From: Will Walters <WWalters@aspeneg.com>
To: Eric Solorio <ESolorio@energy.state.ca.us>
Date: 3/10/2009 4:25 PM
Subject: FW: Canyon Information to Docket (NO.2)
Attachments: corrected table 3.2.doc

Eric,

Here is the second of two resent for docketing. Again both the attachment and the e-mail chain should be docketed.

Will

From: Will Walters
Sent: Wednesday, February 25, 2009 10:18 AM
To: Eric Solorio
Subject: Canyon Information to Docket (NO.2)

Eric,

Second Item that should be docketed...again I will be referencing the information provided.

Will

From: Suzanne Wilson [mailto:SWilson@anaheim.net]
Sent: Friday, February 06, 2009 7:45 AM
To: Will Walters
Subject: RE: Canyon - Operating Emission Assumption Questions

Will,
Here are the responses to your questions in the same order as asked:

1. The worst case month shown in the most recent information submitted to the SCAQMD shows 90 hrs/month for normal operation per gas turbine, 20 startups/month per gas turbine, and 20 shutdowns/month per gas turbine. If this worst case month occurred every month during a year, the total would be 1,080 hrs/year for normal operation per gas turbine, 240 starts/year per gas turbine, and 240 shutdowns/year per gas turbine. With 35 minutes for a startup and 10 minutes for a shutdown this results in an annual total of 1,260 hours per gas turbine.

2. Correct.

3. For a worst case assumption the cooling tower operates for every normal gas turbine operating hour which is a total of 4,320 hours per year ((1,080 per turbine x 4 turbines).

Part 2 of questions asked:

1. Correct.

2. For a black start situation (i.e., a true emergency operating scenario for the generator engine), the emergency generator engine would operate for a maximum of 38 minutes in order to get at least one gas turbine started. If this occurred during the first hour of the day and taking into account it takes 35 minutes for a gas turbine startup, the gas turbines would operate a maximum of approximately 23.5 normal operating hours during this day.

3. Correct, the maximum hourly ammonia emissions are 3.64 lbs/hr for full load operation and the total annual operating hours including startup/shutdown time is 1,260 hours per year per gas turbine

4. Correct. Only the sulfur value has changed. Regarding the change in the NOx value, between the December 2007 and September 2008 versions AQMD required us to accept a turbine BACT level for NOx emissions of 2.3 ppm. Prior to that, we were using a maximum emission rate of 4.05 lb/hour. That corresponded to 2.5 ppm at full load operation at 59 degrees. So we then set the new emission rate for that ambient condition to 3.98 and scaled the mass emission rates for all the other conditions by the ratio 2.3/2.5. The 3.98 number is correct and has been used in the last several rounds of modeling. However, in making the revisions to Table 3.2 of the September application revision for the NOx lb/hour values, we missed changing the lb/hour values to reflect the commitment to 2.3 ppmv. This was a text error only. The corrected values are shown in the Track Change mode in the attached file. The value used in the modeling was the right one. See page 3 of the attached document.

5. The maximum daily emissions for NOx, CO, and VOC would be based on 2 startups and 2 shutdowns per day along per gas turbine along with 22.5 hours of normal full load operation per gas turbine (this results in a total of 24 hours of operation for each gas turbine). For PM10 and SOx the maximum daily emissions would be based on 24 hours per day of normal full load operation per gas turbine.

Please let me know if you have any additional questions.
I can also be reached at 714-765-4112.

From: Will Walters [mailto:WWalters@aspeneg.com]
Sent: Wednesday, February 04, 2009 1:03 PM
To: John_Lague@URSCorp.com
Cc: 'Eric Solorio'; Suzanne Wilson; Steve Sciortino
Subject: Canyon - Operating Emission Assumption Questions

John,

In the revised emission information the latest basis I seem to have is as follows:

1) 1,080 hours per turbine normal operations with 240 starts and 240 shutdowns (ammonia basis is 1,260 hours/year)

2) Black-start engine up to 200 hours/year of use (I assume this includes emergency use)

3) Cooling tower 5,040 hours per year

Could you please confirm that is still the current basis.

Also, I have the following additional questions:

1) Are the hourly black-start engine emissions the same as the those revised in Table 3-4 in the September 2008 update?

2) What is the maximum daily black-start engine use...considering the complications with black-start use and turbine up time it would seem maximum daily for the facility would be one hour of engine testing with maximum daily turbine emissions, correct?

3) Ammonia emissions are still 3.64 lbs/day and annual emissions are based on 1,260 hours per turbine, correct?

4) All turbine hourly emission rates have not changed...other than the sulfur basis...from the September

08 Revised PTC application, correct? The issue I am having resolving this is that the revised modeling information on page 2/19 shows a maximum NOx 1-hour of 3.98 lbs/hour while the September 08 document, revised Table 3-2 shows a maximum of 4.05 lbs/hour. Am I missing a subsequent revision of Table 3-2?

