

Memorandum

Date: May 6, 2010
 Telephone: (916) 654-4679

To: Commissioner James D. Boyd, Presiding Member

From: California Energy Commission – John Kessler, Project Manager
 1516 Ninth Street
 Sacramento, CA 95814-5512

DOCKET	
07-AFC-3	
DATE	<u>MAY 06 2010</u>
REC'D	<u>MAY 06 2010</u>

**Subject: ENERGY COMMISSION STAFF'S ERRATA
 TO THE FINAL STAFF ASSESSMENT AIR QUALITY ADDENDUM
 CPV SENTINEL ENERGY PROJECT (07-AFC-3)**

Energy Commission staff is providing an Errata to the Final Staff Assessment (FSA) Air Quality Addendum to provide minor corrections to the assessment and Conditions of Certification. This errata corrects references to Quarterly Operations Reporting as would be required under Condition of Certification AQ-SC9 as referenced in Conditions of Certification AQ-1, -3, -4, -7, -10, and -15 which were inadvertently stated in the FSA Addendum as referring to AQ-SC10. This errata also includes staff's responses to the applicant's comments to the FSA Air Quality Addendum as filed on May 3, 2010 for which staff concurs. All corrections are presented in underline-strikeout form.

Cc: Docket (07-AFC-3)
 WebWorks
 POS

Errata to Staff's April 15, 2010 Fsa Air Quality Addendum

INITIAL COMMISSIONING EMISSIONS, PAGES 2.1-19 AND -20

New power generation facilities must go through an initial firing and commissioning phase before being deemed commercially available to generate power. During this period, emissions may exceed permitted levels due to numerous startups and shutdowns, periods of low load operation, lack of pollution control equipment during test periods and other testing required before emission control systems are fine-tuned for optimum performance.

The applicant anticipates six distinct commissioning phases (CPV 2007a), with a total of approximately ~~200~~ 150 hours of operation per turbine without full emissions controls, and a further 300 hours per turbine of commissioning tuning under full emissions control. **AIR QUALITY Table 7** presents the predicted maximum short term emissions of NO_x, CO, and VOC. PM₁₀ and SO₂ emissions are not included here since they are proportional to fuel use, and fuel use (and thus PM₁₀ and SO₂ emissions) during commissioning is equal to or lower than during full load operations.

Air Quality Table 7
Estimated Maximum Initial Commissioning Emissions

	NO_x	CO	VOC
Maximum Hourly Emissions (lb/hour)	168	305	15

Source: CPV 2007a

PROPOSED OPERATION EMISSIONS , CORRECTIONS TO AIR QUALITY TABLE 8, PAGE 2.1-21

Per the applicant's request, all emissions calculations and limitations are based on an assumed availability of 2,628 hours per year, plus 300 startups and 300 shutdowns for all eight CTG Units (CPV 2007a, CPV 2009). The CTGs will burn only pipeline natural gas; there are no provisions for an alternative or back-up fuel.

The proposed maximum criteria air pollutant emissions are based entirely on vendor data for the GE LMS100 turbine and the data presented in the SCAQMD Preliminary Determination of Compliance (SCAQMD 2007a). **AIR QUALITY Table 8** lists the maximum 1-hour emissions from each piece of equipment on the proposed project site.

**Air Quality Table 8
Equipment Maximum Short-Term Emissions Rates
(pounds per hour [lb/hr], except as noted)**

Chapter 1 PROCESS DESCRIPTION	NO_x	SO₂	CO	VOC	PM₁₀
CTG Startup (per turbine) (25 minute startup, lb/4-hr event)	24.86	0.17	16.89	4.26	2.08
CTG Full Load (per turbine)	7.95	0.63	7.74	2.21	5.00
CTG Shutdown (per turbine) (10 minute shutdown, lb/4-hr event)	6.0	0.02	35.0	3.0	0.86
Fire Pump Engine	2.54	0.001	0.31	0.05	0.07
Cooling Towers (all 8 cells)	0	0	0	0	0.79

