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# FINAL
# DETERMINATION OF COMPLIANCE
# AMENDMENT

# PIO PICO ENERGY CENTER

SAN DIEGO AIR POLLUTION CONTROL DISTRICT
August 25, 2015

Amendment Application Number
APCD2014-APP-003627

Original Application Number
APCD2010-APP-001251

## DISTRICT REVIEW INFORMATION

| | |
|---|---|
| Project Engineer: | Nicholas Horres |
| Senior Engineer: | Steve Moore |
| App. Numbers: | APCD2014-APP-003627 |
| Site ID Number: | APCD2010-SITE-00471 |
| Fee Schedule: | 3 x 20F |
| BEC: | TBD |

## APPLICATION INFORMATION

| | |
|---|---|
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# 1.0 List of Acronyms, Abbreviations, Units and Chemicals

**Acronyms and Abbreviations**

APCD – Air Pollution Control District
AQIA – Air quality impact assessment
BACT – Best available control technology
CEC – California energy commission
CEMS – Continuous emission monitoring system
CFR – Code of Federal Regulations
EPA – United States Environmental Protection Agency
FDOC – Final determination of compliance
GE – General Electric
GHG – Greenhouse gas
HHV – Higher heating value
LAER – Lowest achievable emission rate
LHV – Lower heating value
MRTE – Manufacturer's rated thermal efficiency
NESHAP – National Emission Standards for Hazardous Air Pollutants
NSPS – New Source Performance Standards
PPEC – Pio Pico Energy Center
PSD – Prevention of significant deterioration
SCR – Selective catalytic reduction
TAC – Toxic air contaminant
WSAC – Wet surface air cooler

**Chemical Abbreviations**

CO – Carbon monoxide
NOx – Oxides of nitrogen
$NO_2$ – Nitrogen dioxide
$O_2$ – Oxygen gas
PM – Particulate matter
$PM_{10}$, $PM_{2.5}$ – PM with aerodynamic diameter $\leq$ 10 microns or 2.5 microns, respectively
SOx – Sulfur oxides
$SO_2$ – Sulfur dioxide
VOC – Volatile organic compound

**Unit Abbreviations**

kW – Kilowatt
Lb - Pound
MMBtu – Million British thermal units
MW – Megawatt
SCF – standard cubic foot
ppm – Parts per million
ppmvd – Parts per million by volume, dry conditions

## 2.0 Project Description

The purpose of this application is to modify the equipment proposed for installation at the Pio Pico Energy Center, as previously described in the original FDOC issued by the San Diego Air Pollution Control District (the District) dated May 4th, 2012. The proposed modification is to increase the maximum design heat rate of each gas turbine to a total of 1000 MMBtu/hr on an HHV basis up from the original evaluated 903 MMBtu/hr. The maximum generating capacity will also increase slightly to a maximum of 106.4 MW in the peak case.

This amendment will also review pre-construction design plans for the cooling tower mist eliminator and gas turbine emission controls submitted by Pio Pico Energy Center LLC (Applicant) to satisfy conditions 40 and 43 of the original FDOC.

See the May 4th, 2012 original FDOC for full description of the project.

## 3.0 Equipment Description

Three nominal 100 MW natural-gas fired simple-cycle intercooled GE LMS100 combustion turbine generators, serial number to be determined, each equipped with an evaporative cooler for the inlet air; a compressor intercooler utilizing a heat exchanger and a common partial dry cooling system with a wet surface air cooler; a continuous emission monitoring system (CEMS) for NOx and CO; a data acquisition and handling system (DAHS) to record key operational parameters; water injection and a selective catalytic reduction system (SCR), and an oxidation catalyst.

## 4.0 Process Description

The modification to maximum heat input proposed by application APCD2014-APP-003627 does not change the process it only increases the maximum heat rate and generating capacity of each unit by about 10%.

In addition to the modification to heat rate, this amendment also reviews the detailed design specifications for the cooling tower mist eliminator and gas turbine emission controls. The District determined that these specifications met the requirements contained in original FDOC conditions 40 and 43. The District also made some minor wording changes to these conditions in the modified conditions contained in this FDOC Amendment to better reflect the most relevant operating parameters necessary for review.

**Mist Eliminator**. Condition 40 of the original FDOC requires the use of a mist eliminator designed to achieve a drift rate of 0.001% or less and requires that the applicant submit to the District the final selection, design parameters and details of the mist eliminator and wet surface air cooler (WSAC). The proposed WSAC will be manufactured by SPX, specification MHF7113VAEBNS. The tower is filled with Marley MX75 Crossflow film fill, which includes integral mist eliminators molded into each fill sheet. The use of these integral mist eliminators allows the tower to comply with the 0.001% drift rate, and SPX has provided a certification letter stating that it meets a design drift rate of 0.001% or less. It is designed for a maximum closed side circulating flow rate of 9780 gpm and maximum open side circulating flow rate of 23,520 gpm.

**Oxidation Catalyst**. Condition 43 of the original FDOC requires that the specifications of the oxidation catalyst be provided to the District including the catalyst volume, space velocity and area velocity and CO control efficiency at temperatures between 100 and 1000 degrees Fahrenheit at 100% load. The oxidation catalyst will be manufactured by BASF and is a model CAMET CO Catalyst. The catalyst structure is made of corrugated stainless steel foil. The catalyst also contains alumina and platinum group metals. The oxidation reaction is dependent on temperature, beginning to occur at approximately 500 degrees Fahrenheit, with a maximum operating temperature of 1050 degrees Fahrenheit recommended by the manufacturer. The catalyst is modular and each unit will include 112 total modules. Each module is approximately 25.25" wide by 26.5" tall by 3.53" deep. The modules are loaded into a carbon steel support structure and sealed using expansion seals to ensure that all gasses pass through the catalyst elements at all times. CO Conversion efficiency is predicted to range from above 90% to 97% through the end of the catalyst lifespan.

**Selective Catalytic Reduction System (SCR).** The SCR system will utilize a Haldor Topsoe DNX catalyst. The catalyst is composed of a titanium dioxide carrier plate which is homogenously impregnated with tungsten trioxide and vanadium pentoxide. The NOx reduction reaction occurs between 400 and 1050 degrees Fahrenheit, although permit conditions only require ammonia injection when temperature is above 575 degrees Fahrenheit to prevent the formation of ammonium bisulfate. The exact maximum ammonium bisulfate formation temperature varies by catalyst configuration, but the proposed minimum catalyst operating temperature is within the lowest range found for SCR catalysts. Additionally the catalyst should not be operated above 825 degrees Fahrenheit to prevent thermal degradation.

The proposed SCR catalyst elements will have cell pitches of 2.7 mm (1.06") and wall thicknesses of 0.3 mm (0.118") and void percentage of 80%. There will be a total of 29 cubic meters of catalyst per reactor. Each module consists of multiple "cassettes", each cassette is 18.3" x 18.3" and two different depths (22.52" and 12.67") are utilized for a total depth of each module of 35.19". Two different sizes of module (one is six cassettes wide, one is five cassettes wide) are used in a 2 x 5 configuration, resulting in a total of 11 cassettes wide by 20 tall and two deep.

## 5.0 Emission Estimates

This modification to increase the allowable heat rate of each combustion turbine will have a minor effect on the emissions. The applicant has agreed to limit, on a mass emission basis (lb/hr, lb/day, ton/yr), emissions of NOx, CO and VOC to the same levels as in the original FDOC, so this application does not affect those emissions.

Regarding $PM_{10}$ and $PM_{2.5}$ emissions, since these are not calculated on a heat input basis the increase in heat input is not expected to increase the potential to emit. However, based on review of other proposed power plants utilizing the same model of turbine, the District has revised the limits for $PM_{10}$ and $PM_{2.5}$ down to a maximum of 5 lb/hr per turbine and 3.5 lb/hr averaged across all 3 turbines, so this is reflected in the calculations in this section and discussed more in depth in Section 6.1.

Emissions of toxics and oxides of sulfur (SOx) are calculated on a heat input basis, so are expected to increase as part of this application, and therefore changes to these calculations are reflected in this section. For SOx, the applicant has agreed to maintain the same annual emission limit as contained in the original FDOC conditions, so these emissions will not change, only daily and hourly.

**Combustion Turbine Generator Emissions—Standard Operations Maximum Hourly Emissions**

The applicant has not applied to change the normal operations hourly emission limits for NOx, CO, and VOCs in the original FDOC and the BACT evaluation for the FDOC Amendment does not indicate any change is warranted, so the increased heat input for the FDOC Amendment does not affect the potential maximum hourly emissions of these pollutants from the turbines. Hourly emissions of SOx are not directly limited by permit condition and depend on the sulfur content of the fuel, which is limited, and the maximum fuel input so its maximum potential emissions do increase with the increased fuel use associated with the higher heat input. Based on a revised BACT determination for $PM_{10}$ and $PM_{2.5}$ as described in Section 6, the emission rate for particulate emissions will be reduced to 5.0 lb/hr for a single turbine. Table 1a contains revised emission rates for normal operation. Emissions were calculated using the same procedures as described in the original FDOC except 1000 MMBtu/hr heat input used for calculating $SO_2$ emissions.

**Table 1a - Maximum Single Turbine Emission Rates During Normal Operation**

| Pollutant | Concentration, ppmvd @15% $O_2$ | Emission Rate at Average Peak Ambient Temperature, lb/hr |
|---|---|---|
| NOx | 2.5 (1-hour average) | 8.18 |
| CO | 4.0 (1-hour average) | 7.97 |
| VOCs | 2.0 (1-hour average) | 2.28 |
| PM10 | N/A | 5.0 |
| PM2.5 | N/A | 5.0 |
| SOx | N/A | 2.1 |

The applicant has not applied to change the startup and shutdown hourly emission limits for NOx, CO, and VOCs in the original FDOC and the BACT evaluation for the FDOC Amendment does not indicate any change is warranted, so the increased heat input for the FDOC Amendment does not affect the potential maximum hourly emissions of these pollutants from the turbines during startups and shutdowns. Startup and shutdown emissions for particulate matter and SOx are reduced and increased, respectively during startup and shutdown periods. Permit conditions will ensure that emission levels contained below are not exceeded.

**Table 1b –Maximum Single Turbine Emission Rates During Startup and Shutdown**

| Pollutant | Startup Emissions, lbs/hr | Shutdown Emissions, lbs/hr | Startup and Shutdown, lbs/hr |
|---|---|---|---|
| NOx | 26.63 | 12.68 | 31.13 |
| CO | 21.84 | 53.51 | 67.38 |
| VOCs | 5.81 | 4.86 | 8.39 |
| PM10 | 5.0 | 5.0 | 5.0 |
| PM2.5 | 5.0 | 5.0 | 5.0 |
| SOx | <2.1 | <2.1 | <2.1 |

## Maximum Daily Emissions

Maximum daily emissions do not change due to this modification except for the small increase in SOx emissions and decrease in particulate emissions. The same assumptions and calculation procedures as described in the original FDOC were utilized for calculations except the use of 1000 MMBtu/hr heat input to calculate SOx emissions and the use of 5.0 lb/hr for each turbine's particulate emissions.

| Table 1c – Expected Maximum Turbine Daily Emissions | | |
|---|---|---|
| Pollutant | Emissions from Each Turbine lbs/day | Emissions from Three Turbines lbs/day |
| NOx | 288.12 | 864.36 |
| CO | 428.92 | 1286.76 |
| VOCs | 79.16 | 237.48 |
| PM10 | 120 | 360 |
| PM2.5 | 120 | 360 |
| SOx | 50.4 | 151.3 |

## Maximum Annual Emissions

Maximum annual emissions for the combustion turbines will be limited by permit conditions to the levels specified in the original FDOC, which were based on an expected maximum of 4335 hours of operation, including 500 hours of startups and 500 hours of shutdowns, at the maximum allowed hourly emission rates. However, only emissions, not hours of operation, are limited in the original FDOC (and the FDOC Amendment), and the actual number of hours of operation allowed by the annual emission limits would depend on actual levels of hourly emissions for the various pollutants, which would likely be below their potential maximums. The heat input increase of the FDOC Amendment might be expected to reduce the maximum expected hours of operation by about 10% from the original FDOC if the annual average sulfur content remained unchanged based on the lowest level allowed by SOx emissions since SOx hourly emissions increase with the increase in heat input. For $PM_{10}$ and $PM_{2.5}$, the BACT evaluation of the FDOC Amendment resulted in reducing the annual average emission rate to 3.5 lb/hr per turbine from the 5.5 lb/hr in the original FDOC. This could allow about 6800 hours of operation at the maximum annual average emission rate if not constrained by the emission limit for another pollutant since the annual limit of contained in the original FDOC of 35.8 ton/yr has not been changed. For comparison to the original FDOC, Table 1d assumes 4335 hours of operation per year, as assumed in the original FDOC, with sufficiently low sulfur content in the fuel to allow SOx emissions to remain below the original FDOC annual limit, which has not been changed. However Table 1d does reflect an average $PM_{10}$ and $PM_{2.5}$ emission rate of 3.5 lb/hr per turbine.

| Table 1d – Maximum Expected Turbine Annual Emissions | | |
|---|---|---|
| Pollutant | Emissions from Each Turbine tons/yr | Emissions from Three Turbines tons/yr |
| NOx | 23.47 | 70.41 |
| CO | 32.13 | 96.39 |
| VOCs | 6.47 | 19.41 |
| PM10 | 7.59 | 22.76 |
| PM2.5 | 7.59 | 22.76 |
| SOx | 1.37 | 4.12 |

**Wet Surface Air Cooler Emissions**

This application will not affect emissions from the WSAC. However, the revised permit conditions for the FDOC Amendment explicitly limit particulate emissions of the WSACs to 1.43 tons per year, which were the maximum expected emissions calculated in the FDOC based on the maximum allowed total dissolved solids in the recirculating air-side cooling water, maximum recirculating air-side cooling water flow rate, the allowed drift percentage, all twelve fans operating at their maximum capacity (maximum forced air flow), and 4335 hours of operation.

## Project Emissions—Standard Operations

Permitted emissions from the project during standard operations will not change due to this modification except as previously described. Tables 2a and 2b list expected total emissions for the project as calculated in the original FDOC and described in this FDOC Amendment. Table 2c lists total annual emissions allowed by permit conditions.

| Table 2a –Maximum Project Total Daily Emissions | | | |
|---|---|---|---|
| Pollutant | Turbines Total Daily Emissions, lbs/day | WSAC Daily Emissions, lbs/day | Project Total Daily Emissions, lbs/day |
| NOx | 864.36 | 0 | 864.36 |
| CO | 1286.76 | 0 | 1286.76 |
| VOCs | 237.48 | 0 | 237.48 |
| PM10 | 360 | 15.8 | 375.8 |
| PM2.5 | 360 | 15.8 | 375.8 |
| SOx | 151.3 | 0 | 151.3 |

| Table 2b – Expected Maximum Project Total Annual Emissions | | | |
|---|---|---|---|
| Pollutant | Turbines Total Annual Emissions, tons/yr | WSAC Annual Emissions, tons/yr | Project Total Annual Emissions, tons/yr |
| NOx | 70.41 | 0 | 70.41 |
| CO | 96.39 | 0 | 96.29 |
| VOCs | 19.41 | 0 | 19.41 |
| PM10 | 22.76 | 1.43 | 24.19 |
| PM2.5 | 22.76 | 1.43 | 24.19 |
| SOx | 4.12 | 0 | 4.12 |

| Table 2c – Allowed Project Total Annual Emissions | | | |
|---|---|---|---|
| Pollutant | Turbines Total Annual Emissions, tons/yr | WSAC Annual Emissions, tons/yr | Project Total Annual Emissions, tons/yr |
| NOx | 70.41 | 0 | 70.41 |
| CO | 96.39 | 0 | 96.29 |
| VOCs | 19.41 | 0 | 19.41 |
| PM10 | 35.76 | 1.43 | 37.19 |
| PM2.5 | 35.76 | 1.43 | 37.19 |
| SOx | 4.12 | 0 | 4.12 |

**Project Emissions—Toxic Emissions**

Unlike previously described emissions, toxic emissions are not limited directly by permit condition and therefore are assumed to change based on the increase in heat input. To calculate the increases, it was assumed that VOC emissions would not increase during either startup and shutdown or normal operation since these are limited by permit conditions. It was further assumed that toxic emissions during startup and shutdown and commissioning are calculated on a pounds per million Btu basis emission factor that is elevated above the normal operation emission factor based on the ratio of VOC emissions expressed in units of pounds per million Btu during each mode of operation.

The full calculation sheet can be seen in Appendix A of this FDOC Amendment. These emissions were used for the revised health risk assessment described in Section 6 and contained in Appendix B.

