STATE OF CALIFORNIA

Energy Resources Conservation
and Development Commission

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| In the Matter of: | ) | Docket No. 07-AFC-6 |
| | ) | |
| Application for Certification for the | ) | |
| Carlsbad Energy Center Project | ) | |
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# STAFF RESPONSE TO CITY OF CARLSBAD'S MOTION TO REOPEN PROCEEDING

RICHARD C. RATLIFF
Staff Counsel IV
California Energy Commission
1516 Ninth Street, MS-14
Sacramento, CA 95814
Tel: (916) 653-1653
Fax: (916) 654-3843
E-mail: dratliff@energy.state.ca.us

March 29, 2011

**STATE OF CALIFORNIA**
**Energy Resources Conservation**
**And Development Commission**

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| In the Matter of: | ) | Docket No. 07-AFC-06 |
| | ) | |
| Application for Certification for the | ) | |
| Carlsbad Energy Center Project | ) | |
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# STAFF RESPONSE TO CITY OF CARLSBAD'S MOTION TO REOPEN PROCEEDING

## I. Introduction

On March 14, 2011, intervenor City of Carlsbad (City) moved to reopen the Carlsbad Energy Center Project (CECP) proceeding to augment the evidentiary record in several areas. Intervenor Terramar Association subsequently filed a document supporting this motion. On March 25, 2011, intervenor Power of Vision concurred in this request and added the additional area of seismic safety as an area that needs to be addressed. Staff believes that, to the extent the issue areas listed by intervenors require any further augmentation of the record, this can be accomplished through official notice of agency documents, without further evidentiary hearings. However, Staff proposes that the Commission hold an evidentiary hearing, perhaps coinciding with the PMPD conference, to take additional evidence on CECP's compliance with the new federal air quality standard for nitrogen dioxide (NO2).

## II. The New Federal Standard for Nitrogen Dioxide.

At the 2010 evidentiary hearings, there was some discussion of a proposed new federal standard for NO2. The new standard was described as being considerably more stringent than the standard that it replaces. The new standard

became effective in April 2010, for projects requiring a Prevention of Significant Deterioration (PSD) permit. Although the federal Environmental Protection Agency (EPA) has determined that CECP does not require a PSD permit, Staff believes that CECP should be evaluated for compliance with the standard for CEQA purposes, as the standard is "health-based."

When EPA promulgated the new standard in 2010 it did not provide guidance at the outset as to how to perform the modeling required to demonstrate compliance with the new standard. Nevertheless, the applicant filed in the docket a modeling analysis that indicates CECP will not have emissions that will cause violation of the new standard. Late in 2010 EPA finally issued non-binding guidance for how the modeling might be performed. The San Diego Air Quality Management District has now performed an analysis demonstrating CECP's conformity with the new standard. Staff believes that the record should be reopened to admit both the applicant's earlier NO2 analysis and the air district's later analysis into the record.

The Air District No. 2 analysis will be presented by Dr. Steven Moore of the Air District, along with staff witness Will Walters. The analysis is an attachment to this filing.

## III. Staff Does Not Support New Hearings for Other Issues, Although Official Notice May Be Appropriate for Documents From Other Agencies.

The City and Power of Vision have requested that the record be re-opened, and that hearings be held, regarding several issues.

### A. Worker Safety

The City believes the record should be re-opened to consider fire and explosion events at other power plants that have occurred since the evidentiary hearing was held. The Committee has already held hearings and heard extensive evidence from the parties on this issue. Of the five events listed by the City, two involve power plants licensed by the Commission. Staff suggests that, to the extent this evidence is relevant to CECP, the

Committee should take official notice of the fire reports prepared by the government agencies that responded to such events or produced reports on such. This would allow the PMPD and Final Decision to consider the importance and relevance of such events to the CECP project. Additional hearings would add little to the already elaborate hearing record.

### B. Once-Through Cooling (OTC)

The State Water Resources Control Board adopted the OTC policy in May 2010, and Staff has submitted the Policy to the Committee and the parties. The water use issue has been sufficiently covered in the evidentiary hearings, and the nothing in the Policy adds anything important to the existing record. The Committee should take official notice of the Policy, but the document "is what it is," and Staff can see no useful purpose in holding a hearing with regard to it.

### C. CALTRANS I-5 Widening EIR

CALTRANS issued its EIR-DEIS for the widening project in June 2010. Staff does not oppose official notice of this agency document if such is legally appropriate. However, Staff sees no purpose in further hearings regarding the document. Staff's evidence on the "cumulative effect" of the widening was considered exhaustively at the evidentiary hearings, and was based on information from CALTRANS regarding the proposed alignment of the project. Staff is unaware of anything new in the document that is relevant to CECP that would warrant additional hearings.

### D. Redevelopment Plans for SP 144

The City has testified that it has plans and "visions" for the redevelopment of the Encina power site. It now states that it has "documents illustrating that these plans are not dreams or wishes," and would like to augment the record with such. The Committee has already heard from the City and Redevelopment Agency its plans for future use of the site, and Staff believes no further hearings are necessary on this subject. If the City or its

Redevelopment Agency have actually adopted documents in this regard, Staff has no objection to the Committee taking official notice of such documents.

### E. Interceptor Sewer Project and Rail Trail

The City has argued that these projects are inconsistent with CECP, and the issue has been joined at hearing. Staff disagrees that the projects are inherently inconsistent with CECP, and both Staff and the applicant have testified to that effect. There is no need for further elaboration on the City's redevelopment desires. Staff does not see reason to hold hearings on this issue.