Source: CPV 2007a, FDOC Reference

COMMISSIONING PHASE MODELING IMPACT ANALYSIS. CORRECTIONS TO LAST 2 PARAGRAPHS, PAGE 2.1-32

The initial commissioning of a power plant refers to the time frame between completion of construction and the consistent production of electricity for sale on the market. Normal operating emission limits usually do not apply during initial commissioning procedures. The CPV Sentinel project will go through several tests during initial commissioning. During the first set of tests, post-combustion controls will not be operational (i.e., the SCR and oxidation catalyst).

Initial commissioning starts with a Full-Speed, No-Load test. This test runs the turbine at approximately 20 percent of its maximum heat input rate. Components tested include the ignition system, synchronization with the electric generator, and the turbine-overspeed safety system. Part Load testing runs the turbines at approximately 60 percent of the maximum heat input rating. During this test, the turbine will be tuned. Full Load testing runs the turbines to their maximum heat input rate. This testing entails further tuning of the turbine. Full Load with partial SCR testing runs the turbines at 100 percent of their maximum heat input rate and operates the SCR ammonia injection grid for the first time at less than maximum injection rate. Finally, Full Load with full SCR testing runs the turbines at their maximum heat input rate and operates the SCR ammonia inject grid at its full capacity. It is during this test that the SCR system will be completely tuned and operated at design levels (i.e., NO_x control at 2.50 ppm).

There is little experience to draw from regarding the initial commissioning of the GE LMS100 turbines. The applicant is estimating that it will need approximately ~~394~~ 150 hours of actual turbine operation per turbine train for commissioning purposes. ~~The applicant plans to Commission all five turbine trains at approximately the same time. The applicant estimates that the maximum NO_x emission rate (475 80 lbs/hr for one turbine) is most likely to occur during the water injection commissioning phase when the water injection will be 50 percent effective and the turbine train will be at 50 percent load. The and the maximum CO emission rate (255 198 lbs/hr) will most likely occur during Load Step 10 of the dynamic commissioning when the water injection is 100 percent effective and the turbine train is at 100 percent load (SCR and oxidation catalyst are not yet commissioned).~~

DISTRICT CONDITIONS OF CERTIFICATION, BEGINNING ON PAGE 2.1-83

Changes to Condition and Verification of AQ-1

AQ-1 The project owner shall limit the emissions from each gas fired combustion turbine train exhaust stack as follows:

Units 1 through 8

Contaminant	Emissions Limit
PM10	2,428 lbs in any one month
CO	6,477 lbs in any one month
Sox	293 lbs in any one month
VOC	1,425 lbs in any one month

For the purpose of this condition, the limit(s) shall be based on the emissions from a single exhaust stack.

The project owner shall calculate the emission limit(s) by using the monthly fuel use data and the following emission factors: PM10: ~~6.97~~ 5.0 lb/hr, VOC: 2.189 lb/mmscf & SOx: ~~0.74~~ 0.69 lb/mmscf.

Compliance with the CO emission limit shall be verified through valid CEMS data.

The project owner shall calculate the emission limit(s) for CO for the purpose of determining compliance with the monthly emission limit in the absence of valid CEMS data by using the following emission factor(s):

- A. During the commissioning period and prior to CO catalyst installation: 38.48 lb/mmscf.
- B. After installation of the CO catalysis but prior to CO CEMS certification testing: ~~48.73~~ 14.38 lb/mmscf; The emission rate shall be recalculated in accordance with Condition AQ-10 if the approved CEMS certification test resulted in emission concentration higher than ~~64~~ ppmv.
- C. After CO CEMS certification testing: ~~48.73~~ 14.38 lb/mmscf; After CO CEMS certification test is approved by the AQMD, the emissions monitored by the CEMS and calculated in accordance with Condition AQ-10 shall be used to calculated emissions.