**Combustion Turbine Generator Emissions—Commissioning Period**

Emissions during the turbine commissioning periods are expected to change minimally based on this modification. Particulate emissions will decrease due to a decrease in allowed particulate emissions that was previously discussed. SOx emissions may increase slightly if heat inputs during commissioning are higher. However, they will not exceed the maximum steady state emission levels previously described for the combustion turbines. NOx, VOC, and CO emissions will not increase beyond the emissions calculated in the original FDOC because NOx and CO emissions are limited by permit conditions to not exceed these amounts (and VOC emissions are assumed to correlate with CO emissions, so no increase to CO emissions ensures no increase to VOC emissions as well). Additionally, the applicant requested that NOx emissions during the commissioning period be limited to 150 lb/hr for all 3 turbines rather than 50 lb/hr for each turbine individually. This will not affect hourly and daily emission rates for the project. However, it will affect potential total NOx emissions during the commissioning periods for all three turbines because they may be commissioned separately, resulting in emissions from each turbine allowed of up to 150 lb/hr. These changes are reflected in Tables 3a and 3b. Total annual emissions from the turbines will not increase, however, since commissioning emissions are

included in the annual maximums specified by permit conditions and these limits are not being increased.

| Table 3a – Maximum Turbine Hourly Emissions During Commissioning | | |
|---|---|---|
| Pollutant | Emissions from Each Turbine lbs/hr | Emissions from Three Turbines lbs/hr |
| NOx | 150 | 150 |
| CO | 75 | 225 |
| VOCs | 5 | 15 |
| PM10 | 5.0 | 15.0 |
| PM2.5 | 5.0 | 15.0 |
| SOx | <2.1 | <6.3 |

| Table 3b – Maximum Turbine Daily Emissions During Commissioning | | |
|---|---|---|
| Pollutant | Emissions from Each Turbine lbs/day | Emissions from Three Turbines lbs/day |
| NOx | 3600 | 3600 |
| CO | 1800 | 5400 |
| VOCs | 120 | 360 |
| PM10 | 120 | 360 |
| PM2.5 | 120 | 360 |
| SOx | <50.4 | <151.3 |

| Table 3c – Maximum Turbine Total Emissions During Commissioning | | |
|---|---|---|
| Pollutant | Emissions from Each Turbine tons | Emissions from Three Turbines tons |
| NOx | 8.4 | 25.2 |
| CO | 4.2 | 12.6 |
| VOCs | 0.28 | 0.84 |
| PM10 | 0.31 | 0.93 |
| PM2.5 | 0.31 | 0.93 |
| SOx | <0.12 | <0.36 |

## 6.0 Rules Analysis

### 6.1 District PSD and NSR Rules

This section will discuss the implications to the PSD and NSR discussions contained in the original FDOC due to the proposed modification. For full discussion of the issues, see the original FDOC.

#### Rule 20.1(c)(35) – Major Stationary Source

This modification does not affect the major source status of the stationary source – it is still considered a major source of NOx but not a major source for any of the other criteria pollutants.

## Rule 20.1(c)(58) – Prevention of Significant Deterioration (PSD) Stationary Source and 40 CFR 52.21

This modification does not affect the PSD status of the stationary source – it is still not considered a PSD stationary source under District Rules and Regulations.

As noted in the original FDOC, the project was previously determined to be subject to federal PSD permitting due to the increase in greenhouse gas (GHG) emissions. However, since the issuance of the original FDOC and the federal PSD permit, the U.S. Supreme Court invalidated the portion of the EPA regulation requiring PSD permits for projects that only trigger PSD permitting due to an increase in GHG emissions (known as "Step 2 of the Green House Gas Tailoring Rule"). The EPA has subsequently modified their rules to allow the rescission of PSD permits issued under this rule provision[1].

## Rule 20.1( c)(16), 40 CFR §52.21, and 40 CFR Appendix S to Part 51– Contemporaneous Emission Increase

This modification does not affect the contemporaneous emission increase for the project except for the reduction in $PM_{10}$ and $PM_{2.5}$ emissions as will be discussed later in this section. The contemporaneous emission increase for this stationary source is shown in Table 2b.

## Rule 20.3(d)(1)- Best Available Control Technology(BACT)/Lowest Achievable Emission Rate (LAER)

The only changes to the BACT or LAER determinations for this project being made as part of this modification are to lower the emission limits for $PM_{10}$ and $PM_{2.5}$. The change will lower the allowable emissions from each single turbine to no more than 5.0 lb/hr for both $PM_{10}$ and $PM_{2.5}$. Additionally, a maximum of 3.5 lb/hr average for all 3 combustion turbines averaged across the most recent 2 source tests for each turbine (for a total of six tests) will be included in permit conditions. This change is based on the Districts review of other projects involving the use of similar LMS100 gas turbines which have shown the ability to comply with a 5 lb/hr limit and a 3.5 lb/hr limit average as described, so these are considered achievable for this class/category of equipment and are, therefore, BACT.

NOx and VOC emission rates were also reviewed as part of this modification and found to continue to meet BACT requirements. The only change will be permit conditions to require that test methods used to measure VOC emissions will include measurement of formaldehyde, but this does not alter the BACT emission limit of 2.0 ppmvd VOC corrected to 15% $O_2$.

Because this was a modification to an existing project, alternative technologies (such as solar power or energy storage) were not reviewed because they constitute entire new projects rather than modifications to the existing project, and therefore are not technologically feasible because they do not meet the project objective of the modification – to increase the heat input of a gas turbine. The original FDOC addresses alternatives to the existing project.

[1] http://www.epa.gov/airquality/permits/actions.html

## Rule 20.3(d)(2) – Air Quality Impact Analysis (AQIA)

Permit conditions will ensure that emissions of any pollutants potentially subject to AQIA do not increase compared to the allowed emissions described in the original FDOC that were analyzed with an AQIA, with the exception of SOx emissions which may increase on daily and hourly bases. This small increase is below the thresholds listed in Table 20.3-1, and therefore an AQIA is not required for this modification. Additionally, the applicant included with the application the results of modeling conducted using the revised exhaust parameters due to the increase in heat input to demonstrate to the District that no additional exceedances of the state or federal ambient air quality standards would occur. Based on the District's review of these model runs plus some additional model runs performed by the District, there is no indication that the modification would affect the conclusions of the AQIA described in the original FDOC that the project meets the requirements of Rule 20.3(d)(2).

One final change was the request by the applicant to have the commissioning NOx limit allow for up to 150 lb/hr NOx combined for all three turbines instead of 50 lb/hr from each turbine. The stacks are located sufficiently near each other such that this change will not affect the conclusions of the AQIA described in the original FDOC.

The detailed AQIA report is in Appendix C.

## Rule 20.3 (d)(3) -Prevention of Significant Deterioration (PSD)

This application does not result in an increase in annual emissions, and therefore does not change the PSD conclusions of the original FDOC – that this project is not subject to District PSD regulations.

## Rule 20.3(d)(4) – Public Notice and Comment

This application was not subject to PSD or the AQIA requirements of this rule. However, because this modification project is subject to CEC review similar to an AFC, the District provided a Preliminary Determination of Compliance (PDOC) for public notice and public comment period in accordance with the provisions of this section to satisfy the requirements of Rule 20.5(g). The PDOC was noticed on June 17, 2015, with a 30-day comment period. No comments were received except for minor editorial comments from the applicant.

## Rule 20.3(d)(5)-Emission Offsets

As stated in the original FDOC, the NOx emission increase of the project triggered the requirement to provide offsets. This application does not increase the allowable NOx emissions or increase emissions such that offsets would be required for another pollutant, and, therefore, no additional requirements apply for this application.

## Rule 20.3(e)(1) – Compliance Certification

As stated in the original FDOC, the applicant submitted all required compliance certifications for the original project. This modification application does not trigger LAER or offset requirements, and therefore an additional compliance certification is not required.

**Rule 20.3(e)(2) – Alternative Siting and Alternatives Analysis**

This modification application did not result in offset or LAER requirements, and therefore an alternative siting and alternatives analysis was not required.

**Rule 20.5 – Power Plants**

This rule requires that the District issue a PDOC/FDOC for all projects which have submitted an AFC to the CEC. This application is an amendment that modifies a project for which an AFC has been filed and the District has previously issued an FDOC and for which the CEC has licensed. The District, therefore, issued a PDOC for the proposed modification with proposed revised permit conditions to reflect the modification and this FDOC Amendment.

## 6.2 District Prohibitory Rules and Toxics

The only District prohibitory rule that is potentially affected by this modification is rule 69.3.1. For discussion of compliance with all other prohibitory rules, see the original FDOC.

**Rule 69.3.1 – Stationary Gas Turbines – Best Available Retrofit Control Technology**
This rule limits NOx emissions from combustion turbines greater than 10 MW to 15 x (E/25) ppmvd when operating uncontrolled and 9 x (E/25) ppmvd at 15% oxygen when operating with add-on emission controls and averaged over a one-hour period, where E is the thermal efficiency of the unit based on the higher heating value of the fuel. Since this application changes the maximum heat input and energy output, the emission standard may be altered as shown in the following table:

| | Original | Modification |
|---|---|---|
| MRTE | 0.429 | 0.430 |
| HI LHV | 818.2 | 844.5 |
| HI HHV | 908.2 | 937.4 |
| Output (MW) | 102.9 | 106.4 |
| Output (MMBtu/hr) | 351.2 | 363.1 |
| E | 38.7% | 38.7% |
| Controlled Emission Limit | 13.9 | 13.9 |
| Uncontrolled Emission Limit | 23.2 | 23.2 |

This table shows that the modified controlled and uncontrolled NOx emission limits would be the same as in the original permit. The District notes that this calculation is based on the "manufacturer's continuous rated percent thermal efficiency of the gas turbine engine…at peak load" which utilizes the somewhat lower heat input provided by the turbine manufacturer (GE) for the peak load rather than the maximum heat input of 1000 MMBtu/hr requested by the applicant.

This modification application does not have any further impacts on rule 69.3.1 compliance or any other prohibitory rules.

**Rule 1200 – Toxic Air Contaminants**

The original FDOC conditions do not directly limit emissions of toxic air contaminants (TACs), the District determined that the proposed modification would result in a potential increase in emissions of TACs, and, therefore, a revised health risk assessment was conducted. The analysis was conducted based on the entire potential emissions of TACS for the proposed equipment rather than just the increase in emissions due to this modification.

The full health risk assessment report can be seen as appendix B. This assessment demonstrated that the potential additional health risk from PPEC including the added emissions from this modification result in no more than one in one million cancer risk increase and acute and chronic HHI of no more than one. Thus, toxic best available control technology (TBACT) is not required and the project is in compliance with the acute and chronic standards of Rule 1200.

## 6.3 State Regulations Implemented by the District

This modification application does not affect compliance with any state regulations implemented by the District.

## 6.4 National Emission Standards for Hazardous Air Pollutants (NESHAPs)

This equipment is not subject to any NESHAPs, and therefore the modification does not affect compliance with any NESHAPs.

## 6.5 New Source Performance Standards (NSPS)

This is subject to NSPS subpart KKKK however this modification application will not affect the applicability of any rule requirements. See the original FDOC for full discussion of NSPS requirements. There are some changes to the language of permit conditions, some of which relate to NSPS compliance, however these changes are administrative or enhancing the enforceability or clarity of the condition and do not affect the stringency of the actual requirements previously discussed in the original FDOC.

## 6.6 Acid Rain

This application does not affect acid rain program requirements. As stated in the original FDOC, an application for acid rain has been filed with the U.S. EPA for the project. For additional discussion of acid rain program requirements, see the original FDOC.

## 7.0 Additional Issues

There are no additional issues associated with this modification.

## 8.0 Conclusion and Recommendations

If operated in accordance with the proposed conditions specified in this Final Determination of Compliance Amendment, this equipment is expected to operate in compliance with all Rules and Regulations of the San Diego County Air Pollution Control District. (See Appendix D for the proposed conditions).

Signed By _____ 8/25/15
Project Engineer Date

Signed By _____ 8-26-15
Senior Engineer Date

# Appendix A: Emission Calculation Tables

## Table A-1: Toxics Emission Factors

| Pollutant | EF (lb/MMBtu) | Source | Controlled EF (lb/MMBtu) | Max non-commissioning hour EF (lb/MMBtu) | Startup-Shutdown hour EF (lb/MMBtu) | Max commissioning EF (lb/MMBtu) | Startup emission factor (lb/MMBtu) | Shutdown EF (lb/MMBtu) |
|---|---|---|---|---|---|---|---|---|
| Ammonia, | 6.81E-03 | District/AP-42 | 6.81E-03 | 6.81E-03 | 6.81E-03 | 6.81E-03 | 6.81E-03 | 6.81E-03 |
| Propylene | 7.63E-04 | CATEF | 3.82E-04 | 3.28E-03 | 2.03E-03 | 7.08E-03 | 1.56E-03 | 1.76E-02 |
| Acetaldehyde | 4.00E-05 | District/AP-42 | 2.00E-05 | 1.72E-04 | 1.06E-04 | 3.71E-04 | 8.17E-05 | 9.20E-04 |
| Acrolein | 6.40E-06 | District/AP-42 | 3.20E-06 | 2.75E-05 | 1.70E-05 | 5.94E-05 | 1.31E-05 | 1.47E-04 |
| Benzene | 1.20E-05 | District/AP-42 | 6.00E-06 | 5.15E-05 | 3.19E-05 | 1.11E-04 | 2.45E-05 | 2.76E-04 |
| 1,3-Butadiene | 4.30E-07 | District/AP-42 | 2.15E-07 | 1.85E-06 | 1.14E-06 | 3.99E-06 | 8.79E-07 | 9.89E-06 |
| Ethylbenzene | 3.20E-05 | District/AP-42 | 1.60E-05 | 1.37E-04 | 8.50E-05 | 2.97E-04 | 6.54E-05 | 7.36E-04 |
| Formaldehyde | 9.08E-04 | CATEF | 4.54E-04 | 3.90E-03 | 2.41E-03 | 8.42E-03 | 1.86E-03 | 2.09E-02 |
| n-Hexane | 2.56E-04 | CATEF | 1.28E-04 | 1.10E-03 | 6.81E-04 | 2.38E-03 | 5.24E-04 | 5.90E-03 |
| Naphthalene | 1.64E-06 | District/AP-42 | 8.22E-07 | 7.06E-06 | 4.37E-06 | 1.53E-05 | 3.36E-06 | 3.78E-05 |
| PAH Total (individually below) | 2.30E-06 | CATEF | 1.15E-06 | 9.87E-06 | 6.10E-06 | 2.13E-05 | 4.69E-06 | 5.29E-05 |
| Acenaphthene | 1.88E-08 | CATEF | 9.41E-09 | 8.08E-08 | 5.00E-08 | 1.75E-07 | 3.84E-08 | 4.33E-07 |
| Acenaphthlyene | 1.46E-08 | CATEF | 7.28E-09 | 6.25E-08 | 3.87E-08 | 1.35E-07 | 2.97E-08 | 3.35E-07 |
| Anthracene | 3.35E-08 | CATEF | 1.67E-08 | 1.44E-07 | 8.89E-08 | 3.11E-07 | 6.84E-08 | 7.70E-07 |
| Benzo(a)anthracene | 2.24E-08 | CATEF | 1.12E-08 | 9.61E-08 | 5.94E-08 | 2.08E-07 | 4.57E-08 | 5.15E-07 |
| Benzo(a)pyrene | 1.38E-08 | CATEF | 6.88E-09 | 5.91E-08 | 3.66E-08 | 1.28E-07 | 2.81E-08 | 3.17E-07 |
| Benzo(e)pyrene | 5.39E-10 | CATEF | 2.69E-10 | 2.31E-09 | 1.43E-09 | 5.00E-09 | 1.10E-09 | 1.24E-08 |
| Benzo(b)fluoranthrene | 1.12E-08 | CATEF | 5.59E-09 | 4.80E-08 | 2.97E-08 | 1.04E-07 | 2.29E-08 | 2.57E-07 |
| Benzo(k)fluoranthrene | 1.09E-08 | CATEF | 5.45E-09 | 4.68E-08 | 2.89E-08 | 1.01E-07 | 2.23E-08 | 2.51E-07 |
| Benzo(g,h,i)perylene | 1.36E-08 | CATEF | 6.78E-09 | 5.82E-08 | 3.60E-08 | 1.26E-07 | 2.77E-08 | 3.12E-07 |
| Chrysene | 2.50E-08 | CATEF | 1.25E-08 | 1.07E-07 | 6.63E-08 | 2.32E-07 | 5.10E-08 | 5.74E-07 |
| Dibenz(a,h)anthracene | 2.33E-08 | CATEF | 1.16E-08 | 9.99E-08 | 6.18E-08 | 2.16E-07 | 4.75E-08 | 5.35E-07 |
| Fluoranthene | 4.28E-08 | CATEF | 2.14E-08 | 1.84E-07 | 1.14E-07 | 3.97E-07 | 8.74E-08 | 9.84E-07 |
| Fluorene | 5.74E-08 | CATEF | 2.87E-08 | 2.47E-07 | 1.53E-07 | 5.33E-07 | 1.17E-07 | 1.32E-06 |
| Indeno(1,2,3-cd)pyrene | 2.33E-08 | CATEF | 1.16E-08 | 9.99E-08 | 6.18E-08 | 2.16E-07 | 4.75E-08 | 5.35E-07 |
| Phenanthrene | 3.10E-07 | CATEF | 1.55E-07 | 1.33E-06 | 8.23E-07 | 2.88E-06 | 6.33E-07 | 7.13E-06 |
| Pyrene | 2.74E-08 | CATEF | 1.37E-08 | 1.18E-07 | 7.28E-08 | 2.54E-07 | 5.60E-08 | 6.31E-07 |
| Toluene | 1.30E-04 | District/AP-42 | 6.50E-05 | 5.58E-04 | 3.45E-04 | 1.21E-03 | 2.66E-04 | 2.99E-03 |
| Xylenes | 6.40E-05 | District/AP-42 | 3.20E-05 | 2.75E-04 | 1.70E-04 | 5.94E-04 | 1.31E-04 | 1.47E-03 |

