

## CALIFORNIA ENERGY COMMISSION

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California Energy Commission

**DOCKETED**  
**08-AFC-10C**

TN 71532

JUL 08 2013

**DATE:** July 8, 2013

**TO:** Interested Parties

**FROM:** Eric Veerkamp, Compliance Project Manager

**SUBJECT:** Lodi Energy Center (08-AFC-10C)  
Staff analysis of proposed modifications to Air Quality Conditions of Certification regarding emissions, combustor tuning definitions and limits, and fuel flow meter specifications.

On February 1, 2013, Northern California Power Authority (NCPA) filed a petition with the California Energy Commission (Energy Commission) to amend the Energy Commission Final Decision for the Lodi Energy Center (LEC), requesting modifications to seven Air Quality Conditions of Certification (COCs). On April 14, 2013, NCPA filed a revised petition, repeating their February 1 request and asking for changes to one additional condition. NCPA made a final request to make additional minor changes to maintain consistency of the Conditions of Certification with the San Joaquin Valley Air Pollution Control District revised Authority to Construct. Staff has prepared an analysis of these proposed changes, and recommends the Energy Commission approve the changes requested. A copy of staff's analysis is enclosed for your information, review, and comment.

LEC is a 296-megawatt, natural gas-fired, combined-cycle generating facility consisting of one Siemens STGS-5000F combustion turbine generator, one heat recovery steam generator, one Siemens SST-900R4 condensing steam turbine generator, and associated equipment. The project was certified by the Energy Commission on April 21, 2010, and began commercial operation in November 2012. The project is located in the City of Lodi, in San Joaquin County, adjacent to the City's Wastewater Treatment plant, fronting Interstate-5 at Thornton Road.

The revised petition, if approved, would change COCs **AQ-25** through **AQ-29**, **AQ-32**, **AQ-33**, and **AQ-52** in the Final Commission Decision. As a result of subsequent discussions with an NCPA representative that occurred after the petition to amend was filed, and the letter requesting further modifications to Conditions of Certification, staff is also recommending changes to COCs **AQ-22**, **AQ-23**, **AQ-65**, and **AQ-66**. These changes to 12 COCs would:

1. Increase CO emissions during combustion turbine startup (**AQ-25**) to match actual performance rather than anticipated performance, as approved in the Energy Commission Final Decision;
2. Allow gas turbine combustor tuning necessary for periodic maintenance and calibration, and ensure appropriate recordkeeping for tuning events (**AQ-22**, **AQ-26**, **AQ-27**, **AQ-28**, **AQ-29**, **AQ-32**, **AQ-33**, **AQ-65**, and **AQ-66**);

3. Revise language which refers to establishing the minimum temperature at which the Selective Catalytic Reduction (SCR) system starts ammonia injection (**AQ-22** and **AQ-23**); and
4. Define the type of volumetric fuel flow meter that is used to measure the amount of natural gas that is combusted (**AQ-52**).

Actual CO emissions will increase during startup, based on LEC operating data; however, no additional mitigation is necessary and no additional emission credits are required because the annual emission limit for CO will remain unchanged, and the State of California is in attainment for CO. It is staff's opinion that, with the implementation of the revised conditions, the project will remain in compliance with applicable laws, ordinances, regulations, and standards, and the proposed changes to COCs would not result in any significant adverse direct, indirect, or cumulative impacts to the environment (Title 20, California Code of Regulations, Section 1769).

The petitions and staff's analysis have been posted on the California Energy Commission's LEC webpage at <http://www.energy.ca.gov/sitingcases/lodi/compliance/html>. Staff intends to recommend approval of the petition at the **August 14, 2013** business meeting of the Energy Commission. If the petition is approved, the Commission's order will also be posted on the above webpage.

Any person may file written comments on the staff analysis. All comments must be in writing and filed with the Energy Commission's Dockets Unit. Those who wish to provide comments on the staff analysis are asked to file them prior to **August 8, 2013**. All written comments and all materials filed with the Dockets Unit will become part of the public record of the proceeding and may be posted on the Commission's webpage for the LEC.