For the purpose of this condition, the limit(s) shall be based on the emissions from a single turbine. During Commissioning, the CO emissions shall not exceed 11,602 lbs/month and the VOC emissions shall not exceed 620 lbs/month.

The project owner shall provide the AQMD with written notification of the date of initial CO catalyst use within (7) days of this event.

For the purpose of this condition the turbine shall not commence with normal operation until the commissioning process has been completed. Normal operations may proceed in the same commissioning month provided the project owner follows the requirements listed below.

The project owner shall calculate the commissioning emissions for VOC, SO_x and PM₁₀) for the commissioning month (beginning of the month to the last day of commissioning) using the equation below and the following emission factors: VOC: 2.06 lb/mmcf; PM₁₀: 2.99 lb/mmcf; and SO_x: 0.12 lb/mmcf.

The commissioning emissions for VOC, SO_x, and PM₁₀ shall be subtracted from the monthly emissions limits (listed in the table at the top of this condition) and the revised monthly emission limits will be the maximum emissions allowed for the remaining of the month.

For the purpose of this condition, the term “normal operations” is defined as the turbine is able to supply electrical energy to the power grid.

Verification: The project owner shall submit all emission calculations, fuel use, CEM records and a summary demonstrating compliance of all emission limits stated in this Condition for approval to the CPM on a quarterly basis in the quarterly emissions report (AQ-SC910).

Changes to Condition and Verification of AQ-3

AQ-3 The 2.5 ppm NO_x emission limit, the 2.0- ppm VOC limit and the 4.0 ppm CO emission limit shall not apply during turbine commissioning, start-up and shutdown. The commissioning period shall not exceed 150 operating hours per turbine from the initial start-up. Following commissioning, start-ups shall not exceed 25 minutes and shutdowns shall not exceed 10 minutes. Written records of commissioning, start-ups and shutdowns shall be kept and made available to SCAQMD and submitted to the CPM for approval. Emissions of NO_x shall not exceed ~~29.5254~~ lbs/hr for any hour in which a startup occurs. Units 1 through 8 shall be limited to a maximum of 300 startups per year;

The 19 lb/mmcf NO_x emission limit(s) shall only apply during interim reporting period during initial turbine commissioning and the ~~12.40~~ 12.26 lbs/mmcf shall apply only during the interim reporting period after the initial turbine commissioning period, to report RECLAIM emissions. The interim period shall not exceed 12 months from the initial start-up date.

For this condition startup shall be defined as the start up process to bring the turbine in full successful operations. If during startup the process is aborted and the startup is restarted, then the startup and restart is defined as one startup. In this case the startup time shall not exceed 1 hour.

The project owner/operator shall complete construction and the project shall be fully operational within three years of the issuance of the permit to construction from the District.

Verification: The project owner shall provide the SCAQMD and the CPM with the written notification of the initial start-up date no later than 60 days prior to the startup date. 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 this condition and the emission limits of Condition **AQ-13**. The monthly commissioning status report shall include criteria pollutant emission estimates for each commissioning activity and total commissioning emission estimates. The monthly commissioning status report shall be submitted to the CPM until the report includes the completion of the initial commissioning activities. The project owner shall provide start-up and shutdown occurrence and duration data as part as part of the Quarterly Operation Report (**AQ-SC910**) including records of all aborted turbine startups. The project owner shall make the site available for inspection of the commissioning and startup/shutdown records by representatives of the District, CARB and the Commission.

Changes to Condition and Verification of AQ-4

AQ-4 Each combustion turbine stack shall have the following emission limitations.

- 2.5 PPM NO_x emission averaged over 60 minutes at 15 percent oxygen, dry basis.
- 4.0 ppm CO emission averaged over 60 minutes at 15 percent oxygen, dry basis.
- 2.0 ppm VOC emission averaged over 60 minutes at 15 percent oxygen, dry basis.
- 5.0 ppm NH₃ emission averaged over 60 minutes at 15 percent oxygen, dry basis.

