 2588, California Air Toxics Hot Spots Program and SDAPCD Rule 1200 established allowable incremental health risks for new or modified sources of toxic air contaminant (TAC) emissions. The SDAPCD rule specifies limits for maximum individual cancer risk (MICR), and non-carcinogenic acute and chronic hazard indices (HI) for new or modified sources of TAC emissions. The health risks resulting from project emissions, as demonstrated by means of an approved health risk assessment, must not exceed established threshold values.

3.3 U.S. ENVIRONMENTAL PROTECTION AGENCY REQUIREMENTS

USEPA has promulgated PSD regulations applicable to criteria pollutant emissions from major sources and modifications to existing PSD sources. The PPEC project will not be a major source under the PSD rules, because facility-wide emissions for all criteria pollutants will be below the PSD threshold applicable to simple cycle gas turbines of 250 tons per year. Therefore PSD analyses will not be required for this project.

SECTION 4 MODELS PROPOSED AND MODELING TECHNIQUES

This section describes the dispersion models and modeling techniques that will be used in performing the air quality analysis for the PPEC facility. The objectives of the modeling are to demonstrate that air emissions from the PPEC project will not cause or contribute to an exceedance of an ambient air quality standard, and will not cause a significant health risk.

The American Meteorological Society/ Environmental Protection Agency Regulatory Model (AERMOD) is the USEPA officially recognized preferred dispersion model for regulatory applications. Also, both CEC and SDAPCD staff recommend the use of AERMOD for power plant licensing/permitting analyses. Accordingly, the most recent version of AERMOD will be used for the dispersion modeling associated with the Project. The air dispersion modeling for this project will be conducted in accordance with CEC and SDAPCD guidance.

4.1 TURBINE SCREENING MODELING

An initial screening modeling analysis will be conducted to determine the turbine stack parameters for the most important project sources, *i.e.,* the CTGs, that correspond to maximum ground-level pollutant concentrations. This information will be obtained by running a series of AERMOD simulations with the full meteorological input data set (see Section 4.4.3) with source inputs representing a range of different load conditions and ambient temperatures. Building downwash effects will be addressed, as described in Section 4.4.2. The AERMOD screening runs will be setup with unit emission rate (1 gram per second [g/s] per turbine) to obtain the unit concentration (Χ/Q) in micrograms per cubic meter/g/s ($\mu g/m^3$)/(g/s) per averaging time. The unit concentration will then be multiplied by the actual emission rate for that scenario to obtain the pollutant concentration. The stack parameters that align with the highest offsite impact from these sources for each pollutant and averaging time will be used in the subsequent refined modeling simulations.

4.2 REFINED MODELING

The purpose of the refined modeling analysis is to demonstrate that air pollutant emissions from the PPEC project will not cause or contribute to an AAQS violation and will not cause a significant health risk impact. The most recent version of the AERMOD model will be used for the refined modeling. The regulatory default settings will be selected. Specific modeling procedures that will be used for evaluating project impacts versus the state and federal ambient air quality standards and applicable health risk criteria are discussed below. Table 4-1 shows the regulatory criteria that will be used to evaluate the significance of predicted pollutant concentrations. Refined modeling using AERMOD will be conducted to evaluate impacts from both the construction and operational phases of the Project.

Analysis of land uses adjacent to the PPEC was conducted in accordance with Section 8.2.8 of the Guideline on Air Quality Models (EPA 2005 and Auer 1978), EPA AERMOD implementation guide (2005), and its addendum (2006).

Based on the Auer land use procedure, more than 50 percent of the area within a 3-km radius of the PPEC site is classified as rural. Thus the rural (default) mode will be used in the AERMOD modeling analyses.

All regulatory default options will be used, including building and stack tip downwash, default wind speed profiles, exclusion of deposition and gravitational settling, consideration of buoyant plume rise, and complex terrain.

4.2.1 Ambient Air Quality Standards Analysis

In accordance with SDAPCD Rules 20.1-20.3, the proposed PPEC will be required to demonstrate compliance, through modeling, with the following requirements:

- The project maximum ground-level concentrations plus background must not exceed the most stringent applicable ambient air quality standard for each attainment pollutant (nitrogen dioxide [NO_2], SO_2, CO).
- For non-attainment pollutants (PM_{10} and $PM_{2.5}$), the project must not contribute significantly to an existing AAQS violation.

Compliance with these modeling requirements for attainment pollutants will be demonstrated by determining the maximum impact of the proposed Project at any receptor and adding a conservative background concentration based on recent data from the SDAPCD air quality monitoring station (Section 4.4.4) determined to be most representative of pre-project conditions in the project area.