### F. Seismic/Tsunami Issues

Power of Vision believes that this issue should now be opened for the first time, apparently based on the recent tragedy in Japan. As Power of Vision acknowledges, the issue of seismic safety was addressed in both the AFC and the FSA, and these issues have not been raised as issues before Power of Vision's March 25, 2011, filing. The issue is not timely raised. Moreover, CECP is proposed to be built pursuant to the very stringent seismic standards set forth in the current California Building Code.

Power of Vision implies that the analytic requirements for the seismic safety of the SONGS nuclear facilities must be met by CECP, including "three-dimensional seismic reflection mapping," a form of analysis apparently outstanding even for the SONGS facility. AB 1632 was directed to nuclear facilities, which have much different and more drastic risk considerations than facilities powered by natural gas. Staff believes that the Committee has sufficient evidence on these issues, and that the record does not require reopening.

Dated: March 29, 2011

Respectfully submitted,

/S/

RICHARD C. RATLIFF
Staff Counsel IV

# Attachment

# AIR QUALITY IMPACT ANALYSIS

# REPORT

# ADDENDUM 1

# NEW FEDERAL $NO_2$ AND $SO_2$ STANDARDS

## CARLSBAD ENERGY CENTER PROJECT
## APPLICATION 985745

**MARCH 29, 2011**

**Prepared For**
**Mechanical Engineering**
**San Diego Air Pollution Control District**
**10124 Old Grove Road**
**San Diego, California 92131**

**Prepared By**
**Ralph DeSiena**

**Monitoring and Technical Services**
**San Diego Air Pollution Control District**
**10124 Old Grove Road**
**San Diego, California 92131**

## 1.0 INTRODUCTION

The San Diego Air Pollution Control District (SDAPCD or District) issued an Air Quality Impact Assessment (AQIA) review report on September 24, 2008 and a final revised review report on July 27, 2009, which is included in the District's Final Determination of Compliance (FDOC) for the Carlsbad Energy Center Project. This addendum discusses additional modeling and review performed by the SDAPCD to determine compliance with the recently implemented new federal Ambient Air Quality Standards (AAQSs)for nitrogen dioxide ($NO_2$) and sulfur dioxide ($SO_2$).

## 2.0 PROJECT DESCRIPTION

NRG Energy, Inc. is proposing to remove three of the five existing boilers at the Encina Power Station (Units 1, 2 and 3) and install two new Siemens Rapid Response SGT6-5000F Combined Cycle (R2C2) combustion turbine generators (CTGs) and an emergency engine powering a fire pump. The gas turbines will be equipped with steam power augmentation and evaporative cooling. Each gas turbine is followed by a heat recovery steam generator (HRSG) and condensing steam turbine generator. The two units will provide a total nominal generating capacity of 558 MW net.

## 3.0 AIR QUALITY IMPACT ANALYSIS

As discussed in the District's 2009 revised final review report, dispersion modeling was conducted for normal, startup/shutdown and commissioning period emissions of $NO_2$, CO, $SO_2$, and $PM_{10}$ and $PM_{2.5}$. The applicant and their consultant (Sierra Research) worked closely with the District in developing modeling and analysis procedures in support of demonstrating compliance with all applicable NSR requirements. Modeling was performed in order to determine whether emissions during these time periods would impact the state and/or federal ambient air quality standards applicable at that time for all criteria pollutants.

Subsequent to the District's 2009 revised final report, EPA announced new federal 1-hour standards for $SO_2$ and $NO_2$. The new $NO_2$ standard is the 3-year average of the 98$^{th}$ percentile daily maximum 1-hour concentrations and shall not exceed 100 ppbv, which is equivalent to 188 µg/m$^3$ at standard temperature and pressure (STP). The new SO2 standard is the 3-year average of the 99$^{th}$ percentile daily maximum 1-hour concentrations and shall not exceed 75 ppbv, which is equivalent to 196 µg/m$^3$ at STP. For purposes of determining compliance based on an AQIA, these standards are applied on a receptor-specific basis including the background (i.e., 98$^{th}$ or 99$^{th}$ percentiles are calculated for each receptor individually and compliance is based on the highest value that occurs at any receptor).

Sierra Research of Sacramento, California, provided an AQIA on behalf of CECP to demonstrate compliance with the recently promulgated $NO_2$ standard. However, because of the issues involved in determining compliance with this newly promulgated standard and the evolution in the modeling methodologies used by the District and other agencies to address compliance determinations with respect to this standard, the District performed supplemental AQIA modeling to determine compliance with the new standard. The supplemental modeling was based on the receptor grid and meteorology used by Sierra

Research in their submittal, which had previously been approved by the District. The District also evaluated the same operating modes as Sierra Research except for certain changes as noted below. The District's conclusion regarding compliance with the federal 1-hour $NO_2$ standard is based on this supplemental modeling.

## 3.1 MODELING METHODOLOGIES

No additional modeling for determination of compliance with the new $SO_2$ standard was deemed necessary due to the fact that both predicted facility impacts and background $SO_2$ concentrations are very low and compliance could be determined from previous modeling results based on the worst-case project impact added to the maximum background (see Section 4.3 below).