Verification: The project owner shall submit to the CPM for approval all emissions and emission calculations on a quarterly basis as part of the quarterly emissions report of Condition of Certification **AQ-SC910**.

Change to Verification of AQ-5

Verification: The project owner shall submit to the CPM for approval all emissions and emission calculations on a quarterly basis as part of the quarterly emissions report of Condition of Certification **AQ-SC910**.

Changes to Condition and Verification of AQ-6

AQ-6 The project owner shall limit the fuel usage during a commissioning period from each turbine to no more than 301 mmscf of pipeline quality natural gas per month. After the completion of commissioning, units 1 through 8 shall limit the fuel usage from each turbine to no more than 418 425 mmcf in any one non-commissioning calendar month and ~~2,414~~ 2,455 mmcf in any one non-commissioning year.

The operator shall maintain records in a manner approved by the District to demonstrate compliance with this condition. The operator shall install and maintain a fuel flow meter and recorder to accurately indicate and record the

fuel usage being supplied to each turbine. The natural gas shall not exceed H₂S concentrations of more than 0.25 gr/100scf on an annual average of the monthly samples of gas composition or gas supplier documentation. The natural gas fuel sample shall be tested using District Method 307-91 for total sulfur calculated as H₂S.

Verification: The project owner shall submit to the CPM for approval all fuel usage records on a quarterly basis as part of the quarterly emissions report of Condition of Certification **AQ- SC910**.

Change to Condition of AQ-7

AQ-7 The project owner shall conduct an initial source test for NO_x, CO, SO_x, VOC, NH₃ and PM₁₀ and periodic source test every three years thereafter for NO_x, CO, SO_x, VOC and PM₁₀ of each gas turbine exhaust stack in accordance with the following requirements:

- The project owner shall submit a source test protocol to the SCAQMD and the CPM 45 days prior to the proposed source test date for approval. The protocol shall include the proposed operating conditions of the gas turbine, the identity of the testing lab, a statement from the lab certifying that it meets the criteria of SCAQMD Rule 304, and a description of all sampling and analytical procedures.
- The initial source test shall be conducted no later than 180 days following the date of first fire.
- The SCAQMD and CPM shall be notified at least 10 days prior to the date and time of the source test.
- The source test shall be conducted with the gas turbine operating under maximum, average and minimum loads.
- The source test shall be conducted to determine the oxygen levels in the exhaust.
- The source test shall measure the fuel flow rate, the flue gas flow rate and the turbine generating output in MW.
- The source test shall be conducted for the pollutants listed using the methods, averaging times, and test locations indicated and as approved by the CPM as follows:

Source Test Requirements

Pollutant	Method	Averaging Time	Test Location
NOx	SCAQMD Method 100.1	1 hour	Outlet of SCR
CO	SCAQMD Method 100.1	1 hour	Outlet of SCR
SOx	District Method 307.91	N/A	Fuel Sample
VOC	District Method 25.3	1 hour	Outlet of SCR
PM10	District Method 5	4 hours	Outlet of SCR
Ammonia	SCAQMD Methods 5.3 and 207.1 or U.S. EPA Method 17.	1 hour	Outlet of SCR

- The source test results shall be submitted to the SCAQMD and the CPM no later than 60 days after the source test was conducted.
- All emission data is to be expressed in the following units:
 1. ppmv corrected to 15 percent oxygen dry basis,
 2. pounds per hour,
 3. pounds per million cubic feet of fuel burned and
 4. additionally, for PM10 only, grains per dry standard cubic feet of exhaust flow ~~fuel burned~~.
- Exhaust flow rate shall be expressed in terms of dry standard cubic feet per minute and dry actual cubic feet per minute.
- All moisture concentrations shall be expressed in terms of percent corrected to 15 percent oxygen.
- For the purpose of this condition, alternative test methods may be allowed for each of the above pollutants upon concurrence of the AQMD, CARB, EPA and the CEC.