NO_2 impact estimates for both the 1-hour and annual averaging times will be modeled by executing AERMOD with the USEPA ozone limiting method (OLM) option for both hourly and annual impacts. Hourly ozone measurement data collected at the Chula Vista SDAPCD air quality monitoring station for the same years corresponding to the meteorological input data will be used when conducting the OLM modeling.

The new federal NO_2 1-hour AAQS is based on the 3-year average of the 98^{th} percentile of the daily maximum 1-hour average NO_2 concentrations. To show compliance with this standard, AERMOD with OLM will be run to obtain 1-hour NO_2 concentrations at each receptor for every hour of meteorological data. The 1-hour NO_2 concentrations predicted from AERMOD will be processed to obtain the maximum daily 1-hour average values, then the 98^{th} percentile value for each year will be averaged for each 3 year time frame and the highest of those values will be presented. The background concentration that will be added to this value will be the EPA determined average 1-hour 98^{th} percentile over 3 years for San Diego County (Section 4.4.4).

If compliance with the new federal NO_2 1-hour AAQS is not shown using the technique described above, hourly NO_2 background data from the Chula Vista monitoring station for the same years corresponding to the meteorological input data will be added to the hourly NO_2 concentrations predicted from AERMOD with OLM. These data will be processed to obtain the 98^{th} percentile value for each year, averaged for each 3 year time frame and the highest of those concentrations will be presented.

Note that emissions offsets will be obtained by the applicant to provide at least a one-to-one offsetting of all Project emissions increases of all non-attainment pollutants and their precursors, *i.e.*, NO_x, VOC, PM_{10} and SO_2.

4.2.1.1 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. Especially on sunny mornings with light winds, the heating of the earth's surface causes a layer of turbulence which grows in depth over time and may intersect an elevated exhaust plume, rapidly drawing it down to ground level and creating relatively high pollutant concentrations for a short period. Typically, fumigation analysis is conducted using SCREEN3 when the project site is rural and the stack height is greater than 10 meter.

A fumigation analysis will be performed using the USEPA model SCREEN3. The SCREEN3 model will be used to calculate concentrations from an inversion breakup fumigation. Unit emission rate will be used (1 gram per second) in the fumigation modeling to represent the project emissions and the model results will be scaled to reflect expected plant emissions for each pollutant. Since SCREEN3 only models the impacts from one source, the entire project emissions will be emitted from a single representative stack with the same stack parameters as each CTG, per USEPA guidance (USEPA 1992).

Fumigation concentrations will be calculated for 1-, 3- and 8-hour averaging times using USEPA-approved conversion factors. These multiple-hour model predictions are conservative since fumigation is a transitory condition that would most likely affect a given receptor location for only a few minutes at a time.

Table 4-1
Relevant Ambient Air Quality Standards and Significance Levels

Pollutant	Averaging Time	CAAQS[a,c]	NAAQS[b,c]	SDAPCD AQIA Trigger Levels
CO	8-hour	9.0 ppm (10,000 µg/m³)	9.0 ppm (10,000 µg/m³)	100 pound/hour 550 pound/day 100 TPY
	1-hour	20 ppm (23,000 µg/m³)	35 ppm (40,000 µg/m³)	
NO_2[d]	Annual	0.030 ppm (57 µg/m³)	0.053 ppm (100 µg/m³)	25 pound/hour 250 pound/day 40 TPY
	1-hour	0.18 ppm (339 µg/m³)	0.100 ppm (191 µg/m³)	
SO_2	Annual	-	0.030 ppm (80 µg/m³)	25 pound/hour 250 pound/day 40 TPY
	24-hour	0.04 ppm (105 µg/m³)	0.14 ppm (365 µg/m³)	
	3-hour	-	0.5 ppm (1,300 µg/m³)	
	1-hour	0.25 ppm (655 µg/m³)	-	

Table 4-1
Relevant Ambient Air Quality Standards and Significance Levels
(Continued)

Pollutant	Averaging Time	CAAQS[a,c]	NAAQS[b,c]	SDAPCD AQIA Trigger Levels
PM_{10}	Annual	20 µg/m³	-	100 pound/day 15 TPY
	24-hour	50 µg/m³	150 µg/m³	
$PM_{2.5}$	Annual	12 µg/m³	15.0 µg/m³	--
	24-hour	-	35 µg/m³	
O_3	8-hour	0.070 ppm (137 µg/m³)	0.075 ppm (147 µg/m³)	--
	1-hour	0.09 ppm (180 µg/m³)	--	

Notes:

[a] California standards for ozone (as volatile organic compounds, carbon monoxide, sulfur dioxide (1-hour), nitrogen dioxide, and PM_{10}), are values that are not to be exceeded.

