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May 11, 2010

File No. 030137-0024

DOCKET
08-AFC-11
DATE MAY 11 2010
RECD. MAY 11 2010

VIA FEDEX

CALIFORNIA ENERGY COMMISSION
Attn: Docket No. 08-AFC-11
1516 Ninth Street, MS-4
Sacramento, California 95814-5512

Re: CPV Vaca Station Power Plant Project: Docket No. 08-AFC-11

Dear Sir/Madam:

Pursuant to California Code of Regulations, title 20, sections 1209, 1209.5, and 1210, enclosed herewith for filing please find a document entitled, "Supplemental NO_2 Air Quality Impact Analysis."

Please note that the enclosed submittal was filed today via electronic mail to your attention and served on all parties to the above-referenced project.

Very truly yours,

Paul E. Kihm
Senior Paralegal

Enclosure

cc: 08-AFC-11 Proof of Service List (w/encl., via e-mail and U.S. Mail)
Michael J. Carroll, Esq. (w/encl.)
Marc T. Campopiano, Esq. (w/encl.)

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May 7, 2010

Susan McLaughlin
Yolo Solano Air Quality Management District
1947 Galileo Ct., Suite 103
Davis, CA 95618

Subject: CPV Vaca Station
Analysis of Compliance with New National Ambient Air Quality Standard for NO_2

Dear Ms McLaughlin:

On December 11, 2008, EPA received an application for a PSD permit for CPV Vaca Station. On July 23, 2009, EPA indicated that the application was incomplete, and requested additional information and analysis, including a supplemental analysis of $PM_{2.5}$ air quality impacts. On November 23, 2009, EPA received the requested information necessary to complete the application. On February 3, 2010, EPA received the supplemental $PM_{2.5}$ analysis that it had requested.

EPA has yet to determine whether the application is complete. Had EPA met the 30-day completeness determination requirement of 40 CFR 124.3(c), an initial determination would have been issued in January 2009, the application would have been deemed complete by July 2009, and a decision would have been due by June 2010 pursuant to Section 165(c) of the Clean Air Act.

One of the consequences of an extended permit review process is that new requirements may come into effect during the review process. Some of these requirements may not have even been proposed at the time that project design was completed and the original application submitted. The District's regulations, in contrast, specify that the rules adopted after an application is complete do not apply to that application.

On February 9, 2010, EPA announced the adoption of a new 1-hour average NO_2 National Ambient Air Quality Standard, to become effective on April 12, 2010. EPA Region 9 has requested that we prepare an analysis that demonstrates the project's compliance with that standard.

Because the District's regulations specify that the rules in effect at the time a complete application is submitted govern the review of that application, the new federal one-hour NO_2 standard is not applicable to the District's review of this project.

The attached demonstration of compliance with the new standard, requested by EPA, is therefore provided for the District's information.

Sincerely,

Steve Hill

cc: Andy Welch, CPV Vaca Station
Mike Carroll, Latham & Watkins
CEC Dockets Office (08-AFC-11)

Attachment: Supplemental NO_2 Air Quality Impact Analysis

sierra research

Supplemental NO_2 Air Quality Impact Analysis

CPV Vaca Station

prepared for:

Competitive Power Ventures

May 2010

prepared by:

Sierra Research, Inc.
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(916) 444-6666

Supplemental NO_2 Air Quality Impact Analysis
CPV Vaca Station

prepared for:

Competitive Power Ventures

May 2010

Principal author:

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Supplemental NO_2 Air Quality Impact Analysis
CPV Vaca Station

Table of Contents

1. BACKGROUND

1.1 Project Description

The CPV Vaca Station (CPVVS) will be a combined-cycle 550-megawatt (MW) power generation facility consisting of either two GE Energy Frame 7FA or Siemens SGT6 5000F natural gas-fired turbine-generators, a single condensing steam turbine (STG), 12-cell cooling tower, and associated balance-of-plant equipment. The facility will be located on a 25-acre parcel in the City of Vacaville, Solano County, California. The project site is located on property owned by the City of Vacaville (City). To the northwest is the City's Easterly Wastewater Treatment Plant (EWTP). There are agricultural land uses to the east, west, and south. This project site is currently occupied by a fallow agricultural field.