**See notes after Table A-3.**

## Table A-2: Single Turbine Toxic Emission Calculations

| Pollutant | Max steady state (lb/hr) | Startup (lb/event) | Shutdown (lb/event) | Max non-commissioning hour (lb/hr) | Startup-Shutdown (lb/hr) | Max Commissioning/Sync-idle (lb/hr) | **Max Acute (lb/hr)** | **Annual (commissioning year) (lb/yr)** | **Annual (non-commissioning year) (lb/yr)** |
|---|---|---|---|---|---|---|---|---|---|
| Ammonia, | 6.81E+00 | 2.17E+00 | 3.00E-01 | 3.79E+00 | 4.68E+00 | 8.77E-01 | **6.81E+00** | **2.86E+04** | **2.85E+04** |
| Propylene | 3.82E-01 | 4.97E-01 | 7.73E-01 | 1.82E+00 | 1.39E+00 | 9.12E-01 | **1.82E+00** | **2.26E+03** | **2.16E+03** |
| Acetaldehyde | 2.00E-02 | 2.60E-02 | 4.05E-02 | 9.56E-02 | 7.31E-02 | 4.78E-02 | **9.56E-02** | **1.19E+02** | **1.13E+02** |
| Acrolein | 3.20E-03 | 4.16E-03 | 6.48E-03 | 1.53E-02 | 1.17E-02 | 7.64E-03 | **1.53E-02** | **1.90E+01** | **1.81E+01** |
| Benzene | 6.00E-03 | 7.81E-03 | 1.22E-02 | 2.87E-02 | 2.19E-02 | 1.43E-02 | **2.87E-02** | **3.56E+01** | **3.40E+01** |
| 1,3-Butadiene | 2.15E-04 | 2.80E-04 | 4.36E-04 | 1.03E-03 | 7.85E-04 | 5.14E-04 | **1.03E-03** | **1.28E+00** | **1.22E+00** |
| Ethylbenzene | 1.60E-02 | 2.08E-02 | 3.24E-02 | 7.65E-02 | 5.84E-02 | 3.82E-02 | **7.65E-02** | **9.49E+01** | **9.06E+01** |
| Formaldehyde | 4.54E-01 | 5.91E-01 | 9.20E-01 | 2.17E+00 | 1.66E+00 | 1.08E+00 | **2.17E+00** | **2.69E+03** | **2.57E+03** |
| n-Hexane | 1.28E-01 | 1.67E-01 | 2.60E-01 | 6.13E-01 | 4.68E-01 | 3.06E-01 | **6.13E-01** | **7.60E+02** | **7.26E+02** |
| Naphthalene | 8.22E-04 | 1.07E-03 | 1.66E-03 | 3.93E-03 | 3.00E-03 | 1.96E-03 | **3.93E-03** | **4.87E+00** | **4.65E+00** |
| PAH Total (individually below) | 1.15E-03 | 1.50E-03 | 2.33E-03 | 5.49E-03 | 4.20E-03 | 2.74E-03 | **5.49E-03** | **6.81E+00** | **6.51E+00** |
| Acenaphthene | 9.41E-06 | 1.22E-05 | 1.91E-05 | 4.50E-05 | 3.44E-05 | 2.25E-05 | **4.50E-05** | **5.58E-02** | **5.33E-02** |
| Acenaphthlyene | 7.28E-06 | 9.47E-06 | 1.47E-05 | 3.48E-05 | 2.66E-05 | 1.74E-05 | **3.48E-05** | **4.32E-02** | **4.12E-02** |
| Anthracene | 1.67E-05 | 2.18E-05 | 3.39E-05 | 8.00E-05 | 6.11E-05 | 4.00E-05 | **8.00E-05** | **9.92E-02** | **9.48E-02** |
| Benzo(a)anthracene | 1.12E-05 | 1.46E-05 | 2.27E-05 | 5.35E-05 | 4.09E-05 | 2.67E-05 | **5.35E-05** | **6.64E-02** | **6.34E-02** |
| Benzo(a)pyrene | 6.88E-06 | 8.96E-06 | 1.39E-05 | 3.29E-05 | 2.51E-05 | 1.64E-05 | **3.29E-05** | **4.08E-02** | **3.90E-02** |
| Benzo(e)pyrene | 2.69E-07 | 3.51E-07 | 5.46E-07 | 1.29E-06 | 9.84E-07 | 6.43E-07 | **1.29E-06** | **1.60E-03** | **1.53E-03** |
| Benzo(b)fluoranthrene | 5.59E-06 | 7.28E-06 | 1.13E-05 | 2.67E-05 | 2.04E-05 | 1.34E-05 | **2.67E-05** | **3.32E-02** | **3.17E-02** |
| Benzo(k)fluoranthrene | 5.45E-06 | 7.09E-06 | 1.10E-05 | 2.60E-05 | 1.99E-05 | 1.30E-05 | **2.60E-05** | **3.23E-02** | **3.08E-02** |
| Benzo(g,h,i)perylene | 6.78E-06 | 8.83E-06 | 1.37E-05 | 3.24E-05 | 2.48E-05 | 1.62E-05 | **3.24E-05** | **4.02E-02** | **3.84E-02** |
| Chrysene | 1.25E-05 | 1.62E-05 | 2.53E-05 | 5.96E-05 | 4.56E-05 | 2.98E-05 | **5.96E-05** | **7.40E-02** | **7.07E-02** |
| Dibenz(a,h)anthracene | 1.16E-05 | 1.51E-05 | 2.36E-05 | 5.56E-05 | 4.25E-05 | 2.78E-05 | **5.56E-05** | **6.90E-02** | **6.59E-02** |
| Fluoranthene | 2.14E-05 | 2.78E-05 | 4.33E-05 | 1.02E-04 | 7.81E-05 | 5.11E-05 | **1.02E-04** | **1.27E-01** | **1.21E-01** |
| Fluorene | 2.87E-05 | 3.74E-05 | 5.82E-05 | 1.37E-04 | 1.05E-04 | 6.86E-05 | **1.37E-04** | **1.70E-01** | **1.63E-01** |
| Indeno(1,2,3-cd)pyrene | 1.16E-05 | 1.51E-05 | 2.36E-05 | 5.56E-05 | 4.25E-05 | 2.78E-05 | **5.56E-05** | **6.90E-02** | **6.59E-02** |
| Phenanthrene | 1.55E-04 | 2.02E-04 | 3.14E-04 | 7.41E-04 | 5.66E-04 | 3.70E-04 | **7.41E-04** | **9.19E-01** | **8.78E-01** |
| Pyrene | 1.37E-05 | 1.78E-05 | 2.78E-05 | 6.55E-05 | 5.01E-05 | 3.28E-05 | **6.55E-05** | **8.13E-02** | **7.77E-02** |
| Toluene | 6.50E-02 | 8.46E-02 | 1.32E-01 | 3.11E-01 | 2.37E-01 | 1.55E-01 | **3.11E-01** | **3.86E+02** | **3.68E+02** |
| Xylenes | 3.20E-02 | 4.16E-02 | 6.48E-02 | 1.53E-01 | 1.17E-01 | 7.64E-02 | **1.53E-01** | **1.90E+02** | **1.81E+02** |

**See notes after Table A-3.**

## Table A-3: Combined Three Turbine Toxic Emission Calculations

| Pollutant | Max steady state (lb/hr) | Startup (lb/event) | Shutdown (lb/event) | Max non-commissioning hour (lb/hr) | Startup-Shutdown (lb/hr) | Max Commissioning/Sync-idle (lb/hr) | Max Acute (lb/hr) | Annual (commissioning year) (lb/yr) | Annual (non-commissioning year) (lb/yr) |
|---|---|---|---|---|---|---|---|---|---|
| Ammonia, | 2.04E+01 | 6.51E+00 | 9.00E-01 | 1.14E+01 | 1.41E+01 | 2.63E+00 | **2.04E+01** | **8.57E+04** | **8.54E+04** |
| Propylene | 1.15E+00 | 1.49E+00 | 2.32E+00 | 5.47E+00 | 4.18E+00 | 2.73E+00 | **5.47E+00** | **6.79E+03** | **6.49E+03** |
| Acetaldehyde | 6.00E-02 | 7.81E-02 | 1.22E-01 | 2.87E-01 | 2.19E-01 | 1.43E-01 | **2.87E-01** | **3.56E+02** | **3.40E+02** |
| Acrolein | 9.60E-03 | 1.25E-02 | 1.94E-02 | 4.59E-02 | 3.51E-02 | 2.29E-02 | **4.59E-02** | **5.69E+01** | **5.44E+01** |
| Benzene | 1.80E-02 | 2.34E-02 | 3.65E-02 | 8.60E-02 | 6.57E-02 | 4.30E-02 | **8.60E-02** | **1.07E+02** | **1.02E+02** |
| 1,3-Butadiene | 6.45E-04 | 8.39E-04 | 1.31E-03 | 3.08E-03 | 2.36E-03 | 1.54E-03 | **3.08E-03** | **3.83E+00** | **3.65E+00** |
| Ethylbenzene | 4.80E-02 | 6.25E-02 | 9.72E-02 | 2.29E-01 | 1.75E-01 | 1.15E-01 | **2.29E-01** | **2.85E+02** | **2.72E+02** |
| Formaldehyde | 1.36E+00 | 1.77E+00 | 2.76E+00 | 6.51E+00 | 4.97E+00 | 3.25E+00 | **6.51E+00** | **8.08E+03** | **7.71E+03** |
| n-Hexane | 3.85E-01 | 5.01E-01 | 7.79E-01 | 1.84E+00 | 1.40E+00 | 9.19E-01 | **1.84E+00** | **2.28E+03** | **2.18E+03** |
| Naphthalene | 2.47E-03 | 3.21E-03 | 4.99E-03 | 1.18E-02 | 9.00E-03 | 5.89E-03 | **1.18E-02** | **1.46E+01** | **1.40E+01** |
| PAH Total (individually below) | 3.45E-03 | 4.49E-03 | 6.98E-03 | 1.65E-02 | 1.26E-02 | 8.23E-03 | **1.65E-02** | **2.04E+01** | **1.95E+01** |
| Acenaphthene | 2.82E-05 | 3.67E-05 | 5.72E-05 | 1.35E-04 | 1.03E-04 | 6.74E-05 | **1.35E-04** | **1.67E-01** | **1.60E-01** |
| Acenaphthlyene | 2.18E-05 | 2.84E-05 | 4.42E-05 | 1.04E-04 | 7.97E-05 | 5.21E-05 | **1.04E-04** | **1.29E-01** | **1.24E-01** |
| Anthracene | 5.02E-05 | 6.53E-05 | 1.02E-04 | 2.40E-04 | 1.83E-04 | 1.20E-04 | **2.40E-04** | **2.98E-01** | **2.84E-01** |
| Benzo(a)anthracene | 3.36E-05 | 4.37E-05 | 6.80E-05 | 1.60E-04 | 1.23E-04 | 8.02E-05 | **1.60E-04** | **1.99E-01** | **1.90E-01** |
| Benzo(a)pyrene | 2.06E-05 | 2.69E-05 | 4.18E-05 | 9.87E-05 | 7.54E-05 | 4.93E-05 | **9.87E-05** | **1.22E-01** | **1.17E-01** |
| Benzo(e)pyrene | 8.08E-07 | 1.05E-06 | 1.64E-06 | 3.86E-06 | 2.95E-06 | 1.93E-06 | **3.86E-06** | **4.79E-03** | **4.58E-03** |
| Benzo(b)fluoranthrene | 1.68E-05 | 2.18E-05 | 3.40E-05 | 8.02E-05 | 6.13E-05 | 4.01E-05 | **8.02E-05** | **9.95E-02** | **9.51E-02** |
| Benzo(k)fluoranthrene | 1.63E-05 | 2.13E-05 | 3.31E-05 | 7.81E-05 | 5.97E-05 | 3.90E-05 | **7.81E-05** | **9.69E-02** | **9.25E-02** |
| Benzo(g,h,i)perylene | 2.03E-05 | 2.65E-05 | 4.12E-05 | 9.72E-05 | 7.43E-05 | 4.86E-05 | **9.72E-05** | **1.21E-01** | **1.15E-01** |
| Chrysene | 3.74E-05 | 4.87E-05 | 7.58E-05 | 1.79E-04 | 1.37E-04 | 8.94E-05 | **1.79E-04** | **2.22E-01** | **2.12E-01** |
| Dibenz(a,h)anthracene | 3.49E-05 | 4.54E-05 | 7.07E-05 | 1.67E-04 | 1.27E-04 | 8.34E-05 | **1.67E-04** | **2.07E-01** | **1.98E-01** |
| Fluoranthene | 6.42E-05 | 8.35E-05 | 1.30E-04 | 3.07E-04 | 2.34E-04 | 1.53E-04 | **3.07E-04** | **3.81E-01** | **3.63E-01** |
| Fluorene | 8.61E-05 | 1.12E-04 | 1.75E-04 | 4.12E-04 | 3.15E-04 | 2.06E-04 | **4.12E-04** | **5.11E-01** | **4.88E-01** |
| Indeno(1,2,3-cd)pyrene | 3.49E-05 | 4.54E-05 | 7.07E-05 | 1.67E-04 | 1.27E-04 | 8.34E-05 | **1.67E-04** | **2.07E-01** | **1.98E-01** |
| Phenanthrene | 4.65E-04 | 6.05E-04 | 9.42E-04 | 2.22E-03 | 1.70E-03 | 1.11E-03 | **2.22E-03** | **2.76E+00** | **2.63E+00** |
| Pyrene | 4.11E-05 | 5.35E-05 | 8.33E-05 | 1.97E-04 | 1.50E-04 | 9.83E-05 | **1.97E-04** | **2.44E-01** | **2.33E-01** |
| Toluene | 1.95E-01 | 2.54E-01 | 3.95E-01 | 9.32E-01 | 7.12E-01 | 4.66E-01 | **9.32E-01** | **1.16E+03** | **1.10E+03** |
| Xylenes | 9.60E-02 | 1.25E-01 | 1.94E-01 | 4.59E-01 | 3.51E-01 | 2.29E-01 | **4.59E-01** | **5.69E+02** | **5.44E+02** |

**Notes:**

**1. Based on 5 ppm ammonia slip limit.**

**2. Factors labeled District/AP-42 from District website, profile t10 (except ammonia).**

**3. Factors labeled CATEF from CARB CATEF database. Mean values were used. For compounds with multiple emission rates provided, the lowest was selected.**

**4. Controlled emission factor assume 50% control from oxidation catalyst except for ammonia.**

**5. All VOC emission rates are assumed not to change from original application except for commissioning.**

**6. Maximum commissioning VOC emissions from original application, heat input from ACECP.**

**7. Maximum heat input of 1000 MMBtu/hr from steady state calculations.**

**8. Propylene oxide emission factor in AP-42 data omitted from District factors since based on a non-detection.**

**9. Startup and shutdown heat inputs from original application (289.27 and 40 MMBtu/event respectively) ratioed up for larger heat input.**

**10. VOC emission rates of lb VOC/MMBtu calculated using revised heat inputs**

**11. Ratios of VOC emissions based on lb/MMBtu factors.**

**12. Emission factors for each mode calculated by multiplying the controlled toxic emission factor by the VOC ratio.**

**13. Emission rates for each mode calculated by multiplying emission factor by heat input**

# Appendix B: Health Risk Assessment Report

**Rule 1200 Health Risk Assessment Report**

| | |
|---|---|
| Site ID: | 00471 |
| Application: | 003627 |
| Project Engineer: | Steven Moore |
| Toxics Risk Analyst: | Michael Kehetian |
| HRA Tools Used: | AERMOD (09292) / HARP On-Ramp / HARP (1.4d) |
| Report Date: | May 19, 2015 |

**Health Risk Assessment (HRA) evaluation for the Pio Pico Energy Center Project (PPEC)**

A health risk assessment (HRA) was evaluated for the Pio Pico Energy Center Project (PPEC) by Sierra Research on behalf of Apex Power Group, LLC. The project is for a 300 megawatt power plant consisting of three simple cycle General Electric LMS 100 natural gas turbines and a cooling tower to be located in Otay Mesa on the southeast instersection of Alta Road and Calzada de la Fuente Road.

The following review references supporting documentation contained in the application for certification provided to the California Energy Commission (CEC) dated February 9, 2011, along with additional supplemental information requested by the District and received on March 8, 2011. The HRA was reviewed for adherence to the Office of Environmental Health Hazard Assessment (OEHHA), Air Resources Board (ARB), and District Rule 1200 guidelines.

Rule 1200 requires the HRA address the increases in potential to emit (PTE) associated with any new or modified emission units. The emission increases for the PPEC are associated with the following sources:

- Three simple cycle turbines each maximally rated at 1000 MMBtu/hr and equipped with an oxidation catalyst to control volatile organic compounds (VOC) and carbon monoxide (CO) emissions. The oxidation catalyst is assumed to reduce toxic air contaminant (TAC) emissions by 50% during normal operations. The turbines are also equipped with a selective catalytic reduction (SCR) system to control oxides of nitrogen.