Those submitting comments electronically should provide them as either a Microsoft Word document (.doc or .docx) or in Portable Document Format (.pdf) and include your name or your organization's name in the file name. Please e-mail electronic written comments to [docket@energy.ca.gov](mailto:docket@energy.ca.gov) and include the docket number 08-AFC-10C in the subject line of your e-mail. Those submitting non-electronic written comments should include the docket number 08-AFC-10C in the first paragraph and mail or hand-deliver the comments to:

California Energy Commission  
Dockets Unit, MS-4  
Docket No. 08-AFC-10C  
1516 9<sup>th</sup> Street, MS-2000  
Sacramento, CA 95814-5512

If you have any questions, please contact Eric W. Veerkamp, Compliance Project Manager, at (916) 654-4611, or fax your questions to (916) 654-3882, or e-mail them to [eric.veerkamp@energy.ca.gov](mailto:eric.veerkamp@energy.ca.gov).

If you desire information on participating in the Energy Commission's review of the petition, please contact the Energy Commission's Public Adviser at (916) 654-4489, or at (800) 822-6228 (toll free in California). The Public Adviser's Office can also be contacted via e-mail at [publicadviser@energy.ca.gov](mailto:publicadviser@energy.ca.gov). News media inquiries should be directed to the Energy Commission Media Office at (916) 654-4989, or by e-mail at [mediaoffice@energy.ca.gov](mailto:mediaoffice@energy.ca.gov).

Enclosure

Mail List No. 7327

# LODI ENERGY CENTER (08-AFC-10C)

## Petition to Amend Carbon Monoxide Start-up Emission Limit and Other Minor Air Quality Changes Joseph Hughes July 8, 2013

### INTRODUCTION

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On April 4, 2013, the Northern California Power Agency (NCPA) filed a petition to amend the California Energy Commission Decision (CEC 2010) to increase the carbon monoxide (CO) emission limit during start-up operations and make other minor changes to air quality conditions of certification (COC) for the Lodi Energy Center (LEC). The 296 megawatt (MW) project was certified by the Energy Commission on April 21, 2010. LEC is located on a 4.4-acre parcel in the City of Lodi, adjacent to the existing 49 MW NCPA Combustion Turbine Project #2 (STIG plant) and the City of Lodi's White Slough Water Pollution Control Facility (WPCF). The combined cycle generating facility includes one Siemens STGS-5000F natural gas-fired combustion turbine generator (CTG), one heat recovery steam generator (HRSG), one Siemens SST-900RH condensing steam turbine generator (STG), and associated support equipment. The project is located in the San Joaquin Valley and within the boundaries of the San Joaquin Valley Air Pollution Control District (SJVAPCD).

NCPA is requesting several changes to air quality COCs. The proposed modifications in the petition to amend would change COC **AQ-25** through **AQ-29**, **AQ-32**, **AQ-33** and **AQ-52** in the Final Commission Decision. Based on subsequent discussions with a representative of NCPA that occurred after this petition to amend was filed and the letter requesting additional changes to COCs (NCPA 2013a) provided May 20, 2013, NCPA is also proposing changes to COC **AQ-22**, **AQ-23**, **AQ-65** and **AQ-66**. The proposed changes would:

1. Increase CO emissions during combustion turbine startup (**AQ-25**) to match actual performance rather than anticipated performance as presented in the Application for Certification (AFC) and approved in the Commission Final Decision;
2. Allow gas turbine combustor tuning necessary for periodic maintenance and calibration, and ensure appropriate record keeping for tuning events (**AQ-22**, **AQ-26**, **AQ-27**, **AQ-28**, **AQ-29**, **AQ-32**, **AQ-33**, **AQ-65** and **AQ-66**);
3. Revise language which refers to establishing minimum temperature at the Selective Catalytic Reduction (SCR) system to start ammonia injection (**AQ-22** and **AQ-23**);
4. Define the type of volumetric fuel flow meter that is used to measure the amount of natural gas that is combusted in the CTG (**AQ-52**).