1.2 PSD Permit Application History

- November 26. 2008 — PSD permit application submitted
- December 11, 2008 — PSD permit application received by EPA Region 9
- July 23, 2009 — EPA requests additional information prior to accepting the application as complete
- November 23, 2009 — CPVVS submits information necessary to complete application submitted.
- February 10, 2010 — Supplemental PM impact analysis provided at EPA's request
- Pending — EPA determination of application completeness

An ambient air quality impact analysis was prepared to support the November 2008 PSD permit application. The air dispersion modeling indicated that maximum annual NO_2 impact from the project (2.3 $\mu g/m^3$) would exceed the Significant Impact Level (1.0 $\mu g.m^3$) for the annual NO_2 NAAQS.

A full impact analysis demonstrating compliance with the annual NO_2 NAAQS was included in the November 2008 application. At the time that the application was originally submitted, there was no hourly NO_2 NAAQS.

1.3 The New NO_2 Standard

On February 9, 2010 EPA revised the primary NO_2 NAAQS, establishing a new one-hour NO_2 standard to supplement the existing annual standard (75 FR 6473). The new standard became effective on April 12, 2010. .

The new one-hour standard is a statistically-based standard at a level of 100 ppb, based on the 3-year average of the 98th percentile of the yearly distribution[1] of 1-hour daily maximum concentrations, and will supplement the existing annual standard.[2]

This report demonstrates that CPVVS will not interfere with attainment of the new NO_2 standard using the procedure in the Notice Regarding Modeling for New Hourly NO_2 NAAQS (Updated 2/25/2010).

[1] For a reasonably complete annual set of daily measurements, the 98th percentile is the 8th highest measurement.
[2] 75 FR 6474

2. METHODOLOGY

2.1 Overview of Methodology

A full impact analysis requires consideration of the project emissions, nearby sources that might affect concentrations in the area impacted by the project (the "study area"), and regional background concentrations.

The NO_2 impacts in the Study Area from the Project and nearby sources were estimated using AERMOD and the Plume Volume Molar Ratio Method (PVMRM) for each hour in the five-year analysis period (2003–2007).

The representative background concentration for each hour was added to the modeled impact from the Project plus nearby sources to get a predicted concentration for each hour in the analysis period, for each receptor.

EPA's guidance on the use of AERMOD modeling results to calculate NO_2 impacts for comparison to the new standard was followed:[3]

- For each day in the analysis period, the highest one-hour concentration was determined for each receptor in the modeling domain. This is the daily maximum concentration.
- At each receptor, for each calendar year in the analysis period, the 98th percentile daily maximum concentration was determined. Because all five of the annual data sets are essentially complete, the 98th percentile corresponded to the 8th highest daily maximum.
- At each receptor, the 98th percentile daily maximum concentrations were averaged across each three-year period in the five-year analysis period.[4]
- The highest three-year average 98th percentile concentration across all receptors represents the modeled 1-hour NO_2 concentration for comparison with the NAAQS.

[3] *Notice Regarding Modeling for New Hourly NO2 NAAQS*; EPA (Updated February 25, 2010).
[4] This approach is more conservative (results in a higher maximum value) than the approach described in the EPA guidance, which calls for an average across all modeled years. This approach was taken to make the result more closely match the form of the standard.

- The design value was converted from $\mu g/m^3$ (the units used by AERMOD) to ppb (the units in the standard) using the ratio 100 $\mu g/m^3$ = 53 ppb; the result was rounded to the nearest ppb and compared to the standard.

2.2 AERMOD Modeling

The following USEPA air dispersion models were used to quantify pollutant impacts on the surrounding environment based on the emission sources' operating parameters and their locations:

- American Meteorological Society/Environmental Protection Agency Regulatory Model Improvement Committee (AERMIC) model, also known as AERMOD (Version 09292); and
- Building Profile Input Program – Plume Rise Model Enhancements (BPIP-PRIME, Version 04274); and

The air dispersion modeling for the November 2008 PSD permit application was conducted with AERMOD Version 07026, but subsequent updates to the air dispersion modeling analysis (including this analysis) have been conducted using AERMOD Version 09292. The air quality modeling analysis followed the January 2008 USEPA AERMOD Implementation Guide and EPA's 2005 "Guideline on Air Quality Models." USEPA default options for AERMOD were used (model option DFAULT). Standard AERMOD control parameters were used, including stack tip downwash, non-screening mode, non-flat terrain, and sequential meteorological data check. The modeled hourly NO_2 concentrations were limited by the available ozone according to the use of AERMOD with the PVMRM option. To the extent that the meteorological data set contained missing values for any hour such that a valid NO_2 concentration could not be modeled, the results for that hour were coded as missing.

