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DATE: November 6, 2015

TO: Interested Parties

FROM: Dale Rundquist, Compliance Project Manager

SUBJECT: **Pio Pico Energy Center (11-AFC-1C)**
Staff Analysis of Petition to Amend Hourly Heat Input

On July 15, 2014, the Pio Pico Energy Center, LLC filed a petition with the California Energy Commission (Energy Commission) requesting to amend the Final Decision for the Pio Pico Energy Center (PPEC). Staff prepared an analysis of this proposed change that can be reviewed on the Energy Commission website for this facility (see below).

The simple-cycle, natural gas-fired, 300-megawatt facility was certified by the Energy Commission in its Decision on September 12, 2012, and construction is approximately 25 percent complete. The project site is adjacent to the Otay Mesa Energy Center, an existing natural gas-fired power plant, in an unincorporated area of San Diego County, California.

Energy Commission staff (staff) reviewed the petition and assessed the impacts of this proposal on environmental quality and on public health and safety. In the Staff Analysis, staff proposes new and revised **Air Quality** conditions of certification and revised **Traffic and Transportation** Condition of Certification **TRANS-9**. It is staff's opinion that, with the implementation of these new and revised conditions, the facility would remain in compliance with applicable laws, ordinances, regulations, and standards, and the proposed modification would not cause a significant impact on the environment (Cal. Code of Regs., tit. 20, § 1769). Energy Commission staff intends to recommend approval of the petition to amend at the January 2016, Business Meeting of the Energy Commission.

The Energy Commission's webpage for this facility, http://www.energy.ca.gov/sitingcases/piopico/, has a link to the petition and the Staff Analysis on the right side of the webpage in the box labeled "Compliance Proceeding." Click on the "Documents for this Proceeding (Docket Log)" option. After the Energy Commission makes a decision on this petition, the Energy Commission's Order regarding this petition will also be available from the same webpage.

This notice has been mailed to the Commission's list of interested parties and property owners adjacent to the facility site. It has also been e-mailed to the facility listserv. The listserv is an automated Energy Commission e-mail system by which information about this facility is e-mailed to parties who have subscribed. To subscribe, go to the Commission's webpage for this facility, cited above, scroll down the right side of the project webpage to the box labeled "Subscribe," and provide the requested contact information.

Any person may comment on the Staff Analysis. Those who wish to comment on the analysis are asked to submit their comments by 5:00 p.m., December 7, 2015. To use the Energy Commission's electronic commenting feature, go to the Energy Commission's webpage for this facility, cited above, click on the "Submit e-Comment" link, and follow the instructions in the on-line form. Be sure to include the facility name in your comments. Once submitted, the Energy Commission Dockets Unit reviews and approves your comments, and you will receive an e-mail with a link to them.

Written comments may also be mailed or hand-delivered to:

California Energy Commission
Dockets Unit, MS-4
Docket No. 11-AFC-1C
1516 Ninth Street
Sacramento, CA 95814-5512

All comments and materials filed with and approved by the Dockets Unit will be added to the facility Docket Log and become publically accessible on the Energy Commission's webpage for the facility.

If you have questions about this notice, please contact Dale Rundquist, Compliance Project Manager, at (916) 6512072, or by fax to (916) 654-3882, or via e-mail to dale.rundquist@energy.ca.gov.

For information on participating in the Energy Commission's review of the petition, please call the Public Adviser at (800) 822-6228 (toll-free in California) or send your e-mail to publicadviser@energy.ca.gov. News media inquiries should be directed to the Energy Commission Media Office at (916) 654-4989, or by e-mail to mediaoffice@energy.ca.gov.

Mail List 7398
Pio Pico listserv

PIO PICO ENERGY CENTER (11-AFC-1C)

Petition to Amend Hourly Heat Input

Executive Summary

Dale Rundquist

INTRODUCTION

On July 15, 2014, the Pio Pico Energy Center, LLC filed a petition with the California Energy Commission (Energy Commission) requesting to amend the Final Decision for the Pio Pico Energy Center (PPEC). The modification would be limited to the proposed nominal (~10 percent) increase in hourly heat input. This increase is a result of operational experience and machine tuning rather than major physical changes to the General Electric (GE) LMS100 natural gas-fired combustion turbine generators.

The purpose of the Energy Commission's review process is to assess any impacts the proposed modifications would have on environmental quality and on public health and safety. The process includes an evaluation of the consistency of the proposed changes with the Energy Commission's Final Decision and an assessment of whether the project, as modified, would remain in compliance with applicable laws, ordinances, regulations, and standards (Cal. Code Regs., tit. 20, § 1769).

Energy Commission staff (staff) has completed its review of all materials received. The Staff Analysis below is staff's assessment of the project owner's proposal to increase the hourly heat input for the Pio Pico Energy Center.

PROJECT LOCATION AND DESCRIPTION

PPEC is a simple-cycle, natural gas-fired, 300-megawatt facility certified by the Energy Commission in its Decision on September 12, 2012, and construction is approximately 25 percent complete. PPEC is located in an unincorporated area at 7363 Calzada de la Fuente, San Diego, CA 92154.

DESCRIPTION OF PROPOSED MODIFICATIONS

Although the Final Decision does not limit the hourly heat input, Condition of Certification **AQ-2** implicitly limits operations to the conditions described in the Application for Certification (Condition of Certification **AQ-2** requires the operator to operate the project "in accordance with all data and specifications submitted with the application under which this license is issued"). This Petition to Amend addresses all issues associated with the proposed nominal increase in hourly heat input by the project.

The increase in hourly heat input to the gas turbines increases the heights of the thermal plumes that will emit from the turbine exhaust stacks, necessitating changes to the aviation hazard notifications required under Condition of Certification **TRANS-9** to reflect the higher elevation of the thermal plumes.

NECESSITY FOR THE PROPOSED MODIFICATIONS

GE has made performance improvements to the LMS100 gas turbines since the license was originally issued in 2012. These improvements allow slightly higher hourly heat input and higher electrical output. The PPEC gas turbines will be capable of operating with a higher heat input and higher electrical output of approximately 18 MW than the specifications in the original permit.

STAFF'S ASSESSMENT OF THE PROPOSED PROJECT CHANGE

Energy Commission technical staff reviewed the petition for potential environmental effects and consistency with applicable laws, ordinances, regulations and standards (LORS). Staff's conclusions in each technical area are summarized in **Executive Summary Table 1**, below.

Staff has determined that the technical or environmental areas of Cultural Resources, Facility Design, Hazardous Materials Management, Land Use, Noise and Vibration, Paleontological Resources, Public Health, Socioeconomics, Transmission Line Safety and Nuisance, Transmission System Engineering, Waste Management, and Worker Safety and Fire Protection are not affected by the proposed change.

For the technical areas of Biological Resources, Soil and Water Resources, and Visual Resources, staff has determined the project would continue to comply with applicable LORS and no changes to any conditions of certification are necessary to ensure no significant impacts occur. Staff notes the following for these technical areas:

- **Biological Resources.** Because the increase in hourly heat input will not increase the maximum modeled impacts of nitrogen dioxide (or any other criteria pollutant), the project's nitrogen deposition impacts will not change.
- **Soil and Water Resources.** Staff consulted with the project owner representative, who confirmed there will be no increased water use and the limit on water use as described in Condition of Certification **SOIL&WATER-5** will be adhered to.
- **Visual Resources.** As stated in the PPEC Final Staff Assessment, "[b]ased on the proposed technology for the PPEC facility, potential visible [water vapor] plumes may rarely occur from the cooling system and/or exhaust stack." The proposed increase in hourly heat input to the gas turbines would not change this conclusion.

Staff determined, however, that changes are required to conditions of certification in the technical areas of Air Quality and Traffic and Transportation. Staff proposes changes that do not result in any significant adverse air quality impacts. In all cases the Air Quality impacts of the amendment are less than or equal to those in the original Commission Decision. The proposed changes are not limited by or specifically addressed in any conditions of certification (COCs). Therefore, no changes to the Air Quality COCs are directly related with the proposed changes. All proposed Air Quality COC changes by staff are administrative changes, which make the Energy Commission and San Diego Air Pollution Control District air quality conditions consistent. Air Quality COC changes are provided in the Air Quality Staff Analysis section below. Traffic and Transportation staff has proposed modifications to **TRANS-9** in order to assure potential

environmental impacts remain less than significant. The proposed changes to **TRANS-9** are provided in the Traffic and Transportation Staff Analysis section below.

