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March 5, 2010

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**VIA EMAIL**

Mr. Paul Kramer  
Hearing Officer  
California Energy Commission  
1516 Ninth Street  
Sacramento, CA 95814

<b>DOCKET</b>	
<b>07-AFC-6</b>	
DATE	<u>MAR 05 2010</u>
RECD.	<u>MAR 05 2010</u>

**Re: Carlsbad Energy Center Project (07-AFC-6)  
One-Hour NO<sub>2</sub> National Air Quality Modeling Protocol**

Dear Mr. Kramer :

On behalf of Carlsbad Energy Center LLC, please find the enclosed correspondence from Sierra Research, Inc. to the San Diego County Air Pollution Control District regarding one-hour NO<sub>2</sub> air quality modeling protocol for the Carlsbad Energy Center Project. On this date, a copy of the same will be hand delivered to the Docket Unit and served on all parties via email and U.S. Mail.

Should you have any questions regarding this document, please contact our office.

Very truly yours,

  
Kimberly J. Hellwig  
Paralegal

KJH:kjh

Enclosure

cc: See Proof of Service List

March 4, 2010

Ralph DeSiena  
Modeling and Meteorology Group  
San Diego County Air Pollution Control District  
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San Diego, CA 92131



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Subject: One-hour NO<sub>2</sub> National Air Quality Standard Modeling Protocol for CECP

Dear Mr. DeSiena:

On behalf of Carlsbad Energy Center LLC, Sierra Research is please to submit the enclosed supplemental modeling protocol for the proposed Carlsbad Energy Center Project (CECP). This supplemental protocol is for dispersion modeling to demonstrate compliance with the new one-hour nitrogen dioxide (NO<sub>2</sub>) National Ambient Air Quality Standard (NAAQS) that goes into effect on April 12, 2010.

If you have any questions or need any additional information, please do not hesitate to contact me at 916-273-5139.

Sincerely,



Tom Andrews  
Senior Engineer

Enclosure

cc: Steve Moore, SDAPCD  
John McKinsey, Stoel  
Will Walters, CEC  
Michael Monasmith, CEC  
CEC Dockets Office (07-AFC-6)

# Carlsbad Energy Center Supplemental Modeling Protocol 1-Hour NO<sub>2</sub> NAAQS Compliance

## 1. Background

On behalf of Carlsbad Energy Center LLC, Sierra Research is submitting this supplemental modeling protocol to the San Diego Air Pollution Control District (SDAPCD or District) for approval of air dispersion modeling and post-processing that demonstrates compliance of the Carlsbad Energy Center (Project) potential air quality impact with the new 1-hour nitrogen dioxide (NO<sub>2</sub>) National Ambient Air Quality Standard<sup>1</sup> (NAAQS) that goes into effect April 12, 2010. This protocol follows modeling guidance provided by the U. S. Environmental Protection Agency (EPA) in its “*Guideline on Air Quality Models*” (including supplements), and requirements in the new 1-hour NO<sub>2</sub> NAAQS Final Rule. The original modeling protocol, submitted in August 2007, governed the air dispersion modeling for all other pollutants and averaging times, and for the state 1-hour NO<sub>2</sub> AAQS. This protocol only repeats some basic information about the proposed and existing emitting units (sources) to provide context for the various modeling runs required for the supplemental air quality impact analysis.

The proposed project will consist of constructing and operating two fast-start Siemens SGT6-5000F combustion gas turbines in combined-cycle mode. Existing Boilers 1-3 will be shut down; Boilers 4-5 and the existing 16 MW simple-cycle combustion gas turbine will continue to operate.

The proposed modeling will address the potential 1-hour NO<sub>2</sub> ambient impacts of commissioning, startups, shutdowns and normal operation of the two new combustion gas turbines plus operation of existing Boilers 4 and 5 and the existing simple-cycle combustion gas turbine.

All source locations, emission rates, and stack parameters will be the same as those used in the final modeling analyses for the Project previously approved by the District.

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<sup>1</sup> 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*, February 9, 2010.

## 2. Meteorological Data

The District provided a three-year (2004-2006) meteorological data set appropriate for use (i.e., already processed by AERMET) with AERMOD<sup>2</sup> (current version 09292), the primary air dispersion model used for this project. The data set combines surface meteorological data (e.g., wind speed and direction, temperature) from the District's monitoring station at the Camp Pendleton Marine Base (see Figure 1) and upper air data from the Marine Corps Air Station Miramar (MCAS Miramar, Upper Air Station No. 03190). This meteorological data set was used for the prior modeling analyses, and will be used for the supplemental modeling analysis as well.