5) Could you provide assumptions for maximum daily gas turbine emissions, or is the turbine scenario data in the AFC still correct? That would be an assumption of one startup and one shutdown and rest of day in operation for NOx, VOC, and CO and 24 hours of maximum normal operations for PM10 and SOx.

I'm trying to make sure I get everything in the PSA done as correctly as possible so I don't need to revise very much based on what I see in the PDOC. So any help would be appreciated. Thanks,

Will

From: Will Walters
Sent: Tuesday, February 03, 2009 11:42 AM
To: 'John_Lague@URSCorp.com'
Cc: 'Eric Solorio'; 'Suzanne Wilson'; 'ssciortino@anaheim.net'
Subject: Canyon - Cumulative Air Quality Analysis

John,

This is a follow-up to our telephone conversation regarding the air quality cumulative air quality analysis. Please provide the information regarding your findings that there were no sources of a magnitude to require a cumulative air dispersion modeling assessment with all appropriate background information and District correspondence (you do not need to resend the two page list but can just refer to it). Please address this as an official follow-up to the response to Data Request Air-5 and provide it to dockets. Thank you.

Also, I checked and found that the Walnut Creek project, which is likely held up due to offsets anyways, is outside of the six mile radius from the site.

Will Walters, Aspen
818-597-3407 ext. 345

SECTION 3 PROJECT EMISSIONS INFORMATION

This section provides quantitative estimates of air pollutant emissions that will result from operation of the proposed Project.

3.1 EMISSIONS ESTIMATION METHODOLOGY

The four CTGs 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 2.3 ppmvd NO_x, 4 ppmvd CO, and 2 ppmvd ROG, all referenced to 15% O_2. The proposed CTGs will use pipeline-quality natural gas fuel exclusively. The natural gas will be supplied to the proposed project by Southern California Gas Company (SCGC). Estimated emissions of sulfur oxides for combustion of this fuel by proposed project equipment assumed full oxidation of all fuel sulfur to SO_2 and an average natural gas sulfur content of 0.25 grains per 100 dry standard cubic feet (dscf). The emission rate used in modeling annual average concentrations of this pollutant used this sulfur content. Modeling for short-term SO_2 concentrations (1-hour, 3-hour, and 24-hour averages) assumed the maximum sulfur content that SCGC may legally provide to the project (i.e., 1 grain per 100 dry standard cubic feet). This higher sulfur content was used in modeling short-term impacts to ensure evaluation that maximum possible concentrations of SO_2 would be addressed, although the likelihood that actual natural gas shipments will ever contain such high sulfur levels is considered very remote. The black start engine will use ultra-low sulfur diesel fuel. Estimated emissions of sulfur oxides for combustion of this latter fuel assumed full oxidation of all fuel sulfur to SO_2 and a diesel sulfur content of 15 ppm by weight. Calculation sheets showing detailed criteria pollutant emission calculations are provided in Appendix B to this revised application.

3.2 ESTIMATED CRITERIA POLLUTANT EMISSIONS

3.2.1 Normal Turbine Operating Emissions

The most important emission sources of the proposed project will be the new CTGs. Maximum short-term operational emissions from the CTGs were determined from a comparative evaluation of emissions corresponding to a full range of possible turbine loads and ambient conditions, as well as CTG startup/shutdown conditions. The long-term operational emissions from the CTGs were estimated by summing the anticipated annual emissions contributions from normal full-load operations and from the expected numbers of CTG startups and shutdowns. Estimated annual emissions of air pollutants from the CTGs have been calculated based on the expected operating schedule presented in Table 3-1. Table 3-1 has been revised to reflect the increase in startup time from 20 minutes assumed in the original application to 35 minutes which is necessary to achieve full compliance with the steady state emission limit. In addition normal operating hours have been reduced to ensure the CPP will emit less than 4 tons per year of PM_{10}.

Table 3-1 (Revised)
Maximum Proposed CTG Operating Schedules

Operating Conditions (CTGs 1 through 4)	Annual Numbers
Number of Startups/Shutdown Cycles per CTG	129
Startup/Shutdown Time (hours per CTG)	96.75
Normal Operating Hours (Combined hours for Four CTGs)	2,408(4 x 602 hours/turbine)

Each CTG unit will be equipped with a new stack with the following dimensions:
Height – 86 feet (ft)
Diameter – 11.7 ft

The hourly criteria pollutant emission rates and stack parameters provided by the CTG vendors for three load conditions (50 percent, 75 percent, and 100 percent) at three ambient temperatures (38°F, 59°F, and 109°F) are presented in Table 3-2. Table 3-2 has been revised to reflect the lower concentration limit of CO of 4 ppm @ 15 percent O_2. The cases listed in this table also include emissions data for CTG operations with and without evaporative cooling of the inlet air to the turbines for full load CTG operation and/or for the higher ambient temperature conditions. The combined scenarios presented in this table bound the expected normal operating range of each proposed CTG.