[b] National standards, other than those for ozone, particulate matter, and those based on annual averages, are not to be exceeded more than once a year. The ozone standard is attained when the fourth highest eight hour concentration in a year, averaged over three years, is equal to or less than the standard. For PM_{10}, the 24 hour standard is attained when the expected number of days per calendar year with a 24-hour average concentration above 150 µg/m³ is equal to or less than one. For $PM_{2.5}$, the 24 hour standard is attained when 98 percent of the daily concentrations, averaged over three years, are equal to or less than the standard.

[c] Concentrations are expressed first in units in which they were promulgated. Equivalent units are given in parentheses and based on a reference temperature of 25° Celsius (C) and a reference pressure of 760 millimeters (mm) of mercury (1,013.2 millibar).

[d] On January 22, 2010 the USEPA promulgated a new NO_2 1-hour standard (100 ppb) that will become final in April 2010. To attain this standard, the 3-year average of the 98th percentile of the daily maximum 1-hour average at each monitor within an area must not exceed 0.100 ppm.

-	=	Not applicable
AQIA	=	Air Quality Impact Analysis
CAAQS	=	California Ambient Air Quality Standard
NAAQS	=	National Ambient Air Quality Standard
ppm	=	parts per million by volume, or micromoles of pollutant per mole of gas
TPY	=	ton per year
µg/m³	=	micrograms per cubic meter

4.2.2 Health Risk Assessment Analysis

4.2.2.1 Operations

The CEC and SDAPCD require a health risk assessment of TAC emissions from the operation of the project. Contaminants potentially emitted by the PPEC project with carcinogenic, chronic or acute non-carcinogenic health effects will be considered. This health risk assessment will be performed following the SDAPCD Supplemental Guidelines for Submission of Air Toxics "Hot Spots" Program Health Risk Assessments (HRAs) (SDAPCD 2006), the Office of Environmental Health Hazard Assessment

(OEHHA), Air Toxics Hot Spots Program Risk Assessment Guidelines (OEHHA 2003) and guidance from SDAPCD staff. As recommended by both the SDAPCD and OEHHA guidelines, the California Air Resources Board (CARB) Hotspots Analysis and Reporting Program (HARP) (CARB 2005) will be used to perform a health risk assessment for the project, meeting the OEHHA Tier 1 and SDAPCD Tier 1 requirements. HARP includes two modules: a dispersion module and a risk module. The HARP dispersion module incorporates the USEPA ISCST3 air dispersion model, and the HARP risk module implements the latest Risk Assessment Guidelines developed by OEHHA. For consistency with the criteria pollutant modeling, the dispersion modeling will be conducted with AERMOD. The Air Resources Board (ARB) has created a beta version software package, HARP On-Ramp, to convert AERMOD dispersion results into a format that can be read into the HARP risk module. Thus HARP with AERMOD will be used for this HRA.

First, ground-level impacts from the PPEC sources will be estimated using the AERMOD atmospheric dispersion modeling. The AERMOD model will be run with unit emission rate, 1 gram per second emissions, for each source to calculate the 1-hour and annual concentration of TACs X/Q due to each source. HARP then uses this information along with the estimated emission rates per source for specific TAC compounds to calculate ground-level concentrations for each chemical species. The AERMOD modeling analysis will be consistent with, and use similar appropriate parameters as the modeling approach discussed above for the AAQS analyses using AERMOD. The same meteorological data set that will be used for the criteria pollutant air quality impact assessment will be used in the HRA (see meteorological discussion in Section 4.4.3). The maximum 1-hour and annual X/Q determined by AERMOD will be used in the HARP model to estimate the corresponding health risks. The same receptor grid created for criteria pollutant modeling for the air quality analysis will be used in the HRA. HARP will also include census receptors out to 10 km. Receptors will also be placed at all sensitive locations (*e.g.,* child care facilities, schools, hospitals, prisons, libraries, etc.) out to 3-miles, if any are identified. In addition receptors will be placed at the nearest residences and off-site workers.

The 1-hour and annual X/Q values will be processed in the HARP On-Ramp program for input into the HARP program. HARP then will use this information along with the estimated source emission rates for specific TAC compounds to calculate ground-level concentrations at each receptor for each chemical species. Using the built in cancer potency factors and RELs for specific chemicals, HARP will predict the potential cancer risk, 1-hour acute and annual chronic health indices. The HRA will incorporate updated toxicity factors from OEHHA in the HARP analysis, through the use of the February 2009 health database.

Incremental cancer risk will be estimated using the "Derived (Adjusted)" calculation method. For the calculation of cancer risk, the duration of exposure to project emissions will be assumed to be 24 hours per day, for 70 years, at all receptors. Chronic non-cancer risks will be calculated by means of the "Derived (OEHHA)" method. Since water reservoirs are near the Project, the drinking water consumption pathway will be included in this analysis. All other pathways including fish consumption will be included in the HRA and the selection of these pathway parameters will be discussed in the AFC. Default rural values for home grown produce, local pig, chicken and egg consumption, dermal absorption, soil ingestion and mother's milk will be used in the HRA. Cancer burden will be calculated if the cancer risk is predicted to be greater than one in a million.