The basic modeling methodology prior to post processing used for this determination of compliance with the new $NO_2$ standard was as described in Section 3.1 of the District's AQIA final review report. The same methodology was used here with the exception that updated AERMOD Version 09292 was used in place of Version 06341. In addition, the same stack parameters were used that were indentified in the final review report as providing the worst-case 1-hour project impacts for the various operating modes. However, additional modeling and a post processing procedure were required for determination of compliance with the new $NO_2$ 1-hour standard. This additional modeling and post processing is further discussed in Section 4.0, Air Quality Impact Analysis Results.

$NO_2$ emissions for six operating modes were modeled to determine compliance with the new federal standard for $NO_2$. The operating modes are described in Table 3-1. Although the District based its determination of compliance on the modeled project impacts (i.e., the new equipment only), the impacts for the project and the remaining existing equipment after the project completion were included to inform the decisions of other regulatory agencies.

In place of the four phase startup that Sierra Research used, a constant emission rate of approximately 11.96 g/s for each turbine and the same release parameters for commissioning for each turbine for the entire hour (i.e., approximately, a release temperature of 447.6 K, a release velocity of 12.24 m/s, and an NO2 to NOx ratio of 0.4—see below) were used. The emission rate is based on the FDOC conditions for maximum allowed emissions during a startup and shutdown hour and is slightly higher than Sierra's average for the hour. Using the commissioning release parameters for the entire hour is also somewhat conservative in comparison to Sierra's release parameters. The modeling also included the emergency fire pump engine emissions in the modeling of startup and shutdown emission impacts even though it is relatively unlikely that the fire pump would be operated during a startup.

**TABLE 3-1**
**SUPPLEMENTAL $NO_2$ MODELING SCENARIOS**

| Operation Mode | Equipment Included |
|---|---|
| Normal Operation , New Equipment Only | 2 New Gas Turbines, Fire Pump |
| Normal Operations, New Equipment plus Existing Equipment | 2 New Gas Turbines, Fire Pump, Boiler Units 4 and 5, and Peaking Turbine |
| Commissioning, New Equipment Only | 2 New Gas Turbines |
| Commissioning, New Equipment plus Existing Equipment | 2 New Gas Turbines, Boiler Units 4 and 5, and Peaking Turbine |
| Startup, New Equipment Only | 2 New Gas Turbines, Fire Pump |
| Startup, New Equipment plus Existing Equipment | 2 New Gas Turbines, Fire Pump, Boiler Units 4 and 5, and Peaking Turbine |

The initial in-stack ratio of $NO_2$ to total NOx ($NO_2$/NOx) used in the analysis is given in Table 3-2 (see also Appendix C). This differs from the Sierra Research submittal which used 10% $NO_2$/NOx for the emergency fire pump engine and the peaking turbine since information on the NO2/NOx ratio for this equipment was not readily available at time of their submittal and the accepted default value at that time was 10%.

**TABLE 3-2**
**SUPPLEMENTAL $NO_2$ MODELING ASSUMED IN-STACK $NO_2$ Ratio**

| Operation Mode | Equipment Included | $NO_2$/NOx, % |
|---|---|---|
| Normal Operation , New Equipment Only | 2 New Gas Turbines<br>Fire Pump Engine | 25<br>16 |
| Normal Operations, New Equipment plus Existing Equipment | 2 New Gas Turbines<br>Fire Pump Engine<br>Boiler Units 4 and 5<br>Peaking Turbine | 25<br>16<br>10<br>19 |
| Commissioning, New Equipment Only | 2 New Gas Turbines | 40 |
| Commissioning, New Equipment plus Existing Equipment | 2 New Gas Turbines<br>Boiler Units 4 and 5<br>Peaking Turbine | 40<br>10<br>19 |
| Startup and Shutdown, New Equipment Only | 2 New Gas Turbines<br>Fire Pump Engine | 40<br>16 |
| Startup and Shutdown, New Equipment plus Existing Equipment | 2 New Gas Turbines<br>Fire Pump Engine<br>Boiler Units 4 and 5<br>Peaking Turbine | 40<br>16<br>10<br>19 |

## 3.2 METEOROLOGICAL DATA USED FOR DISPERSION MODELING

Meteorological data used for modeling NO2 to determine compliance with the new federal 1-hour $NO_2$ standard was as described in Section 3.2 of the District's AQIA final review report.

## 4.0 AIR QUALITY IMPACT ANALYSIS RESULTS

### 4.1 FEDERAL 1-HOUR $NO_2$ AND $SO_2$ STANDARDS

In accordance with San Diego Air Pollution Control District New Source Review procedures and modeling methodologies, maximum predicted 1-hour concentrations associated with new equipment operations were determined for $NO_2$ and $SO_2$ during normal, startup/shutdown and commissioning operations. For $NO_2$, the Plume Volume Molar Ratio Method (PVMRM) method, which estimates conversion of the nitric oxide (NO) component of NOx to $NO_2$ by its reaction with ozone after exiting the stack, was selected as part of the modeling procedure to predict ground level $NO_2$ concentrations. As an initial screening procedure, the maximum predicted concentrations occurring during any of the operating conditions modeled were added to worst-case background concentrations for comparison to the new federal 1-hour $NO_2$ and $SO_2$.standards.

For $NO_2$, the worst-case background concentrations were determined from the review of 3 years (2004–2006) of monitoring data taken from the District's Camp Pendleton Monitoring Station. For $SO_2$, the San Diego monitoring station was used. These stations are deemed to be most representative of air quality in the facility area for $NO_2$ and $SO_2$, respectively. Table 4-1 summarizes the worst-case background concentrations.