Table 3-2 (Revised)
1-Hour Operating Emission Rates and Stack Parameters for Individual CTG Operating Load Scenarios

Case No.	1	2	3	4	5	6	7	8	9
Ambient Temperature (°F)	109	109	109	59	59	59	38	38	38
Stack Diameter (ft)	11.67	11.67	11.67	11.67	11.67	11.67	11.67	11.67	11.67
Exhaust Flow (lb/hr)	1,066,554	907,936	764,619	1,080,197	963,857	832,416	1,085,651	992,555	867,866
CTG Load Level (percent)	100	75	50	100	75	50	100	75	50
Evaporative Cooler	ON	ON	NONE	ON	NONE	NONE	NONE	NONE	NONE
Exhaust Temperature (°F)	841.6	858.9	832.6	838.6	785.5	754.2	836.7	759.9	710.4
Exit Velocity, ft/minute	5,461.0	4,710.7	3,888.0	5,518.1	4,722.4	3,975.9	5,537.9	4,763.1	3,995.7
NO_x Emissions per Turbine Unit									
ppmvd @ 15 percent O_2	2.32	2.32	2.32	2.32	2.32	2.32	2.32	2.32	2.32
lb/hr	3.993.81	3.192.94	2.402.21	4.053.98	3.202.94	2.382.19	4.033.71	3.182.93	2.392.20
CO Emissions per Turbine Unit									
ppmvd @ 15 percent O_2	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
lb/hr	4.19	3.34	2.52	4.24	3.34	2.50	4.23	3.34	2.50
ROG Emissions per Turbine Unit									
ppmvd @ 15 percent O_2	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
lb/hr as methane (CH_4)	1.19	0.95	0.71	1.20	0.95	0.70	1.20	0.96	0.71
PM_{10} Emissions per Turbine Unit									
lb/hr[1]	2.95	2.36	1.78	3.00	2.37	1.77	2.99	2.36	1.78

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Table 3-2 (Revised)
1-Hour Operating Emission Rates and Stack Parameters for Individual CTG Operating Load Scenarios (Continued)

Case No.	1	2	3	4	5	6	7	8	9
SO_X Emissions per Turbine Unit									
(short-term rate) lb/hr[2]	1.34	1.07	0.81	1.36	1.07	0.80	1.35	1.07	0.80
(long-term rate) lb/hr[2]	0.33	0.27	0.20	0.34	0.27	0.20	0.34	0.27	0.20

Notes:

[1] As discussed with SCAQMD, the applicant will commit to meet a PM_{10} mass emission rate limit of 3.0 lb/hour/turbine during all unit operations, and this value is used in all subsequent analyses of this revised application.

[2] A worst-case short-term natural gas fuel sulfur content of 1.0 grains per 100 dry standard cubic feet was used to estimate the CTG emissions of SO_2 in this table for modeling purposes only and not for emission calculations. The actual expected average fuel gas sulfur content is 0.25 grains per 100 dry standard cubic feet; this latter value was used to estimate the annual SO_2 emission rates and all other emission calculations.

CO = carbon monoxide
CTG = combustion turbine generator
lb/hr = pounds per hour
NO_X = nitrogen oxide
ppmvd = parts per million by volume, dry
O_2 = oxygen
PM_{10} = particulate matter 10 microns in diameter
ppmvd = parts per million by volume, dry
SO_X = sulfur oxides
ROG = reactive organic gases

3.2.2 Turbine Startup and Shutdown Emissions

The expected emissions and durations associated with CTG startup and shutdown events are summarized in Table 3-3. Because hours that include startup and shutdown events would have higher NO_X, CO, and ROG emissions than the normal operating condition with fully functioning SCR and CO oxidation catalyst, one or more startup/shutdown cycles were incorporated (as applicable) into the worst-case short- and long-term emissions estimates in the air quality dispersion modeling simulations for these pollutants. Appendix B provides tables showing the estimated emissions for each minute of a typical turbine startup and shutdown sequence.

For NO_x during a startup event, the total emissions have been increased to account for increasing the startup event time from 20 minutes which was assumed in the previous version of the application to 35 minutes necessary to achieve compliance with the steady state emission limit. For NO_x during a shutdown event the values have been reduced from the values shown in the previous version of the application to account for the continued operation of the SCR for a portion of the shutdown event and have been revised to account for increasing the shutdown time from 8 to 10 minutes.

For CO during a startup event, although the emission concentration has been reduced from 6 ppm to 4 ppm, the total emissions have been revised to account for the increased startup time necessary to achieve compliance with steady state emission rates. For CO during a shutdown event, the total emissions have reduced from the values shown in the previous version of the application to account for the continued operation of the CO catalyst during a shutdown and have been revised to account for increasing the shutdown time from 8 to 10 minutes.

For ROGs during a startup event, the total emissions have been increased to account for increasing the startup event time from 20 minutes which was assumed in the previous version of the application to 35 minutes necessary to achieve compliance with the steady state emission limit and to revise an error in the original calculations. For ROGs during a shutdown event the values have been increased from values shown in the previous version of the application to correct an error in the original calculations and to account for increasing the shutdown time from 8 to 10 minutes.