Executive Summary Table 1
Summary of Impacts for Each Technical Area

TECHNICAL AREAS REVIEWED	STAFF RESPONSE			Revised Conditions of Certification Recommended
	Technical Area Not Affected	No Significant Environmental Impact or LORS Inconsistency*	Process As Amendment	
Air Quality			X	YES
Biological Resources		X		
Cultural Resources	X			
Facility Design	X			
Hazardous Materials Management	X			
Land Use	X			
Noise & Vibration	X			
Paleontological Resources	X			
Public Health	X			
Socioeconomics	X			
Soil & Water Resources		X		
Traffic & Transportation			X	YES
Transmission Line Safety & Nuisance	X			
Transmission System Engineering	X			
Visual Resources		X		
Waste Management	X			
Worker Safety & Fire Protection	X			

*****There is no possibility that the proposed modifications may have a significant effect on the environment, and the modifications will not result in a change in or deletion of a condition adopted by the Commission in the Final Decision, or make changes that would cause project noncompliance with any applicable laws, ordinances, regulations, or standards (Cal. Code Regs., tit. 20, § 1769 (a)(2)).

STAFF RECOMMENDATIONS AND CONCLUSIONS

Staff concludes that the following required findings, mandated by Title 20, California Code of Regulations, section 1769 (a)(3), can be made, and staff recommends approval of the petition by the Energy Commission:

- The proposed modification would not change the findings in the Energy Commission's Decision pursuant to Title 20, California Code of Regulations, section 1755;

- There would be no new or additional unmitigated, significant environmental impacts associated with the proposed modification;
- The facility would remain in compliance with all applicable LORS;
- The modification proposed in the petition would allow performance improvements by increasing the maximum hourly heat input by about 10 percent, from 903 MMBtu/hr to 1,000 MMBtu/hr;
- The proposed modification would be advantageous to the San Diego Gas & Electric Company, with whom PPEC has a power purchase agreement, as it will allow PPEC to deliver up to an additional 18 MW without the need to construct additional power generation facilities; and
- The proposed modification(s) are justified because there has been a substantial change in circumstances since the Energy Commission certification, in that GE has made performance improvements to the LMS100 gas turbines that allow slightly higher hourly heat input and higher electrical output.

PIO PICO ENERGY CENTER (11-AFC-1C)

Petition to Amend Hourly Heat Input

Air Quality Analysis

Tao Jiang, Ph.D., P.E.

INTRODUCTION AND SUMMARY

On July 15, 2014, the Pio Pico Energy Center, LLC (PPEC) filed a petition with the California Energy Commission (Energy Commission) requesting to amend the hourly heat input for the Pio Pico Energy Center (PPEC). This amendment proposes a nominal (~10 percent) increase in hourly heat input to the Energy Commission's Final Decision made on September 17, 2012 (CEC 2012a). All changes have been reviewed and approved by the San Diego Air Pollution Control District (SDAPCD) in a Final Determination of Compliance (FDOC) Addendum issued on August 25, 2015 (SDAPCD 2015).

The requested amendment does not involve significant modifications to any plant equipment, facility design or operating parameters. The modification to increase the allowable heat rate will only have a minor effect on maximum hourly, daily or annual emissions. Accordingly, the proposed changes do not result in any significant adverse air quality impacts. In all cases the impacts are less than or equal to those in the original commission decision. Since the proposed project changes are not limited by or specifically addressed in any existing conditions of certification (COCs), the Petition to Amendment (PTA) does not propose any changes to the COCs. However, SDAPCD FDOC made several changes to conditions to update new application identification numbers, new rule references, and new testing requirements and protocols. In order to facilitate the enforcement of the Energy Commission's permit conditions through the local air district, staff proposes to make the same changes to the Energy Commission's COCs.

Staff evaluated all proposed changes and found them consistent with all applicable laws, ordinances, regulations and standards (LORS).

BACKGROUND

This power plant was certified by the Energy Commission on September 17, 2012, and began construction March 2015. The facility as approved is a nominal 300 megawatt (MW) natural gas-fired peaking power plant located adjacent to the Otay Mesa Energy Center, in an unincorporated area of San Diego County. PPEC consists of three simple cycle GE LMS100 gas turbines and a partial dry cooling system. The current amendment petitions to amend the Commission's Final Decision (CEC 2012a) to reflect a nominal (~10 percent) increase in hourly heat input to the gas turbines, which would increase the facility's capacity by about 18 MW total.

LAWS, ORDINANCES, REGULATIONS, AND STANDARDS - COMPLIANCE

The project's proposed amendment is subject to all the LORS described in the Final Staff Assessment (FSA) (CEC 2012b).

ANALYSIS OF AMENDMENT REQUESTS

PPEC proposed to increase the maximum hourly heat input to each gas turbine from 903 to 1,000 MMBtu/hr. The nominal gas turbine output will increase from 100 MW to approximately 106 MW, which allow PPEC to deliver up to an additional 18 MW. This increase is a result of operational experience and machine tuning rather than major physical changes to the LMS100 model.

PPEC is not requesting any changes of mass emission limits (lb/hr, lb/day, ton/year) of Nitrogen Oxides (NOx), Carbon Monoxide (CO) and Volatile Organic Compounds (VOCs) in the existing conditions of certification. Maintaining compliance with the mass emission limits, while operating with a nominal 10 percent increase in hourly heat input, will require the gas turbines to achieve pollutant exhaust gas concentrations that are nominally 10 percent lower than permitted concentration limits at higher loads. The project owner has evaluated available emission data from similar gas turbine installations and concluded that the mass emission limits of NOx, CO and VOC in the Energy Commission's Final Decision can be met at the proposed higher hourly heat input (CEC 2012a).

Particulate Matter up to 10 micrometers in size (PM10)/ Particulate Matter up to 2.5 micrometers in size (PM2.5) emissions are not expected to increase since they are not based on heat input basis. However, based on review of projects utilizing the same model of turbine, the SDAPCD has revised the PM10/PM2.5 limit down to a maximum of 5 lb/hr per turbine for a single source test and 3.5 lb/hr averaged across all three turbines for six sets of source tests (2 tests per turbine). SOx emissions are calculated on a heat input basis and are expected to increase accordingly. Therefore, the hourly and daily emissions evaluated in the original FSA will increase. However, the project owner has agreed to maintain the same annual emission limit as contained in the existing conditions of certification.

Air Quality Table 1 summarizes the maximum (worst-case) criteria pollutant hourly, daily and annual emissions associated with PPEC's normal and routine operation. Because there will be no increase in annual fuel use or design or operation of the circuit breakers, there will be no change in Greenhouse Gas (GHG) emissions from the project.

Air Quality Table 1
PPEC, Maximum Operation Emissions (Each Turbine)

	NOx	VOC	PM10/PM2.5	CO	SOx
lb/hr	26.6	5.81	5.0 (5.5)	53.5	2.1 (1.9)
lb/day	288.1	79.2	120 (132)	428.9	50.4 (45.6)
tons/year	23.5	6.5	7.6 (11.9)	32.1	1.4

Source: PPEC 2014, CEC 2012b, SDAPCD 2015 and independent staff assessment.

Note: Numbers in parentheses represent the emissions from the previous design in staff FSA (CEC 2012b).

The increases in hourly heat input would produce increased mass flow through the gas turbines, which results in slight increases in exhaust characteristics, such as the exhaust velocities and temperatures. This would increase plume rise and reduce ground-level impacts. To assess the effects of these minor changes in exhaust characteristics on air quality impacts, a revised screening air quality modeling assessment was performed by the applicant. The results of the revised modeling analysis are summarized in **Air Quality Table 2**. As shown in **Air Quality Table 2**, the maximum modeled impacts from the gas turbines with proposed higher heat input are all less than or equal to those evaluated for the original application. Therefore the proposed changes do not result in any significant adverse air quality impacts.