Offsite worker cancer risk will be estimated in HARP using the point estimate and appropriate GLC and exposure assumptions based on the offsite workers' schedules to obtain the maximally exposed individual worker (MEIW).

Since OEHHA adopted new 8-hour acute RELs for six pollutants and these have not yet been incorporated into the HARP model, an additional 8-hour analysis will be conducted. Dispersion modeling will be performed using the AERMOD model to estimate the highest 8-hour concentrations from the pollutants that have 8-hour acute RELs. Actual emissions rates will be entered into AERMOD and the peak 8-hour concentration at each receptor will be output. To obtain the peak acute 8-hour health index, a spreadsheet will be developed that will use the 8-hour concentrations from AERMOD, divide by the appropriate Recommended Exposure Level (REL) and sum by target organ.

At the request of the SDAPCD, stack parameters and emission rates during startup, shutdown, commissioning and normal operations will be considered in the HRA. In AERMOD, different stack parameters will be used wherever appropriate for different turbine activities, *i.e.,* startup, shutdown, and commissioning. Stack parameters will be dependent on PPEC engineering data. Section 4.3.3 discusses the possible emission scenarios to be examined.

4.2.2.2 Construction

The only TAC associated with construction activities will be diesel particulate matter (DPM). To fulfill CEC's recent requests for construction health risk assessments, a construction HRA will be conducted.

The HRA will be conducted in three steps by: (1) determining the construction phase DPM; (2) calculating the ground-level concentrations of DPM for the general grid receptors, sensitive receptors, residential receptors and off-site worker receptors; and (3) characterizing the health risks for all receptor systems based on the DPM ground level concentrations, and toxicological data. DPM only has long-term health risk thresholds, thus only cancer risk and the chronic non-cancer THI will be calculated in the HRA. No acute non-cancer reference exposure level (REL) has been established for diesel particulate, thus no acute non-cancer THI will be calculated.

Dispersion modeling will be performed using the AERMOD model to estimate the PM_{10} ground-level concentrations for all receptors from the DPM sources. The methods used in the dispersion modeling will be consistent with the approach for modeling criteria pollutants from the Project diesel engines. DPM only has health risk factors for cancer and chronic non-cancer risks, thus, only annual ground-level particulate concentrations will be calculated.

Risk characterization will be performed to integrate the health effects and public exposure information and provide quantitative estimates of health risks from the construction phase DPM emissions. Carcinogenic and chronic non-carcinogenic health risks corresponding to the maximum modeled annual DPM concentrations will be estimated using an Excel spreadsheet for each receptor systems. The chronic non-cancer risk will be calculated by dividing the annual ground level particulate concentration by the DPM chronic REL from OEHHA. The cancer risk will be calculated by estimating the inhalation dose (milligrams per kilogram per day [mg/kg-day]) from the annual ground level particulate concentration, which is then multiplied by the DPM inhalation cancer potency factor from OEHHA.

The cancer risk will be calculated by estimating the inhalation dose (mg/kg-day) from the annual ground level particulate concentration, and then multiplying by the diesel particulate inhalation cancer potency factor from OEHHA. Inhalation dose will be calculated using the following equation:

$$\text{Inhalation dose (mg/kg-day)} = (\text{Annual concentration } (\mu g/m^3)) * DBR * A * EF * ED * 10^{-6} / AT$$

where:

DBR = daily breathing rate (L/kg-day), 393 for the general, residential and sensitive receptors and 149 for the off-site worker receptors.

A = Inhalation absorption factor (fraction of chemical absorbed), default = 1

EF = Exposure frequency (days/year), 350 for the general, residential and sensitive receptors and 245 for the off-site worker receptors.

ED = Exposure duration (years) the total number of years of construction for all receptors.

AT = Averaging time period over which exposure is averaged (days), default = 25,550

4.3 EMISSIONS SOURCES REPRESENTED IN MODELING ANALYSES

4.3.1 Operational Project Sources

Operational emissions from the PPEC project will be dominated by the three GE LMS100 natural gas turbines. Emissions will also come from the two natural gas-fired reciprocating engines for black start capabilities, the cooling tower and the diesel fire water pump. Table 4-2 presents preliminary annual emission estimates for the PPEC project from the CTGs and blackstart engines. Although the table does not include the small contribution to project emissions that will come from the cooling tower and diesel fire water pump, these emissions will be included in the dispersion modeling conducted for the Project. Conceptual plant design includes water injection and SCR for NO_x control and oxidation catalyst for CO control that will match recent BACT determinations in California for similar projects. Emissions of SO_2 and PM_{10} will be low, owing to the exclusive use of interstate pipeline quality natural gas as fuel for the gas turbines and blackstart engines.