**TABLE 4-1**
**MAXIMUM BACKGROUND CONCENTRATIONS[a], PROJECT AREA,2004-2006**
**(µg/m$^3$)—REVISED JUNE 25, 2009**

| Pollutant | Averaging Time | 2004 | 2005 | 2006 |
|---|---|---|---|---|
| $NO_2$ (Camp Pendleton) | 1-hour | **186** | 145 | 152 |
| | Annual | **23** | 23 | 21 |
| $SO_2$ (San Diego) | 1-hour | **110** | 105 | 89 |
| | 3-hour | 52 | 68 | **79** |
| | 24-hour | **24** | 24 | 24 |
| | Annual | **10** | 8 | 10 |

Source: California Air Quality Data, California Air Resources Board website; EPA AIRData website. Reported values have been rounded to the nearest tenth of a µg/m$^3$.

Notes:

a. Bolded values are the highest during the three years and are used to represent background concentrations.

Since $SO_2$ modeled predicted impacts and monitored backgrounds are relatively low for the project area, simply adding the predicted 1-hour impact to the maximum 1-hour monitored background concentration is sufficient to determine compliance with the new standard (see Table 4-3). Therefore, no additional modeling to determine yearly 99$^{th}$ percentile values was deemed to be necessary.

However, for $NO_2$, simply adding the worst-case monitored 1-hour $NO_2$ concentration in the three-year period to the maximum hourly modeled project impact indicated there was the possibility that the new federal standard could be exceeded. Also, as a second level screening procedure, the three-year average 98$^{th}$ percentile monitored background in the

modeling period (2003–2005) was added to the maximum modeled 1-hour $NO_2$ concentration. This also indicated there was the possibility that the new federal standard could be exceeded. Therefore, additional modeling was required to produce the output files necessary for post processing that adds hourly $NO_2$ background monitored concentrations to the modeled impacts on an hour-by-hour basis in the modeling period to determine the 98$^{th}$ percentile values for each year. Temporally pairing the project impacts and the monitored background concentrations on an hour-by-hour basis is consistent with District policy regarding other pollutants and ambient air quality standards.

Ozone ($O_3$) and $NO_2$ background concentration data from the Camp Pendleton Monitoring Station were used for these calculations. Consistent with past policy, the District based its conclusion on data that did not have missing background values filled by estimates of the missing value (see Appendix A for a discussion). However, to inform the decisions of other regulatory agencies, the District also evaluated the effect of filling the missing background data. The missing data was filled as in the draft interim screening procedure for filling ozone and $NO_2$ background data (see Appendices A and B for a discussion and the details of the filling procedures).

The model impacts and background were both expressed in parts per billion by volume (ppbv) to be consistent with the standard's form based on concentration per unit volume. Hourly model impacts were converted from micrograms per cubic meter ($\mu g/m_3$) to ppbv using a reference pressure based on the altitude of the stack exit and the hourly filled temperature for the Camp Pendleton monitoring station.

The District developed an interim post-processing procedure that provided a conservatively high calculation of 98$^{th}$ percentile of the daily maximum hourly high values (8$^{th}$ high value of background concentration plus project impacts in this case). The interim post processing extracts the maximum daily maximum hourly high values for all receptors for each day in each year and then determines the 8$^{th}$ high value from these maximums for each year. Thus, the post-processing procedure determines the global 98$^{th}$ percentile of the daily maximum values and not the 98$^{th}$ percentile on a receptor-specific basis as would be allowed by the standard. This procedure results in conservatively high 98th percentile values (see Appendix D). A comparison of the results for one case (startup/shutdown with new and existing equipment and filled background data) with the results of a refined post processing procedure implemented with software that does calculate the 98$^{th}$ percentile on a receptor-specific basis indicates that the District post processor calculation of the 98$^{th}$ percentile is biased high by about 9 ppbv for this AQIA. The refined post processor was kindly provided by the San Joaquin Valley Unified Air Pollution Control District at the District's request.

The results of the supplemental modeling for 1-hour $NO_2$ impacts, including background during normal operations, startup/shutdowns and commissioning compared with the new federal 1-Hour $NO_2$ Ambient Air Quality Standard are provided in Tables 4-2A and 4-2B for unfilled and filled background data, respectively.

Table 4-3 provides a summary of the proposed project modeled maximum $SO_2$ impacts, including worst-case ambient background concentrations, compared with the new federal 1-Hour Ambient Air Quality Standard. Conservatively, the maximum 1-hour $SO_2$ predicted impact rather than the 3-year average of the 99$^{th}$ percentile impact was used for this analysis.

**TABLE 4-2A**
**SUPPLEMENTAL $NO_2$ MODELING RESULTS, UNFILLED BACKGROUND**

| Operation Mode | Total Impact[a] (ppb) | Federal Standard (ppb) |
|---|---|---|
| Normal Operation , New Equipment Only | 85.7 | 100 |
| Normal Operations, New Equipment plus Existing Equipment | 88.4 | 100 |
| Commissioning, New Equipment Only | 79.9 | 100 |
| Commissioning, New Equipment plus Existing Equipment | 87.8 | 100 |
| Startup, New Equipment Only | 86.0 | 100 |
| Startup, New Equipment plus Existing Equipment | 88.3 | 100 |

Notes:
a. Maximum three year average (2003-2005) of 98$^{th}$ percentile of daily maximum one-hour $NO_2$ total impacts (modeled impact plus monitored background).