All of the proposed modifications have been analyzed, and there would be no significant impacts associated with the changes and no additional emission reduction credits

(ERCs) or mitigation would be required because the annual emission limit for CO would remain unchanged.

## **LAWS, ORDINANCES, REGULATION, AND STANDARDS (LORS) - COMPLIANCE**

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All previously analyzed laws, ordinances, regulations, and standards (LORS) continue to apply to the project and the proposed changes do not trigger any additional air quality LORS. An application for permit amendment was filed with the San Joaquin Valley Air Pollution Control District (SJVAPCD) on January 2, 2013 and amended via email on February 28, 2013 and April 3, 2013. The SJVAPCD issued an Authority to Construct (ATC) permit June 17, 2013 demonstrating that the proposed changes comply with all applicable LORS. The ATC permit would become applicable only if the Energy Commission approves this amendment request.

## **SETTING**

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The project setting would not be affected by the requested modifications beyond what was previously analyzed and approved in the Final Commission Decision with the exception of the increase in CO emissions during start-up operations. However, background concentrations of CO remain well below state and national ambient air quality standards (AAQS/NAAQs), and all of California remains in attainment for CO. The impacts associated with the increase in CO emissions during start-up operations would not cause or contribute to violations of these standards. The worst case 3-year background CO concentrations have declined from 5,500 ( $\mu\text{g}/\text{m}^3$ ) and 2,640 ( $\mu\text{g}/\text{m}^3$ ) for the 1-hour and 8-hour averaging times respectively (2006-2008) as presented in the Final Commission Decision to 3,910 ( $\mu\text{g}/\text{m}^3$ ) and 2,544 ( $\mu\text{g}/\text{m}^3$ ) for the 1-hour and 8-hour averaging times respectively (2009-2011).

## **ANALYSIS**

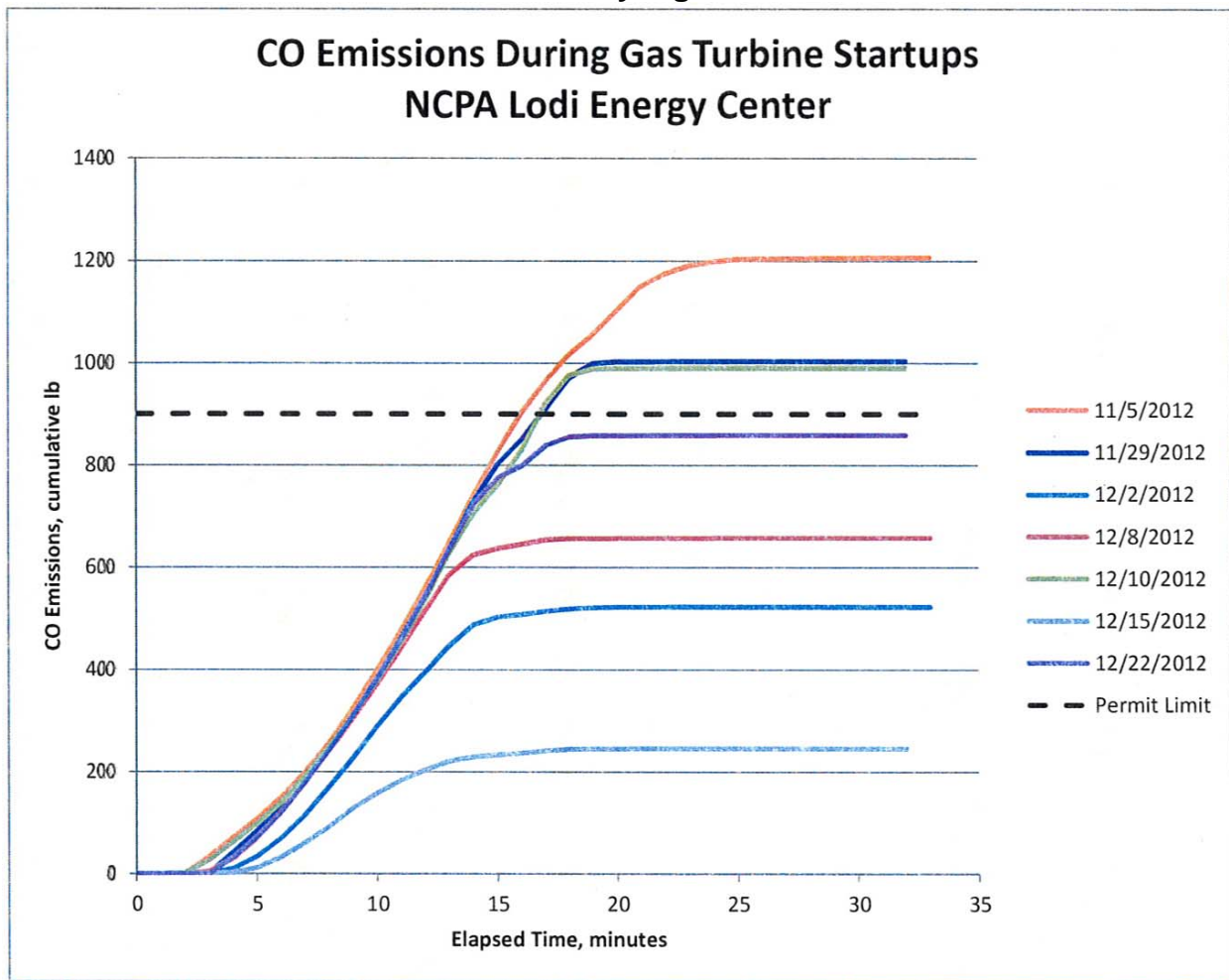
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### **Increase CO Emissions during Start-up Operations**