Air Quality Table 2
Comparison of Maximum Operation Emission Impacts (□g/m3)

Pollutant	Averaging Time	Operating Mode	Maximum Modeled Impacts (μg/m^3)	
			With Proposed Change	Original Design
PM10	24 hour	Normal	1.9	2.2
	Annual	Normal	0.2	0.2
PM2.5	24 hour	Normal	1.9	2.2
	Annual	Normal	0.2	0.2
CO	1 hour	Shutdown	234.4	267.8
	8 hour	Shutdown	60.6	64.3
NO_2	1 hour	Startup	116.7	133.3
	1 hour Federal	Normal	120.8	138
	Annual	Normal	0.3	0.3
SO_2	1 hour	Normal	6.2	8.0
	24 hour	Normal	0.6	0.6
	Annual	Normal	0.1	0.1

Source: PPEC 2014, SDAPCD 2015 and independent staff assessment.

The proposed changes to maximum hourly heat input are not specified in any existing COCs. Therefore, the PTA did not request any changes to existing COCs. However, SDAPCD made several changes to their FDOC amendment conditions during the processing of PTA, which include: 1) updated district application identification numbers (ID numbers) and rule references, 2) a new PM testing protocol for the wet surface air

cooler, and 3) new PM and VOC source testing protocols for the gas turbines. Additional changes were also made to make the conditions more clear and accurate in order to be more easily enforceable. These condition changes are not directly related to the proposed amendment changes. Staff determined that there would be no adverse air quality impacts associated with these minor changes. Therefore, no analysis was necessary. Staff also proposes to incorporate these changes to the Energy Commission COCs to facilitate the enforcement of the Energy Commission conditions by the air district.

CONCLUSIONS AND RECOMMENDATIONS

The requested project changes would continue to comply with all applicable federal, state, and SDAPCD air quality laws, ordinances, regulations and standards (LORS). The amended project would not cause any significant adverse air quality impacts, provided that the following conditions of certification are included. Staff recommends that the revised conditions of certification be approved as shown below.

AMENDED CONDITIONS OF CERTIFICATION

Below is a list of conditions of certification that staff recommends to be revised from those approved in the 2012 Energy Commission Final Decision (CEC 2012a). In addition to the conditions reflecting the project changes discussed above, staff also proposes administrative changes in conditions of certification to make the Energy Commission and SDAPCD air quality conditions consistent. These changes reflect the August 25, 2015, SDAPCD FDOC Addendum. ~~Strikethrough~~ is used to indicate deleted language and **underline and bold** is used for new language. Only changed conditions are shown here; the final complete conditions of certification are shown in **Appendix A**.

Definitions for Conditions of Certification

Commissioning Period—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 permittee 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)]

Compliance Time Periods—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 except as specified in the district approved CEMS Protocol~~. [Rules 69.3, 69.3.1, and 20.3(d)(1)]

Continuous Emissions Monitoring Protocol—A**The** Continuous Emission Monitoring System (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]

Initial Startup—Initial startup shall be defined for each combustion turbine as the first time that the combustion turbine combusts fuel on-site. [Rule 20.3]

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

Startup—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** ~~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)]

Unit Operating Hour—For each turbine, a unit operating hour means any clock hour in which the turbine combusts fuel ~~for any part of the hour or for the entire hour~~.

Unit Operating Minute—For each turbine, a unit operating minute means any clock minute in which the turbine combusts ~~any~~ fuel.

PIO PICO ENERGY CENTER (PPEC) PERMIT CONDITIONS~~District Final Determination of Compliance Conditions~~

The following SDAPCD conditions (**AQ-1** to **AQ-~~79~~83**) apply to each unit of equipment, and the proposed PPEC facility as a whole.

General Conditions

AQ-2 The project owner 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 No. APCD2011-APP-001540 and APCD2014-APP-003627**. [Rule 14]

Verification: The project owner shall make the site available for inspection of records by representatives of the District, ARB, and the Energy Commission.

AQ-5 Prior to the initial startup date for any of the three combustion turbines, the project owner 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 ~~described in District Application No. APCD2010-APP-001251~~**authorized to be constructed under this permit**. [Rule 20.3(d)(8)]

Verification: The project owner shall submit to the CPM, within 15 days of ERC surrender to the District, information demonstrating compliance with this condition.

AQ-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 **14**21]

Verification: The project owner shall make the site available for inspection of records by representatives of the District, ARB, and the Energy Commission.

COMBUSTION TURBINE CONDITIONS

General Conditions

AQ-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]

Verification: The project owner shall submit to the District and the CPM for review the exhaust stack specification at least 60 days before the installation of the stack.

AQ-18 The combustion turbines shall be fired on Public Utility Commission (PUC) quality natural gas. The ~~permittee~~ **project owner** 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)** ~~(btu/scf)~~ of the natural gas~~;~~**.** ~~and~~ **These records shall be** provide**d** ~~records~~ 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)]

Verification: The project owner shall submit the quarterly fuel sulfur content values in the Quarterly Operation Reports (**AQ-SC8**) and make the site available for inspection of records by representatives of the District, ARB, and the Energy Commission.

AQ-19 Unless otherwise specified in this permit ~~or the District approved CEMS Protocol~~, all continuous monitoring data shall be collected at least once every **clock** minute. [Rules 69.3, 69.3.1, and 20.3(d)(1)]

Verification: The project owner shall make the site available for inspection of records by representatives of the District, ARB, and the Energy Commission.

Emission Limits

AQ-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]

Verification: Source test results demonstrating compliance with this condition shall be provided to the CPM and are due within the timeframes specified in Conditions **AQ-48** and **AQ-49**. CEMS data summaries shall be submitted to the CPM as part of the Quarterly Operation Reports (**AQ-SC8**).

AQ-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]

Verification: CEMS data summaries shall be submitted to the CPM as part of the Quarterly Operation Reports (**AQ-SC8**).

AQ-22 ~~NOT USED.~~ **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)]**

Verification: CEMS data summaries shall be submitted to the CPM as part of the Quarterly Operation Reports (AQ-SC8).

AQ-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 ~~parts per million by volume on a dry basis (~~ppmvd~~)~~ corrected to 15% oxygen averaged over a ~~1~~**one**-clock-hour period, except during commissioning, startup and shutdown periods for that turbine. [Rule 20.3(d)(1)]

Verification: The project owner shall provide CEMS emissions data to demonstrate compliance with this condition as part of the Quarterly Operation Reports (**AQ-SC8**).

AQ-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 ~~1~~**one**-clock-hour period, except during commissioning, startup, and shutdown periods for that turbine. [Rule 20.3(d)(1)]

Verification: The project owner shall provide CEMS emissions data to demonstrate compliance with this condition as part of the Quarterly Operation Reports (**AQ-SC8**).

AQ-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~~**one**-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)]

Verification: The project owner shall provide the CEMS data, using the appropriate VOC/CO surrogate relationship, to demonstrate compliance with this condition as part of the Quarterly Operation Reports (**AQ-SC8**).

AQ-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]

Verification: The project owner shall provide the estimated ammonia concentrations and ammonia emissions based on the annual source test data, the CEMS data and SCR ammonia flow data to demonstrate compliance with this condition as part of the Quarterly Operation Reports (**AQ-SC8**).

AQ-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**~~calculated~~ over each **one-**clock-hour period and corrected to 15% oxygen, except **for**~~during~~ 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]

Verification: The project owner shall provide CEMS emissions data to demonstrate compliance with this condition as part of the Quarterly Operation Reports (**AQ-SC8**).

AQ-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 ~~parts per million by volume on a dry basis (~~ppmvd~~)~~ **averaged**~~calculated~~ over each **one-**clock-hour period and corrected to 15% oxygen, except **for**~~during~~ 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]

Verification: The project owner shall provide CEMS emissions data to demonstrate compliance with this condition as part of the Quarterly Operation Reports (**AQ-SC8**).

AQ-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**~~calculated~~ 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]

Verification: The project owner shall provide CEMS emissions data to demonstrate compliance with this condition as part of the Quarterly Operation Reports (**AQ-SC8**).

AQ-30 For each rolling **four**4-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 ~~permittee~~**project owner**, 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**~~4~~-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.