## 3. Existing Ambient Air Quality Data

Modeling of the project-generated 1-hour NO<sub>2</sub> concentrations requires use of ambient monitored O<sub>3</sub> concentrations. In addition, computation of total hourly NO<sub>2</sub> concentrations requires use of the ambient monitored hourly NO<sub>2</sub> concentrations from the nearest monitoring station. Background ambient O<sub>3</sub> and NO<sub>2</sub> concentrations for the project area during 2004-2006 have been obtained from the monitoring station at Camp Pendleton, which is the monitoring site nearest to the project.

Concerning data substitution for missing hourly O<sub>3</sub> and NO<sub>2</sub> ambient monitoring data, the two data sets serve different purposes, and therefore require different data substitution procedures. The hourly O<sub>3</sub> data are used within the AERMOD air dispersion model when operated using the Plume Volume Molar Ratio Method (PVMRM) option that simulates the atmospheric chemistry of O<sub>3</sub> reacting with initially emitted nitric oxide (NO) to form NO<sub>2</sub>. If there is only a limited amount of O<sub>3</sub> in the plume, then the reaction is limited, forming less NO<sub>2</sub> than occurs with the simplifying assumption of complete conversion. The model disperses the initial NO<sub>x</sub> emissions, which are mostly NO, during each of the 8,760 hours in a 365-day year. If the hourly ambient O<sub>3</sub> data from the nearest monitoring station have missing data, the missing O<sub>3</sub> hours are given substituted concentrations with the following procedure to better simulate the resulting NO<sub>2</sub> concentrations:

- If three or fewer consecutive hours of O<sub>3</sub> ambient concentrations are missing, linear interpolation will be used to fill in the missing concentrations based on the previous and subsequent hour concentrations from the same day as follows:
  - If only A<sub>n</sub> is missing, then A<sub>n</sub> = arithmetic mean of A<sub>n-1</sub> and A<sub>n+1</sub>, where A<sub>n-1</sub> is the previous concentration and A<sub>n+1</sub> is the subsequent concentration.

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<sup>2</sup> AERMOD stands for American Meteorological Society/Environmental Protection Agency Regulatory Model, which was developed by the American Meteorological Society/Environmental Protection Agency Regulatory Model Improvement Committee (AERMIC).

- If  $A_n$  and  $A_{n+1}$  are missing, then  $A_n = A_{n-1} * 0.67 + A_{n+2} * 0.33$  and  $A_{n+1} = A_{n-1} * 0.33 + A_{n+2} * 0.67$ .
  - If  $A_{n-1}$ ,  $A_n$  and  $A_{n+1}$  are missing, then  $A_{n-1} = A_{n-2} * 0.75 + A_{n+2} * 0.25$ ,  $A_n = A_{n-2} * 0.5 + A_{n+2} * 0.5$ ,  $A_{n+1} = A_{n-2} * 0.25 + A_{n+2} * 0.75$ .
- If four or more consecutive hours of  $O_3$  ambient concentrations are missing, then substitution for each missing concentration will be by the arithmetic mean of the concentrations from the same hour of the most recent previous day and soonest subsequent day.

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,<sup>3</sup> 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,<sup>4</sup> a day is classified as complete if it has at least 75% of the hourly concentrations recorded (i.e., at least 18 hours 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. In order to determine whether a day, quarter, or year is complete, it is necessary to identify missing data. Missing hourly  $NO_2$  ambient concentrations will be 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 will be identified as invalid, again following the same EPA regulatory guidance.<sup>5</sup>

#### 4. Combining Existing Ambient Air Quality Data with Modeled Impacts

Modeled concentrations will be added to this representative background  $NO_2$  concentration data set to determine compliance 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 will be combined as follows:

- The modeled hourly  $NO_2$  concentrations will be limited by the available ozone according to the use of AERMOD and PVMRM option. To the extent that a meteorological data set contains missing values for any hour such that a valid  $NO_2$  concentration cannot be modeled, the results for that hour will be coded as missing.

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<sup>3</sup> 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.

<sup>4</sup> Ibid, p. 6532.

<sup>5</sup> Ibid.