**TABLE 4-2B**
**SUPPLEMENTAL $NO_2$ MODELING RESULTS, FILLED BACKGROUND**

| Operation Mode | Total Impact[a] (ppb) | Federal Standard (ppb) |
|---|---|---|
| Normal Operation , New Equipment Only | 89.5 | 100 |
| Normal Operations, New Equipment plus Existing Equipment | 91.3 | 100 |
| Commissioning, New Equipment Only | 81.0 | 100 |
| Commissioning, New Equipment plus Existing Equipment | 88.3 | 100 |
| Startup, New Equipment Only | 89.7 | 100 |
| Startup, New Equipment plus Existing Equipment | 92.0 | 100 |

Notes:
a. Maximum three year average (2003-2005) of 98$^{th}$ percentile of daily maximum one-hour $NO_2$ total impacts (modeled impact plus monitored background).

**TABLE 4-3**
**MAXIMUM PROPOSED PROJECT 1-HOUR $SO_2$ IMPACTS**

| Pollutant | Maximum Project Impact ($\mu g/m^3$) | Background ($\mu g/m^3$) | Total Impact ($\mu g/m^3$) | State Standard ($\mu g/m^3$) | Federal Standard ($\mu g/m^3$) |
|---|---|---|---|---|---|
| $SO_2$ | 4.3 | 110 | 114 | 650 | 196 |

## 4.2 STATE 1-HOUR AND FEDERAL AND STATE ANNUAL $NO_2$ STANDARDS

Because the change in in-stack NO2/NOx and the slightly different modeling scenarios, which could lead to higher modeled impacts, the district revisited the AQIA with respect to

the state 1-hour $NO_2$ standard and state and federal annual $NO_2$ standards. Table 4.4 shows the results for the state 1-hour $NO_2$ standard. As in the final review report the determination of compliance is based on the maximum background in 2004-2006 and the maximum modeled impact in each case.

**TABLE 4-4**
**SUPPLEMENTAL $NO_2$ MODELING RESULTS, STATE 1-HOUR $NO_2$ STANDARD,**

| Operation Mode | Maximum Project Impact (µg/m$^3$) | Background (µg/m$^3$) | Total Impact (µg/m$^3$) | State Standard (µg/m$^3$) |
|---|---|---|---|---|
| Normal Operation , New Equipment Only | 133.2 | 186 | 319.2 | 338 |
| Normal Operations, New Equipment plus Existing Equipment | 133.2 | 186 | 319.2 | 338 |
| Commissioning, New Equipment Only | 127.5 | 186 | 313.5 | 338 |
| Commissioning, New Equipment plus Existing Equipment | 134.6 | 186 | 320.6 | 338 |
| Startup, New Equipment Only | 133.2 | 186 | 319.2 | 338 |
| Startup, New Equipment plus Existing Equipment | 133.2 | 186 | 319.2 | 338 |

The District did not deem it necessary to remodel the annual $NO_2$ impact because of the relatively small increase in project maximum hourly impacts compared to the final review report, about 5%; the extremely low annual project impact determined in the final review report, 0.1 µg/m$^3$; and the low worst-case annual average background concentration of 23 µg/m$^3$ compared to the state and federal standards of 56 and 100 ug/m$^3$, respectively.

## 5.0 CONCLUSION

The results of the AQIA indicate that the proposed facility operations including commissioning and startup/shutdowns will not cause or contribute to an exceedance of the new federal 1-Hour Ambient Air Quality Standards for $NO_2$ and $SO_2$. The District also affirms its conclusions in the July 29, 2009, final review report regarding the project's compliance with all other state and federal ambient air quality standards including the state1-hour and the state and federal annual Ambient Air Quality Standards for $NO_2$.

# Appendix A

# $NO_2$ and $O_3$ Missing Data Discussion

## 1.0. Sufficiency of Available Background Concentration Data for $NO_2$ and $O_3$

Compliance with the federal 1-hour nitrogen dioxide ($NO_2$) standard is determined by averaging the 98$^{th}$ percentile daily maximums of the 1-hour $NO_2$ concentrations at each receptor for each year over a three-year period. The 98$^{th}$ percentile is equivalent to the 8$^{th}$ highest daily 1-hour maximum for 351 or more creditable daily samples per year. For $NO_2$ background data for years 2003–2005 from the Camp Pendleton Monitoring Station used in the Carlsbad Energy Center Project (CECP) modeling, the number of creditable daily samples ranged from 354 to 362 based on EPA criteria for a creditable sample. Therefore, the 8$^{th}$ highest daily maximum is equivalent to the 98$^{th}$ percentile.

For a source of emissions not already considered in the background, the modeled impacts from the source at each receptor are added to the background $NO_2$ concentrations to determine the 98$^{th}$ percentile combination of source impacts and background concentrations in each year modeled. The background ozone ($O_3$) concentration is needed for the modeling as well as the $NO_2$ concentration because NOx emitted from combustion emission sources is comprised of both nitric oxide (NO) and $NO_2$. There are no ambient air quality standards for NO. However, NO is converted to $NO_2$ in the atmosphere by:

$$NO + O_3 \rightarrow NO_2 + O_2$$

Background $NO_2$ and $O_3$ concentrations vary with emissions, meteorology, and atmospheric photochemistry. As a result, both $NO_2$ and $O_3$ concentrations in the atmosphere have strong diurnal and seasonal dependencies. The same considerations apply to the modeled emission impacts from operations of the source that are added to the background concentration to determine compliance with the standard, although the source's emissions are often assumed to be fixed at the maximum emission rate. In addition, background emissions and atmospheric chemistry themselves are significantly affected by meteorology (e.g., temperature).