~~15 ppmvd corrected to 15% oxygen and 0.43 lb/MWh, respectively at all times during the clock hour~~. 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]

Verification: The project owner shall provide CEMS emissions data to demonstrate compliance with this condition as part of the Quarterly Operation Reports (**AQ-SC8**).

AQ-31 The emissions of particulate matter less than or equal to 10 microns in diameter (PM10) **from the exhaust stack of each combustion turbine** shall not exceed **5.0**~~5.5~~ 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 subsets.** [Rule 20.3**(d)(1) and** (d)(2)]

Verification: Source tests demonstrating compliance with this condition shall be provided to the CPM and are due within the timeframes specified in Conditions **AQ-48** and **AQ-49**.

AQ-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]

Verification: Source tests demonstrating compliance with this condition shall be provided to the CPM and are due within the timeframes specified in Conditions **AQ-48** and **AQ-49**.

AQ-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**~~1~~-clock-hour averaging period for these limits shall **be used when compliance is determined using**~~apply to~~ CEMS data.

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

[Rule 20.3(d)(2)]

Verification: The project owner shall submit to the CPM operating data to demonstrate compliance with this condition as part of the Quarterly Operation Reports (**AQ-SC8**).

AQ-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, ~~during a combustion turbine's startup period~~ shall not exceed the following limits during ~~any~~ **each of that turbine's** startup period**s**, 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)]

Verification: The project owner shall submit to the CPM operating data to demonstrate compliance with this condition as part of the Quarterly Operation Reports (**AQ-SC8**).

AQ-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, ~~during a combustion turbine's shutdown period~~ shall not exceed the following limits during **each of that turbine's**~~any~~ shutdown period**s**, 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)]

Verification: The project owner shall submit to the CPM operating data to demonstrate compliance with this condition as part of the Quarterly Operation Reports (**AQ-SC8**).

AQ-37 The **total aggregate** oxides of nitrogen (NOx) emissions ~~from each combustion turbine shall not exceed 50 pounds per hour and total aggregate NOx emissions~~ from all combustion turbines combined shall not exceed 150 pounds

per hour, calculated as nitrogen dioxide and measured over each **one**~~1~~-clock-hour period. ~~These~~**This** emission limit~~s~~ 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)]

Verification: The project owner shall provide CEMS emissions data to demonstrate compliance with this condition as part of the Quarterly Operation Reports (**AQ-SC8**).

AQ-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**~~1~~-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)]

Verification: The project owner shall provide CEMS emissions data to demonstrate compliance with this condition as part of the Quarterly Operation Reports (**AQ-SC8**).

AQ-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 (PM10); and oxides of sulfur (SOx), calculated as sulfur dioxide (SO_2), from the combustion turbines ~~described in District Application No. APCD2010-APP-001251~~**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. PM10	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]

Verification: The project owner shall submit to the CPM and the District the facility annual operating and emissions data demonstrating compliance with this condition as part of the fourth quarter's Quarterly Operation Report (**AQ-SC8**).

AQ-40 ~~The cooling tower 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 project owner 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 water used in the cooling tower shall not exceed 5,600 ppm. The TDS concentration shall be verified through quarterly testing of the water by a certified lab using an EPA approved method. [Rule 20.3(d)(1)]~~ **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 of the WSAC, the project owner 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 project shall maintain records not less frequently than a calendar quarterly basis, the project owner 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)]**

Verification: The project owner shall submit to the CPM for review and District for approval final selection, design parameters and details of the ~~cooling tower~~ **WSAC** mist eliminator at least 90 days prior to the start of construction. The project owner shall provide cooling water testing data in compliance with this condition as part of the Quarterly Operation Reports (**AQ-SC8**). The project owner shall make the site available for inspection of records by representatives of the District, ARB, and the Energy Commission.

AQ-41 For each calendar month **and each rolling 12-calendar-month period**, the project owner 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; PM10; and SOx, calculated as SO_2, in tons, from each emission unit ~~described~~

~~in District Application No. APCD2010-APP-001251~~**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]

Verification: The project owner shall provide emissions summary data in compliance with this condition as part of the Quarterly Operation Reports (**AQ-SC8**). The project owner shall make the site available for inspection of records by representatives of the District, ARB, and the Energy Commission.

AQ-42 For each calendar month and each rolling 12-calendar-month period, the project owner 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; PM10; and SOx, calculated as SO_2, in tons from all the emission units ~~described in District Application No. APCD2010-APP-001251~~ **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]

Verification: The project owner shall provide emissions summary data in compliance with this condition as part of the Quarterly Operation Reports (**AQ-SC8**). The project owner shall make the site available for inspection of records by representatives of the District, ARB, and the Energy Commission.

Ammonia – SCR (and CO catalyst)

AQ-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 project owner 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 ~~ammonia injection~~ 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** ~~100 ºF and 1000 ºF~~ 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]

Verification: The project owner shall submit to the CPM for review and District for approval final selection, design parameters and details of the SCR and oxidation catalyst emission control systems at least 90 days prior to the start of construction.

AQ-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)]

Verification: The project owner shall make the site available for inspection of records by representatives of the District, ARB, and the Energy Commission.

AQ-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)]

Verification: The project owner shall submit to the CPM for review and the District for approval a turbine operation and ammonia injection rate monitoring protocol in compliance with this condition at least 90 days prior to the initial startup.

AQ-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 ~~the~~**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**]

Verification: The project owner shall make the site available for inspection of records by representatives of the District, ARB, and the Energy Commission.

AQ-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. [Rule**s** 14 **and 21**]

Verification: The project owner shall maintain on site and provide on request of the CPM or District the ammonia delivery records that demonstrate compliance with this condition.

Testing

AQ-48 All source test or other tests required by this permit shall be performed by the District or ~~by~~ 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]

Verification: The project owner shall submit to the CPM for review and the District for approval the initial source test protocol at least 60 days prior to the initial source test. The project owner shall notify the CPM and District no later than 30 days prior to the proposed source test date and time.

AQ-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]

Verification: The project owner will submit all RATA or source test reports to the CPM for review and the District for approval within 45 days of the completion of those tests.

AQ-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, PM10, 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~~s 25A and/or~~ 18, or **an** alternative method~~s~~ 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.

~~c~~**e**. Measurements of ammonia ~~emissions~~**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.

~~d~~**f**. Measurements of PM10 emissions shall be conducted in accordance with EPA Method 5 and 202 or **an** alternative method~~s~~ approved by the District and EPA. For purposes of this permit, **total particulate matter measured using EPA Method 5 and 202**~~all the particulate matter measured~~ shall be considered to be PM10.

~~e~~**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.

~~f~~**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.

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

~~h~~**j**. Unless otherwise authorized in writing by the District, testing for NOx, CO, VOC, PM10, 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]

Verification: The project owner shall submit to the CPM for review and the District for approval the initial source test protocol and source test report within the timeframes specified in Conditions **AQ-48** and **AQ-49**.

AQ-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**, PM10** 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]

Verification: The project owner shall submit to the CPM for review and the District for approval the periodic RATA and source test protocols, and RATA source test reports within the timeframes specified in Conditions **AQ-48** and **AQ-49**.

AQ-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 turbines. 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]

Verification: The results and field data collected during source tests required by this condition shall be submitted to the CPM for review and the District for approval within 60 days of testing.

AQ-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 ~~r~~**R**ule 1200 **and the conditions of this permit**:

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

If the District requires the ~~permittee~~**project owner** 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**]

Verification: The results and field data collected during source tests required by the District under this condition shall be submitted to the CPM for review and the District for approval within 60 days of testing.

AQ-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 ~~earlier of the~~**earliest** initial startup date~~s~~ for ~~either~~ **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]

Verification: The project owner shall make the site available for inspection of records by representatives of the District, ARB, and the Energy Commission.

CONTINUOUS MONITORING

AQ-58 The project owner 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**]

Verification: The project owner shall maintain a copy of the CEMS protocol required by **AQ-60** on site and provide it, other CEMS data, and the CEMS for inspection on request by representatives of the District, ARB, and the Energy Commission.