Change to Verification of AQ-10

Verification: The project owner shall submit to the CPM for approval all fuel usage records on a quarterly basis as part of the quarterly emissions report of Condition of Certification **AQ- SC910**.

Change to Condition and Verification of AQ-11

AQ-11 The owner/operator shall calculate and continuously record ~~determine~~ the hourly ammonia (NH₃) slip emission concentration from each exhaust stack for each gas turbine ~~individually via both~~ using the following formula:

~~SCAQMD Requirement~~

~~—NH₃ (ppmv) = [a-b*(c*1.2)/1E6]*1E6/b; where~~

~~a = NH₃ injection rate (lb/hr) / 17(lb/lbmol),~~

~~b = dry exhaust flow rate (scf/hr) / 385.5 (scf/lbmol),~~

~~c = change in measured NOx across the SCR (ppmvd at 15 percent O₂)~~

~~The above described ammonia slip calculation procedure shall not be used for compliance determination or emission information determination without corroborative data using an approved reference method for the determination of ammonia for the District.~~

~~Energy Commission Requirement:~~

~~NH₃ (ppmv @ 15 percent O₂) = ((a-b*(c/1E6))*1E6/b)*d, where:~~

~~a = NH₃ injection rate (lb/hr)/17(lb/lbmol),~~

~~b = dry exhaust gas flow rate (lb/hr)/ (29(lb/lbmol), or~~

~~b = dry exhaust flow rate (scf/hr) / 385.35 (scf/lbmol), and~~

~~c = change in measured NOx concentration ppmv corrected to 15 percent O₂ across the SCR (ppmvd at 15% O₂) catalyst, and~~

~~d = correction factor.~~

The 5 PPMV NH₃ emission limit(s) shall be averaged over 60 minutes at 15% O₂, dry basis.

The operator shall install and maintain a NOx analyzer to measure the SCR inlet NOx ppmv accurate to plus or minus 5 percent calibrated at least once every twelve months.

The NOx analyzer shall be installed and operated within 90 days of initial start-up.

The operator shall use the above described method or another alternative method approved by the Executive Officer of the SCAQMD.

The ammonia slip calculation procedures described above shall not be used for compliance determination or emission information without corroborative data using an approved reference method for the determination of ammonia.

~~The correction factor shall be derived through compliance testing by comparing the measured and calculated ammonia slip. The correction factor shall be reviewed and approved by the CPM on at least an annual basis. The~~

~~correction factor may rely on previous compliance source test results or other comparable analysis as the CPM finds the situation warrants. The above described ammonia slip calculation procedure shall be used for Energy Commission compliance determination for the ammonia slip limit as prescribed in Condition of Certification **AQ-4** and reported to the CPM on a quarterly basis as prescribed in Condition of Certification **AQ-SC910**. An exceedance of the ammonia slip limit as demonstrated by the above Energy Commission formula shall not in and of itself constitute a violation of the limit. An exceedance of the ammonia slip limit shall not exceed 6 hours in duration. In the event of an exceedance of the ammonia slip limit exceeding 6 hours duration, the project owner shall notify the CPM within 72 hours of the occurrence. This notification must include, but is not limited to: the date and time of the exceedance, duration of the exceedance, estimated emissions as a result of the exceedance, the suspected cause of the exceedance and the corrective action taken or planned. Exceedances of the ammonia limit that are less than or equal to 6 hours in duration shall be noted in a specific section within the Quarterly Report (**AQ-SC910**). This section shall include, but is not limited to: the date and time of the exceedance, duration of the exceedance, and the estimated emissions as a result of the exceedance. Exceedances shall be deemed chronic if they total more than 10 percent of the operation for any single exhaust stack. Chronic exceedances must be investigated and redressed in a timely manner and in conjunction with the CPM through the cooperative development of a compliance plan. The compliance plan shall be developed to bring the project back into compliance first and foremost and shall secondly endeavor to do so in a feasible and timely manner, but shall not be limited in scope.~~