- A cooling tower producing aerosol particulate matter emissions from the evaporation of water drift droplets. Using a partial-dry cooling system, the drift eliminator reduces the drift loss rate to 0.001%.

The operating scenarios evaluated to determine the maximum potential health impacts include acute risk from startups and shutdowns, cancer and chronic risk from normal full load operations, the 8-hour hazard index, and health impacts for the commissioning year.

- Annual Emissions - Each turbine operates for 4,000 hours at full load plus 500 startups and 500 shutdowns (4,337.5 hours).

- Hourly Emissions – Each turbine has one startup for 30 minutes with the remainder of the hour at full load. A shutdown for each turbine is for 10.5 minutes with the remainder of the hour at full load.

- Commissioning – Each turbine operates for 112 hours for the first year.

***Worst-Case Potential Health Impacts**

| Category | Health Impact | Rule 1200 Significance Level |
|---|---|---|
| Maximum Incremental Cancer Risk—Resident (per million) | 0.11 | 1.0 or 10 (with TBACT) |
| Maximum Incremental Cancer Risk—Worker (per million) | 0.02 | 1.0 or 10 (with TBACT) |
| Total Chronic Noncancer Health Hazard Index | 0.012 | 1.0 |
| Total Acute Noncancer Health Hazard Index | 0.12 | 1.0 |
| Total 8-Hour Noncancer Health Hazard Index | 0.01 | 1.0 |
| Sub-Chronic Lead Exposure Risk ($ug/m^3$) | 5.5E-07 | 0.12 (ARB Standard) |

*The health impacts listed are a ratio of the revised heat input increase from 890.2 MMBtu/hr to 1000 MMBtu/hr. To simplify, all health impacts are slightly scaled up by a factor of 1.2 rather than re-calculating in the Air Resources Board (ARB) Hotspots Analysis Reporting Program (HARP).

Although not fully implemented by the District yet, the residential cancer risk was also calculated using the updated Air Toxics Hot Spots Program Guidance Manual dated February 2015 from the 2003 version, and estimated be 0.16 in one million. The estimated residential cancer risk is using the OEHHA Derived Method (high-end point estimate) and a 30 year residential exposure period. The updated 2015 guidance does not affect occupational cancer risk, chronic, 8-hour, and acute results from the 2003 guidance (i.e., these health impacts are the same using the updated or previous assessment guidelines).

The reported cancer, chronic, 8-hour, and acute worst-case health impacts are at the point of maximum impact (PMI) which is the maximum impact point beyond the facility boundary. The presented worker cancer risk is a conservative ratio of residential exposure assumed to be at the PMI (8/24 hours per day, 245/365 days a year, and 40/70 years).

The reported cancer, chronic, 8-hour, and acute worst-case potential health impacts are at the point of maximum impact (PMI) which is the maximum impact point beyond the facility boundary. The presented worker cancer risk is a conservative ratio of residential exposure assumed to be at the PMI (8/24 hours per day, 245/365 days per year, and 40/70 years).

To determine the worst-case health impacts, modeling consisted of three years (2006, 2007, and 2008) of Otay Mesa meteorological data. For all health impacts, the 2006 meteorological data

produced the worst-case results by a small margin. However, using the updated Air Toxics Hot Spots Program Guidance Manual dated February 2015 for calculating cancer risk and the 8-hour noncancer health hazard index (HHI), three years of more recent Otay Mesa meteorological data (2010, 2011, and 2012) was used. The more recent Otay Mesa meteorological data was also used for Sync-Idle. For these health impacts, the 2012 meteorological data produced the worst-case results also by a small margin.

Cancer risk at the PMI is primarily due to formaldehyde (~49%) and noninhalation exposure to benzo[a]pyrene (~21%) along with dibenz[a,h]anthracene (~13%). The location of the PMI is modeled grid receptor 10443, UTM NAD 83 Zone 11 coordinates 509796 E and 3603904 N.

The chronic HHI to the respiratory system is mainly due to formaldehyde (~48%) and ammonia (~33%).

Acute risk to the eye endpoint is due to formaldehyde (~79%) and acrolein (~12%). The acute PMI HHI is located at grid receptor 8377, 508696 E and 3604889 N.

On June 18, 2008, the Scientific Review Panel approved OEHHA's Air Toxics Hot Spots Program Technical Support Document (TSD) for the Derivation of Noncancer Reference Exposure Levels (REL) as mandated by the Children's Environmental Health Protection Act of 1999. In addition to revising the chronic and acute health data for several chemicals, a newly added 8-hour hazard index was created. For this project and referencing the Consolidated Table of OEHHA and ARB Approved Risk Assessment Health Values updated on July 3, 2014, 8-hour RELs exist for acetaldehyde, acrolein, benzene, butadiene, 1,3, and formaldehyde. The Air Toxics Hot Spots Program Guidance Manual dated February 2015 is to calculate the 8-hour HHI using the annual average modelling period (24 hours per day and 7 days a week) resulting in the worst-case 8-hour hazard index to respiratory system equal to 0.01.

The maximum 1-hour lead concentration is estimated to be 5.5E-07 ug/m$^3$ which is much less than the 30-day High Exposure Scenario approval level of 0.12 ug/m$^3$ in the ARB Risk Management Guidelines for Lead, 2001. Although the hourly emissions rate equal to 3.6E-09 g/s is ten times less than the 30-day, 2.1E-08 g/s, the results are using the 1-hour averaging period dispersion factor which is significantly higher than what the guidelines require, a 30-day average, so the results are overly conservative.

**Emission Factors**

Emission factors reference the U.S. EPA AP-42 (Table 3.1-3) and California Air Toxic Emission Factor (CATEF) database for toxic compounds. The turbines are proposed to be equipped with an oxidation catalyst reducing the emission factors by 50% during normal operations. The emission factor for ammonia was calculated based on the proposed permit limit.

| Toxic Air Contaminant | Emission Factor Uncontrolled (lb/MMBtu) | Source | Emission Factor Controlled (lb/MMBtu) |
|---|---|---|---|
| ACETALDEHYDE | 4.00E-05 | AP-42 | 2.00E-05 |
| ACROLEIN | 6.40E-06 | AP-42 | 3.20E-06 |
| AMMONIA | 6.81E-03 | SDAPCD | 6.81E-03 |
| BENZENE | 1.20E-05 | AP-42 | 6.00E-06 |

| | | | |
|---|---|---|---|
| BUTADIENE, 1,3- | 4.30E-07 | AP-42 | 2.15E-07 |
| ETHYL BENZENE | 3.20E-05 | AP-42 | 1.60E-05 |
| FORMALDEHYDE | 9.08E-04 | CATEF | 4.54E-04 |
| HEXANE-N | 2.56E-04 | CATEF | 1.28E-04 |
| NAPHTHALENE | 1.64E-06 | AP-42 | 8.22E-07 |
| PAHs | | | |
| ACENAPHTHENE | 1.88E-08 | CATEF | 9.41E-09 |
| ACENAPTHYENE | 1.46E-08 | CATEF | 7.28E-09 |
| ANTHRACENE | 3.35E-08 | CATEF | 1.67E-08 |
| BENZO[a]ANTHRACENE | 2.24E-08 | CATEF | 1.12E-08 |
| BENZO[a]PYRENE | 1.38E-08 | CATEF | 6.88E-09 |
| BENZO[e]PYRENE | 5.39E-10 | CATEF | 2.69E-10 |
| BENZO[b]FLUORANTHENE | 1.12E-08 | CATEF | 5.59E-09 |
| BENZO[k]FLUORANTHENE | 1.09E-08 | CATEF | 5.45E-09 |
| BENZO[g,h,i]PERYLENE | 1.36E-08 | CATEF | 6.78E-09 |
| CHRYSENE | 2.50E-08 | CATEF | 1.25E-08 |
| DIBENZ[a,h]ANTHRACENE | 2.33E-08 | CATEF | 1.16E-08 |
| FLUORANTHENE | 4.28E-08 | CATEF | 2.14E-08 |
| FLUORENE | 5.74E-08 | CATEF | 2.87E-08 |
| INDENO(1,2,3-cd)PYRENE | 2.33E-08 | CATEF | 1.16E-08 |
| PHENANTHRENE | 3.10E-07 | CATEF | 1.55E-07 |
| PYRENE | 2.74E-08 | CATEF | 1.37E-08 |
| PROPYLENE | 7.63E-04 | CATEF | 3.82E-04 |
| TOLUENE | 1.30E-04 | AP-42 | 6.50E-05 |
| XYLENES | 6.40E-05 | AP-42 | 3.20E-05 |

**Emissions – Normal Operations (Each Turbine, 4337.5 hours)**

| Toxic Air Contaminant | Emission Factor (lb/MMBtu) | Emissions (lb/hr) | Emissions (lb/yr) |
|---|---|---|---|
| ACETALDEHYDE | 2.00E-05 | 2.00E-02 | 8.68E+01 |
| ACROLEIN | 3.21E-06 | 3.21E-03 | 1.39E+01 |
| AMMONIA | 6.87E-03 | 6.87E+00 | 2.98E+04 |
| BENZENE | 5.99E-06 | 5.99E-03 | 2.60E+01 |
| BUTADIENE, 1,3- | 2.15E-07 | 2.15E-04 | 9.33E-01 |
| ETHYL BENZENE | 1.60E-05 | 1.60E-02 | 6.94E+01 |
| FORMALDEHYDE | 4.50E-04 | 4.50E-01 | 1.95E+03 |
| HEXANE-N | 1.27E-04 | 1.27E-01 | 5.51E+02 |
| NAPHTHALENE | 6.53E-07 | 6.53E-04 | 2.83E+00 |
| PAHs | | | |
| ACENAPHTHENE | 9.32E-09 | 9.32E-06 | 4.04E-02 |
| ACENAPTHYENE | 7.21E-09 | 7.21E-06 | 3.13E-02 |
| ANTHRACENE | 1.66E-08 | 1.66E-05 | 7.20E-02 |
| BENZO[a]ANTHRACENE | 1.11E-08 | 1.11E-05 | 4.81E-02 |
| BENZO[a]PYRENE | 6.82E-09 | 6.82E-06 | 2.96E-02 |
| BENZO[e]PYRENE | 2.67E-10 | 2.67E-07 | 1.16E-03 |
| BENZO[b]FLUORANTHENE | 5.54E-09 | 5.54E-06 | 2.40E-02 |

| | | | |
|---|---|---|---|
| BENZO[k]FLUORANTHENE | 5.40E-09 | 5.40E-06 | 2.34E-02 |
| BENZO[g,h,i]PERYLENE | 6.72E-09 | 6.72E-06 | 2.91E-02 |
| CHRYSENE | 1.24E-08 | 1.24E-05 | 5.38E-02 |
| DIBENZ[a,h]ANTHRACENE | 1.15E-08 | 1.15E-05 | 4.99E-02 |
| FLUORANTHENE | 2.12E-08 | 2.12E-05 | 9.20E-02 |
| FLUORENE | 2.85E-08 | 2.85E-05 | 1.24E-01 |
| INDENO(1,2,3-cd)PYRENE | 1.15E-08 | 1.15E-05 | 4.99E-02 |
| PHENANTHRENE | 1.54E-07 | 1.54E-04 | 6.68E-01 |
| PYRENE | 1.36E-08 | 1.36E-05 | 5.90E-02 |
| PROPYLENE | 3.78E-04 | 3.78E-01 | 1.64E+03 |
| TOLUENE | 6.53E-05 | 6.53E-02 | 2.83E+02 |
| XYLENES | 3.20E-05 | 3.20E-02 | 1.39E+02 |

Hourly TAC emissions during startup and shutdown are scaled up as a ratio of volatile emissions from normal operations to account for overall combustion conditions and limited/non-operational control from the oxidation catalyst. For commissioning and sync idle, a factor equal to 2.38 as a ratio of volatile emissions from normal operations.

**Emissions – Scaled VOCs for Startup, Shutdown and Commissioning**

| Operating Mode | VOC Emissions (lb/hr) | Ratio of Normal Operations |
|---|---|---|
| Normal Operations | 2.31 | -- |
| Startup | 3.0 | 1.3 |
| Shutdown | 4.67 | 1.56 |
| Commissioning/Sync Idle | 5.51 | 2.38 |

**Emissions – Shutdown (Each Turbine)**

| Toxic Air Contaminant | Emission Factor (lb/MMBtu) | Emissions (lb/hr) |
|---|---|---|
| ACETALDEHYDE | 9.20E-04 | 4.05E-02 |
| ACROLEIN | 1.47E-04 | 6.48E-03 |
| AMMONIA | 6.81E-03 | 3.00E-01 |
| BENZENE | 2.76E-04 | 1.22E-02 |
| BUTADIENE, 1,3- | 9.89E-06 | 4.36E-04 |
| ETHYL BENZENE | 7.36E-04 | 3.24E-02 |
| FORMALDEHYDE | 2.09E-02 | 9.20E-01 |
| HEXANE-N | 5.90E-03 | 2.60E-01 |
| NAPHTHALENE | 3.78E-05 | 1.66E-03 |
| PAHs | | |
| ACENAPHTHENE | 4.33E-07 | 1.91E-05 |
| ACENAPTHYENE | 3.35E-07 | 1.47E-05 |
| ANTHRACENE | 7.70E-07 | 3.39E-05 |
| BENZO[a]ANTHRACENE | 5.15E-07 | 2.27E-05 |
| BENZO[a]PYRENE | 3.17E-07 | 1.39E-05 |
| BENZO[e]PYRENE | 1.24E-08 | 5.46E-07 |

| | | |
|---|---|---|
| BENZO[b]FLUORANTHENE | 2.57E-07 | 1.13E-05 |
| BENZO[k]FLUORANTHENE | 2.51E-07 | 1.10E-05 |
| BENZO[g,h,i]PERYLENE | 3.12E-07 | 1.37E-05 |
| CHRYSENE | 5.74E-07 | 2.53E-05 |
| DIBENZ[a,h]ANTHRACENE | 5.35E-07 | 2.36E-05 |
| FLUORANTHENE | 9.84E-07 | 4.33E-05 |
| FLUORENE | 1.32E-06 | 5.82E-05 |
| INDENO(1,2,3-cd)PYRENE | 5.35E-07 | 2.36E-05 |
| PHENANTHRENE | 7.13E-06 | 3.14E-04 |
| PYRENE | 6.31E-07 | 2.78E-05 |
| PROPYLENE | 1.76E-02 | 7.73E-01 |
| TOLUENE | 2.99E-03 | 2.99E-03 |
| XYLENES | 1.47E-03 | 1.47E-03 |

**Emissions – *Commissioning/Sync-Idle (Each Turbine)**

| Toxic Air Contaminant | Emission Factor (lb/MMBtu) | Emissions (lb/hr) |
|---|---|---|
| ACETALDEHYDE | 3.71E-04 | 4.78E-02 |
| ACROLEIN | 5.94E-05 | 7.64E-03 |
| AMMONIA | 6.81E-03 | 8.77E-01 |
| BENZENE | 1.11E-04 | 1.43E-02 |
| BUTADIENE, 1,3- | 3.99E-06 | 5.14E-04 |
| ETHYL BENZENE | 2.97E-04 | 3.82E-02 |
| FORMALDEHYDE | 8.42E-03 | 1.08E+00 |
| HEXANE-N | 2.38E-03 | 3.06E-01 |
| NAPHTHALENE | 1.53E-05 | 1.96E-03 |
| PAHs | | |
| ACENAPHTHENE | 1.75E-07 | 2.74E-03 |
| ACENAPTHYENE | 1.35E-07 | 2.25E-05 |
| ANTHRACENE | 3.11E-07 | 1.74E-05 |
| BENZO[a]ANTHRACENE | 2.08E-07 | 4.00E-05 |
| BENZO[a]PYRENE | 1.28E-07 | 2.67E-05 |
| BENZO[e]PYRENE | 5.00E-09 | 1.64E-05 |
| BENZO[b]FLUORANTHENE | 1.04E-07 | 6.43E-07 |
| BENZO[k]FLUORANTHENE | 1.01E-07 | 1.34E-05 |
| BENZO[g,h,i]PERYLENE | 1.26E-07 | 1.30E-05 |
| CHRYSENE | 2.32E-07 | 1.62E-05 |
| DIBENZ[a,h]ANTHRACENE | 2.16E-07 | 2.98E-05 |
| FLUORANTHENE | 3.97E-07 | 2.78E-05 |
| FLUORENE | 5.33E-07 | 5.11E-05 |
| INDENO(1,2,3-cd)PYRENE | 2.16E-07 | 6.86E-05 |
| PHENANTHRENE | 2.88E-06 | 2.78E-05 |
| PYRENE | 2.54E-07 | 3.70E-04 |
| PROPYLENE | 7.08E-03 | 9.12E-01 |
| TOLUENE | 1.21E-03 | 1.55E-01 |
| XYLENES | 5.94E-04 | 7.64E-02 |

*Commissioning (Each Turbine, 112 hours per year)

**Commissioning and Sync-Idle Health Impacts**

| Category | Health Impact |
|---|---|
| Maximum Incremental Cancer Risk—Resident (per million) | 0.0007 |
| Total Chronic Noncancer Health Hazard Index | 0.003 |
| Total Acute Noncancer Health Hazard Index | 0.03 |
| Sync-Idle Acute Noncancer Health Hazard Index | 0.007 |

The partial dry cooling tower operates annually for 4,337.5 hours, a water circulation rate of 14,000 gallons per minute (GPM), and 4.67 cycles of concentration. The maximum total dissolved solids (TSD) is 5,600 ppmw. The concentration for each TAC in the make-up water is determined from the highest water samples collected from the Otay Water District's Ralph W. Chapman Water Recycling Facility effluent in 2007, 2008, and 2009.