AQ-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 h**~~H~~ourly average~~(s)~~ concentration of oxides of nitrogen (NOx) **in parts per million by volume on a dry basis (ppmvd), both** uncorrected and corrected to 15% oxygen~~, in parts per million (ppmvd), necessary to demonstrate compliance with the NOx limits of this permit~~;

b. **Clock h**~~H~~ourly average concentration of carbon monoxide (CO) **in parts per million by volume on a dry basis (ppmvd), both** uncorrected and corrected to 15% oxygen~~, in parts per million (ppmvd), necessary to demonstrate compliance with the CO limits of this permit~~;

c. Percent oxygen (O_2) in the exhaust gas for each unit operating minute;

d. **Clock h**~~H~~ourly 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 d**~~D~~aily 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**~~4~~-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**4-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 h**~~H~~ourly mass emissions of carbon monoxide (CO), in pounds;

m. **Calendar d**~~D~~aily 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~~, in parts per million (ppmvd),~~ 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]

Verification: The project owner shall submit to the CPM for review and the District for approval a CEMS protocol, as required by **AQ-60**, which includes description of the methods of compliance with the requirements of this condition. The project owner shall make the site available for inspection of records and equipment by representatives of the District, ARB, and the Energy Commission.

AQ-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 the 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 project owner 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]

Verification: The project owner shall submit to the CPM for review and the District for approval the RATA certification test protocol at least 60 days prior to the RATA test and shall notify the CPM, the U.S. EPA and the District of the RATA test date at least 45 days prior to conducting the RATA and other certification tests. The project owner will submit all RATA or source test reports to the CPM for review and the District for approval within 45 days of the completion of those tests.

AQ-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]

Verification: The project owner shall submit to the CPM for review and the U.S. EPA and District for approval a monitoring plan in compliance with this condition at least 45 days prior to the RATA test.

AQ-63 The oxides of nitrogen (NOx) and oxygen (O_2) components of the CEMS shall be certified and maintained in accordance with applicable ~~F~~**f**ederal ~~R~~**r**egulations including the requirements of ~~s~~**S**ections 75.10 and 75.12 of ~~t~~**T**itle 40, Code of Federal Regulations Part 75 (40 CFR 75), the ~~p~~**P**erformance ~~s~~**S**pecifications of ~~a~~**A**ppendix A of 40 CFR **Part** 75, the ~~q~~**Q**uality ~~a~~**A**ssurance 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]

Verification: The project owner shall submit to the CPM for review and the District for approval a CEMS protocol, as required by **AQ-60**, which includes description of the methods of compliance with the requirements of this condition. The project owner shall make the site available for inspection of records and equipment by representatives of the District, ARB, and the Energy Commission.

AQ-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. [~~H&S §42706~~**Rule 19.2**]

Verification: The project owner shall notify the District regarding any emission standard violation as required in this condition and shall document all such occurrences in each Quarterly Operation Report (**AQ-SC8**).

AQ-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 ~~a~~**the** CEMS Protocol approved by the District. [Rule 19.2]

Verification: The project owner shall submit to the District the CEMS reports as required in this condition and shall make the site available for inspection of records and equipment by representatives of the District, ARB, and the Energy Commission.

AQ-68 Except for changes that are specified in the initially 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 ~~or~~**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]

Verification: The project owner shall submit to the CPM for review and the District for approval any revision to the CEMS/DAHS or ammonia flow control software, as required by this condition, to be approved in advance at least 30 days before any planned changes are made. The project owner shall notify the District regarding any unplanned emergency changes to these software systems within 96 hours and shall document all such occurrences in each Quarterly Operation Report (**AQ-SC8**).

AQ-69 At least 90 calendar days prior to the Initial Emissions Source Test, the project owner 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 ~~emission~~ limits **when using CEMS data**. This protocol can be provided as part of the Initial Source Emissions Test Protocol. [Rule 20.3(d)(1)]

Verification: The project owner shall submit to the CPM for review and the District for approval the monitoring protocol as part of the initial source test protocol in compliance with requirements of this condition at least 90 days prior to the initial source test.

AQ-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, ~~and~~ 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]

Verification: The project owner shall submit to the CPM the natural gas fuel usage data from the fuel flow meters as part of the Quarterly Operation Report (**AQ-SC8**).

AQ-71 Each combustion turbine shall be equipped with continuous monitors to measure, calculate, and record unit operating days**,** ~~and~~ 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 on 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 ~~million~~ British thermal units per standard cubic foot (~~MM~~Btu/scf);

e. ~~Combustion turbine~~**Gross** electrical ~~energy~~**power** output during each unit operating minute in ~~gross~~ megawatts ~~hours~~ (MW~~h~~); **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 ~~the~~**a** ~~T~~**t**urbine ~~O~~**o**peration ~~M~~**m**onitoring ~~P~~**p**rotocol, which may be part of the CEMS Protocol~~, approved by the District,~~ **and** 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]

Verification: The project owner shall submit to the CPM for review and the District for approval a turbine operation monitoring protocol in compliance with this condition and within the timeframes specified in **AQ-72**. The project owner shall make the site available for inspection of records and equipment required in this condition by representatives of the District, ARB, and the Energy Commission.

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

Verification: The project owner shall submit to the CPM for review and the District for approval a turbine monitoring protocol in compliance with this condition at least 90 days prior to the initial startup of each combustion turbine.

AQ-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~~s~~, shutdown~~s~~, 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 ~~term "~~hours of turbine operation~~"~~ is defined as the total ~~operating~~ 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]

Verification: The project owner shall make the site available for inspection of records by representatives of the District, ARB, and the Energy Commission.

COMMISSIONING

AQ-75 ~~Thirty~~ **Within thirty** calendar days after the end of the commissioning period for each combustion turbine, the project owner shall submit a written ~~progress~~ 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 ~~steady state operation~~**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 ~~million~~ British thermal units per standard cubic foot (~~MM~~Btu/scf);

j. Gross electrical power output of the turbine, in megawatts ~~hours~~ (MW~~h~~) for each hour;

k. SCR outlet temperature, in degrees Fahrenheit;~~ and~~

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)]

Verification: A log of the dates, times, and cumulative unit operating hours when fuel is being combusted during the commissioning period shall be maintained by the project owner. The project owner shall submit, commencing one month from the time of gas turbine first fire, a monthly commissioning status report throughout the duration of the commissioning phase that demonstrates compliance with the requirements listed in this condition. The monthly commissioning status report shall be submitted to the CPM by the 10th of each month for the previous month, for all months with turbine commissioning activities following the turbine first fire date. The project owner shall also provide the reporting required by this condition to the District and CPM within 30 days of completing commissioning of each turbine. The project owner shall make the site available for inspection of records by representatives of the District, ARB, and the Energy Commission.

AQ-76 For each combustion turbine, the project owner shall submit the following notifications to the District and U. S. EPA, Region ~~IX~~**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 project owner 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]

Verification: The project owner shall provide notification to the District and U.S. EPA Region IX as required by this condition and shall provide copies of these notifications as part of the final monthly commissioning status reports (**AQ-75**) due the month after the notifications are sent.

REPORTING

AQ-77 The ~~permittee~~**project owner** shall file semiannual reports in accordance with 40 CFR §60.4375. [40 CFR Part 60 Subpart KKKK]

Verification: Semiannual compliance reports shall be submitted to the District and the CPM as part of the second quarter's and fourth quarter's Quarterly Operation Reports (**AQ-SC8**).

NEW PROJECT AMMENDMENT PERMIT CONDITIONS

GENERAL CONDITIONS

AQ-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.

Verification: The project owner shall make the site available for inspection of records by representatives of the District, ARB, and the Energy Commission.

COMBUSTION TURBINE CONDITIONS

AQ-81 [RESERVED—SEE DEFINITIONS]

Emission Limits

AQ-82 The emissions of particulate matter less than or equal to 10 microns in diameter (PM10) 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 emission rate. [Rule 20.3(d)(1) and (d)(2)]

Verification: The project owner shall make the site available for inspection of records by representatives of the District, ARB, and the Energy Commission.

Testing

AQ-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.

Verification: The project owner shall make the site available for inspection of records by representatives of the District, ARB, and the Energy Commission.