The Final Commission Decision limits CO emissions to 900 lb/hr. This limit was proposed by NCPA in the AFC and was based on start-up data from other similar gas turbines. However, now that the plant is operational, NCPA has found that under certain conditions (e.g. low load and low ambient temperatures) CO emissions are higher than originally expected. Under these conditions, continuous emission monitoring at LEC has indicated that CO emissions can be as high as 1,207 lb/hr during a cold start. After discussion with the SJVAPCD permit engineer, NCPA is proposing to add a compliance margin of 25 percent to the highest measured emission rate to ensure future compliance. Therefore, NCPA is proposing to modify COC **AQ-25** to limit CO emissions to 1,500 lb/hr during start-up and shutdown periods. NCPA is not requesting any changes to daily or annual emission limits. No additional ERCs or mitigation would be required because the annual emission limit for CO would remain the same and the

entire state is in attainment for CO. **Air Quality Figure 1** shows how cumulative pounds (lb) of CO emissions from the LEC combustion turbine vary during start-up.

**Air Quality Figure 1**



Source: NCPA 2013.

The proposed increase in start-up emissions from 900 lb/hr to 1,500 lb/hr is lower than the previously analyzed and approved commissioning period impacts for the LEC at 2,000 lb/hr, which did not lead to adverse impacts at this emission rate. Therefore, no significant impacts would occur at 1,500 lb/hr. Nonetheless, **Air Quality Table 1** provides the revised modeled maximum impacts during start-up operations. The original 1-hour and 8-hour impacts, as identified in the Final Commission Decision, were 337.3 ( $\mu\text{g}/\text{m}^3$ ) and 110.2 ( $\mu\text{g}/\text{m}^3$ ) respectively. The revised 1-hour impact was obtained by scaling the maximum hourly emission rate of 900 lb/hr to 1,500 lb/hr and multiplying by the original maximum facility impact. In the Commission Final Decision, the 8-hour impact was modeled assuming that the gas turbine was in start-up mode for six hours and at base load under cold temperature conditions for two hours, for a total of 5,408 lb CO over the 8-hour period. The revised maximum 8-hour impact is evaluated by assuming all maximum daily emissions (5,570.3 lb/day) occur in an 8-hour period. Even

with the increased start-up emissions, worst-case impacts lead to results that are only 19 and 27 percent of the 1-hour and 8-hour CO standards respectively.