For SO_2 during a startup event the values have been revised to account for increasing the startup event time from 20 minutes which was assumed in the previous version of the application to 35 minutes. For shutdown the total emissions have been revised to account for the increased shutdown time from 8 to 10 minutes. In addition the original application calculated startup emissions for SO_2 during startup and shutdown events using a sulfur content of 1 gr/100 dscf which is the tariff limit. The emission calculations for both startup and shutdown have been revised to reflect the lower expected sulfur content of 0.25 gr/100 dscf.

For PM_{10} the emission values have been increased for both startup and shutdown events to account for the event times increases, as described above and to reflect the GE guarantee.

Table 3-3 (Revised)Criteria Pollutant Emission Rates During CTG Startup and Shutdown (per turbine)

Pollutant	Startup (35 minutes duration)	Shutdown (10 minutes duration)

	Maximum Instantaneous Emission Rate (lb/hr)*	Total Emissions (lb/event)	Maximum Instantaneous Emissions Rate (lb/hr)*	Total Emissions (lb/event)
N	50.00	10.0	6.35	0.69
C	22.00	4.06	4.8	0.62
R	2.50	0.79	2.25	0.27
S	1.32	0.14	1.32	0.02
P	3.0	1.29	2.52	0.18

Note:

CO = carbon monoxide
NO_x = nitrogen oxide
PM_{10} = particulate matter 10 microns in diameter
SO_2 = sulfur dioxide
ROG = reactive organic gases

*The Maximum Instantaneous Emission Rate is the highest instantaneous value shown on the respective startup or shutdown emission curves, as included Appendix E

3.2.3 Additional Emission Sources

The proposed project will include a black start generator engine powered by diesel fuel. The 750 kilowatt (kW) black start engine will be tested once per month to ensure its operability during an emergency outage of grid power. However, the applicant requests that the AQMD permit allow for up to 200 hours per year of total operating time. Annual emissions and stack parameters for the testing of the engine are provided in Table 3-4. Emission rates shown in this table are based on EPA Tier 2 diesel engine emission factors. Credit has been taken for a particulate emission control efficiency of 85% which will be achieved by installation of a particulate filter trap. The engine fuel will be ultra-low sulfur diesel containing a maximum of 15 ppm sulfur (weight basis). Table 3-4 emission calculations have been revised to reflect SCAQMD direction to increase the NO_x emission rate from 10.54 to 12.06 pounds/hour and to reflect the lower emission rates associated with the installation of the particulate filter trap.

The proposed project will also include a small mechanical draft evaporative chiller cooling tower with a total of four cells. The cooling tower will emit a small amount of particulate matter (see Table 4-2 and Appendix B).

Detailed emissions calculations for all equipment of the operation of the proposed project, including estimated ROG and organic TACs due to an on-site oil water separator, are provided in Revised Appendix B.

Table 3-4 (Revised)
Black Start Generator Engine Emission Parameters

	Black Start Engine Emissions	
Pollutant	lb/hr	lb/yr
NO_x	12.06	2,412
CO	5.79	1157.4
ROG	0.05	10.00
SO_x	0.006	1.14
PM_{10}	0.0496	9.92

Source
Annual emissions based on 200 hours of operation
Stack height: 20 feet
Stack diameter: 0.83 feet
Stack exhaust flow rate at full firing: 5,647 actual cubic feet per minute (ACFM)
Stack exhaust temperature at full firing: 949.8 °F

3.2.4 Turbine Commissioning Emissions

Commissioning of each new CTG will be performed in a defined series of tests that will be conducted following its installation at the proposed project facility. The specific tests to be run on each CTG include:

- First fire the unit and then shutdown to check for leaks, etc.
- Synch and check emergency stop (e-stop)
- Additional automatic voltage regulator (AVR) commissioning
- Break-in run
- Dynamic commissioning of AVR and commission water injection and SPRINT
- Base load AVR commissioning

The duration of all tests may be affected by unforeseen events and therefore can only be estimated in advance. Commissioning of each CTG with partially abated emissions is expected to require a maximum of 156 hours of operation.. At least one CTG start would be needed for each test, and additional starts may be necessary. The annual frequency of CTG starts during the year when commissioning occurs is not expected to exceed the frequency of CTG starts during operation (refer to Table 3-1). Fuel flow monitoring would be conducted for all tests.

The CPP proposes a commissioning period of approximately 4 months during which all installed equipment would be run and tested. The CTG commissioning periods would begin when the CTGs first burn natural gas fuel. The applicant will make every effort to minimize emissions of CO, ROG, and NO_x during the commissioning period. However, not all of the equipment to abate these emissions would be fully operational at the start of the commissioning period. The CPP requests a maximum of 156 hours of partially abated emissions for each CTG.