Table 4-2
Preliminary Estimated Emissions for PPEC Facility Combustion Turbine-Generators and Natural Gas-Fired Black Start Engines
(tons per year)

NO_x	CO	SO_2	VOC	PM_{10}	Pb
65	99	4	17	38	0

Worst-case emissions scenarios will be determined and modeled for each pollutant and averaging time using realistic combinations of normal operations, turbine startups/shutdowns. Startup and shutdown conditions will be incorporated in the modeling analysis for the operational project. The emissions from these events and their durations will be quantified conservatively, using data provided by the turbine vendors and a reasonable maximum number of startups/shutdowns will be assumed in developing the worst-case emissions scenarios for each relevant averaging time.

Initial commissioning activities will be evaluated separately, as this will be a relatively short-lived, one-time activity. Emissions resulting from turbine commissioning immediately following equipment installation will also be represented, based on the sequence of commissioning activities recommended by the equipment manufacturers and the expected durations and pollutant emissions profiles for each step in the commissioning process. Care will be taken to ensure that conservative assumptions are used for all parameters in order to avoid underestimating these one-time emissions or their impacts on local air quality levels.

4.3.2 Project Construction Sources

Temporary construction emissions will result from heavy equipment exhaust (primarily NO_x and diesel particulate emissions), fugitive dust (PM_{10}) from demolition, earthmoving activities and vehicle traffic on paved and unpaved surfaces. A detailed Excel Workbook will be created to estimate peak daily and annual criteria pollutant emissions from Project construction, based on information from the Project design engineers on the equipment use by month throughout the construction schedule, and the area extent of ground disturbance that will occur during different construction phases. Depending on the magnitude of emissions for different pollutants and the proximity of construction activities to the property boundary for each phase, emission scenarios representing reasonable worst-case construction activities, including emissions from combustion equipment and fugitive dust, for each averaging time will be selected for subsequent dispersion modeling to ensure that maximum off-site air quality impacts due to these temporary activities will be assessed. The selected emissions scenarios will be modeled using AERMOD with the same meteorological input data used for the modeling of the Project's operational emissions. Fugitive dust from the construction site, including the corridors for new transmission lines, gas lines or water pipelines, parking areas and lay-down areas will be modeled as area or volume sources. Fuel burning equipment will be represented as point sources deployed in appropriate locations within the project site. Ultra-low sulfur diesel fuel (15 parts per million (ppm) by weight or less) will be utilized on any emission calculations for construction equipment used at the Project site. Mitigation measures that will be implemented to control dust or exhaust emissions will be accounted for in the emission inventory.

4.3.3 Toxic Air Contaminant Sources

TACs will be emitted from the operational PPEC project due to turbine and blackstart engine combustion of natural gas. TAC emissions are also expected from the cooling tower and the diesel fire water pump. Emissions estimates for TACs will be based on the most appropriate emission factors obtained from CATEF, EPA AP-42, SDAPCD published emission factors (which are based on AP-42 emission factors) and/or vendor data, if available.

Per SDAPCD recommendations, to estimate turbine emissions at low load when the pollution control equipment is not fully functional, such as during startup, shutdown and commissioning, emission factors presented in the Carlsbad Energy Center Project (CECP) HRA may be used if other data are unavailable. The CECP emission factors were derived from stack testing of a GE 7FA natural gas combined cycle turbine during a cold start at the Palomar Energy Center. For pollutants that were not monitored during the stack test, the CECP HRA used AP-42 and the California Air Toxic Emission Factor (CATEF) emission factors. It should be noted that the stack test data are from a combined cycle turbine; however, because the PPEC is proposing only simple cycle turbines, these data may not be representative.

At this time it is expected that two emission scenarios will be examined for the PPEC for both annual operations and hourly operations.

Annual

1. Maximum hours of normal operations plus maximum yearly number of startups and shutdowns.
2. Commissioning operations plus maximum hours of normal operations with yearly number of startups and shutdowns.

Hourly

1. Commissioning operations based on peak 1-hour commissioning activity.
2. Normal operations based on one startup and one shutdown and the remainder of the hour with normal operations.

4.3.4 Greenhouse Gas Emissions

Potential greenhouse gas emissions from the proposed project will be calculated using the California Climate Action Registry power/utility protocol. The estimated greenhouse gas emissions from the Project will be presented in a table.

4.3.5 Cumulative Impact Analysis Including Sources Outside the PPEC Facility

A cumulative impact analysis will evaluate the combined air quality impacts of all operational sources within the PPEC site together with the emissions from other projects within six miles from the PPEC Site that are currently either under construction, undergoing permitting or expected to be permitted in the near future. A request will be made to SDAPCD asking for a list of all newly permitted sources or other sources that are reasonably anticipated to be permitted within six miles of the PPEC site. This list, when compiled will be forwarded on to CEC for review. Based on this information, sources to be included in the cumulative source modeling analysis will be determined.