Based on a drift rate of 0.001% at the circulators cooling water, which results in maximum particulate emissions of 15.8 pounds per day and 1.43 tons per year, maximum toxic emissions from the cooling tower are:

**Emissions - Cooling Towers (Each of the 12 Cells)**

| Toxic Air Contaminant | Concentration (ug/liter) | Emissions (lb/hr) | Emissions (lb/yr) |
|---|---|---|---|
| ARSENIC | 1.80E+00 | 4.91E-09 | 2.12E-05 |
| CARBON TETRACHLORIDE | 2.10E+00 | 5.73E-09 | 2.48E-05 |
| CHLORINE | 2.30E+05 | 6.28E-04 | 2.72E+00 |
| CHROMIUM | 2.80E+00 | 7.64E-09 | 3.32E-05 |
| COPPER | 6.50E+00 | 1.77E-08 | 7.70E-05 |
| FLUORIDE | 6.60E+02 | 3.00E-06 | 1.30E-02 |
| LEAD | 8.60E-01 | 2.35E-09 | 1.02E-05 |

**Air Dispersion Modeling**

The US Environmental Protection Agency (EPA) AERMOD Dispersion Model (Version 09292) was used to predict concentration impacts using an emissions rate input of 1 g/s.

The District's Monitoring & Technical Services (M&TS) Division provided the AERMET preprocessor files used which included the following three years (2006, 2007, and 2008) of meteorological data:

Surface Data – Otay Mesa-Paseo International Monitoring Station.
Upper Air Data – MCAS Miramar Monitoring Station.

For all health impacts, the 2006 meteorological data predicted the worst-case results by a small margin.

The dispersion results, X/Q $(ug/m^3)/(g/s)$, were imported into ARB's Hotspots Analysis Reporting Program (HARP, Version 1.4d) via HARP On-Ramp to calculate actual chemical concentrations and resulting health impacts.

The dispersion modeling included a course 250-meter spacing grid extending out 10 km to assess the extent of maximum impacts. Refined 25-meter resolution receptor grids surrounding the areas of maximum impacts in addition to along the facility fenceline property boundary is sufficiently dense.

**Release Parameters – Modeled Operating Modes**

| Operating Mode | Ambient Temperature (deg F) | Exhaust Temperature (deg F) | Exhaust Velocity (m/s) |
|---|---|---|---|
| Startup/Shutdown | 30 | 820 | 19.86 |
| Hot Peak | 110 | 802 | 27.01 |
| Average Peak | 63 | 785 | 28.11 |
| Cold Peak | 30 | 754 | 27.98 |
| Hot Low | 122 | 825 | 22.56 |
| Average Low | 63 | 831 | 19.89 |
| Cold Low | 30 | 820 | 19.86 |

**Release Parameters – Normal Operations (Worst-Case, Cold Peak)**

| Release Parameter | Value |
|---|---|
| Stack Height (ft) | 100 |
| Stack Diameter (ft) | 14.5 |
| Temperature deg F | 758.4 |
| Exhaust Velocity (fps) | 95.08 |

**Release Parameters – Startup/Shutdown, Commissioning, 8-Hour (Worst-Case, Cold Low)**

| Release Parameter | Value |
|---|---|
| Stack Height (ft) | 100 |
| Stack Diameter (ft) | 14.5 |
| Temperature deg F | 798.5 |
| Exhaust Velocity (fps) | 67.42 |

**Release Parameters – Sync-Idle (*Reference CECP, Table 3.1E-2, Revised 6/24/14)**

| Release Parameter | Value |
|---|---|
| Stack Height (ft) | 100 |
| Stack Diameter (ft) | 14.5 |
| Temperature deg F | 982.3 |
| Exhaust Velocity (fps) | 25.92 |

*Amended Carlsbad Energy Center Project (CECP) GE LMS 100 Performance Runs, Case #311

**Release Parameters – Cooling Towers**

| Release Parameter | Value |
|---|---|
| Stack Height (ft) | 22 |
| Stack Diameter (ft) | 13 |
| Temperature deg F | 86 |
| Exhaust Velocity (fps) | 33.73 |

**Risk Calculations**

The HRA was reviewed using ARB's Hotspots Analysis and Reporting Program (HARP), Version 1.4d, referencing the OEHHA Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments, August 2003.

- Inhalation Breathing Rates and Exposure Duration: For calculating residential cancer risk over 70 years with inhalation as one of the two dominant pathways, the ARB Derived (Adjusted) Analysis Method was used which incorporates the minimum 80$^{th}$ percentile breathing rate equal to 302 Liters/Kilogram-day in accordance with the recommended interim risk management policy for inhalation-based residential cancer risk.

  The worker cancer risk is a conservative ratio of residential exposure (8/24 hours per day, 245/365 days per year, and 40/70 years).

  In accordance with the OEHHA Guidance Manual, *Calculating Cancer Risk Using Different Exposure Durations*, Section 8.2.2, *B. Worker*, a ground level concentration (GLC) adjustment factor was not applied to calculate occupational cancer risk since potential emissions are continuous (24 hours a day, 7 days per week).

- Noninhalation Exposure: Cancer and chronic health impacts include the required noninhalation pathways of dermal contact and soil ingestion per the OEHHA Guidance Manual, *Determination of Noninhalation (Oral) Cancer Risk*, Section 8.2.4, and *Noncancer Chronic Health Impacts from the Oral Route*, Section 8.3.2.

  In addition to the exposure pathways of dermal contact and soil ingestion, residential cancer risk conservatively includes the rural home grown produce pathway with a human ingestion fraction equal to 15%.

  The drinking water and fish consumption pathways using the default fraction of 1.0 (fraction of ingested fish and drinking water from contaminated source) were included in the analysis for the Otay Lake Reservoir.

- Deposition Rate: In accordance with the OEHHA Guidance Manual, *Criteria for Exposure Pathway Evaluation*, Section 5.2, noninhalation exposure used the OEHHA deposition rate equal to 0.05 meters per second, which conservatively assumes particulate matter of less than or equal to 10 microns in diameter ($PM_{10}$).

- The acute hazard index was calculated using the conservative default simple concurrent maximum approach. At each receptor, the maximum hourly dispersion factors for the entire period are summed from all sources assuming these impacts occur simultaneously at

the same location. The more refined approach processes the meteorological data hourly variation dispersion impacts from different sources which for a given receptor will not necessarily be at their maximums at the same time.

# Appendix C: Air Quality Impact Assessment

# AIR QUALITY IMPACT ANALYSIS

# FINAL REVIEW REPORT

## AMENDMENT TO THE PIO PICO ENERGY CENTER PROJECT APPLICATION 2010-APP-001251

**April, 2015**

**Prepared For**
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## 1.0 INTRODUCTION

An Amendment to the Air Quality Impact Analysis (AQIA) for the Pio Pico Energy Center Project (PPEC) was performed by Sierra Research of Sacramento, CA in June, 2014. Since the issuance of permits GE has made performance improvements to their LMS 100 gas turbines which result in slightly higher heat input and electrical power output. These improvements result in a heat input increase from 902 MMBtu/hr to 1,000 MMBtu/hr and electrical power increase from 100MW per turbine to 106 MW per turbine. There was no change to permitted annual and hourly criteria pollutant emission rates.

## 2.0 PROJECT DESCRIPTION

Pio Pico Energy Center, LLC (PPEC LLC) is proposing a simple-cycle power generation project that consists of three General Electric (GE) LMS100 natural gas-fired combustion turbine generators (CTGs). The total new net generating capacity would be about 318 megawatts (MW), with each CTG capable of generating 106MW. The proposed plant will be owned and operated by PPEC LLC. The electricity generated by this project would be in support of a contract with SDG&E. NOx emissions are controlled with a selective catalytic reduction system and CO emissions are controlled with an oxidation catalyst.

## 3.0 AIR QUALITY IMPACT ANALYSIS

Dispersion modeling using revised turbine exhaust parameters resulting from the increase in hourly heat input was conducted for Normal and Startup/Shutdown emissions of $NO_2$, CO, $SO_2$, and $PM_{10}$ and $PM_{2.5}$. Turbine startups were modeled using low load (50%) and hot ambient (110 F) exhaust parameters and emission rates. The applicant and their consultant (Sierra Research) worked closely with the District in developing modeling and analysis procedures in support of demonstrating compliance with all applicable NSR requirements. Modeling was performed in order to determine whether emissions during these time periods would impact the State and/or Federal Ambient Air Quality Standards for all criteria pollutants.

The modeling procedures are discussed in the following subsections.

### 3.1 MODELING METHODOLOGIES

AERMOD was used first to "screen" the different turbine stack emission and ambient temperature parameters for the conditions that generate the highest ground-level concentrations of criteria pollutants. Gas turbine specifications were developed and modeled for three temperature scenarios: extreme hot temperature (110 F), annual average temperature (63 F) and extreme low temperature (30 F). Stack parameters and criteria pollutant emission rates were provided at each of these three ambient temperatures. Similarly, stack parameters and emission rates were provided at each ambient temperature for the turbines running at 100% and 50% load. The stack parameters and maximum emission rates for the Screening Modeling are presented in Tables 3-1 and 3-2.

The screening modeling was performed using EPA's AERMOD (Version 13350) model and a 1gram per second emission rate for each turbine. The results were then scaled by the actual emission rates to determine predicted impacts for each turbine load and

ambient condition. Table 3-3 compares these screening results with the original approved turbine design.

All modeling was performed in accordance with EPA guidance and District standard procedures. The receptor grid was sufficiently dense to identify maximum impacts. AERMAP (Version 11103) was used to determine receptor elevations and controlling hill heights.

A refined analysis modeling analysis for the Federal 1-Hour $NO_2$ Standard was performed by the District assuming the worst case Startup/Shutdown condition. The Plume Volume Molar Ratio (PVMRM) method was used in determining predicted $NO_2$ impacts for all facility operations. Background Ozone data from the Chula Vista monitoring station was used for this purpose. A data post processing program included in AERMOD was used to perform the refined analysis for the Federal 1-Hour $NO_2$ Standard. This program adds the predicted hour by hour $NO_2$ impacts to the monitored background $NO_2$ value (Chula Vista) for that hour for each receptor. Per District NSR requirements, actual hour-by-hour background $NO_2$ data, with any missing data filled per the District's draft data filling guidance procedure was used. Per the form of the Federal standard, for each modeled year the highest daily combination of predicted plus background concentration at each receptor is first determined. The 98$^{th}$ percentile value (8$^{th}$ high) can then be calculated for each receptor for each of the three years. A three year average 98$^{th}$ percentile value for each receptor is then determined. The highest three year average 98$^{th}$ percentile value at any receptor can then be compared to the Federal 1-Hour standard to determine compliance with this standard.

## 3.2 METEOROLOGICAL DATA USED FOR DISPERSION MODELING

Meteorological data used for EPA's AERMOD model consisted of the following data for the 2010 through 2012. The data was processed by the District using EPA's AERMET meteorological data processor (Version 14134) to produce AERMOD ready files.

- Wind speed, wind direction, standard deviation of the horizontal wind direction and temperature from the District's Otay Mesa monitoring station.
- Twice-daily upper-air soundings from Miramar Marine Corps Air Station, San Diego, CA.
- Cloud height and total opaque cloud amount from Brown Field Airport, Otay Mesa, CA.
- Wind speed, wind direction and temperature data from Brown Field Airport, Otay Mesa, CA for replacement of missing data in the Otay Mesa data set.

**Table 3-1**
**Pio Pico Energy Center Amendment**
**Exhaust Parameters Used for Updated Screening Modeling Analysis**

| Operating Mode | Ambient Temp, °F | Turbine Load, % | Stack Height, meters | Stack Diam, meters | Stack Flow, m3/sec | Stack Velocity, m/sec | Stack Temp, °K |
|---|---|---|---|---|---|---|---|
| Hot Peak | 110 | 100 | 30.48 | 4.42 | 432.76 | 28.21 | 700.3 |
| Average Peak | 63 | 100 | 30.48 | 4.42 | 482.32 | 31.44 | 691.6 |
| Cold Peak | 30 | 100 | 30.48 | 4.42 | 444.62 | 28.98 | 676.7 |
| Hot Low | 110 | 50 | 30.48 | 4.42 | 306.42 | 19.97 | 708.8 |
| Average Low | 63 | 50 | 30.48 | 4.42 | 318.24 | 20.74 | 702.0 |
| Cold Low | 30 | 50 | 30.48 | 4.42 | 315.24 | 20.55 | 699.0 |
| Start Up | 110 | 50 | 30.48 | 4.42 | 306.42 | 19.97 | 708.8 |

**Table 3-2**
**Pio Pico Energy Center Amendment**
**Emission Rates Used for Updated Screening Modeling Analysis**

| OPERATING | NOx | CO | SOx | PM10 |
|---|---|---|---|---|
| MODE | EMISSION RATE | EMISSION RATE | EMISSION RATE | EMISSION RATE |
| | (lb/hr) | (lb/hr) | (lb/hr) | (lb/hr) |
| Hot Peak | 7.27 | 7.08 | 1.69 | 5 |
| Avg Peak | 8.18 | 7.97 | 1.9 | 5 |
| Cold Peak | 7.51 | 7.32 | 1.75 | 5 |
| Hot Low | 4.38 | 4.27 | 1.02 | 5 |
| Avg Low | 4.59 | 4.47 | 1.07 | 5 |
| Cold Low | 4.54 | 4.43 | 1.06 | 5 |
| Startup | 26.63 | 53.51 | n/a | n/a |

**Table 3-3**
**Pio Pico Energy Center Amendment**
**Comparison of Project Impacts with Original Screening Modeling Results**

| Pollutant | Averaging Time | Operating Mode | Maximum Modeled Impact, µg/m$^3$ | |
|---|---|---|---|---|
| | | | Proposed Change[a] | Original Design[b] |
| $NO_2$ | 1-hour | startup | 116.7 | 133.3 |
| | Annual | normal | 0.3 | 0.3 |
| $SO_2$ | 1-hour | normal | 6.2 | 8.0 |
| | 3-hour | normal | 2.3 | 2.7 |
| | 24-hour | normal | 0.6 | 0.6 |
| | Annual | normal | 0.1 | 0.1 |
| CO | 1-hour | shutdown | 234.4 | 267.8 |
| | 8-hour | shutdown | 60.6 | 64.3 |
| $PM_{10}/PM_{2.5}$ | 24-hour | normal | 1.9 | 2.2 |
| | Annual | normal | 0.2 | 0.2 |

Notes:
a. Based on stack parameters that reflect proposed higher hourly heat input and final permitted emission limits (5.0 lb/hr $PM_{10}/PM_{2.5}$).
b. Based on stack parameters for permitted design and emission limits from FDOC (5.5 lb/hr $PM_{10}/PM_{2.5}$). See Table 3-4 of Appendix A ("Air Quality Impact Analysis, Final Review Report") to the FDOC.

## 4.0 AIR QUALITY IMPACT ANALYSIS RESULTS

In accordance with EPA and San Diego Air Pollution Control District New Source Review Guidance and the modeling methodologies described above, maximum predicted concentrations associated with facility operations were determined for each of the required criteria pollutants and the applicable averaging periods during Normal and Startup/Shutdown conditions. The maximum predicted concentrations occurring during these operating conditions modeled were added to worst-case background concentrations for comparison to Federal and State Ambient Air Quality Standards. Worst case background concentrations were determined from the review of monitoring data for 3 years (2010-2012). ***Monitoring data was taken from the District's Chula Vista monitoring station, which was deemed to be most representative of air quality in the facility area.***

Table 4-1 provides the summary of the proposed project normal operations modeled maximum impacts, including worst case ambient background concentrations, compared with Federal and California Ambient Air Quality Standards (AAQS).

Table 4-2 provides the summary of the proposed project commissioning, sync idle, modeled maximum impacts, including worst case ambient background concentrations, compared with Federal and California Ambient Air Quality Standards (AAQS).