When it has been installed, the oxidation catalyst in each train will abate CO and ROG emissions from the CTG, because it is essentially a passive device. While in some cases it may be possible to install the oxidation catalyst prior to initial startup of the CTGs, it may not be installed until late in the commissioning period. The SCR catalyst may not be installed at the same time as the oxidation catalyst. NO_x emissions from the CTG may be only partially abated during times that the CTG burners are being tuned and the SCR system is being tested. Regardless of the fact that the oxidation catalyst and SCR may not be installed until late in the commissioning process, the inherent low emissions of NO_x, CO, and ROG associated with water injection will ensure that the impacts of these emissions are kept to low levels. Dispersion modeling to evaluate the impacts of commissioning tests on local air quality is presented in Section 4.7.

Conservative, worst-case turbine commissioning emissions were estimated by assuming that the control efficiency of the applicable abatement systems will be zero during the commissioning tests. Emissions of SO_2 are estimated by assuming full conversion of the sulfur in the natural gas to SO_2, and may vary based on the amount of natural gas burned. Since the commissioning activities occur at low loads, SO_2 emissions will be higher from full-load normal operations and thus were not examined in the analysis of impacts during the turbine commissioning phase.

The durations and corresponding pollutant emission rates of individual commissioning tests for a single combustion turbine generator are summarized in Table 3-5. Table 3-5 has been revised to reflect the increase in the number of commissioning hours from 104 to 156. In addition, the original application calculated PM_{10} emissions during commissioning using a commissioning emission rate of 4 pounds/hour. After consultation with GE, the emission rate during commissioning would meet the GE guarantee of 3 pounds/hour, and the table has been revised to reflect this lower emission rate for PM_{10}. In addition, in order to address requests from SCAQMD, the table has been revised to add the fuel flow rate and estimated total fuel usage during commissioning.

Detailed information regarding the assumed sequence of individual CTG commissioning tests and the associated pollutant emissions is provided in Appendix B.

Detailed emissions calculations for all equipment of the operation of the proposed project, including estimated ROG and organic TACs due to an on-site oil water separator, are provided in Revised Appendix B.

Table 3-4 (Revised)
Black Start Generator Engine Emission Parameters

Pollutant	Black Start Engine Emissions	
	lb/hr	**lb/yr**
NO_x	12.06	2,412
CO	5.79	1157.4
ROG	0.05	10.00
SO_x	0.006	1.14
PM_{10}	0.0496	9.92

Source
Annual emissions based on 200 hours of operation
Stack height: 20 feet
Stack diameter: 0.83 feet
Stack exhaust flow rate at full firing: 5,647 actual cubic feet per minute (ACFM)
Stack exhaust temperature at full firing: 949.8 °F

Table 3-5 (Revised)
Durations and Criteria Pollutant Emissions for Commissioning of a Single CTG

Activity	Duration (hours)	% Output at ISO	Fuel Gas Flow Rate (MMCF/hr)	Estimated Total Fuel Usage (MMCF)	Exhaust Temp (°F)	Exhaust Flow Rate (acfm)	Total Pollutant Estimated Emission per Event (lbs)				
							NO_x	CO	ROG	PM_{10}	SO_2
1. First fire the unit and then shutdown to check for leaks, etc.	24	CI	0.0833	1.9032	694	199,271	200	822	27	96	6
2. Synch and check e-stop	18	SI	0.0833	1.4355	694	199,271	150	617	20	72	4
3. Additional automatic voltage regulator (AVR) commissioning	18	5%	0.1031	1.8065	726	218,499	261	329	8	72	5
4. Break-in run	12	5%	0.1031	1.2097	726	218,499	174	219	5	48	4
5. Dynamic commissioning of AVR and commission water injection and SPRINT	60	10 – 100%	0.1194 – 0.4559	31.3871	713 – 843	239,475 – 513,911	1636	819	11	240	49
6. Base load AVR commissioning	24	100%	0.4559	5.1613	843	513,911	1023	409	30	96	32
Total emissions during commissioning	156			42.90			3443	3213	99	468	100

Notes:
After SCR catalyst installaton, the NOx emissions would be reduced by 82%. This applies to activities 2-6; thus NOx emissions presented in this table will be reduced by 82%
After SCR catalyst installaton, the NOx emissions would be reduced by 85%. This applies to activities 2-6; thus CO emissions presented in this table will be reduced by 85%
AVR = automatic voltage regulator
SCR = selective catalytic reduction
At ISO = ambient temperature of 59 °F, relative humidity of 60%, and sea level
CI = core idle mode of turbine operation, no load placed on unit
SI = synch idle mod of turbine operation, no load placed on unit

3.2.5 Combined Annual Project Emissions

The estimated total combined annual emissions from all criteria pollutants sources of the proposed project are shown in Table 3-6, including four CTG units, the black start engine, and the 4-cell chiller cooling tower. Annual emissions of all pollutants were calculated assuming the CTG hours per year of operation described previously in Table 3-1 and the corresponding hours of the 4-cell chiller cooling tower operation. Total operating time for the blackstart engine was assumed to be 200 hours per year). Table 3-6 has been revised to reflect the reduced operating hours of all equipment, the increase startup and shutdown times, and the revised emission rates as described in this revised application.