**Air Quality Table 1**  
**Maximum Modeled Impacts for Proposed Start-up Emissions**

Pollutant	Averaging Time	Maximum Facility Impact <sup>a</sup> (µg/m <sup>3</sup> )	Background <sup>b</sup> (µg/m <sup>3</sup> )	Total Impact (µg/m <sup>3</sup> )	AAQS (µg/m <sup>3</sup> )	Percent of Standard
CO	1-hour	562	3,910	4,472	23,000	19%
	8-hour	113	2,544	2,657	10,000	27%

Source:

- a. NCPA 2008, CEC 2010, NCPA 2013, and staff calculations (scaling).
- b. ARB, Air Quality Data Statistics (<http://www.arb.ca.gov/adam/welcome.html>) and EPA, Air Data ([http://www.epa.gov/airdata/ad\\_rep\\_mon.html](http://www.epa.gov/airdata/ad_rep_mon.html)). Accessed April 2013.

### Allow Gas Turbine Combustor Tuning

Gas turbine combustor tuning was initially performed during the commissioning period. However, infrequent periodic gas turbine combustor tuning is also required after turbine combustor parts replacement, for maintenance and calibration, and to achieve better performance. Tuning operations may require operation of the turbine at low loads, and during these low load tuning operations, gas turbine CO and NO<sub>x</sub> emissions are expected to exceed the routine operation hourly and daily limits.

NCPA is proposing changes to **AQ-25**, **AQ-26**, **AQ-27**, **AQ-28**, **AQ-29**, **AQ-32** and **AQ-33** to define and limit combustor tuning activities and to provide that the higher emission limits applicable to start-up and shutdown periods also apply during combustor tuning periods. NCPA is proposing in **AQ-27** to limit combustor tuning to not exceed 8 hours in any calendar day or 40 hours in any calendar year. Combustor tuning periods would be restricted to the previously analyzed and approved start-up and shutdown emission limits in **AQ-25** and **AQ-32**. With the implementation of the amended language in the COCs, there would be no significant impacts associated with gas turbine combustor tuning periods.

### Volumetric Fuel Flow Meter

NCPA is requesting a change to the requirement that a fuel flow meter on the gas turbine be “non resettable and totalizing” to avoid inconsistency with the continuous emissions monitoring requirements under 40 CFR Part 60 and the fuel metering requirements under 40 CFR Part 75.

Non-resettable totalizing fuel meters are commonly used on emergency engines and portable tanks, but fuel use in gas turbines is measured and totalized through the computerized data acquisition and handling system that processes and performs calculations using fuel flow meter data and other data collected by the Continuous Emissions Monitoring System (CEMS). This data is used to record historical fuel use, equivalent to having a non-resettable fuel meter. There would be no air quality related impacts with this requested modification.

## Establishing Minimum Temperature at the SCR System to Start Ammonia Injection

Air quality COC **AQ-22** and **AQ-23** require establishing minimum temperature at the SCR catalyst face to start ammonia injection into the system. NCPA has supplied a minimum catalyst face temperature of 406°F at which ammonia injection into the SCR system would occur. The proposed changes to COC **AQ-22** and **AQ-23** acknowledge that minimum catalyst face temperature has already been established and enables the SJVAPCD and California Energy Commission to administratively modify the temperature as necessary following any replacement of the SCR catalyst material.

## CONCLUSIONS AND RECOMMENDATIONS

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Staff recommends approval of the proposed project modifications. The project would continue to comply with applicable laws, ordinances, regulations, and standards (LORS). The proposed project modifications would not cause any significant impacts with the recommended changes to the conditions of certification (COCs).

## PROPOSED MODIFICATIONS TO CONDITIONS OF CERTIFICATION

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The following Conditions of Certification would be amended in the Final Commission Decision for the Lodi Energy Center. ~~Strikethrough~~ is used to indicate deleted language and bold underline for new language.