Companion software, AERMET (Version 06341), was used to arrange meteorological data from Travis AFB into the format required by AERMOD. The surface characteristics appropriate for the land uses surrounding the meteorological station at Travis AFB, namely surface roughness length, albedo, and Bowen Ratio, were computed for use in AERMET using the AERSURFACE (Version 08009). AERSURFACE obtains the needed values from the1992 US Geological Survey National Land Cover Data archives. The meteorological data set used for this analysis is unchanged from that included in the November 2008 PSD permit application.

2.3 Receptor Grids

Receptor and source base elevations were determined from USGS Digital Elevation Model (DEM) data using the 7½-minute format (10- to 30-meter spacing between grid nodes). All coordinates were referenced to UTM North American Datum 1927 (NAD27), Zone 10. The AERMOD receptor elevations were interpolated among the DEM nodes according to standard AERMAP procedure.

Nested Cartesian coordinate receptor grids were developed to efficiently identify the maximum impact area(s), and to identify maximum impact locations. The resolution and extent of each nested grids were as follows:

- 25-meter resolution along the facility fence line in a single tier of receptors composed of four segments extending out to 100 meters from the fence line;
- 100-meter resolution from 100 meters to 1,000 meters from the fence line; and
- 250-meter resolution from 1 km out to approximately 11 km from the site.

When maximum first-high or maximum second-high impacts occurred in the 100- or 250-meter spaced areas, an additional refined receptor grid with 25-meter resolution was placed around each maximum coarse grid impact in the form of a circular area extending out to a distance of two coarse grid "spacings" from the location of each coarse grid maximum. Concentrations within the facility fence line were not calculated.

The following 7.5-minute USGS Digital Elevation Model (DEM) quadrangles in California were employed for modeling the Project:

- Allendale;
- Elmira;
- Dixon;
- Dozier;
- Fairfield South;
- Fairfield North;
- Mount Vaca;
- Birds Landing; and
- Denverton.

2.4 Data Requirements—Meteorological Data

AERMOD uses hourly meteorological data to characterize plume dispersion. The representativeness of the data is dependent on the proximity of the meteorological monitoring site to the area under consideration, the complexity of the terrain, the exposure of the meteorological monitoring site, and the period during which the data are collected. The meteorological data used in this analysis were collected at the Travis Air Force Base, located 5.3 miles southwest of the site. This data set was selected to be representative of meteorological conditions at the project site and to meet the requirements of the EPA On Site Meteorological Program Guidance for Regulatory Model Applications (EPA 450/4 87 013, August 1995). The analysis used meteorological data collected during 2003-2007. This meteorological data set was used for the prior modeling analyses included in the initial PSD Permit application.

Three years of the data for 2003, 2004, and 2005 did not quite meet the EPA 90% criterion for monthly meteorological data completeness; the data for the two other years of 2006 and 2007 did meet the criterion. This meteorological data set was identified in the May 12, 2008 modeling protocol submitted to EPA for review.

2.5 Data Requirements—Ambient Monitoring Data

Ambient NO_2 data collected at the Davis-UCD monitoring station were used to characterize the representative ambient background concentrations. This monitoring station is located 15 miles northeast of the project site, and is the closest NO_2 monitoring station to the project site. The ambient pollution levels monitored at the UCD monitoring station represent area-wide ambient conditions rather than the localized impacts of any particular facility. The use of monitoring data from this station was described in the May 12, 2008 modeling protocol.

Computation of hourly NO_2 impacts from the Project and nearby sources also requires use of ambient monitored hourly ozone concentrations. The PVMRM adaptation of the Ozone Limiting Method (Cole and Summerhays, 1979) was used to determine the extent to which the NO emitted from the exhaust stacks is converted to NO_2 when it reaches the ground. AERMOD PVMRM calculates the NO_2 concentration using hourly ozone data. As described in the May 12, 2008 modeling protocol, hourly ozone data collected at the Vacaville-Urbati Drive monitoring station during the years 2003-2007 was used in conjunction with PVMRM to calculate hourly NO_2 concentrations from hourly NOx concentrations.