Table 3-6 (Revised)
Estimated Total Project Annual Emissions of Criteria Pollutants for Normal Operating Year

Pollutant	Emissions (tons/year)[1,2]
SO_2	0.45
NO_x	8.78
ROG	1.72
PM_{10}[3]	3.99
CO	6.89
Lead[4]	<0.6

Notes:
[1] Includes emissions from four new CTG units
[2] CTG emissions based on 602 hours normal operation, plus 129 starts and shutdowns for each turbine
[3] PM_{10} emissions includes both filterable (front-half) and condensable (back-half) particulates
[4] Annual SO_2 emissions calculated based on expected maximum natural gas sulfur content of 0.25 gr/100 dry standard cubic feet
[4] Lead emissions are 'non-detect' from AP-42 for CTGs firing natural gas
CO = carbon monoxide
NO_x = nitrogen oxides
PM_{10} = particulate matter less than 10 micrometers in diameter
ROC = reactive organic compounds
SO_2 = sulfur dioxide

3.3 ESTIMATED TOXIC AIR CONTAMINANT EMISSIONS

Facility operations were evaluated to determine whether particular substances would be used or generated at the proposed project site that may have the potential to cause adverse health effects upon their release to the air. The primary sources of potential emissions from facility operations would be the four natural gas-fired CTGs, as well as the aqueous ammonia slip stream from the SCR control system on each turbine. Secondary sources of potential emissions include the evaporative cooling towers and diesel fuel combustion in the black start engine. The black start engine will normally be operated only for short periods in testing mode to ensure operability if needed. The cooling tower will employ a high-efficiency drift elimination system to minimize the release of drift droplets containing trace amounts of hazardous substances. The substances that would be emitted from facility operations (with potential toxicological impacts) are listed in Table 3-7. The table has revised to reflect toxicity values recommended by Cal-

EPA/OEHHA. These toxic air contaminants were identified from emission factors published by the United States Environmental Protection Agency AP-42 (USEPA, 1995), the California.

Table 3-7
Toxicity Values Used To Characterize Health Risks

Compound	Sources of Emissions	Inhalation Cancer Potency Factor (mg/kg-day)-1	Chronic REL (µg/m³)	Acute REL (µg/m³)
Diesel particulate (PM_{10})	Black start engine	1.10E+00	5.00E+00	--
Ammonia	Gas turbine stacks	--	2.00E+02	3.20E+03
1,3-Butadiene	Gas turbine stacks	6.00E-01	2.00E+01	--
Acetaldehyde	Gas turbine stacks	1.00E-02	9.00E+00	--
Acrolein	Gas turbine stacks	--	6.00E-02	1.90E-01
Benzene	Gas turbine stacks	1.00E-01	6.00E+01	1.30E+03
Ethylbenzene	Gas turbine stacks	8.70E-03	2.00E+03	--
Formaldehyde	Gas turbine stacks	2.10E-02	3.00E+00	9.40E+01
Propylene oxide	Gas turbine stacks	1.30E-02	3.00E+01	3.10E+03
Toluene	Gas turbine stacks	--	3.00E+02	3.70E+04
Xylenes	Gas turbine stacks	--	7.00E+02	2.20E+04
Benzo(a)anthracene	Gas turbine stacks	3.90E-01	--	--
Benzo(a)pyrene	Gas turbine stacks	3.90E+00	--	--
Benzo(b)fluoranthene	Gas turbine stacks	3.90E-01	--	--
Benzo(k)fluoranthene	Gas turbine stacks	3.90E-01	--	--
Chrysene	Gas turbine stacks	3.90E-02	--	--
Dibenz(a,h)anthracene	Gas turbine stacks	4.10E+00	--	--
Indeno(1,2,3-cd)pyrene	Gas turbine stacks	3.90E-01	--	--
Naphthalene	Gas turbine stacks	1.20E-01	9.00E+00	--
Arsenic	Cooling tower	1.20E+01	3.00E-02	1.90E-01
Beryllium	Cooling tower	8.40E+00	7.0E-03	--
Cadmium	Cooling tower	1.50E+01	2.00E-02	--
Chlorine	Cooling tower	--	2.00E-01	2.10E+02
Chromium	Cooling tower	5.10E+02	2.00E-01	--
Copper	Cooling tower	--	--	1.00E+02
Cyanide	Cooling tower	--	9.0E+00	3.4E+02
Fluoride	Cooling tower	--	1.30E+01	2.40E+02
Lead	Cooling tower	4.20E-02	--	--
Manganese	Cooling tower	--	2.0E-01	--

Table 3-7
Toxicity Values Used To Characterize Health Risks
(Continued)

Compound	Sources of Emissions	Inhalation Cancer Potency Factor (mg/kg-day)$^{-1}$	Chronic REL (µg/m³)	Acute REL (µg/m³)
Mercury	Cooling tower	--	9.0E-02	1.8E+00
Nickel	Cooling tower	9.1E-01	5.00E-02	6.0E+00
Selenium	Cooling tower	--	2.00E+01	--
Silica	Cooling tower	--	3.00E+00	--
Sulfate	Cooling tower	--	--	1.20E+02

Source: Cal-EPA/OEHHA, 2008

Notes:

-- = not applicable

mg/kg-day = milligrams per kilogram per day

µg/m³ = micrograms per cubic meter

REL = reference exposure levels

Air Toxic Emission Factors database (CATEF) (CARB, 1996), and from analysis of the chiller cooling tower makeup water. In addition, potential emissions of ammonia slip from the SCR systems were included.