**AQ-22** During all types of operation, including startup (cold, warm and hot), ~~and shutdown,~~ and combustor tuning periods, ammonia injection into the SCR system shall occur once the minimum temperature at the catalyst face has been reached to ensure NOx emission reductions can occur with a reasonable level of ammonia slip. ~~The minimum catalyst face temperature shall be determined during the final design phase of this project and shall be submitted to the District at least 30 days prior to commencement of construction.~~ [District Rule 2201]

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

**AQ-23** The District shall may administratively ~~add~~ modify the ~~minimum-temperature limitation established pursuant to the above condition in the final Permit to Operate~~ as necessary following any replacement of the SCR catalyst material. [District Rule 2201]

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

**AQ-25** During start-up, ~~and shutdown,~~ and combustor tuning periods, the emissions shall not exceed any of the following limits: NOx (as NO2) - 160.00 lb/hr; CO -



900.00 **1,500.00** lb/hr; VOC (as methane) - 16.00 lb/hr; PM10 - 9.00 lb/hr; SOx (as SO2) - 6.10 lb/hr; or Ammonia (NH3) - 28.76 lb/hr. [District Rule 2201]

**Verification:** A summary of significant operation and maintenance events and monitoring records required shall be included in the quarterly operation report (**AQ-SC8**).

**AQ-26** Start-up is defined as the period of time during which a unit is brought from a shutdown status to its operating temperature and pressure, including the time required by the unit's emission control system to reach full operation. **Shutdown is defined as the period of time during which a unit is taken from an operational to a non-operational status ending when the fuel supply to the unit is completely turned off.** [District Rule 4703, **3.26**, 3.29]

**Verification:** No verification necessary.

~~**AQ-27** Shutdown is defined as the period of time during which a unit is taken from an operational to a non-operational status ending when the fuel supply to the unit is completely turned off. [District Rule 4703, 3.26]~~ **Combustor tuning periods are any periods, not to exceed 8 hours in any calendar day or 40 hours in any calendar year, when combustor tuning activities are taking place. Combustor tuning activities are defined as any testing, adjustment, tuning and calibration activities recommended by the gas turbine manufacture to insure safe and reliable steady-state operation of the gas turbines following replacement of the combustor components, during seasonal tuning events, or other times when recommended by the turbine manufacturer or necessary to maintain low emissions performance. This includes, but is not limited to, adjusting the amount of fuel distributed between the combustion turbines staged fuel systems to simultaneously minimize NOx and CO production while minimizing combustor dynamics and ensuring combustor stability.**

~~**Verification:** No verification necessary~~ **The owner or operator shall maintain records of the following items on the combustor tuning activities: (1) date and hours on which combustor tuning activity occurs, (2) description of each combustor tuning activity, (3) reason why each combustor tuning activity is required, (4) documentation (such as operating manuals, letters, e-mails, etc.) showing that each combustor tuning activity is necessary. A summary of any combustor tuning activity shall be included in the quarterly operation report (AQ-SC8).**

**AQ-28** The emission control systems shall be in operation and emissions shall be minimized insofar as technologically feasible during startup, and shutdown **and combustor tuning periods.** [District Rule 4703, 5.3.2]

**Verification:** The project owner shall submit to the District and CPM the startup, and shutdown **and combustor tuning** event duration data demonstrating compliance with this condition as part of the quarterly operation report (**AQ-SC8**).

**AQ-29** Except during startup, ~~and shutdown~~ **and combustor tuning** periods, emissions from the gas turbine system shall not exceed any of the following limits: NOx (as NO2) - 15.54 lb/hr and 2.0 ppmvd @ 15% O2; CO – 9.46 lb/hr and 2.0 ppmvd @ 15% O2; VOC (as methane) - 3.79 lb/hr and 1.4 ppmvd @ 15% O2; PM10 - 9.0 lb/hr; or SOx (as SO2) - 6.10 lb/hr. NOx (as NO2) emission limits are based on 1-hour rolling average period. All other emission limits are based on 3-hour rolling average period. [District Rules 2201, 4001 and 4703]

**Verification:** A summary of significant operation and maintenance events and monitoring records required shall be included in the quarterly operation report (**AQ-SC8**).