Consistent with existing District policy for other pollutants in air quality impact assessments (AQIAs), the District finds that the most appropriate way to address the diurnal and seasonal dependence is to examine a sufficiently large number of periods with matching meteorology, background concentrations, and source emissions. For evaluating the $NO_2$ impacts of the CECP with respect to the federal 1-hour standard, the District's standard three-year modeling period was used (in this case, the years 2003–2005). This period includes approximately 25,000 separate hours where background concentrations were available for both $O_3$ and $NO_2$ at the Camp Pendleton monitoring station, determined to be the most representative monitoring station for background $O_3$ and $NO_2$ for this project. Table A-1 shows the background data availability by year.

Table A-1. Availability of Hourly $O_3$ and $NO_2$ Background Concentration Data.

| Year | **$O_3$** | **$NO_2$** | **$O_3$ & $NO_2$** |
|---|---|---|---|
| 2003 | 0.977 | 0.975 | 0.974 |
| 2004 | 0.983 | 0.975 | 0.973 |
| 2005 | 0.935 | 0.932 | 0.931 |

The drop in data availability in 2005 is due to the District increasing calibrations of the monitoring equipment to once per day, which causes one hour of missing data for each day.

The District examined the potential impact of missing $O_3$ and $NO_2$ data on assessing the air quality impacts with respect to the 1-hour federal $NO_2$ standard. Since the 8$^{th}$ high daily $NO_2$ maximums from the AQIA (modeled impact plus backgrounds) are less than the standard (100 ppbv) for each year, the District notes that the potential impact of missing background concentrations are only potentially significant if inclusion of the sum of the missing background and modeled project impacts would cause the 8$^{th}$ highest sum overall to exceed the standard. In the case of the CECP, the District estimates that, if all the missing data were available, the probability of significantly affecting the results of the AQIA for any year is less than $10^{-3}$. The District believes this a conservatively high estimate of the probability because, even if the standard were exceeded in one year, compliance might still be demonstrated based on the 3-year average and $NO_2$ background concentration levels continue to decrease in the District. In addition, the modeling considered the emergency fire pump engine to be operating on every hour of the modeling period, which greatly overestimates its likely contribution to the 8$^{th}$ highest daily maximum $NO_2$ concentration since, aside from actual emergencies, it is only allowed to operate 50 hours per year for maintenance and testing purposes.

Thus, the District has concluded that basing the AQIA only on the available data is sufficient without attempting to fill missing $O_3$ and $NO_2$ background concentration data. However, as discussed below, the District analyzed the effect of filling the missing O3 and $NO_2$ background values with a draft interim screening filling procedure developed by the District in order to address potential concerns of other regulatory agencies.

## 2.0. Ozone and Nitrogen Dioxide Background Concentration Filling

The draft interim screening $O_3$ and $NO_2$ filling procedures recommended by the District are given in Appendix B. The $O_3$ and $NO_2$ filling procedure used the existing data available at the representative modeling station rather than substitution of data from an additional monitoring station(s).

To address hour-of-day and seasonal effects, both the $O_3$ and $NO_2$ single hour filling procedures are based on filling the data with the maximum value from the immediately adjacent clock-hours (either on the same day or immediately adjacent days). For multiple missing hours, each

missing clock-hour was filled using the maximum value within the 30-day period centered on the missing hour for either the missing clock-hour or, if this data was not available, the preceding or succeeding clock hour. Additionally, for filling multiple hours of missing $NO_2$ background concentrations, the maximum filled background value was not allowed to exceed the 98$^{th}$ percentile maximum background (design value for the standard) for the year. This assures that compliance is based on the same design value that the District attainment status is based on and prevents a situation where filling the background $NO_2$ data could by itself lead to an exceedance of the standard.

Maximum values were used to fill the missing concentrations to limit underestimates of background concentrations during peaks. As a result, the procedure overestimates the missing background concentrations for most hours. The performance of the filling procedure was evaluated by applying the procedure to the existing $O_3$ and $NO_2$ data for 2003–2005 from the Camp Pendleton Monitoring Station. The performance analysis consisted of assuming that a given hour was missing in the data (either as a single missing hour or part of a multiple missing hour period), filling that hour per the procedure, and then comparing the results to the actual data. The results are shown in Tables A-2–A-5. Results for one alternative procedure for single missing hours (interpolation) and one alternative procedure for multiple missing hours (use of the maximum on preceding and succeeding days for a missing clock hour) are also presented.

As can be seen, in comparison to the draft procedure, interpolation provides the most unbiased estimate during missing single hours in general but significantly underestimates concentrations on the hours of daily maxima. It is also apparent that the draft interim screening filling procedures used are biased significantly high for single missing hours in general and are also biased high for multiple missing hours on the hours of daily maxima in general. However, the procedure for a single missing hour is nearly an unbiased estimate for the hours of daily maxima.

One characteristic of conservative filling procedures is that they are likely to significantly distort the upper tail of the AQIA results (i.e., the eight highest daily maxima each year) upon which regulatory decisions for the federal 1-hour $NO_2$ standard are based. In this case, 1–3 of the highest eight daily maxima for each year, depending on the scenario and year, were hours with filled $O_3$ or $NO_2$ background data although only about 4% of the background data over the modeled 3-year period was filled. The filled hours included in the highest eight hours were overwhelming dominated by hours filled with the multiple-hour filling procedure, which is considerably more conservative (and also considerably more unlikely to actually occur) than the single hour procedure.