Worst-case estimates of hourly and annual turbine emissions were made by assuming that all turbines would operate simultaneously under full load conditions with a maximum higher heating value (HHV) fuel energy input rate of 480.6 million British thermal units per hour per turbine (MMBtu/hr/turbine) (100 percent load at 59 degrees Fahrenheit [°F]). The annual emission calculations are based on operation of each turbine for a maximum of 698.75 hours per year (602 hours of normal operations plus 129 startups and shutdowns for an additional 96.75 hours).

Per SCAQMD recommendations, emission factors for natural gas-fired turbines were obtained from Table 3.1 3 of the AP-42 reference (USEPA, 1995). Speciated polycyclic aromatic hydrocarbons (PAH) emission factors for natural gas-fired combustion turbines equipped with SCR and CO catalyst systems were provided from the CATEF database In addition, potential ammonia slip emissions from the SCR systems were included in the air toxics analysis. The emission factors and estimated maximum hourly and annual turbine emissions of toxic air contaminants (TAC) are summarized in Table 3-8. The annual turbine emissions have been revised to reflect the decreased hours of operation.

Table 3-8 (Revised)
Toxic Air Contaminant Emission Rates from Operation of the CPP Natural Gas Fired Combustion Turbines (Per Turbine)

Chemical Species	Emission Factor (lb/MMBtu)[1]	Maximum Hourly Emissions per Turbine (lb/hr)	Annual Emissions Per Turbine (lb/hr)
Ammonia[2]		3.64	2.54E+03
1,3-Butadiene	4.30E-07	2.07E-04	1.44E-01
Acetaldehyde	4.00E-05	1.92E-02	1.34E+01
Acrolein	3.62E-06	1.74E-03	1.22E+00
Benzene	3.26E-06	1.57E-03	1.09E+00
Ethylbenzene	3.20E-05	1.54E-02	1.07E+01
Formaldehyde	3.60E-04	1.73E-01	1.21E+02
Propylene Oxide	2.90E-05	1.39E-02	9.74E+00
Toluene	1.30E-04	6.25E-02	4.37E+01
Xylenes	6.40E-05	3.08E-02	2.15E+01
Polycyclic Aromatic Hydrocarbons (PAH)			
Benzo(a)anthracene	2.23E-08	1.07E-05	7.50E-03
Benzo(a)pyrene	1.37E-08	6.60E-06	1.32E-01
Benzo(b)fluoranthene	1.12E-08	5.37E-06	3.75E-03
Benzo(k)fluoranthene	1.09E-08	5.22E-06	3.65E-03
Chrysene	2.49E-08	1.20E-05	8.36E-03
Dibenz(a,h)anthracene	2.32E-08	1.12E-05	7.80E-03
Indeno(1,2,3-cd)pyrene	2.32E-08	1.12E-05	7.80E-03
Naphthalene	1.64E-06	7.88E-04	5.51E-01

Notes:
[1] See Appendix C for detailed emission calculations. Emission factors obtained from USEPA AP-42 Table 3.1-3 for uncontrolled natural gas-fired stationary turbines. Formaldehyde, Benzene, and Acrolein emission factors are from the Background document for AP-42 Section 3.1, Table 3.4-1 for a natural gas-fired combustion turbine with a CO catalyst. Speciated PAH emission factors obtained from the CATEF database for natural gas-fired combustion turbines with SCR and CO catalyst. Ammonia emission rate based on an exhaust NH_3 limit of 5 ppmv @ 15% O2 guaranteed by the equipment vendor.
[2] Not a Clean Air Act Hazardous Air Pollutant (HAP).
lb/hr = pounds per hour
lb/yr = pounds per year
lb/MMBtu = pounds per million British thermal units
ppm = parts per million

Trace levels of inorganic particles were identified in the analysis of the source water for the 4-cell chiller cooling tower, and low-level emissions of these pollutants would therefore be contained in the particulate matter emitted as drift from the chiller cooling tower. To calculate the cooling tower emissions, a water circulating rate of 7,740 gallons per minute with 10 cycles of concentration was used, with a drift elimination system capable of limiting drift to no more than 0.001 percent of the circulating water rate, as guaranteed by the equipment vendor. Water anticipated to be used for makeup to the cooling tower was sampled to determine the maximum concentrations of inorganic chemicals. These values were then used to determine the maximum TAC emissions from the cooling tower. For the annual emission calculations it was conservatively assumed that the chiller cooling tower would operate for a maximum of 2,795 hours per year (i.e., 4 times the annual total operating time of any one turbine, including startups and shutdowns). Emission factors and estimated maximum hourly and annual TAC emissions from the entire cooling tower are summarized in Table 3-9.