2.5.1 Data Substitution—Ozone

The O_3 and NO_2 ambient monitoring data serve different purposes in this analysis, and therefore require different data substitution procedures. Hourly NO_2 data are added to modeled project NO_2 impacts to calculate concentrations (see section 2.5.2). The hourly O_3 data are used by the AERMOD air dispersion model when operated using the PVMRM option to model the reaction of atmospheric O_3 with initially emitted nitric oxide (NO) to form NO_2. If there is only a small amount of O_3 in the plume, then the reaction is limited. Not all of the NO is converted to NO_2, and the project NO_2 impacts are lower than would be calculated if complete conversion were assumed. Missing hourly O_3 data were substituted by hour-appropriate values (e.g., data for the same hour from the previous day or the following day) as described in the May 12, 2008 modeling protocol.

2.5.2 Data Substitution—NO_2

Unlike the O_3 data that are used by the dispersion model to determine modeled impacts, the NO_2 ambient data are used to establish the baseline ambient conditions for an area of interest. As such, based on EPA guidance related to determinations of compliance with the new 1-hour average NO_2 NAAQS,[5] no data substitution is performed for the NO_2 data. Instead it is necessary to determine whether there are sufficient hourly data available for a complete day, quarter, and year. Under this EPA guidance,[6] a day is

[5] Federal Register, Volume 75, Number 26, Part III, Environmental Protection Agency, 40 CFR Parts 50 and 58, *Primary National Ambient Air Quality Standards for Nitrogen Dioxide; Final Rule,* Appendix S, pages 6532-6533, February 9, 2010.
[6] Ibid, p. 6532.

classified as complete if it has at least 75% of the hourly concentrations recorded (i.e., at least 18 hourly readings per day). A quarter is classified as complete if it has at least 75% of the sampling days with complete data (i.e., at least 67 to 69 depending on quarter). A year is classified as complete if it has four complete quarters. An incomplete year cannot be used to demonstrate compliance (although under certain circumstances it could be used to demonstrate noncompliance).

To determine whether a day, quarter, or year is complete, it is necessary to identify missing data. Missing hourly NO_2 ambient concentrations were replaced with the value -99, which informs the computation algorithm that no valid NO_2 concentration was measured for that hour. If more than 6 hourly concentrations are missing in the same day, the entire day was identified as invalid, again following the same EPA regulatory guidance.[7]

2.6 Combining Existing Ambient Air Quality Data with Modeled Impacts

Modeled concentrations were added to representative background NO_2 concentration data set to determine total concentrations for comparison with the new NAAQS using the procedure outlined below, which complies with the requirements of the final rule.

The modeled and monitored 1-hour NO_2 concentrations were combined as follows:

- As described above, the impacts of project and nearby sources at each receptor in the study area and for each hour in the analysis period were modeled using AERMOD.
- The predicted total hourly NO_2 concentration at each receptor was calculated by adding the modeled hourly project impact at the receptor to the corresponding hour NO_2 concentration measured at the Davis ambient monitoring station.
- For hours with missing modeled NO_2 concentrations or missing ambient monitored background NO_2 concentrations, the resulting total hourly concentrations (modeled impacts plus background concentrations) were labeled as missing using the value -99 at every receptor.
- The daily maximum total hourly NO_2 concentration for each day was determined for each receptor. If there were fewer than 18 complete hours for a day, the value for that day was labeled as missing using the value of -99.
- If there were four complete quarters for a given complete year, the 98th percentile daily maximum total hourly NO_2 concentration was determined for that year for each receptor as follows from EPA guidance:
    - 8th highest value if the annual number of valid daily maximum total hourly NO_2 concentrations is at least 351;
    - 7th highest value if the annual number of valid daily maximum total hourly NO_2 concentrations is between 301 and 350; and
    - 6th highest value if the annual number of valid daily maximum total hourly NO_2 concentrations is between 251 and 300.

[7] Ibid.

- At each receptor, the 98th percentile daily maximum concentrations were averaged across each three-year period in the analysis period.
- From the field of receptors, the receptor with the highest three-year average was selected to represent the maximum total hourly NO_2 concentration for the project impact area. This maximum total hourly NO_2 concentration was converted from $\mu g/m^3$ to ppb (using the annual NO_2 NAAQS conversion ratio of 100 $\mu g/m^3$ = 53 ppb); the result was rounded to the nearest ppb and compared to the new 1-hour NO_2 NAAQS.

Sierra Research developed a postprocessor in FORTRAN to perform these calculations.