4.4 MODEL PARAMETERS

4.4.1 Building Wake Effects

The effect of building wakes (*i.e.,* downwash) upon the stack plumes of emission sources at the PPEC plant will be evaluated in accordance with USEPA guidance (USEPA 1985). Direction-specific building data will be generated for stacks below good engineering practice (GEP) stack height, using the most recent version of USEPA Building Parameter Input Program – Prime (BPIP-Prime). Appropriate information will be provided in the application that describes the input assumptions and output results from the BPIP-Prime model.

4.4.2 Receptor Grid

The receptor grids that will be used in the AERMOD modeling analyses described in this protocol for operational sources will be as follows:

- 25-meter spacing along the fenceline and extending from the fenceline out to 100 meters beyond the property line;
- 100-meter spacing from 100 meters to 1 km beyond the property line;
- 500-meter spacing within 1 to 5 km of project sources; and
- 1,000-meter spacing within 5 to 10 km of project sources.

During the refined modeling analysis for operational Project emissions, if a maximum predicted concentration for a particular pollutant and averaging time is located within the portion of the receptor grid with spacing greater than 25 meters, a supplemental dense receptor grid will be placed around the original maximum concentration point and the model will be rerun. The dense grid will use 25-meter spacing and will extend to the next grid point in all directions from the original point of maximum concentration.

Because construction emission sources release pollutants to the atmosphere from small stacks or from soil disturbances at ground level, maximum predicted construction impacts for all pollutants and averaging times will occur within the first kilometer from the PPEC site boundary. Accordingly, only the portion of the above grid out to a distance of 1 km will be used for the construction modeling.

For the HRA modeling, the same grid receptors will be used plus census receptors out to 10 km. These census receptors will include the populated areas near the proposed PPEC facility location. Discrete receptors will also be placed at all sensitive locations (*e.g.,* schools, hospitals, etc.) out to three miles. Receptors will be located at the nearest residences and offsite workers.

4.4.3 Meteorological Data

Meteorological data suitable for input to AERMOD were obtained for the Brown Municipal Airport meteorological station, which is located approximately three miles southwest of the PPEC project site. The meteorological data recorded at Brown Municipal Airport, the closest long-term meteorological monitoring station, are considered to be representative of conditions at the PPEC facility. This conclusion is based on proximity to the Project site and similarity in terrain characteristics.

The Miramar Airport upper air data monitoring station is located approximately 22 miles north of the Project. This is the closest upper air station and was determined the most representative data available for use in this modeling analysis.

The meteorological record selected for this modeling analysis includes hourly data for the years 2000 through 2009. The most recent five years of consecutive and complete data will be used in this analysis. Missing data will be replaced by following the USEPA approved techniques for filling in missing data. The data will be processed in AERMET for input into AERMOD.

Land use sectors will be determined and entered into AERSURFACE to determine the appropriate land use characteristics by season around Brown Municipal Airport. AERSURFACE calculates that surface roughness from the land cover data for a 1 km radius around the meteorological tower and the albedo and Bowen ratio from a 10 by 10 km area around the meteorological tower adhering to the recommendations from the AERMOD Implementation Guide (USEPA 2008). The representative surface moisture input will be set to average. The seasons will be designated by months as follows: Spring-February and March; Summer-April through September; and Fall-October through January. The winter season parameters are not appropriate for this station.

For the HRA modeling, the SDAPCD recommends using a minimum of three sequential years of meteorological data to determine average annual concentrations for calculation of chronic (cancer and non-cancer) risks. Thus the same 5 years of meteorological data from Brown Municipal Airport will be used.

The AERMOD input meteorological data will be provided to CEC and SDAPCD with the AFC and the Authority to Construct (ATC).

4.4.4 Background Air Pollutant Monitoring Data

Available air quality monitoring data will be used to represent background air pollutant concentrations. The ambient air quality in San Diego County is currently monitored at various permanent air pollutant stations. The closest monitoring station to the facility is located in Otay Mesa at the Otay Mesa-Paseo International border crossing, 3.7 miles south of the PPEC facility. However, these data are very heavily influenced by the emissions emitted from the hundreds of vehicles waiting each hour at the border entry point of Otay Mesa-Paseo International. Therefore, data from the Chula Vista monitoring station eight miles northwest of the Project site will be used to represent appropriate background air pollutant concentrations for the PPEC facility.

For both the construction and operational phase modeling, the highest reported concentration that has occurred within the last three years at the Chula Vista monitoring station will be used as the background value for each pollutant and averaging time. These background values will be added to the maximum modeled contributions of project sources to obtain total pollutant concentrations suitable for comparison with the ambient air quality standards. This highly conservative approach assumes that the highest recorded value and the modeled maximum impact both occur at the same time and at the same location.