- The predicted total hourly NO<sub>2</sub> concentration at each receptor will be calculated by adding the modeled hourly project impact at the receptor to the corresponding hour NO<sub>2</sub> concentration measured at the Camp Pendleton ambient monitoring station.
- For hours with missing modeled NO<sub>2</sub> concentrations or missing ambient monitored background NO<sub>2</sub> concentrations, the resulting total hourly concentrations (modeled impacts plus background concentrations) will be labeled as missing using the value -99 at every receptor.
- The daily maximum total hourly NO<sub>2</sub> concentration for each day will be determined for each receptor. If there are less than 18 complete hours for a day, that day will be labeled as missing using the value of -99.
- If there are four complete quarters for a given complete year, the 98<sup>th</sup> percentile daily maximum total hourly NO<sub>2</sub> concentration will be determined for that year for each receptor as follows from EPA guidance:<sup>6</sup>
  - 8<sup>th</sup> highest value if the annual number of valid daily maximum total hourly NO<sub>2</sub> concentrations is at least 351;
  - 7<sup>th</sup> highest value if the annual number of valid daily maximum total hourly NO<sub>2</sub> concentrations is between 301 and 350; and
  - 6<sup>th</sup> highest value if the annual number of valid daily maximum total hourly NO<sub>2</sub> concentrations is between 251 and 300.
- If the year is not complete, the same EPA guidance continues the above sequential scale to determine the 98<sup>th</sup> percentile daily maximum total hourly NO<sub>2</sub> concentration for that year for each receptor:
  - 5<sup>th</sup> highest value if the annual number of valid daily maximum total hourly NO<sub>2</sub> concentrations is between 201 and 250;
  - 4<sup>th</sup> highest value if the annual number of valid daily maximum total hourly NO<sub>2</sub> concentrations is between 151 and 200;
  - 3<sup>rd</sup> highest value if the annual number of valid daily maximum total hourly NO<sub>2</sub> concentrations is between 101 and 150;
  - 2<sup>nd</sup> highest value if the annual number of valid daily maximum total hourly NO<sub>2</sub> concentrations is between 51 and 100; and
  - 1<sup>st</sup> highest value if the annual number of valid daily maximum total hourly NO<sub>2</sub> concentrations is between 1 and 50.

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<sup>6</sup> Ibid, Table 1, p. 6534.

- Provided that there are three consecutive complete years, the arithmetic mean of the three 8<sup>th</sup> highest daily maximum total NO<sub>2</sub> concentrations will be calculated for the three consecutive years for each receptor.
- From the field of receptors, the receptor with the highest three-year average will be selected to represent the maximum total hourly NO<sub>2</sub> concentration for the project impact area. This maximum total hourly NO<sub>2</sub> concentration will be compared to the new 1-hour NO<sub>2</sub> NAAQS.

The 1-hour NO<sub>2</sub> NAAQS level is 100 parts per billion by volume (ppb), and hourly monitoring concentrations are to be reported to no more detail than “one place after the decimal”<sup>7</sup> (tenths of a ppb), with additional digits to the right of the decimal being truncated. The NAAQS level of 100 ppb is equivalent to 188 µg/m<sup>3</sup>, and the analysis procedure described above will be conducted in units of µg/m<sup>3</sup>. The final NO<sub>2</sub> concentration, calculated as described above, that will be compared to the NAAQS level will be “rounded to the nearest whole number” or 1 µg/m<sup>3</sup>, with decimals 0.5 and greater rounded up to the nearest whole number and decimals lower than 0.5 rounded down to the nearest whole number, following regulatory guidance.<sup>8</sup>

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<sup>7</sup> 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, page 6533, February 9, 2010.

<sup>8</sup> Ibid.

BEFORE THE ENERGY RESOURCES CONSERVATION AND DEVELOPMENT  
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1516 NINTH STREET, SACRAMENTO, CA 95814  
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APPLICATION FOR CERTIFICATION  
FOR THE CARLSBAD ENERGY  
CENTER PROJECT

Docket No. 07-AFC-6  
PROOF OF SERVICE  
(Revised 2/16/2010)

Carlsbad Energy Center LLC's  
One-Hour NO<sub>2</sub> National Air Quality Modeling Protocol

CALIFORNIA ENERGY COMMISSION  
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**DECLARATION OF SERVICE**

I, Judith M. Warmuth, declare that on March 5, 2010, I deposited copies of the aforementioned document in the United States mail at 500 Capitol Mall, Suite 1600, Sacramento, California 95814, with first-class postage thereon fully prepaid and addressed to those identified on the Proof of Service list above.

**OR**

Transmission via electronic mail was consistent with the requirements of California Code of Regulations, Title 20, sections 1209, 1209.5, and 1210. All electronic copies were sent to all those identified on the Proof of Service list above.

I declare under penalty of perjury that the foregoing is true and correct.

  
\_\_\_\_\_  
Judith M. Warmuth