Table 3-9 (Revised)
Toxic Air Contaminant Emission Rates from Operation of the Chiller Cooling Tower (Emission Totals for all Four Cells)

Chemical Species	TAC Concentration in Water (µg/L)[1]	Maximum Hourly Emissions (lb/hr)	Annual Emissions (lb/yr)
Arsenic	4.8	1.86E-06	5.20E-03
Beryllium	0.1	3.88E-08	1.08E-04
Cadmium	0.1	3.88E-08	1.08E-04
Chlorine	9,300	3.60E-03	1.01E+01
Chromium	1.1	4.26E-07	1.19E-03
Copper[2]	28	1.09E-05	3.03E-02
Cyanide	46	1.78E-05	4.98E-02
Fluoride[2]	30	1.16E-05	3.25E-02
Lead	1.6	6.20E-07	1.73E-03
Manganese	9.2	3.57E-06	9.96E-03
Mercury	0.05	1.94E-08	5.42E-05
Nickel	0.1	3.88E-08	1.08E-04
Selenium	16	6.20E-06	1.73E-02
Silica[2]	970	3.76E-04	1.05E+00
Sulfate[2]	2,550	9.88E-04	2.76E+00

Notes:
[1]See Revised Appendix C for detailed emission calculations. The maximum concentration for each TAC as determined from water samples collected from the water for use with the CPP cooling tower.
[2]Not a Clean Air Act Hazardous Air Pollutant (HAP).
µg/L = micrograms per liter
lb/hr = pounds per hour
lb/yr = pounds per year

Fine particulate (PM_{10}) emission factors for the diesel-fired black start engine were obtained from the vendor, and are based on the USEPA Tier 2 emission limit for new diesel engines with an additional 85%

PM_{10} control efficiency from use of a particulate trap. PM_{10} emissions from the diesel-fired black start engine were estimated assuming it would run at its full rated capacity of 750 kW no more than 200 hours per year for testing, maintenance and emergency generation duty. Emission factors and estimated maximum hourly and annual emissions from the black start engine are summarized in Table 3-10.

Table 3-10 (Revised)
Toxic Air Contaminant Emission Rates from Operation of the Diesel Black Start Engine

Engine	Chemical Species	Emission Factor[1]	Maximum Hourly Emissions per Engine (lb/hr)	Annual Emissions Per Engine (lb/yr)
Black Start	Diesel Particulate (PM_{10})[2]	0.03 g/kW-hr	0.0496	9.912

Notes:

[1] See Revised Appendix C for detailed emission calculations. Emission factors obtained from engine vendor for USEPA Tier 2 engines with an additional 85% control efficiency from the particulate trap.
[2] Not a Clean Air Act Hazardous Air Pollutant (HAP).
g/kW-hr = grams per kilowatt hour

lb/hr = pounds per hour
lb/yr = pounds per year

The emissions data in Tables 3-8 through 3-10 are used in the health risk assessment presented in Section 5 of this revised application.

BEFORE THE ENERGY RESOURCES CONSERVATION AND DEVELOPMENT COMMISSION OF THE STATE OF CALIFORNIA
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APPLICATION FOR CERTIFICATION FOR THE *CANYON POWER PLANT PROJECT*

Docket No. 07-AFC-9

PROOF OF SERVICE
(Revised 2/25/2009)

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DECLARATION OF SERVICE

I, Maria Santourdjian, declare that on March 11, 2009, I served and filed copies of the attached URS Project Emissions Information. The original document, filed with the Docket Unit, is accompanied by a copy of the most recent Proof of Service list, located on the web page for this project at: **[http://www.energy.ca.gov/sitingcases/canyon/index.html]**. The document has been sent to both the other parties in this proceeding (as shown on the Proof of Service list) and to the Commission's Docket Unit, in the following manner:

(*Check all that Apply*)

For service to all other parties:

__✓__ sent electronically to all email addresses on the Proof of Service list;

__✓__ by personal delivery or by depositing in the United States mail at Sacramento, California with first-class postage thereon fully prepaid and addressed as provided on the Proof of Service list above to those addresses **NOT** marked "email preferred."

AND

For filing with the Energy Commission:

__✓__ **sending an original paper copy and one electronic copy, mailed and emailed respectively, to the address below (preferred method);**

OR

_____ depositing in the mail an original and 12 paper copies, as follows:

CALIFORNIA ENERGY COMMISSION
Attn: Docket No. 07-AFC-9
1516 Ninth Street, MS-4
Sacramento, CA 95814-5512

docket@energy.state.ca.us

I declare under penalty of perjury that the foregoing is true and correct.

Maria Santourdjian

Maria Santourdjian