## Table 4-1
## Pio Pico Energy Center Amendment
## Summary of Results (Modeled Maximum Impacts Plus Background)
## (2010-2012 Meteorological Data) (Revised June, 2014)

| Pollutant | Averaging Time | Maximum Predicted Impact (operating mode) (µg/m³) | Background[3] Concentration (µg/m³) | Total Concentration (Maximum Impact plus Background) (µg/m³) | 3 year Average of 98th Percentile of Total Concentration (µg/m³) | NAAQS (µg/m³) | CAAQS (µg/m³) |
|---|---|---|---|---|---|---|---|
| $NO_2$ | 1-hr | 17.3 (startup)[6] | 107 | 124.3 | | --- | 339 |
| | 1-hr, 98th | 8.1(startup)[6] | 92[1] | ---- | 109.3[7] | 188 | --- |
| | Annual | 0.3 (normal)[6] | 23 | 23.3 | | 100 | 57 |
| $SO_2$ | 1-hr | 6.2 (normal) | 13 | 19.2 | -- | 196 | 655 |
| | 3-hr | 2.3 (normal) | 13[4] | 15.3 | -- | 1300 | -- |
| | 24-hr | 0.6 (normal) | 7.9 | 8.5 | -- | --- | 105 |
| | Annual | 0.1 (normal) | 2.6 | 2.7 | -- | --- | -- |
| CO | 1-hr | 234.4 (shutdown) | 3207[5] | 3441 | -- | 40,000 | 23,000 |
| | 8-hr | 60.6 (shutdown) | 2748[5] | 2748 | -- | 10,000 | 20.000 |
| $PM_{10}$ | 24-hr | 1.9 (normal) | 45 | 46.9 | -- | 150 | 50 |
| | Annual | 0.2 (normal) | 24.6 | 24.8 | -- | -- | 20 |
| $PM_{2.5}$ | 24-hr | 1.9 (normal) | 24.3[2] | --- | 26.2 | 35 | -- |
| | Annual | 0.2 (normal) | 10.2 | 10.4 | -- | 15.0 | 12 |
| | | | | | | | |

Notes:

[1] 3 year average of the 98th percentile of hourly background concentrations
[2] 3 year average of the 98th percentile of daily background concentrations
[3] Chula Vista Monitoring Station unless noted
[4] Used 1-Hr maximum average at Chula Vista
[5] Downtown San Diego Monitoring Station
[6] Results using OLM group option
[7] 3 year average 98th percentile plus max 1-Hr Impact

**Table 4-2**
**Pio Pico Energy Center Amendment**
**Summary of Results for Commissioning, Sync Idle (2010-2012 Meteorological Data)**

| Pollutant | Averaging Time | Maximum Predicted Impact (µg/m³) | Background[3] Concentration (µg/m³) | Total Concentration (Maximum Impact plus Background) (µg/m³) | 3 year Average of 98th Percentile of Total Concentration (µg/m³) | NAAQS (µg/m³) | CAAQS (µg/m³) |
|---|---|---|---|---|---|---|---|
| $NO_2$ | 1-hr | 163[6] | 107 | 270 | | --- | 339 |
| | 1-hr, 98th | 119[6] | 92[1] | ---- | 151[7] | 188 | --- |
| $SO_2$ | 1-hr | 2.1 | 13 | 15.1 | -- | 196 | 655 |
| | 3-hr | 0.93 | 13[4] | 13.9 | -- | 1300 | -- |
| | 24-hr | 0.18 | 7.9 | 8.1 | -- | --- | 105 |
| CO | 1-hr | 889 | 3207[5] | 4096 | -- | 40,000 | 23,000 |
| | 8-hr | 216 | 2748[5] | 2964 | -- | 10,000 | 20.000 |
| $PM_{10}$ | 24-hr | 3.33 | 45 | 48.3 | -- | 150 | 50 |
| $PM_{2.5}$ | 24-hr | 3.33 | 24.3[2] | --- | 27.6 | 35 | -- |
| | | | | | | | |

Notes:
[1] 3 year average of the 98th percentile of hourly background concentrations
[2] 3 year average of the 98th percentile of daily background concentrations
[3] Chula Vista Monitoring Station unless noted
[4] Used 1-Hr maximum average at Chula Vista
[5] Downtown San Diego Monitoring Station
[6] Results using OLM group option
[7] 3 year average 98th percentile predicted impact plus background

## 5.0 CONCLUSION

The results of the modeling indicate that the proposed facility changes in this amendment will not result in Normal operations, including Startup/Shutdowns as well as Commissioning (Sync Idle) will not cause or contribute to an exceedance of the Federal and California Ambient Air Quality Standards for $NO_2$, $SO_2$, CO and $PM_{2.5}$ and $PM_{10}$, except for the $PM_{10}$ annual California standard.

For $PM_{10}$, background concentrations already exceed the annual California standard. Since the background is already in exceedance of the annual standard no additional violations can be due to facility operations. Additionally, the 0.2 µg/m³ predicted annual impact is well below PSD Significant Impact Levels (SILs) shown in Table 5-1. Predicted impacts less than SILs are normally considered to not significantly affect compliance with Federal Ambient Air Quality Standards regardless of the background level. Specifically, in non-attainment areas, project impacts less than the SILs are deemed to not significantly cause or contribute to violations of, or attainment of, the Federal Ambient Air Quality Standard. The District considers that this is the case for California Annual $PM_{10}$ Ambient Air Quality Standards as well.

**Table 5-1**
**Comparison Of Maximum Modeled Impacts During Normal Operation And PSD Significant Impact Levels**
**(2010-2012 Meteorological Data) (Revised June, 2014)**

| Pollutant | Averaging Time | Significant impact Level, µg/m$^3$ | Maximum Modeled Impact for PPEC, µg/m$^3$ | Exceed Significant Impact Level? |
|---|---|---|---|---|
| $NO_2$ | 1-Hour | 7.5[1] | 26.6 | |
| | Annual | 1 | 0.3 | No |
| $SO_2$ | 1-Hour | 7.8[1] | 6.2 | No |
| | 3-hour | 25 | 2.3 | |
| | 24-Hour | 5 | 0.6 | |
| | Annual | 1 | 0.1 | |
| CO | 1-Hour | 2000 | 25.9 | No |
| | 8-Hour | 500 | 7.3 | |
| $PM_{2.5}$ | 24-Hour | 1.2 | 1.9 | |
| | Annual | 0.3 | 0.2 | |
| $PM_{10}$ | 24-Hour | 5 | 1.9 | No |
| | Annual | 1 | 0.2 | |

Notes:
[1] These are interim SILs and have not been formally adopted by EPA

# Appendix D: Permit Conditions

# PIO PICO ENERGY CENTER (PPEC) PERMIT CONDITIONS AS AMENDED

## GENERAL CONDITIONS

1. This equipment shall be properly maintained and kept in good operating condition at all times, and, to the extent practicable, the Applicant shall maintain and operate the equipment and any associated air pollution control equipment in a manner consistent with good air pollution control practices for minimizing emissions. [Rule 21 and 40 CFR §60.11]

2. The Applicant shall operate the project in accordance with all data and specifications submitted with the application under which this license is issued and District Application No. APCD2010-APP-001251 as amended by Application Nos. APCD2011-APP-001540 and APCD2014-APP-003627. [Rule 14]

3. The Applicant shall provide access, facilities, utilities, and any necessary safety equipment, with the exception of personal protective equipment requiring individual fitting and specialized training, for source testing and inspection upon request of the Air Pollution Control District. [Rule 19]

4. The Applicant shall obtain any necessary District permits for all ancillary combustion equipment including emergency engines, prior to on-site delivery of the equipment. [Rule 10]

5. Prior to the initial startup date for any of the three combustion turbines, the Applicant shall surrender to the District Class A Emission Reduction Credits (ERCs) in an amount equivalent to 84.5 tons per year of oxides of nitrogen (NOx) to offset the net maximum allowable increase of 70.4 tons per year of NOx emissions for the three combustion turbines authorized to be constructed under this permit. [Rule 20.3(d)(8)]

6. A rolling 12-calendar-month period is one of a series of successive consecutive 12-calendar-month periods. The initial 12-month-calendar period of such a series shall begin on the first day of the month in which the applicable beginning date for that series occurs as specified in this permit. [Rule 20.3 (d)(3), Rule 20.3(d)(8) and Rule 21].

7. Pursuant to 40 CFR §72.30(b)(2)(ii) of the Federal Acid Rain Program, the Applicant shall submit an application for a Title IV Operating Permit at least 24 months prior to the initial startup of the combustion turbines. [40 CFR Part 72]

8. The Applicant shall comply with all applicable provisions of 40 CFR Part 73, including requirements to acquire, hold and retire sulfur dioxide ($SO_2$) allowances. [40 CFR Part 73]

9. All records required by this permit shall be maintained on site for a minimum of five years and made available to the District upon request. [Rule 1421]

## COMBUSTION TURBINE CONDITIONS

### Definitions

10. Unless otherwise defined for purposes of a specific condition, for purposes of determining compliance with the emission limits of this permit, a shutdown period is the 11 minutes period preceding the moment at which fuel flow ceases. [Rule 20.3(d)(1)]

11. A startup period is the period of time that begins when fuel flows to the combustion turbine following a non-operational period. Unless otherwise defined for purposes of a specific condition, for purposes of determining compliance with the emission limits of this permit, the duration of a startup period shall not exceed 30 consecutive minutes. [Rule 20.3(d)(1)]

12. A non-operational period is any five-consecutive-minute period when fuel does not flow to the combustion turbine. [Rule 20.3(d)(1)]

13. The Continuous Emission Monitoring System Protocol (CEMS Protocol) is a document approved in writing by the District that describes the methodology and quality assurance and quality control procedures for monitoring, calculating, and recording stack emissions from the combustion turbine that is monitored by the CEMS. [Rules 69.3, 69.3.1, and 20.3(d)(1) and 40 CFR Part 60 Subpart KKKK, , 40 CFR Part 60 Appendix B and F, and 40 CFR Part 75]

14. For each combustion turbine, the commissioning period is the period of time commencing with the initial startup, also known as the first fire, of that turbine and ending after 112 hours of turbine operation, or the date the pemittee notifies the District the commissioning period has ended. For purposes of this condition, the number of hours of turbine operation is defined as the total unit operating minutes during the commissioning period divided by 60 rounded to the nearest hundredth of an hour. [Rule 20.3(d)(1)]
15. For each combustion turbine, a unit operating day, hour, and minute mean the following:
    a. A unit operating day means any calendar day in which the turbine combusts fuel.
    b. A unit operating hour means any clock hour in which the turbine combusts fuel.
    c. A unit operating minute means any clock minute in which the turbine combusts fuel.

    [Rule 21, 40 CFR Part 75, Rule 20.3(d)(1), 40 CFR Part 60 Subpart KKKK]

16. Tuning is defined as adjustments to the combustion or emission control system that involves operating the combustion turbine or emission control system in a manner such that the emissions control equipment may not be fully effective or operational. Only one gas turbine shall be tuned at any given time. Tuning events shall not exceed 720 unit operating minutes in a calendar day nor exceed 40 hours in a calendar year for each turbine. The District compliance division shall be notified at least 24 hours in advance of any tuning event. For purposes of this condition, the number of hours of tuning in a calendar year is defined as the total unit operating minutes of tuning during the calendar year divided by 60. [Rule 20.3(d)(1)]

**General Conditions**

17. The exhaust stacks for each combustion turbine shall be at least 100 feet in height above site base elevation and with an interior exhaust stack diameter of no more than 14.5 feet at the point of release unless it is demonstrated to the District that all requirements of District Rules 20.3 and 1200 are satisfied with a different stack configuration. [Rules 20.3(d)(2) and 1200]

18. The combustion turbines shall be fired on Public Utility Commission (PUC) quality natural gas. The Applicant shall maintain, on site, quarterly records of the natural gas sulfur content expressed in units of grains of sulfur compounds per 100 dscf of natural gas and hourly records of the higher and lower heating values expressed in British thermal units per standard cubic foot (Btu/scf) of the natural gas. These records shall be provided to District personnel upon request. Natural gas sulfur content records must be kept with a minimum reporting limit of 0.25 grains sulfur compounds per 100 dscf of natural gas. [Rule 20.3(d)(1)]

19. Unless otherwise specified in this permit, all continuous monitoring data shall be collected at least once every clock minute. [Rules 69.3, 69.3.1, and 20.3(d)(1)]

**Emission Limits**

20. For purposes of determining compliance with emission limits based on source testing, the average of three subtests shall be used. For purposes of determining compliance with emission limits based on a Continuous Emission Monitoring System (CEMS), data collected in accordance with the District approved CEMS Protocol shall be used and the averages for averaging periods specified herein shall be calculated as specified in the CEMS Protocol. [Rules 69.3, 69.3.1, and 20.3(d)(1) and 40 CFR Part 60 Subpart KKKK, 40 CFR Part 60 Appendix B and F, and 40 CFR Part 75]

21. For purposes of determining compliance with emission limits based on CEMS data, all CEMS calculations, averages, and aggregates shall be performed in accordance with the CEMS Protocol approved in writing by the District. [Rules 69.3, 69.3.1, and 20.3(d)(1) and 40 CFR Part 60 Subpart KKKK, 40 CFR Part 60 Appendix B and F, and 40 CFR Part 75]

22. For each emission limit expressed as pounds, pounds per hour, or parts per million by volume on a dry basis (ppmvd) based on a one-hour or less averaging period or compliance period, compliance shall be based on using data collected at least once every minute when compliance is based on CEMS data. [Rules 69.3, 69.3.1, and 20.3(d)(1)]

23. When a combustion turbine is combusting fuel (operating), the emission concentration of oxides of nitrogen (NOx), calculated as nitrogen dioxide ($NO_2$), shall not exceed 2.5 ppmvd corrected to 15% oxygen averaged over a one-clock-hour period, except during commissioning, startup, and shutdown periods for that turbine. [Rule 20.3(d)(1)]

24. When a combustion turbine is operating, the emission concentration of carbon monoxide (CO) shall not exceed 4.0 ppmvd corrected to 15 % oxygen, averaged over a one-clock-hour period, except during commissioning, startup, and shutdown periods for that turbine. [Rule 20.3(d)(1)]

25. When a combustion turbine is operating, the volatile organic compound (VOC) concentration, calculated as methane, measured in the exhaust stack, shall not exceed 2.0 ppmvd corrected to 15% oxygen, averaged over a one-clock-hour period, except during commissioning, startup, and shutdown periods for that turbine. For purposes of determining compliance based on the CEMS, the District approved VOC/CO surrogate relationship and the CO CEMS data, averaged over a 1-clock-hour period shall be used. The VOC/CO surrogate relationship shall be verified and/or modified, if necessary, based on source testing. [Rule 20.3(d)(1)]

26. When a combustion turbine is operating, the ammonia concentration (ammonia slip), shall not exceed 5.0 ppmvd corrected to 15 % oxygen and averaged over a one-clock-hour period, except during commissioning, startup, and shutdown periods for that turbine. [Rule 1200]

27. When a combustion turbine is operating with post-combustion air pollution control equipment that controls oxides of nitrogen (NOx) emissions, the emission concentration NOx, calculated as nitrogen dioxide ($NO_2$), shall not exceed 13.9 ppmvd averaged over each one-clock-hour period and corrected to 15% oxygen, except for startup and shutdown periods for that turbine for that turbine, as defined in Rule 69.3.1. This limit does not apply during any period in which the facility is subject to a variance from the emission limits contained in Rule 69.3.1. [Rule 69.3.1]

28. When a combustion turbine is operating without any post-combustion air pollution control equipment that controls oxides of nitrogen (NOx) emissions, the emission concentration of NOx calculated as nitrogen dioxide ($NO_2$) from each turbine shall not exceed 23.2 ppmvd averaged over each one-clock-hour period and corrected to 15% oxygen, except for startup and shutdown periods for that turbine, as defined in Rule 69.3.1. This limit does not apply during any period in which the facility is subject to a variance from the emission limits contained in Rule 69.3.1. [Rule 69.3.1]

29. When a combustion turbine is operating, the emission concentration of oxides of nitrogen (NOx), calculated as nitrogen dioxide ($NO_2$) shall not exceed 42 ppmvd averaged over each one-clock-hour period and corrected to 15% oxygen, on a dry basis, except during startup and shutdown periods for that turbine, as defined in Rule 69.3. This limit does not apply during any period in which the facility is subject to a variance from the emission limits contained in Rule 69.3. [Rule 69.3]

30. For each rolling four unit operating hour period, average emission concentration of oxides of nitrogen (NOx) for each turbine calculated as nitrogen dioxide ($NO_2$) in parts per million by volume on a dry basis (ppmvd) corrected to 15% oxygen or, alternatively, as elected by the Applicant, the average NOx emission rate in pounds per megawatt-hour (lb/MWh) shall not exceed an average emission limit calculated in accordance with 40 CFR Section 60.4380(b)(3). The emission concentration and emission rate averages shall be calculated in accordance with 40 CFR Section 60.4380(b)(1). The average emission concentration limit and emission rate limit shall be based on an average of hourly emission limits over the four unit operating hour period including the operating hour and the three unit operating hours immediately preceding that hour. For any unit operating hour where multiple emission standards would apply based on load of the turbine, the applicable standard shall be the higher of the two limits. The hourly emission concentration limit and emission rate limit shall be as follows based on the load of the turbine over the four unit operating hour period:

| **Case** | **Emission Limit, ppmvd at 15% $O_2$** | **Emission Limit, lb/MWh** |
|---|---|---|
| i. All four hours at or above 75% Load | 15 | 0.43 |
| ii. All four hours below 75% Load | 96 | 4.7 |
| iii. Combination of hours | (a x 15+b x 96)/4 | (a x 0.43+b x 4.7)/4 |

Where: a = the number of unit operating hours in the four hour period with all operation above 75% load and b = 4-a.