Hourly ozone measurement data collected at the Chula Vista air quality monitoring station for the same years corresponding to the meteorological input data will be used when conducting the OLM modeling.

To show compliance with the new federal 1-hour NO_2 standard, the background concentration from the EPA determined average 1-hour 98th percentile over 3 years for San Diego County will be used (EPA 2010).

SECTION 5 PRESENTATION OF MODELING RESULTS

Two separate permit documents will be created with the results of the air quality analyses and HRA, an AFC for the CEC, and an application to construction/permit to operate (ATC/PTO) for the SDAPCD.

The results from all of the air quality analyses to evaluate the construction and operational impacts of the Project will be summarized in the AFC, along with the health risk assessments for construction and operations. The cumulative impact analysis will be included if completed or a discussion of how the proposed analysis will be conducted.

The ATC/Permit to Construct (PTO) will present the air quality and health risk impacts from the operational project sources.

5.1 NAAQS AND CAAQS ANALYSIS

The modeling analysis results for the new PPEC sources alone and the cumulative analysis will be presented in summary tables. A figure indicating the locations of the maximum pollutant concentrations will be provided. The modeled values of the criteria pollutants from the PPEC sources will be added to the appropriate background concentrations for each averaging time and compared with the NAAQS and CAAQS.

5.2 HEALTH RISK ASSESSMENT ANALYSIS

Maps depicting the following data will be prepared:

- The locations of sensitive receptors, including schools, pre-schools, hospitals, etc., within a 3-mile radius of the Project, and the nearby residences included in the HRA;
- Isopleths for any areas where predicted exposures to air toxics result in estimated chronic non-cancer impacts or acute impacts equal to or exceeding a hazard index of 1; and
- Isopleths for any areas where exposures to air toxics lead to an estimated carcinogenic risk equal to or greater than one in one million.

Health risk assessment modeling results will be summarized in tabular form to include maximum annual (chronic, both carcinogenic and non-carcinogenic) and hourly (acute) adverse health effects from toxic air contaminant emissions. Cancer burden will also be presented if the maximum predicted cancer risk is greater than one in one million. Health risk values will be calculated and presented in the summary table for the points of maximum impact, maximally exposed individual resident (MEIR), MEIW and the sensitive receptor with the maximum risk value.

5.3 DATA SUBMITTAL

Electronic copies of all modeling input and output files will be provided to SDAPCD and CEC.

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CALIFORNIA ENERGY COMMISSION
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March 15, 2010

Ms. Anne Runnalls
Senior Air Quality Engineer
URS Corporation
1615 Murray Canyon Road, Suite 1000
San Diego, California 92108

RE: Comments on Air Quality Modeling Protocol for the Pio Pico Energy Center Project, Chula Vista, California

Dear Ms. Runnalls:

Thank you for providing Energy Commission staff the opportunity to review the February 17, 2010 Air Quality Modeling Protocol for the Pio Pico Energy Center (PPEC) project, planned for Chula Vista, California. The protocol is generally adequate for existing air quality modeling requirements but has some degree of information deficiency. Staff has the following comments for your consideration for inclusion in the Application for Certification (AFC).

Comments on Prevention of Significant Deterioration (PSD) Requirement

The protocol indicated that PSD analyses would not be required for the PPEC project. This conclusion is correct based on current PSD requirements that apply to criteria pollutants. However, the U.S. Environmental Protection Agency (EPA) requirements could change per a recently proposed PSD and Title V Greenhouse Gas (GHG) Tailoring Rule. This proposed rule would phase in applicability thresholds for both the PSD and Title V programs for sources of GHG emissions. The first phase, which would last 6 years, would establish temporary applicability thresholds for the PSD and Title V at 25,000 tons per year (tpy), on a "carbon dioxide equivalent" (CO2e) basis. Under the Tailoring Rule as currently proposed, most gas-fired power plants in California, including peakers that are too small to be within the jurisdiction of the Energy Commission, would require PSD permitting. PPEC as proposed is sufficiently large that it would very likely fall within this category even though no GHG emission data have been provided in the protocol. Since the promulgation dates of the final rule and the final emission thresholds are still uncertain, staff recommends the applicant keep track of the EPA Tailoring Rule process and update PSD requirements accordingly to avoid any potential delay in the project licensing.