~~The owner/operator shall maintain compliance with the ammonia slip limit, redress exceedances of the ammonia slip limit in a timely manner, and avoid chronic exceedances of the ammonia slip limit. Exceedances shall be deemed a violation of the ammonia slip limit if they are not properly redressed as prescribed herein.~~

~~The owner/operator shall install a NO_x analyzer to measure the SCR inlet NO_x ppm accurate to within +/- 5 percent calibrated at least once every 12 months.~~

Verification: ~~The project owner shall include ammonia slip concentrations averaged on an hourly basis calculated via both protocols provided as part of the Quarterly Operational Report required in Condition of Certification **AQ-SC910** and calculated via the protocol provided in this condition. The project owner shall submit all calibration results performed to the CPM within 60 days of the calibration date. The project owner shall submit to the CPM for approval a proposed correction factor to be used in the Energy Commission formula at least once a year but not to exceed 180 days following the completion of the annual ammonia compliance source test. Exceedances of the ammonia limit shall be reported in the following quarterly report as prescribed herein. Chronic exceedances of the ammonia slip limit shall be identified by the project owner and confirmed by the CPM within 60 days of the fourth quarter Quarterly Operational Report (**AQ-SC910**) being submitted to the CPM. If a chronic exceedance is identified~~

~~and confirmed, the project owner shall work in conjunction with the CPM to develop a reasonable compliance plan to investigate and redress the chronic exceedance of the ammonia slip limit within 60 days of the above confirmation.~~

Change to Verification of AQ-15

Verification: The project owner shall submit to the CPM no less than 30 days after installation, a written statement by a California registered Professional Engineer stating that said engineer has reviewed the as-built-designs or inspected the identified equipment and certifies that the appropriate devices have been installed and are functioning properly. The project owner shall submit all dates of operation, elapsed time in hours, and the reason for each operation in the Quarterly Operations Report (**AQ-SC910**).



**BEFORE THE ENERGY RESOURCES CONSERVATION AND DEVELOPMENT
COMMISSION OF THE STATE OF CALIFORNIA
1516 NINTH STREET, SACRAMENTO, CA 95814
1-800-822-6228 – WWW.ENERGY.CA.GOV**

**APPLICATION FOR CERTIFICATION FOR THE
CPV SENTINEL ENERGY PROJECT
BY THE CPV SENTINEL, L.L.C**

DOCKET No. 07-AFC-3

**PROOF OF SERVICE
(Revised 3/24/2010)**

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DECLARATION OF SERVICE

I, April Albright, declare that on May 6, 2010, I served and filed a copy of the attached Energy Commission Staff's Errata to the Final Staff Assessment Air Quality Addendum, dated May 6, 2010. The original document, filed with the Docket Unit, is accompanied by a copy of the most recent Proof of Service list, located on the web page for this project at:

<http://www.energy.ca.gov/sitingcases/sentinel/index.html>

The documents has been sent to both the other parties in this proceeding (as shown on the Proof of Service list) and to the Commission's Docket Unit, in the following manner:

(Check all that Apply)

For service to all other parties:

- sent electronically to all email addresses on the Proof of Service list;
- by personal **delivery**;
- by delivering on this date, for mailing with the United States Postal Service with first-class postage thereon fully prepaid, to the name and address of the person served, for mailing that same day in the ordinary course of business; that the envelope was sealed and placed for collection and mailing on that date to those addresses **NOT** marked "email preferred."

AND

For filing with the Energy Commission:

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

OR

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

CALIFORNIA ENERGY COMMISSION

Attn: Docket No. 07-AFC-3

1516 Ninth Street, MS-4

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I declare under penalty of perjury that the foregoing is true and correct, that I am employed in the county where this mailing occurred, and that I am over the age of 18 years and not a party to the proceeding.

Original signed by: _____
April Albright