REFERENCES

CEC 2012a - California Energy Commission, Commission Final Decision of the Pio Pico Energy Center (11-AFC-01). September 17, 2012.

CEC 2012b - California Energy Commission, Final Staff Assessment of the Pio Pico Energy Center (11-AFC-01). May 23, 2012.

PPEC 2014 – Pio Pico Energy Center, LLC. Petition to Amend Hourly Heat Input for Pio Pico Energy Center (11-AFC-01C). July 15, 2014.

SDAPCD 2015 – San Diego Air Pollution Control District. Final Determination of Compliance Addendum, Pio Pico Energy Center, dated August 25, 2015.

PIO PICO ENERGY CENTER (11-AFC-1C)
Petition to Amend Hourly Heat Input
Traffic and Transportation
John Hope

INTRODUCTION

The Pio Pico Energy Center (PPEC) consists of three simple cycle General Electric LMS100 gas turbines and a partial dry cooling system. The proposed amendment requests an approximate 10 percent increase in the hourly heat input to the gas turbines. The change in the gas turbine operating characteristics would increase the height of the thermal plumes emitted from the exhaust stacks. As discussed in the Final Decision, high velocity thermal plumes could present a potentially significant hazard to aircraft overflying the PPEC at low altitudes. Brown Field Municipal Airport is located approximately three miles due west of the PPEC site. Conditions of Certification **TRANS-8** (Obstruction Marking and Lighting) and **TRANS-9** (Pilot Notification and Awareness) were adopted to mitigate potential impacts on aviation to less than significant.

LAWS, ORDINANCES, REGULATIONS AND STANDARDS (LORS) COMPLIANCE

As discussed in the Final Decision, the project site is located approximately three miles east of Brown Field Municipal Airport and outside of the Airport Influence Area, Review Area 2. Therefore, the Brown Field Municipal Airport Land Use Compatibility Plan does not apply to the project. Approval of the amendment would not require analysis or inclusion of any new aviation-related LORS.

ANALYSIS

An analysis of the exhaust plume characteristics with an approximate 10 percent increase in hourly heat input to the gas turbines showed the average vertical velocity for a single plume would be 4.3 meters per second (m/s)[1] or higher up to an elevation of approximately 1,190 feet above ground level (AGL). Analysis of the exhaust plume characteristics for the original certified project showed the average vertical velocity for a single plume would be 4.3 m/s or higher up to an elevation of approximately 1,080 feet AGL (CEC, May 2012). At this height, two adjacent plumes would be sufficiently large to merge. For the case of two merged plumes with an approximate 10 percent increase in hourly heat input to the gas turbines, average plume vertical velocity would be 4.3 m/s or higher up to a height of approximately 1,910 feet AGL, which would be 190 feet higher than the merged plume elevation calculated for the original certified project in the FSA at 1,720 AGL. It should be noted that the FSA determined three plumes merging as a "very remote possibility" and "staff considered the realistic worst-case scenario as two plumes merging …" (Please see **Appendix TT-1** of this analysis).

[1] This velocity generally defines the point at which general aviation aircraft begin to experience more than light turbulence.

The Commission found the certified project's impacts on aviation to be less than significant with the implementation of Conditions of Certification **TRANS-8** and **TRANS-9**. This finding considered the fact that aircraft do not need to fly over the project site to enter or depart the traffic pattern, and pilots would have the flexibility to avoid direct overflight of the PPEC while conducting their normal operations because of the small 10-acre footprint of the project and the wide open airspace in the general area. The increase in thermal exhaust plume heights associated with the proposed change would not change this conclusion. However, **TRANS-9** would need to be revised to reflect changes in plume heights. **TRANS-9** requires the project owner to implement several actions to ensure aircraft pilots are aware of the project location near Brown Field Municipal Airport and potential hazards to aviation from thermal plumes. As a result of increased heights in thermal plumes that would be created with an approximate 10 percent increase in hourly heat input to the gas turbines, notifications required under **TRANS-9** need to reflect the higher elevation.

Although the average plume vertical velocity would be 4.3 m/s or higher up to 1,910 feet with the proposed change, Staff believes avoidance of overflight of the project site below 2,000 feet should be required to create an additional buffer from potential hazards to aviation from thermal plumes.

CONCLUSIONS AND RECOMMENDATIONS

Staff has reviewed the petition for potential environmental effects and consistency with applicable LORS. There are no aviation-related LORS applicable to the amended project. Staff proposes modifications to Condition of Certification **TRANS-9** to ensure the amended project does not have a significant impact on aviation.

PROPOSED MODIFICATIONS TO CONDITION OF CERTIFICATION

Staff has proposed modifications to Condition of Certification **TRANS-9** as shown below. ~~Strikethrough~~ is used to indicate deleted language and **underline and bold** is used for new language.

TRANS-9 Pilot Notification and Awareness - The project owner shall initiate the following actions to ensure pilots are aware of the project location and potential hazards to aviation:

- Submit a letter to the FAA requesting a Notice to Airmen (NOTAM) be issued advising pilots of the location of the PPEC and recommending avoidance of overflight of the project site below ~~1,720~~ **2,000** feet AGL. The letter should also request that the NOTAM be maintained in active status until all navigational charts and Airport Facility Directories (AFDs) have been updated.
- Submit a letter to the FAA requesting a power plant depiction symbol be placed at the PPEC site location on the San Diego Sectional Chart with a notice to "avoid overflight below ~~1,720~~ **2,000** feet AGL".
- Submit a request to and coordinate with the Brown Field Airport Manager to add a new remark to the Automated Surface Observing System (ASOS)

identifying the location of the PPEC and advising pilots to avoid direct overflight below ~~1,720~~ **2,000** feet AGL as they approach or depart the airport.

- Request that Southern California TRACON and/or the San Diego Air Traffic Control Center submit aerodrome remarks describing the location of the PPEC plant and advising against direct overflight below ~~1,720~~ **2,000** feet AGL to the:
  - ✓ FAA AeroNav Services, formerly the FAA National Aeronautical Charting Office (Airport/Facility Directory)
  - ✓ Jeppesen Sanderson Inc. (JeppGuide Airport Directory, Western Region)
  - ✓ Airguide Publications (Flight Guide, Western States)

Verification: Within 30 days following the start of construction **of the heat input components,** the project owner shall submit draft language for the letters of request to the FAA (including Southern California TRACON) and Brownfield Airport to the CPM for review and approval.

At least 60 days prior to the start of operations, the project owner shall submit the required letters of request to the FAA and request that Southern California TRACON submit aerodrome remarks to the listed agencies. The project owner shall submit copies of these requests to the CPM. A copy of any resulting correspondence shall be submitted to the CPM within 10 days of receipt.

If the project owner does not receive a response from any of the above agencies within 45 days of the request (or by 15 days prior to the start of operations) the project owner shall follow up with a letter to the respective agency/ies to confirm implementation of the request. A copy of any resulting correspondence shall be submitted to the CPM within 10 days of receipt.

The project owner shall contact the CPM within ~~72 hours~~**10 days** if notified that any or all of the requested notices cannot be implemented. Should this occur, the project owner shall appeal such a determination, consistent with any established appeal process and in consultation with the CPM. A final decision from the jurisdictional agency denying the request, as a result of the appeal process, shall release the project owner from any additional action related to that request and shall be deemed in compliance with that portion of this condition of certification.

REFERENCES

California Energy Commission (CEC), May 2012. *Pio Pico Energy Center Final Staff Assessment*. Docket Number 11-AFC-1.

CEC, September 2012. *Pio Pico Energy Center Commission Decision* (TN # 67366). Docket Number 11-AFC-1.

CEC, August 5, 2014. *Revised Appendix TT-1: Plume Velocity Analysis*. Prepared by Tao Jiang.

PPEC (Pio Pico Energy Center) 2014 – Petition to Amend Final Commission Decision (11-AFC-01C). Submitted to the California Energy Commission on July 15, 2012.

PIO PICO ENERGY CENTER (11-AFC-1C)
TRAFFIC AND TRANSPORTATION-APPENDIX TT-1
Petition to Amend Hourly Heat Input
Plume Velocity Analysis

Tao Jiang, Ph.D., P.E.