The postprocessor uses the two following input files:

- AERMOD 1-hour average NO_2 DAYTABLE[8] output file (processed with PVMRM); and
- Hourly ambient background NO_2 concentrations (in units of $\mu g/m^3$).

To allow the postprocessor to handle the large DAYTABLE output files for tens of thousands of receptors in the CPV grids and the five years of hourly meteorological data, the postprocessor reads and processes concentrations from both files in 24-hour blocks.

The AERMOD output file is read, receptor-by-receptor, for each hour. Then the background concentration is read for that hour and added to the modeled concentrations. By the end of a day's values, if 75% completeness is not achieved, then hourly maxima for the day are replaced with an incompleteness indicator (-99).

Once the daily maxima are determined for each receptor for the entire year, two tables are generated. The first table calculated is the daily maxima for all receptors, and becomes the first output table from the postprocessor.

The daily maxima for each receptor are sorted by the postprocessor through use of the HEAPSORT utility from Numerical Recipes.[9] The second table is calculated and output for the eight highest daily maximum concentrations for each receptor (tagged by Julian day) is generated.

Examination of the second table yields the highest three-year average of 8th-highest concentrations from among all the receptors, for comparison to the federal standard.

---

[8] A February 25, 2010 USEPA *Notice Regarding Modeling for New Hourly NO2 NAAQS,* suggests the same computational post-processing with the AERMOD-generated POSTFILE (*http://www.epa.gov/scram001/no2_hourly_NAAQS_aermod_02-25-10.pdf*). The AERMOD generated DAYTABLE and POSTFILE contain identical data, but in different formats.

[9] The heapsort sorting routine is taken from Press, W.H., B.P. Flannery, S.A. Teukolsky, and W.T. Vetterling,, *Numerical Recipes, The Art of Scientific Computing (FORTRAN Version),* Section 8.2, page 229, Cambridge University Press, New York, 1989.

3. RESULTS

The highest three-year average of 98th percentile concentrations at any receptor was 141.9 µg/m^3, or 75 ppb. This is lower than the one-hour NO_2 NAAQS of 100 ppb. The project will therefore not cause or contribute to an exceedance of the standard.

Each quarter in the analysis period met the validity requirements for a compliance demonstration under EPA guidelines. There were more than 350 valid daily measurements in each calendar year. Thus the 98th percentile concentration for each receptor was the 8th highest daily one-hour maximum in each calendar year

It is worth noting that the highest modeled impacts occur under normal operations, not during turbine startup/shutdown, and are significantly influenced by the assumed testing for the emergency generator.

STATE OF CALIFORNIA
ENERGY RESOURCES
CONSERVATION AND DEVELOPMENT COMMISSION

In the Matter of:	)	Docket No. 08-AFC-11
	)	
Application for Certification,	)	**PROOF OF SERVICE**
for the CPV VACA STATION POWER PLANT	)	
PROJECT	)	(April 14, 2010)
by CPV Vacaville, LLC	)	
	)	

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CPV VACA STATION POWER PLANT PROJECT
CEC Docket No. 08-AFC-11

DECLARATION OF SERVICE

I, Paul Kihm, declare that on May 11, 2010, I served and filed copies of the attached:

SUPPLEMENTAL NO_2 AIR QUALITY IMPACT ANALYSIS

to all parties identified on the Proof of Service List above in the following manner:

California Energy Commission Docket Unit

☒ Transmission via electronic mail and by depositing a copy via FedEx overnight mail delivery service at Costa Mesa, California, with delivery fees thereon fully prepaid and addressed to the following:

CALIFORNIA ENERGY COMMISSION
Attn: DOCKET NO. 08-AFC-11
1516 Ninth Street, MS-4
Sacramento, California 95814-5512
docket@energy.state.ca.us

For Service to All Other Parties

☒ Transmission via electronic mail to all email addresses on the Proof of Service list; and

☒ by depositing one paper copy with the United States Postal Service via first-class mail at Costa Mesa, California, with postage fees thereon fully prepaid and addressed as provided on the Proof of Service list to those addresses **NOT** marked "email preferred."

I further declare that transmission via electronic mail and U.S. Mail was consistent with the requirements of California Code of Regulations, title 20, sections 1209, 1209.5, and 1210.

I declare under penalty of perjury that the foregoing is true and correct. Executed on May 11, 2010, at Costa Mesa, California.

Paul Kihm