Table A-2. Performance of the Draft Interim Screening $O_3$ Background Filling Procedure for All Hours Compared to Two Alternate Procedures.

| | Single Missing Hour | Multiple Missing Hours | Alternative A, for Single Missing Hours[a] | Alternative B, for Multiple Missing Hours[b] |
|---|---|---|---|---|
| **Analysis Period** | | | | |
| Total Period, hr | 26304 | 26304 | 26304 | 26304 |
| Analyzed, hr[c] | 24232 | 25384 | 24232 | 25374 |
| **Fraction of Hours:** | | | | |
| Overestimated | 0.883 | 0.966 | 0.454 | 0.670 |
| Underestimated | 0.058 | 0.028 | 0.460 | 0.288 |
| Accurate | 0.059 | 0.006 | 0.087 | 0.042 |
| **Residuals, ppbv[d]** | | | | |
| Mean | 9.3 | 25.2 | 0.0 | 5.7 |
| Maximum | 78.0 | 95.0 | 49.0 | 78.0 |
| Minimum | -22.0 | -34.0 | -37.0 | -52.0 |
| Percentile Levels | | | | |
| 0.95 | 31.0 | 50.0 | 6.5 | 30.0 |
| 0.5 | 6.0 | 24.0 | 0.0 | 4.0 |
| 0.05 | -1.0 | 3.0 | -6.0 | -14.0 |

[a]Alternative A fills single hours by interpolation between immediately adjacent hours.

[b]Alternative B fills multiple missing hours with the maximum for that clock hour on the immediately preceding and succeeding days.

[c]Hours not analyzed were hours that had either missing $O_3$ values for that hour in the data set or, for single hours, missing adjacent hours, which would make that hour part of a multiple missing hour period.

[d]Positive values indicated overestimates and negative values indicate underestimates.

Table A-3. Performance of Draft Interim Screening $O_3$ Background Filling Procedure at Daily Maxima Compared to Two Alternate Procedures.

| | Single Missing Hour | Multiple Missing Hours | Alternative A, for Single Missing Hours[a] | Alternative B, for Multiple Missing Hours[b] |
|---|---|---|---|---|
| **Analysis Period** | | | | |
| Total Period, hr | 1481 | 1527 | 1481 | 1527 |
| Analyzed, hr[c] | 1474 | 1520 | 1474 | 1520 |
| **Fraction of Hours:** | | | | |
| Overestimated | 0.377 | 0.886 | 0.003[e] | 0.361 |
| Underestimated | 0.365 | 0.095 | 0.941 | 0.582 |
| Accurate | 0.258 | 0.019 | 0.056 | 0.057 |
| **Residuals, ppbv[d]** | | | | |
| Mean | 1.7 | 15.2 | -3.4 | -2.7 |
| Maximum | 46.0 | 69.0 | 2.5 | 46.0 |
| Minimum | -17.0 | -34.0 | -35.5 | -45.0 |
| Percentile Levels | | | | |
| 0.95 | 13.0 | 38.0 | 0.0 | 13.0 |
| 0.5 | 0.0 | 14.5 | -2.5 | -2.0 |
| 0.05 | -4.0 | -4.0 | -10.5 | -22.0 |

[a]Alternative A fills single hours by interpolation between immediately adjacent hours.

[b]Alternative B fills multiple missing hours with the maximum for that clock hour on the immediately preceding and succeeding days.

[c]Hours not analyzed were hours that had either missing $O_3$ values for that hour in the data set or, for single hours, missing adjacent hours, which would make that hour part of a multiple missing hour period.

[d]Positive values indicated overestimates and negative values indicate underestimates.

[e]It is possible for interpolation based on the immediately preceding and succeeding hours to overestimate calendar-day maxima that occur in the first or last hour of a calendar day.

Table A-4. Performance of Draft Interim Screening $NO_2$ Background Filling Procedure for All Hours Compared to Two Alternate Procedures.

| | Single Missing Hour | Multiple Missing Hours | Alternative A, for Single Missing Hours[a] | Alternative B, for Multiple Missing Hours[b] |
|---|---|---|---|---|
| **Analysis Period** | | | | |
| Total Period, hr | 26304 | 26304 | 26304 | 26304 |
| Analyzed, hr[c] | 24101 | 25266 | 24101 | 25254 |
| **Fraction of Hours:** | | | | |
| Overestimated | 0.835 | 0.962 | 0.464 | 0.628 |
| Underestimated | 0.075 | 0.029 | 0.387 | 0.261 |
| Accurate | 0.089 | 0.009 | 0.150 | 0.111 |
| **Residuals, ppbv[d]** | | | | |
| Mean | 6.4 | 19.5 | 0.0 | 3.6 |
| Maximum | 88.0 | 78.0 | 44.0 | 88.0 |
| Minimum | -58.0 | -57.0 | -62.5 | -76.0 |
| Percentile Levels | | | | |
| 0.95 | 23.0 | 53.0 | 5.5 | 21.0 |
| 0.5 | 4.0 | 16.0 | 0.0 | 2.0 |
| 0.05 | -1.0 | 1.0 | -6.0 | -9.0 |

[a]Alternative A fills single hours by interpolation between immediately adjacent hours.

[b]Alternative B fills multiple missing hours with the maximum for that clock hour on the immediately preceding and succeeding days.