The averages shall exclude all clock hours occurring before the Initial Emission Source Test but shall include emissions during all other times that the equipment is operating including, but not limited to, emissions during startup and shutdown periods for that turbine. For each six-calendar-month period, emissions in excess of these limits and monitor downtime shall be identified in accordance with 40 CFR Sections 60.4350 and 60.4380(b)(2), except that Section 60.4350(c) shall not apply for identifying periods in excess of a NOx concentration limit. . For the purposes of this condition, unit operating hour shall have the same meaning as defined in 40 CFR 60.4420. [40 CFR Part 60 Subpart KKKK]

31. The emissions of particulate matter less than or equal to 10 microns in diameter ($PM_{10}$) from the exhaust stack of each combustion turbine shall not exceed 5.0 pounds per hour for each combustion turbine. Compliance with this limit shall be demonstrated based upon source testing and calculated as the average of three subtests. [Rule 20.3(d)(1) and (d)(2)]

32. The discharge of particulate matter from the exhaust stack of each combustion turbine shall not exceed 0.10 grains per dry standard cubic foot (0.23 grams/dscm) corrected to 12% carbon dioxide. The District may require periodic testing to verify compliance with this standard. [Rule 53]

33. Visible emissions from the lube oil vents and the exhaust stack of each combustion turbine shall not exceed 20% opacity for more than three (3) minutes in any period of 60 consecutive minutes. [Rule50]

34. Mass emissions from each combustion turbine of oxides of nitrogen (NOx), calculated as $NO_2$; carbon monoxide (CO); and volatile organic compounds (VOC), calculated as methane, shall not exceed the following limits, except during commissioning, startup, and shutdown periods for that turbine. A one-clock-hour averaging period for these limits shall be used when compliance is determined using CEMS data.

| Pollutant | Emission Limit, lb/hour |
|---|---|
| a. NOx | 8.2 |
| b. CO | 8.0 |
| c. VOC | 2.3 |

[Rule 20.3(d)(2)]

35. Excluding any minutes that are coincident with a shutdown period, cumulative mass emissions from each combustion turbine of oxides of nitrogen (NOx), calculated as $NO_2$; carbon monoxide (CO); and volatile organic compounds (VOC), calculated as methane, shall not exceed the following limits during each of that turbine's startup periods, except during that turbine's commissioning period.

| Pollutant | Emission Limit, lb/event |
|---|---|
| a. NOx | 22.5 |
| b. CO | 17.9 |
| c. VOC | 4.7 |

[Rule 20.3(d)(1)]

36. Cumulative mass emissions from each combustion turbine of oxides of nitrogen (NOx), calculated as $NO_2$; carbon monoxide (CO); and volatile organic compounds (VOC), calculated as methane, shall not

exceed the following limits during each of that turbine's shutdown periods, except during that turbine's commissioning period.

| | Pollutant | Emission Limit, lb/event |
|---|---|---|
| a. | NOx | 6.0 |
| b. | CO | 47.0 |
| c. | VOC | 3.0 |

[Rule 20.3(d)(1)]

37. The total aggregate oxides of nitrogen (NOx) emissions from all combustion turbines combined shall not exceed 150 pounds per hour, calculated as nitrogen dioxide and measured over each one-clock-hour period. This emission limit shall apply during all times one or more turbines are operating, including, but not limited to, emissions during commissioning, startup, and shutdown periods. [Rule 20.3(d)(2)]

38. The carbon monoxide (CO) emissions from each combustion turbine shall not exceed 75 pounds per hour and total aggregate CO emissions from all combustion turbines combined shall not exceed 225 pounds per hour measured over each one-clock-hour period. This emission limit shall apply during all times that one or more turbines are operating, including, but not limited to emissions during commissioning, startup, and shutdown periods. [Rule 20.3(d)(2)(i)]

39. Beginning with the earlier of the initial startup dates for any combustion turbine, aggregate emissions of oxides of nitrogen (NOx), calculated as nitrogen dioxide ($NO_2$); carbon monoxide (CO); volatile organic compounds (VOCs), calculated as methane; particulate matter less than or equal to 10 microns in diameter ($PM_{10}$); and oxides of sulfur (SOx), calculated as sulfur dioxide ($SO_2$), from the combustion turbines authorized to be constructed under this permit, except emissions from emission units excluded from the calculation of aggregate potential to emit as specified in Rule 20.1 (d) (1), as it exists on the date the permit to operate for this equipment is approved, shall not exceed the following limits for each rolling 12-calendar-month period beginning with the 12-calendar-month period that begins with the month in which the earliest initial startup among the equipment authorized to be constructed under this permit occurs:

| | Pollutant | Emission Limit, tons per year |
|---|---|---|
| a. | NOx | 70.4 |
| b. | CO | 96.4 |
| c. | VOC | 19.4 |
| d. | $PM_{10}$ | 35.8 |
| e. | SOx | 4.1 |

The aggregate emissions of each pollutant shall include emissions during all times that the equipment is operating including, but not limited to, emissions during commissioning, startup, and shutdown periods. All calculations performed to show compliance with these limits shall be performed according to a protocol approved in advance in writing by the District. [Rules 20.3(d)(2), 20.3(d)(3), 20.3(d)(5), 20.3(d)(8) and 21]

40. The wet surface air cooler (WSAC) shall be equipped with a mist eliminator designed to achieve a drift rate of 0.001% or less. Not later than 90 calendar days prior to the start of construction, the Applicant shall submit to the District the final selection, design parameters and details of the mist eliminator. In

addition, the maximum total dissolved solids (TDS) concentration of the air-side recirculating cooling water used in the WSAC shall not exceed 5,600 ppm. The TDS concentration shall be verified through calendar quarterly testing of the water by a certified lab using an EPA approved method. In addition, beginning with the earlier of the initial startup dates for any combustion turbine, emissions of $PM_{10}$ from the WSAC shall not exceed 1.46 tons for each rolling 12-calendar-month period beginning with the 12-calendar-month period that begins with the month in which the earliest initial startup among the equipment authorized to be constructed under this permit occurs. For each calendar month, $PM_{10}$ emissions from the WSAC shall be calculated using a District approved protocol that is based on either the design maximum air-side recirculating cooling water flow to the WSAC or the measured total air-side recirculating water flow to the WSAC during the calendar month; the design maximum drift rate; the TDS concentration from the calendar quarterly measurement for the calendar quarter that contains the month; and the actual hours of operation of the WSAC fans during the calendar month. Except for the TDS concentration, for which the Applicant shall maintain records not less frequently than a calendar quarterly basis, the applicant shall maintain records not less frequently than a calendar monthly basis of each variable parameter necessary to calculate the WSAC $PM_{10}$ emissions with the District approved protocol methodology including, but not limited to, the recirculating air-side cooling water flow rate and actual hours of operation of the WSAC fans, if applicable. [Rule 20.3(d)(1)]

41. For each calendar month and each rolling 12-calendar-month period, the Applicant shall maintain records, as applicable, on a calendar monthly basis, of mass emissions during each calendar month and rolling 12-calendar month period of NOx, calculated as $NO_2$; CO; VOCs, calculated as methane; $PM_{10}$; and SOx, calculated as $SO_2$, in tons, from each emission unit authorized to be constructed under this permit, except for emissions from emission units excluded from the calculation of aggregate potential to emit as specified in Rule 20.1 (d) (1) as it exists on the date the permit to operate for this equipment is approved. These records shall be made available for inspection within 15 calendar days after the end of each calendar month. The recorded emissions shall be calculated in accordance with an emission calculation protocol approved by the District. A proposed emission calculation protocol to calculate the emissions from each emission unit shall be submitted to the District for approval not later than 90 calendar days before the earlier of the initial startup dates for either of the three combustion turbines. Where applicable, this protocol may rely in whole or in part on the CEMS Protocol or other monitoring protocols required by this permit. [Rules 20.3(d)(3), 20.3(d)(8) and 21]

42. For each calendar month and each rolling 12-calendar-month period, the Applicant shall maintain records, as applicable, on a calendar monthly basis, of aggregate mass emissions of NOx, calculated as $NO_2$; CO; VOCs, calculated as methane; $PM_{10}$; and SOx, calculated as $SO_2$, in tons from all the emission units authorized to be constructed under this permit combined, except for emissions from emission units excluded from the calculation of aggregate potential to emit as specified in Rule 20.1 (d) (1). These records shall be made available for inspection within 15 calendar days after the end of each calendar month. [Rules 20.3(d)(3), 20.3(d)(8) and 21]

**Ammonia - SCR**

43. Not later than 90 calendar days prior to the start of construction, unless a later date is approved in writing by the District, the Applicant shall submit to the District the final selection, design parameters and details of the selective catalytic reduction (SCR) and oxidation catalyst emission control systems for the combustion turbines including, but not limited to, the minimum temperature for the SCR catalyst at which ammonia injection is feasible; the catalyst volume, catalyst material, catalyst manufacturer, space

velocity and area velocity at full load; and control efficiencies of the SCR for controlling NOx emissions and the oxidation catalyst for controlling CO and VOCs at temperatures between the minimum and maximum operating temperatures at space velocities corresponding to 100% and 25% load. Such information may be submitted to the District as trade secret and confidential pursuant to District Rules 175 and 176. [Rules 20.3(d)(1) and 14]

44. When a combustion turbine is operating, ammonia shall be injected at all times that the associated selective catalytic reduction (SCR) system catalyst outlet temperature is 575 degrees Fahrenheit or greater. [Rules 20.3(d)(1)]

45. Continuous monitors shall be installed on each SCR system prior to their initial operation to monitor or calculate, and record the ammonia solution injection rate in pounds per hour and the SCR outlet temperature in degrees Fahrenheit for each unit operating minute. The monitors shall be installed, calibrated and maintained in accordance with a District approved protocol, which may be part of the CEMS Protocol. This protocol, which shall include the calculation methodology, shall be submitted to the District for written approval at least 90 calendar days prior to initial startup of the gas turbines with the SCR system, unless a later date is approved in writing by the District. The monitors shall be in full operation at all times when the turbine is in operation. [Rules 20.3(d)(1)]

46. Except during periods when the ammonia injection system is being tuned or one or more ammonia injection systems is in manual control for compliance with applicable permit conditions, the automatic ammonia injection system serving each SCR system shall be in operation in accordance with manufacturer's specifications at all times when ammonia is being injected into the SCR system. Manufacturer specifications shall be maintained on site and made available to District personnel upon request. [Rules 20.3(d)(1) and 21]

47. The concentration of ammonia solution used in the ammonia injection system shall be less than 20% ammonia by weight. Records of ammonia solution concentration shall be maintained on site and made available to District personnel upon request. [Rules 14 and 21]

**TESTING**

48. All source test or other tests required by this permit shall be performed by the District or an independent contractor and witnessed and approved by the District. Unless otherwise specified in this permit or authorized in writing by the District, if testing will be performed by an independent contractor and witnessed by the District, a proposed test protocol shall be submitted to the District for written approval at least 60 calendar days prior to source testing. Additionally, the District shall be notified a minimum of 30 calendar days prior to the test so that observers may be present unless otherwise authorized in writing by the District. [Rules 20.3(d)(1) and 1200 and 40 CFR Part 60 Subpart KKKK and 40 CFR §60.8]

49. Unless otherwise specified in this permit or authorized in writing by the District, within 45 calendar days after completion of a source test or Relative Accuracy Test Audit (RATA) performed by an independent contractor, a final test report shall be submitted to the District for review and approval. [Rules 20.3(d)(1) and 1200 and 40 CFR Part 60 Subpart KKKK, 40 CFR §60.8, and 40 CFR Part 75]

50. The exhaust stacks for each combustion turbine shall be equipped with source test ports and platforms to allow for the measurement and collection of stack gas samples consistent with all approved test

protocols. The ports and platforms shall be constructed in accordance with District Method 3A, Figure 2, and approved by the District. Ninety calendar days prior to construction of the turbine stacks the project owner shall provide to the District for written approval detailed plan drawings of the turbine stacks that show the sampling ports and demonstrate compliance with the requirements of this condition. [Rule 20]

51. Not later than 60 calendar days after completion of the commissioning period for each combustion turbine, an Initial Emissions Source Test shall be conducted on that turbine to demonstrate compliance with the NOx, CO, VOC, $PM_{10}$, and ammonia emission standards of this permit. The source test protocol shall comply with all of the following requirements:

    a. Measurements of NOx and CO concentrations and emissions and oxygen ($O_2$) concentration shall be conducted in accordance with U.S. Environmental Protection Agency (EPA) methods 7E, 10, and 3A, respectively, and District source test Method 100, or alternative methods approved by the District and EPA.

    b. Measurement of VOC concentrations and emissions, except for formaldehyde, shall be conducted in accordance with EPA Method 18, or an alternative method approved by the District and EPA.

    c. Measurement of formaldehyde concentrations and emissions shall be conducted in accordance with EPA Method 316 or 323, as specified by the District, or an alternative method approved by the District and EPA.

    d. The total VOC concentration and emissions shall be the sum of the VOC concentration and emissions measured as specified in Subsection b of this condition and the formaldehyde concentration and emissions measured by Subsection c of this condition.

    e. Measurements of ammonia concentrations shall be conducted in accordance with Bay Area Air Quality Management District Method ST-1B or an alternative method approved by the District and EPA.

    f. Measurements of $PM_{10}$ emissions shall be conducted in accordance with EPA Method 5 and 202 or an alternative method approved by the District and EPA. For purposes of this permit, total particulate matter measured using EPA Method 5 and 202 shall be considered to be $PM_{10}$.

    g. Source testing shall be performed at the normal load level, as specified in 40 CFR Part 75 Appendix A Section 6.5.2.1 (d), provided it is not less than 80% of the combustion turbine's rated load unless it is demonstrated to the satisfaction of the District that the combustion turbine cannot operate under these conditions. If the demonstration is accepted, then emissions source testing shall be performed at the highest achievable continuous power level. The District may specify additional testing at different load levels or operational conditions to ensure compliance with the emission and concentration limits of this permit and District Rules and Regulations.

    h. Measurements of particulate matter emissions shall be conducted in accordance with SDAPCD Method 5 or an alternative method approved by the District and EPA.

    i. Measurements of opacity shall be conducted in accordance with EPA Method 9 or an alternative method approved by the District and EPA.

    j. Unless otherwise authorized in writing by the District, testing for NOx, CO, VOC, $PM_{10}$, and ammonia concentrations and emissions, as applicable, shall be conducted concurrently with the

NOx and CO continuous emission measurement system (CEMS) Relative Accuracy Test Audit (RATA).

[Rules 20.3(d)(1) and 1200]

52. A renewal source test and a NOx and CO Relative Accuracy Test Audit (RATA) shall be periodically conducted on each combustion turbine to demonstrate compliance with the NOx, CO, VOC, $PM_{10}$ and ammonia emission standards of this permit and applicable relative accuracy requirements for the CEMS systems using District approved methods. The renewal source test and the NOx and CO RATAs shall be conducted in accordance with the applicable RATA frequency requirements of 40 CFR75, Appendix B, Sections 2.3.1 and 2.3.3. The renewal source test shall be conducted in accordance with a protocol complying with all the applicable requirements of the source test protocol for the Initial Emissions Source Test. [Rules 69.3, 69.3.1, and 20.3(d)(1) and 40 CFR Part 60 Subpart KKKK, and 40 CFR Part 75]

53. Relative Accuracy Test Audits (RATAs) and all other required certification tests shall be performed and completed on the NOx CEMS in accordance with applicable provisions of 40 CFR Part 75 Appendix A and B and 40 CFR §60.4405 and on the CO CEMS in accordance with applicable provisions of 40 CFR Part 60 Appendix B and F. [Rule 21, Rule 20.3 (d)(1), 40 CFR Part 60 Subpart KKKK, and 40 CFR Part 75]

54. Not later than 60 calendar days after completion of the commissioning period for each combustion turbine, an initial emission source test for toxic air contaminants shall be conducted on that turbine to determine the emissions of toxic air contaminants from the combustion turbine. At a minimum the following compounds shall be tested for, and emissions, if any, quantified:

    a. Acetaldehyde
    b. Acrolein
    c. Benzene
    d. Formaldehyde
    e. Toluene
    f. Xylenes

    This list of compounds may be adjusted by the District based on source test results to ensure compliance with District Rule 1200 and the conditions of this permit is demonstrated. The District may require one or more or additional compounds to be quantified through source testing as needed to ensure compliance with Rule 1200 and the conditions of this permit. Within 60 calendar days after completion of a source test performed by an independent contractor, a final test report shall be submitted to the District for review and approval. [Rule 1200]

55. The District may require one or more of the following compounds, or additional compounds, to be quantified through source testing periodically to ensure compliance with Rule 1200 and the conditions of this permit:

    a. Acetaldehyde

b. Acrolein
c. Benzene
d. Formaldehyde
e. Toluene
f. Xylenes

If the District requires the Applicant to perform this source testing, the District shall request the testing in writing a reasonable period of time prior to the testing date. [Rule 1200 and California H&S Code §41510]

56. The higher heating value of the combustion turbine fuel shall be measured by ASTM D1826–94, Standard Test Method for Calorific Value of Gases in Natural Gas Range by Continuous Recording Calorimeter, or ASTM D1945–96, Standard Method for Analysis of Natural Gas by Gas Chromatography, in conjunction with ASTM D3588-98, Practice for Calculating Heat Value, Compressibility Factor, and Relative Density of Gaseous Fuels, or an alternative test method approved by the District and EPA. [Rules 69.3, 69.3.1, and 20.3(d)(1) and 40 CFR Part 60 Subpart KKKK, and 40 CFR Part 75]