**AQ-32** Emissions from the gas turbine system, on days when a startup, ~~and/or shutdown~~ **and/or combustor tuning activities** occurs, shall not exceed the following limits: NOx (as NO2) - 879.7 lb/day; CO - 5,570.3 lb/day; VOC - 164.2 lb/day; PM10 - 216.0 lb/day; SOx (as SO2) - 146.4 lb/day, or NH3 - 690.3 lb/day. Daily emissions shall be compiled for a twenty-four hour period starting and ending at twelve-midnight. [District Rule 2201]

**Verification:** A summary of significant operation and maintenance events and monitoring records required shall be included in the quarterly operation report (**AQ-SC8**).

**AQ-33** Emissions from the gas turbine system, on days when a startup, ~~and/or shutdown~~ **and/or combustor tuning activities** does not occur, shall not exceed the following: NOx (as NO2) - 373.0 lb/day; CO - 227.0 lb/day; VOC - 91.0 lb/day; PM10 - 216.0 lb/day; SOx (as SO2) - 146.4 lb/day, or NH3 - 690.3 lb/day. Daily emissions shall be compiled for a twenty-four hour period starting and ending at twelve-midnight. [District Rule 2201]

**Verification:** A summary of significant operation and maintenance events and monitoring records required shall be included in the quarterly operation report (**AQ-SC8**).

**AQ-52** A ~~non-resettable, totalizing~~ mass or volumetric fuel flow meter **that meets the requirements of 40 CFR part 75** ~~to measure the amount of natural gas combusted in the unit~~ shall be installed, utilized and maintained **to measure the amount of natural gas combusted in the unit**. [District Rules 2201 and 4703]

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

**AQ-65** The owner or operator shall maintain records of the following items: 1) hourly and daily emissions, in pounds, for each pollutant listed in this permit on the days startup, ~~and or shutdown~~ **and/or combustor tuning** of the gas turbine system occurs, 2) hourly and daily emissions, in pounds, for each pollutant in this permit on the days startup, ~~and or shutdown~~ **and/or combustor tuning activities** of the gas turbine system does not occur, 3) quarterly emissions, in pounds, for each pollutant listed in this

permit, and 4) the combined CO emissions (12 consecutive month rolling total) in pounds, for permit unit N-2697-5 and N-2697-7. [District Rule 2201]

**Verification:** A summary of significant operation and maintenance events and monitoring records required shall be included in the quarterly operation report (**AQ-SC8**).

**AQ-66** The owner or operator shall maintain a stationary gas turbine system operating log that includes, on a daily basis, the actual local startup and stop time, total hours of operation, the type and quantity of fuel used, mode of start-up (cold, warm, or hot), duration of each start-up, ~~and duration of each shutdown,~~ and duration of each combustor tuning event. [District Rule 2201 and 4703, 6.26, 6.28, 6.2.11]

**Verification:** A summary of significant operation and maintenance events and monitoring records required shall be included in the quarterly operation report (**AQ-SC8**).

## REFERENCES

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CEC 2010 – California Energy Commission. Energy Commission Final Decision on the Lodi Energy Project, Application for Certification (08-AFC-10). April 21, 2010.

CEC 2010a – California Energy Commission. Exhibit 303, Addendum to Staff Assessment: Revised Air Quality. Final Staff Assessment for the Lodi Energy Center, Application for Certification (08-AFC-10). January 28, 2010.

NCPA 2008 – Northern California Power Agency. Application for Certification for the Lodi Energy Center (08-AFC-10). September 10, 2008.

NCPA 2013 – Northern California Power Agency. Revised Petition to Amend Air Quality Conditions of Certification. April 4, 2013.

NCPA 2013a – Northern California Power Agency. Letter regarding Petition to Amend Air Quality Conditions of Certifications and SJVAPCD Draft Authority to Construct/Certificate of Conformity. May 20, 2013.

SJVAPCD 2013 – San Joaquin Air Pollution Control District. Authority to Construct for the Lodi Energy Project. June 17, 2013.