INTRODUCTION

On July 15, 2014, the Pio Pico Energy Center (PPEC) filed a petition with the California Energy Commission (Energy Commission) requesting to amend hourly heat input for PPEC (PPEC 2014). The following provides an updated assessment of the Pio Pico Energy Center (PPEC) cooling tower, and gas turbines exhaust stack plume vertical velocities based on the revised equipment parameters. Staff completed calculations to determine the worst-case vertical plume velocities at different heights above the stacks based on the applicant's proposed facility design.

PROJECT DESCRIPTION

PPEC is a proposed 318 megawatt (MW) simple-cycle electrical generating facility. The proposed PPEC includes a 12-cell partial dry cooling tower and three LMS100 natural-gas fired combustion turbine generators (CTG). There are no other plume sources at the PPEC site.

PLUME VELOCITY CALCULATION METHOD

Staff has selected a calculation approach from a technical paper (Best 2003) to estimate the worst-case plume vertical velocities for the PPEC exhausts. The calculation approach, which is also known as the "Spillane approach", used by staff is limited to calm wind conditions, which are the worst-case wind conditions. The Spillane approach uses the following equations to determine vertical velocity for single stacks during dead calm wind (i.e. wind speed = 0) conditions:

(1) $(V*a)^3 = (V*a)_o^3 + 0.12*F_o*[(z-z_v)^2-(6.25D-z_v)^2]$

(2) $(V*a)_o = V_{exit}*D/2*(T_a/T_s)^{0.5}$

(3) $F_o = g*V_{exit}*D^2*(1-T_a/T_s)/4$

(4) $Z_v = 6.25D*[1-(T_a/T_s)^{0.5}]$

Where: V = vertical velocity (m/s), plume-average velocity
a = plume top-hat radius (m, increases at a linear rate of $a = 0.16*(z- z_v)$
F_o= initial stack buoyancy flux m^4/s^3
z = height above ground (m)
z_v= virtual source height (m)
V_{exit}= initial stack velocity (m/s)
D = stack diameter (m)
T_a= ambient temperature (K)
T_s= stack temperature (K)
g = acceleration of gravity (9.8 m/s^2)

Equation (1) is solved for V at any given height above ground that is above the momentum rise stage for single stacks (where z > 6.25D) and at the end of the plume merged stage for multiple plumes. This solution provides the plume-average velocity for the area of the plume at a given height above ground; the peak plume velocity would be two times higher than the plume-average velocity predicted by this equation. As can be seen the stack buoyancy flux is a prominent part of Equation (1). The calm condition calculation basis clearly represents the worst-case conditions, and the vertical velocity will decrease substantially as wind speed increases.

For multiple stack plumes, where the stacks are equivalent, the multiple stack plume velocity during calm winds was calculated by staff in a simplified fashion, presented in the Best Paper as follows:

(5) $V_m = V_{sp} * N^{0.25}$

Where: V_m = multiple stack combined plume vertical velocity (m/s)
V_{sp} = single plume vertical velocity (m/s), calculated using Equation (1)
N = number of stacks

Staff notes that this simplified multiple stack plume velocity calculation method predicts somewhat lower velocity values than the full Spillane approach methodology as given in data results presented in the Best paper (Best 2003). However, the use of this approach on long linear cooling towers such as the cooling tower designed for the PPEC project will likely over predict the combined plume velocities.

On September 24, 2015, the Federal Aviation Administration (FAA) released a guidance memorandum (FAA 2015) recommending that thermal plumes be evaluated for air traffic safety. FAA determined that the overall risk associated with thermal plumes in causing a disruption of flight is low. However, it determined that such plumes in the vicinity of airports may pose a unique hazard to aircraft in critical phase of flight (such as take off and landing). In this memorandum a new computer model, different than the analysis technique used by staff and identified above, to evaluate vertical plumes for hazards to light aircraft was identified as being prepared under FAA funding and available for use in evaluating exhaust plume impacts. This new model, the MITRE Exhaust Plume Analyzer, was identified as a potentially effective tool to assess the impact exhaust plumes may impose on flight operations in the vicinity of airports. The Exhaust Plume Analyzer was developed to evaluate aviation risks from large thermal stacks, such as turbine exhaust stacks. However, at this time the Exhaust Plume Analyzer model cannot be used to provide reasonable risk predictions on most variable exhaust temperature thermal plume sources, such as cooling towers and air cooled condensers, etc.
The FAA has not provided guidance on how to evaluate the risk frequency isopleth output of the Exhaust Plume Analyzer model, but states in their memorandum that they intend to update their guidance on near-airport land use, including evaluation of thermal exhaust plumes, in fiscal year 2016.

In the meantime, this appendix uses the method previously used to be consistent with staff assessments done for other projects (called the “Spillane approach”) and because the previous method is described in the FAA materials as providing similar risk

assessments for light aircraft. Staff will consider using the new method to the extent that it is applicable after conducting further review of the FAA methodology and once FAA develops guidance on how to evaluate the output of the Exhaust Plume Analyzer.

VERTICAL PLUME VELOCITY ANALYSIS

COOLING TOWER DESIGN AND OPERATING PARAMETERS

The design and operating parameter data for the project's cooling tower are provided in **Plume Velocity Table 1**.

Plume Velocity Table 1
PPEC Cooling Tower Operating and Exhaust Parameters

Parameter	Cooling Tower Design Parameters
Number of Cells	12 Cells (1 by 12 Linear Design)
Cell Height (feet)	22
Cell Stack Diameter (feet)	13
Stack Velocity (ft/sec)	33.8
Stack Temperature (°F)	86
Ambient Temperature (°F)	63

Source: PPEC 2014.

The applicant provided exhaust data for the average ambient case, which is a reasonable case for a peaker project that is expected to operate mainly during hot summer conditions that correspond to maximum electrical load demand.

GAS TURBINE/HRSG DESIGN AND OPERATING PARAMETERS

The design and operating parameter data for the gas turbines stack exhaust are provided in **Plume Velocity Table 2**.

Plume Velocity Table 2
PPEC Gas Turbine Operating and Exhaust Parameters

Operating Mode	Ambient Temp (°F)	Stack Height (feet)	Stack Diameter (feet)	Stack Vel (ft/sec)	Stack Temp (°F)
Hot Peak	110	100	14.5	92.54	801
Avg Peak	63	100	14.5	103.14	785
Cold Peak	30	100	14.5	95.07	758
Hot Low	110	100	14.5	65.52	816
Avg Low	63	100	14.5	68.05	804
Cold Low	30	100	14.5	67.41	799

Source: PPEC 2014.

For the worst-case analysis for this plume source the 63°F ambient condition for CTG at peak load, average temperature case was selected to determine the worst-case velocity conditions. The average ambient case is both a more likely operating scenario for a peaking facility and has calm-wind velocity results that are essentially as conservative as the cold peak case.

PLUME VELOCITY CALCULATION RESULTS

Using the Spillane calculation approach, the plume average vertical velocity at different heights above ground was determined by staff for calm conditions. Staff's calculated plume average velocity values for the cooling tower are provided in **Plume Velocity Table 3.** The combined cooling tower velocities are calculated by combining all 12 cells by assuming the multiple cooling tower cell plumes have completely merged.

As explained in the Transportation and Traffic section a plume average vertical velocity of 4.3 m/s has been determined by staff to be the critical velocity of concern to light aircraft. This is based on the Australian Civil Aviation Safety Authority (CASA) advisory circular (CASA 2003). Vertical velocities below this level are not of concern to light aircraft. The cooling tower exhausts were found to have plume average velocities less than 4.3 meters per second at or above 500 feet above ground level.