57. The sulfur content of the combustion turbine fuel shall be sampled not less than once each calendar quarter in accordance with a protocol approved by the District, which shall be submitted to the District for approval not later than 90 calendar days before the earliest initial startup date for any of the three combustion turbines and measured with ASTM D1072–90 (Reapproved 1994), Standard Test Method for Total Sulfur in Fuel Gases; ASTM D3246–05, Standard Test Method for Sulfur in Petroleum Gas by Oxidative Microcoulometry; ASTM D4468–85 (Reapproved 2000), Standard Test Method for Total Sulfur in Gaseous Fuels by Hydrogenolysis and Rateometric Colorimetry; ASTM D6228–98 (Reapproved 2003), Standard Test Method for Determination of Sulfur Compounds in Natural Gas and Gaseous Fuels by Gas Chromatography and Flame Photometric Detection; or ASTM D6667–04, Standard Test Method for Determination of Total Volatile Sulfur in Gaseous Hydrocarbons and Liquefied Petroleum Gases by Ultraviolet Fluorescence or an alternative test method approved by the District and EPA. Sulfur content information provided by the local serving utility may be used to satisfy this condition with the advanced written approval of the District. [Rule 20.3(d)(1), Rule 21, and 40 CFR Part 75]

## CONTINUOUS MONITORING

58. The Applicant shall comply with the applicable continuous emission monitoring requirements of 40 CFR Part 75 and 40 CFR Part 60. [40 CFR Part 75 and 40 CFR Part 60]

59. A continuous emission monitoring system (CEMS) shall be installed on each combustion turbine and properly maintained and calibrated to measure, calculate, and record the following, in accordance with the District approved CEMS Protocol:

    a. Clock-hourly average concentration of oxides of nitrogen (NOx) in parts per million by volume on a dry basis (ppmvd), both uncorrected and corrected to 15% oxygen,;

b. Clock-hourly average concentration of carbon monoxide (CO) in parts per million by volume on a dry basis (ppmvd), both uncorrected and corrected to 15% oxygen;
c. Percent oxygen ($O_2$) in the exhaust gas for each unit operating minute;
d. Clock-hourly mass emissions of oxides of nitrogen (NOx), calculated as $NO_2$, in pounds;
e. Cumulative mass emissions of oxides of nitrogen (NOx), calculated as $NO_2$, in each startup and shutdown period, in pounds;
f. Calendar daily mass emissions of oxides of nitrogen (NOx), calculated as $NO_2$, in pounds;
g. Calendar monthly mass emissions of oxides of nitrogen (NOx), calculated as $NO_2$, in pounds;
h. Rolling four unit operating hour average concentration of oxides of nitrogen (NOx) corrected to 15% oxygen, in parts per million by volume dry on a dry basis (ppmvd) corrected to 15% oxygen;
i. Rolling four unit operating hour average oxides of nitrogen (NOx) emission rate, calculated as $NO_2$, in pounds per megawatt-hour (MWh);
j. Calendar quarter, calendar year, and rolling 12-calendar-month period mass emissions of oxides of nitrogen (NOx), calculated as $NO_2$, in tons;
k. Cumulative mass emissions of carbon monoxide (CO) in each startup and shutdown period, in pounds;
l. Clock-hourly mass emissions of carbon monoxide (CO), in pounds;
m. Calendar-daily mass emission of carbon monoxide (CO), in pounds;
n. Calendar monthly mass emission of carbon monoxide (CO), in pounds;
o. Rolling 12-calendar-month period mass emission of carbon monoxide (CO), in tons;
p. Average concentration of oxides of nitrogen (NOx) and carbon monoxide (CO) in parts per million by volume on a dry basis (ppmvd), both uncorrected and corrected to 15% oxygen during each unit operating minute; and
q. Average emission rate in pounds per hour of oxides of nitrogen (NOx), calculated as $NO_2$, and carbon monoxide (CO) during each unit operating minute.

[Rules 69.3, 69.3.1, and 20.3(d)(1) and 40 CFR Part 60 Subpart KKKK, and 40 CFR Part 75]

60. No later than 90 calendar days prior to initial startup of each combustion turbine, the Applicant shall submit a CEMS protocol to the District, for written approval that shows how the CEMS will be able to meet all District monitoring requirements. [Rules 69.3, 69.3.1, and 20.3(d)(1) and 40 CFR Part 60 Subpart KKKK, and 40 CFR Part 75]

61. No later than the earlier of 90 unit operating days or 180 calendar days after each combustion turbine commences commercial operation, a Relative Accuracy Test Audit (RATA) and other required certification tests shall be performed and completed on that turbine's NOx CEMS in accordance with 40 CFR Part 75 Appendix A and on the CO CEMS in accordance with 40 CFR Part 60 Appendix B. The RATAs shall demonstrate that the NOx and CO CEMS comply with the applicable relative accuracy requirements. At least 60 calendar days prior to the test date, the Applicant shall submit a test protocol to the District for written approval. Additionally, the District and U.S. EPA Region 9 shall be notified a minimum of 45 calendar days prior to the test so that observers may be present. Within 45 calendar days of completion of this test, a written test report shall be submitted to the District for approval. For purposes of this condition, commences commercial operation is defined as the first instance when power is sold to the electrical grid. [Rules 69.3, 69.3.1, and 20.3(d)(1) and 40 CFR Part 60 Subpart KKKK, and 40 CFR Part 75]

62. A monitoring plan in conformance with 40 CFR Section 75.53 shall be submitted to U.S EPA Region 9 and the District at least 45 calendar days prior to the Relative Accuracy Test Audit (RATA), as required in 40 CFR 75.62. [40 CFR Part 75]

63. The oxides of nitrogen (NOx) and oxygen ($O_2$) components of the CEMS shall be certified and maintained in accordance with applicable federal regulations including the requirements of Sections 75.10 and 75.12 of Title 40, Code of Federal Regulations Part 75 (40 CFR 75), the Performance Specifications of Appendix A of 40 CFR Part 75, the Quality Assurance procedures of Appendix B of 40 CFR Part 75 and the CEMS Protocol approved by the District. The carbon monoxide (CO) components of the CEMS shall be certified and maintained in accordance with 40 CFR Part 60, Appendices B and F, unless otherwise specified in this permit, and the CEMS Protocol approved by the District. [Rules 69.3, 69.3.1, and 20.3(d)(1) and 40 CFR Part 60 Subpart KKKK, and 40 CFR Part 75]

64. The CEMS shall be in operation in accordance with the District approved CEMS Protocol at all times when the turbine is in operation. A copy of the District approved CEMS Protocol shall be maintained on site and made available to District personnel upon request. [Rules 69.3, 69.3.1, and 20.3(d)(1) and 40 CFR Part 60 Subpart KKKK, and 40 CFR Part 75]

65. When the CEMS is not recording data and the combustion turbine is operating, hourly NOx emissions for purposes of calendar year and rolling 12-calendar-month period emission calculations shall be determined in accordance with 40 CFR 75 Subpart C. Additionally, hourly CO emissions for rolling 12-calendar-month period emission calculations shall be determined using CO emission factors to be determined from source test emission factors, recorded CEMS data, and fuel consumption data, in terms of pounds per hour of CO for the gas turbine. Emission calculations used to determine hourly emission rates shall be reviewed and approved by the District, in writing, before the hourly emission rates are incorporated into the CEMS emission data. [Rules 20.3(d)(3) and 21 and 40 CFR Part 75]

66. Any violation of any emission standard as indicated by the CEMS shall be reported to the District's compliance division within 96 hours after such occurrence. [Rule 19.2]

67. The CEMS shall be maintained and operated, and reports submitted, in accordance with the requirements of rule 19.2 Sections (d), (e), (f)(1), (f)(2), (f)(3), (f)(4), and (f)(5), and the CEMS Protocol approved by the District. [Rule 19.2]

68. Except for changes that are specified in the initial approved CEMS Protocol or a subsequent revision to that protocol that is approved in advance, in writing, by the District, the District shall be notified in writing at least thirty (30) calendar days prior to any planned changes made in the CEMS or Data Acquisition and Handling System (DAHS), including, but not limited to, the programmable logic controller, software which affects the value of data displayed on the CEMS / DAHS monitors with respect to the parameters measured by their respective sensing devices and any planned changes to the software that controls the ammonia flow to the SCR. Unplanned or emergency changes shall be reported within 96 hours. [Rules 69.3, 69.3.1, and 20.3(d)(1) and 40 CFR Part 60 Subpart KKKK, and 40 CFR Part 75]

69. At least 90 calendar days prior to the Initial Emissions Source Test , the Applicant shall submit a monitoring protocol to the District for written approval which shall specify a method of determining the VOC/CO surrogate relationship that shall be used to demonstrate compliance with all VOC limits when

using CEMS data. This protocol can be provided as part of the Initial Source Emissions Test Protocol. [Rule 20.3(d)(1)]

70. Fuel flowmeters shall be installed and maintained to measure the fuel flow rate, corrected for temperature and pressure, to each combustion turbine. Correction factors and constants shall be maintained on site and made available to the District upon request. The fuel flowmeters shall meet the applicable quality assurance requirements of 40 CFR Part 75, Appendix D, Section 2.1.6. [Rules 69.3, 69.3.1, and 20.3(d)(1) and 40 CFR Part 60 Subpart KKKK, and 40 CFR Part 75]

71. Each combustion turbine shall be equipped with continuous monitors to measure, calculate, and record unit operating days, hours, and minutes and the following operational characteristics:

    a. Date and time;
    b. Natural gas flow rate to the combustion turbine during each unit operating minute, in standard cubic feet per hour;
    c. Total heat input to the combustion turbine based the fuels higher heating value during each unit operating minute, in million British thermal units per hour (MMBtu/hr);
    d. Higher heating value of the fuel on an hourly basis, in British thermal units per standard cubic foot (Btu/scf);
    e. Gross electrical power output during each unit operating minute in megawatts (MW); and
    f. Water injection rate in gallons per minute (gpm) or pounds per hour (lb/hr).

    The values of these operational characteristics shall be recorded at least each unit operating minute. The monitors shall be installed, calibrated, and maintained in accordance with a turbine operation monitoring protocol, which may be part of the CEMS Protocoland which shall include any relevant calculation methodologies, that is approved, in advance, in writing, by the District. The monitors shall be in full operation at all times when the combustion turbine is in operation. Calibration records for the continuous monitors shall be maintained on site and made available to the District upon request. [Rules 69.3, 69.3.1, and 20.3(d)(1) and 40 CFR Part 60 Subpart KKKK, and 40 CFR Part 75]

72. At least 90 calendar days prior to initial startup of the each combustion turbine, the Applicant shall submit a turbine operation monitoring protocol to the District for written approval. This may be part of the submitted CEMS protocol. [Rules 69.3, 69.3.1, and 20.3(d)(1) and 40 CFR Part 60 Subpart KKKK, and 40 CFR Part 75]

73. Operating logs or Data Acquisition and Handling System (DAHS) records shall be maintained to record the beginning and end times and durations of all startup, shutdown, and tuning periods to the nearest minute, quantity of fuel used in each clock minute, clock hour, calendar month, and 12-calendar-month period in standard cubic feet; hours of operation each day; and hours of operation during each calendar year. For purposes of this condition, the hours of turbine operation is defined as the total minutes the turbine is combusting fuel during the calendar year divided by 60 rounded to the nearest hundredth of an hour. [Rules 69.3, 69.3.1, and 20.3(d)(1) and 40 CFR Part 60 Subpart KKKK, and 40 CFR Part 75]

**COMMISSIONING**

74. Before the end of the commissioning period for each combustion turbine, the Applicant shall install post-combustion air pollution control equipment on that turbine to minimize NOx and CO emissions.

Once installed, the post-combustion air pollution control equipment shall be maintained in good condition and shall be in full operation at all times when the turbine is combusting fuel and the air pollution control equipment is at or above its minimum operating temperature. [Rule 20.3(d)(1)]

75. Within thirty calendar days after the end of the commissioning period for each combustion turbine, the Applicant shall submit a written report to the District. This report shall include,at a minimum, the date the commissioning period started and ended, the date and times of all startup and shutdown periods, the emissions of NOx and CO during startup and shutdown periods, and the emissions of NOx and CO during other periods. This report shall also detail any turbine or emission control equipment malfunction, upset, repairs, maintenance, modifications, or replacements affecting emissions of air contaminants that occurred during the commissioning period. All of the following continuous monitoring information shall be reported for each minute and, except for cumulative mass emissions during startup and shutdown periods, averaged over each hour of operation:

    a. Concentration of oxides of nitrogen (NOx) both uncorrected and corrected to 15% oxygen, in parts per million by volume on a dry basis (ppmvd);
    b. Concentration of carbon monoxide (CO) both uncorrected and corrected to 15% oxygen, in parts per million by volume on a dry basis (ppmvd);
    c. Percent oxygen ($O_2$) in the exhaust gas;
    d. Mass emissions of oxides of nitrogen (NOx), calculated as $NO_2$, in pounds;
    e. Cumulative mass emissions of oxides of nitrogen (NOx), calculated as $NO_2$, in each startup and shutdown period, in pounds;
    f. Cumulative mass emissions of carbon monoxide (CO) in each startup and shutdown period, in pounds
    g. Mass emissions of carbon monoxide (CO), in pounds;
    h. Total heat input to the combustion turbine based on the fuel's higher heating value, in million British thermal units per hour (MMBtu/hr);
    i. Higher heating value of the fuel on an hourly basis, in British thermal units per standard cubic foot (Btu/scf);
    j. Gross electrical power output of the turbine, in megawatts (MW) for each hour; and
    k. SCR outlet temperature, in degrees Fahrenheit;
    l. Water injection rate in gallons per minute (gpm) or pounds per hour (lb/hr); and
    m. Ammonia injection rate in pounds per hour (lb/hr).

    The hourly average information shall be submitted in writing and in an electronic format approved by the District. The minute-by-minute information shall be submitted in an electronic format approved by the District. [Rules 69.3, 69.3.1, 20.3(d)(1)and 20.3(d)(2)]

76. For each combustion turbine, the Applicant shall submit the following notifications to the District and U. S. EPA, Region 9:

    a. A notification in accordance with 40 CFR Section 60.7(a)(1) delivered or postmarked not later than 30 calendar days after construction has commenced;
    b. A notification in accordance with 40 CFR Section 60.7(a)(3) delivered or postmarked within 15 calendar days after initial startup; and
    c. An Initial Notification in accordance with 40 CFR Section 63.6145(c) and 40 CFR Section 63.9(b)(2) submitted no later than 120 calendar days after the initial startup of the turbine.

In addition, the Applicant shall notify the District when: (1) construction is complete by submitting a Construction Completion Notice before operating any unit that is the subject of this permit, (2) each combustion turbine first combusts fuel by submitting a First Fuel Fire Notice within five calendar days of the initial operation of the unit, and (3) each combustion turbine first generates electrical power that is sold by providing written notice within 5 days of this event. [Rules 24 and 21 and 40 CFR Part 75, 40 CFR Part 60 Subpart KKKK, 40 CFR Part §60.7, 40 CFR Part 63 Subpart YYYY, and 40 CFR Part §63.9]

**REPORTING**

77. The Applicant shall file semiannual reports in accordance with 40 CFR §60.4375. [40 CFR Part 60 Subpart KKKK]

78. Each semiannual report must cover the semiannual reporting period from January 1 through June 30 or the semiannual reporting period from July 1 through December 31. Each such semiannual compliance report shall be postmarked or delivered no later than January 30 or July 30, whichever date is the first date following the end of the semiannual reporting period. [40 CFR Part 60 Subpart KKKK and Rule 21]

79. All semiannual compliance reports shall be submitted to the District Compliance Division [40 CFR §60.7]

## ADDITIONAL PROJECT AMMENDMENT PERMIT CONDITIONS

**GENERAL CONDITIONS**

80. The equipment authorized to be constructed under this permit is described in Application No. APCD2010-APP-001251 as amended by Application Nos. APCD2011-APP-001540 and APCD2014-APP-003627.

**COMBUSTION TURBINE CONDITIONS**

**Definitions**

81. For the purposes of this permit, initial startup shall be defined for each combustion turbine as the first time that the combustion turbine combusts fuel on-site. [Rule 20.3]

**Emission Limits**

82. The emissions of particulate matter less than or equal to 10 microns in diameter ($PM_{10}$) from the exhaust stacks of the combustion turbines shall not exceed 3.5 pounds per hour per turbine, calculated as the arithmetic average of the source test results from the six most recent sets of valid source tests performed on the three turbines. For the purpose of this condition, a valid source test is a source test for which the results have been approved by the District, and that included at least three subtests in the calculation of average emisson rate. [Rule 20.3(d)(1) and (d)(2)]

**TESTING**

83. All testing conducted to measure concentrations or emissions of volatile organic compounds (VOCs) shall include measurement of formaldehyde and the result shall be added to the result determined for other VOC concentrations or emissions, as applicable. Measurement of VOC emissions shall be conducted in accordance with EPA Method 18, or alternative methods approved by the District and EPA. Measurement of emissions of formaldehyde shall be conducted in accordance with EPA Method 316 or 323, or an alternative method approved by the District and EPA.