Comments on Compliance with the New Federal 1-Hour NO_2 Standard

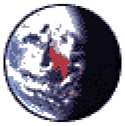
EPA is in the process of establishing a new 1-hour standard at a level of 100 parts per billion (188.68 micrograms per cubic meter), based on the 3-year average of the 98th percentile of the yearly distribution of 1-hour daily maximum concentrations. Staff is aware that San Diego Air Pollution Control District (SDAPCD) will require the compliance with the new 1-Hour Federal NO_2 standard from PPEC. SDAPCD is currently developing the modeling procedure to address the new standard. Staff notices that the protocol has addressed the new 1-Hour Federal NO_2 standard. However, the protocol does not show the details on how to implement the modeling and maintain compliance. Staff recommends that the applicant follow up on the District's updates on modeling procedure and compliance plan, and incorporate them into the Application for Certification (AFC).

If you have any questions, please contact Gerry Bemis of my staff at (916) 654-4960.

Sincerely,

MATTHEW LAYTON, Manager
Engineering & Corridor Designation Office
Siting, Transmission and Environmental
Protection Division

cc: Docket



"Desiena, Ralph"
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04/08/2010 04:31 PM

To <Anne_Runnalls@URSCorp.com>
cc "Moore, Steve " <Steve.Moore@sdcounty.ca.gov>, "Brick, Bill" <Bill.Brick@sdcounty.ca.gov>, "Reeve, Bill " <Bill.Reeve@sdcounty.ca.gov>, "Ralph DeSiena"
bcc
Subject RE: Pio Pico Energy

History: This message has been replied to and forwarded.

Anne,

I've reviewed your submitted modeling protocol for the Pio Pico Energy Center Project.
The protocol is generally adequate for air quality modeling requirements but I do have the following comments:

1. Commissioning and Startups----We would like you to provide both an AQIA and HRA analysis for the facility's commissioning and startup scenarios.
2. New Federal NO_2 standard---We do not agree with the first proposed procedure of combining the 3 year average 98th percentile monitored with the 98th percentile modeled concentrations, which could result in a value that is below the 98th percentile of the combined cumulative distribution and would not be protective of the NAAQS. Alternatively, you may combine the 3 year average 98th percentile monitored concentration with the 3 year average modeled first high concentration as a Tier 1 approach. If compliance is not achieved in that scenario the second proposed procedure, as described in Section 4.2.1 of your protocol, would be an acceptable refined analysis approach.
3. PM_{10}----For the California 24-Hour PM_{10} standard please provide an analysis addressing whether additional violations of this standard would result from the facility's operations. This can essentially be done by modeling all days that an exceedance does not occur but could possibly occur based upon the maximum predicted 24-Hour concentration obtained for all days modeled. For example, if the maximum predicted 24-Hour concentration is 5 ug/m$_3$ then all days with a monitored concentration of 46 to 50 ug/m$_3$ would be modeled, and the results for each day compared with the California standard.
4. PM_{10}----For the California annual standard an analysis of contribution significance to an exceedance of that standard may be based upon a comparison of the maximum modeled annual concentration with Federal/California Significant Impact Levels (SILs).
5. $PM_{2.5}$----We would like you to provide an analysis for facility predicted impacts on Federal and California $PM_{2.5}$ standards. For your analysis conservatively assume all emission of PM_{10} are equivalent to $PM_{2.5}$ emissions. For the Federal $PM_{2.5}$ annual standard the 3 year average modeled first high value may be added to the 3 year average monitored concentration for comparison to that standard. For the California $PM_{2.5}$ annual standard the same procedure may be followed. If the 3 year average annual monitored concentration for the period chosen for modeling already exceeds either standard then a significance test as described for PM10 in item 4 above may be presented. You may use the preliminary Federal screening level SILs proposed September 21, 2007 in 40CFR Parts 51 and 52 for this analysis. For the Federal 24-Hour $PM_{2.5}$ analysis you may combine the 3 year average 98th percentile monitored concentration with the 3 year average modeled first high concentration for comparison with the standard.
6. Data Submittal---Please also provide all input and output electronic files for the meteorological data processing that was performed for this project.

We look forward to working with you on this project. If you have any questions please give me a call.

Regards,

Ralph

Ralph DeSiena
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From: Anne_Runnalls@URSCorp.com [mailto:Anne_Runnalls@URSCorp.com]
Sent: Wednesday, April 07, 2010 5:53 PM
To: Desiena, Ralph
Subject: Re: Pio Pico Energy

great, thanks!

Anne Runnalls
Senior Air Quality Engineer
URS Corp.
619.243.2824 direct

"Desiena, Ralph" <Ralph.Desiena@sdcounty.ca.gov>

"Desiena, Ralph" <Ralph.Desiena@sdcounty.ca.gov>

04/07/2010 05:03 PM

To<Anne_Runnalls@URSCorp.com>

cc

SubjectPio Pico Energy

Anne,

Sorry I didn't get back to you until now.

I'll get you any comments I have on the protocol tomorrow.
There have been some changes in NO_2 and PM 2.5 modeling procedures, as you are aware, and I'd like to make sure we are on the same page with these.

Regards,

Ralph

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