Plume Velocity Table 3
PPEC Cooling Tower Vertical Plume Velocities (m/s)

Height	12-Cell Cooling Tower
300	3.81
400	3.26
500	2.93
600	2.71
700	2.55
800	2.42
900	2.31
1,000	2.23
1,100	2.15
1,200	2.08
1,300	2.02
1,400	1.97
1,500	1.93
1,600	1.88
1,700	1.84
1,800	1.81
1,900	1.77
2,000	1.74

PPEC has 3 turbines in a linear configuration. When the spacing between the gas turbines is not large enough, the exhaust plumes may spread enough to significantly merge prior to the velocity lowering to vertical velocities below levels of concern. Therefore, the gas turbine plume size and vertical velocities for different plume merging scenarios, where the value N is equal to the number of fully merged plumes, were calculated and are presented in **Plume Velocity Table 4.**

Plume Velocity Table 4
PPEC Turbine Plume Size and Vertical Plume Velocities

Height (ft)	Plume Diameter (m)[a]	Plume Velocity (m/s) [b]		
		N=1	N=2	N=3
300	16.396	8.45	Not Merged	Not Merged
400	26.15	6.97	Not Merged	Not Merged
500	35.904	6.20	Not Merged	Not Merged
600	45.657	5.69	Not Merged	Not Merged
700	55.411	5.32	Not Merged	Not Merged
800	65.165	5.03	Not Merged	Not Merged
900	74.918	4.80	Not Merged	Not Merged
1000	84.672	4.60	Not Merged	Not Merged
1100	94.426	4.44	Not Merged	Not Merged
1200	104.18	4.29	Not Merged	Not Merged
1300	113.933	4.16	4.95	Not Merged
1400	123.687	4.05	4.82	Not Merged
1500	133.441	3.95	4.70	Not Merged
1600	143.194	3.86	4.59	Not Merged
1700	152.948	3.77	4.49	Not Merged
1800	162.702	3.69	4.39	Not Merged
1900	172.456	3.62	4.31	Not Merged
2000	182.209	3.56	4.23	Not Merged
2100	191.963	3.50	4.16	Not Merged
2200	201.717	3.44	4.09	Not Merged
2300	211.471	3.38	4.03	Not Merged
2400	221.224	3.33	3.96	4.39
2500	230.978	3.29	3.91	4.33
2600	240.732	3.24	3.85	4.27
2700	250.485	3.20	3.80	4.21
2800	260.239	3.16	3.76	4.16
2900	269.993	3.12	3.71	4.11
3000	279.747	3.08	3.67	4.06

Notes:

a – The separation between stacks is approximately 54 meters for two stacks and 108 meters for all stacks and the plumes will begin to merge when the plume diameter is the same as the separation and is assumed to be fully merged when the plume diameter is twice the stack separation.

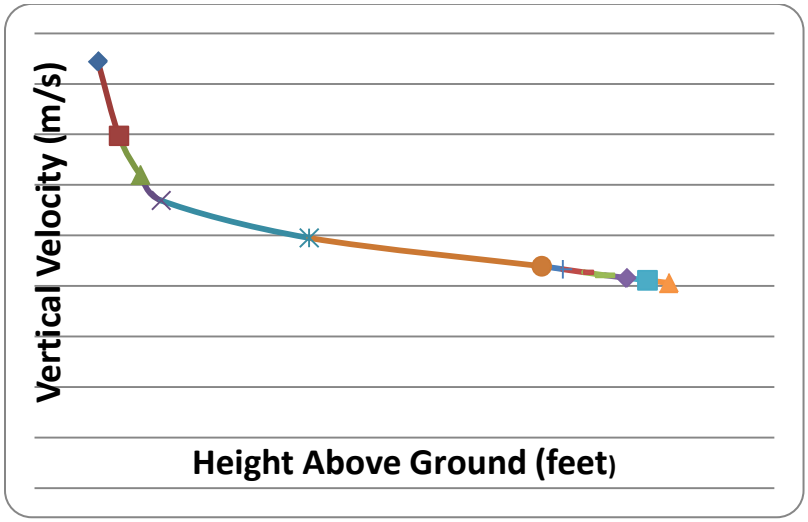
b – Not Merged means not fully merged.

The values shown in **Plume Velocity Table 4** are worst-case values for peak load operation during average ambient temperatures, with dead calm wind conditions from ground level to the height for the 4.3 m/s vertical velocities. For other operating scenarios and ambient temperatures, the top heights for the 4.3 m/s vertical velocities would be somewhat lower than these maximum values and aircraft flying above these levels should not be affected by vertical velocities that exceed 4.3 m/s.

The gas turbine plume average velocity is calculated to drop below 4.3 m/s at a height of approximately 1,190 feet for the single turbine plume (N=1). The plume diameter at this height is around 103m, which is larger than the distance of two adjacent turbines (54m). Therefore the merging of the two adjacent turbine plumes should be considered. In that case of two plumes fully merging (N=2), the average velocity is calculated to drop below 4.3 m/s at the height of 1,910 feet. The most conservative scenario is to assume all three plumes will fully merge (N=3), where plume average velocity is calculated to drop below 4.3 m/s at a height of approximately 2,540 feet. However, it is very unlikely that all three plumes can merge fully to allow this velocity given the stack separation and the height/atmospheric conditions needed for them to fully merge. Therefore staff proposes to use the scenario of two plume merging (N=2), which shows that the average velocity drops below 4.3 m/s at the height of 1,910 feet.

Plume Velocity Table 4 is based on a calculation procedure that does not indicate how the plumes begin to merge before they are fully merged. The plume velocity would not actually go up between 1,200 and 1,300 feet or between 2,300 and 2,400 feet, rather the velocity curve would be based on partial merging of the one stack, two fully merged exhaust plumes, and three fully merged exhaust plumes cases. This worst-case plume merging velocities, combining the velocity data from the three exhaust merging cases is shown in **Plume Velocity Figure 1**.

Plume Velocity Figure 1
PPEC Turbine Plume Merging Vertical Velocity



The velocity values listed above in **Plume Velocity Table 3** and **Plume Velocity Table 4** are plume average velocities across the area of the plume. The maximum plume velocity, based on a normal Gaussian distribution, is two times the plume average velocity as shown in the table.

WIND SPEED STATISTICS

Since the “Spillane approach” used by staff is limited to calm wind conditions, the frequency of calm wind conditions occurring at the project site needs to be evaluated.

However, calm wind statistics data is not needed as input for the plume modeling itself. **Plume Velocity Table 5** provides the Calm wind speed statistics for Otay Mesa from meteorological data collected for 2006 through 2008. Calm winds for the purposes of the reported monitoring station statistics are those hours with average wind speeds below 1 knot (0.5 m/s). Calm or very low wind speeds can also occur for shorter periods of time within each of the monitored average hourly conditions. However, the shortest time resolution for the available meteorological data is one hour.

Plume Velocity Table 5
Calm Wind Statistics for Otay Mesa

Calm Wind Speed Statistics	
2006	20.1%
2007	17.6%
2008	23.6%
Average	20.4%

Source: PPEC 2011a

Calm/low wind speed conditions averaging an hour or longer appear to be frequent in the site area. Therefore, the “Spillane approach” staff used above is appropriate for the plume velocity analysis at the project site.

CONCLUSIONS

The calculated worst case calm wind condition vertical plume average velocities from the PPEC cooling towers are not predicted to exceed 4.3 m/s at heights at or above 500 feet above ground level. However, the calculated worst case calm wind condition vertical plume average velocities from the PPEC gas turbines are predicted to exceed 4.3 m/s at heights at or above 500 feet above ground level (1,910 feet). There are no other plume sources at the PPEC site, although the Otay Mesa power plant is immediately east of PPEC.

The vertical velocity from the equipment exhaust at a given height above the stack decreases as wind speed increases. However, the plume average vertical velocities for the gas turbines will remain relatively high, and would exceed 4.3 m/s above 500 feet about ground level, during calm or very low wind speed conditions. These low wind speed conditions lasting an hour or more occur reasonably frequently at the site location. Additionally, shorter periods of dead calm winds, lasting long enough to increase the vertical plume average velocity height up to its peak height, can also occur during hours with low average wind speeds.

PPEC is designed as a simple-cycle, peaking, and intermediate load facility. Each unit is proposed to be limited to operate no more than 4,000 hr/yr. Actual operation is likely to be considerably less, perhaps no more than 1,000 to 2,000 hours per depending on electrical system load needs. The ambient condition used in this analysis represents the average ambient temperature case at the peak load, which is considered a reasonably conservative worst case for this peaking project that is expected to primarily operate during the summer.

REFERENCES

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