[c]Hours not analyzed were hours that had either missing $NO_2$ values for that hour in the data set or, for single hours, missing adjacent hours, which would make that hour part of a multiple missing hour period.

[d]Positive values indicated overestimates and negative values indicate underestimates.

Table A-5. Performance of Draft Interim Screening $NO_2$ Background Filling Procedure at Daily Maxima Compared to Two Alternate Procedures.

| | Single Missing Hour | Multiple Missing Hours | Alternative A, for Single Missing Hours[a] | Alternative B, for Multiple Missing Hours[b] |
|---|---|---|---|---|
| **Analysis Period** | | | | |
| Total Period, hr | 1250 | 1313 | 1250 | 1313 |
| Analyzed, hr[c] | 1242 | 1305 | 1242 | 1305 |
| **Fraction of Hours:** | | | | |
| Overestimated | 0.385 | 0.847 | 0.023 | 0.352 |
| Underestimated | 0.486 | 0.134 | 0.951 | 0.605 |
| Accurate | 0.130 | 0.019 | 0.026 | 0.044 |
| **Residuals, ppbv[d]** | | | | |
| Mean | 0.2 | 12.6 | -7.5 | -4.4 |
| Maximum | 49.0 | 68.0 | 4.0 | 49.0 |
| Minimum | -58.0 | -57.0 | -62.5 | -76.0 |
| Percentile Levels | | | | |
| 0.95 | 14.0 | 37.0 | -0.5 | 14.0 |
| 0.5 | 0.0 | 12.0 | -5.5 | -2.0 |
| 0.05 | -10.0 | -8.8 | -20.5 | -28.0 |

[a]Alternative A fills single hours by interpolation between immediately adjacent hours.

[b]Alternative B fills multiple missing hours with the maximum for that clock hour on the immediately preceding and succeeding days.

[c]Hours not analyzed were hours that had either missing $NO_2$ values for that hour in the data set or, for single hours, missing adjacent hours, which would make that hour part of a multiple missing hour period.

[d]Positive values indicated overestimates and negative values indicate underestimates.

[e]It is possible for interpolation based on the immediately preceding and succeeding hours to overestimate calendar-day maxima that occur in the first or last hour of a calendar day.

# Appendix B

# DRAFT Interim Screening Filling Procedures for

# $NO_2$ and $O_3$

## 1.0 Screening Procedure for Filling Missing Ozone Ambient Concentrations in AQIA Modeling

Below is a screening procedure for filling missing hours monitored ambient ozone concentrations for purposes of Air Quality Impact Analysis (AQIA) modeling to determine compliance with the federal1-hour $NO_2$ standard. The data should be filled in the units reported by the District monitoring (ppmv) and then converted to units of $\mu g/m^3$ for use in AERMOD based on the ambient temperature reported by the monitor and, optionally, ambient pressure. The ambient temperature data gaps can be filled by standard meteorological data filling procedures such as linearly interpolation between the end points for one, two, or three hours of missing data and data substitution from an alternative temperature monitor(s) for longer gaps (also filled by linear interpolation for up to three hours, if necessary). Ambient pressure data gaps can be filled in the same manner as temperature.

For missing ozone concentration data:

1) Fill any single missing hour with the maximum of the:

    a. Preceding hour
    b. Succeeding hour
    c. Same hour of day on previous day
    d. Same hour of day on succeeding day

    If there is missing data for either c and/or d, use only the maximum of the available data to fill the missing hour (both a and b are guaranteed to be present since only single missing hours are filled in this step). Note that the most likely scenario for both c and d to be missing is for years when the monitor is calibrated at the same hour each day. In this case, the 30-day rolling average (see step 2) for that hour will also not be available.

2) For hours that are not filled by step 1(all periods with more than one hour missing), fill the missing hour with the maximum for that hour of day for a 30-day rolling period centered on the hour (i.e., for the 15 preceding days and the 15 succeeding days). Note that 30-day rolling period will extend into the preceding and succeeding year at the start or end, respectively, of the modeling period.

3) For hours not filled by step 2, fill the missing data with the maximum of the 30-day rolling period for the preceding or succeeding hour.

4) Any hours not filled by steps 1–3, are likely periods with more than a month of missing data for all hours. These will be filled on a case-by-case basis.

## 2.0 Screening Procedure for Filling Missing $NO_2$ Ambient Concentrations in AQIA Modeling

Below is a screening procedure for filling missing hours monitored ambient nitrogen dioxide ($NO_2$) concentrations for purposes of Air Quality Impact Analysis (AQIA) modeling to determine compliance with the federal1-hour $NO_2$ standard. The data should be filled in the units reported by the District monitoring (ppmv).

For missing $NO_2$ concentration data:

1) Fill any single missing hour with the maximum of the:

    a. Preceding hour
    b. Succeeding hour
    c. Same hour of day on previous day
    d. Same hour of day on succeeding day

    If there is missing data for either c and/or d, use only the maximum of the available data to fill the missing hour (both a and b are guaranteed to be present since only single missing hours are filled in this step). Note that the most likely scenario for both c and d to be missing is for years when the monitor is calibrated at the same hour each day. In this case, the 30-day rolling average (see step 2) for that hour will also not be available.

2) For hours that are not filled by step 1(all periods with more than one hour missing), fill the missing hour with the maximum for that hour of day for a 30-day rolling period centered on the hour (i.e., for the 15 preceding days and the 15 succeeding days). Note that 30-day rolling period will extend into the preceding and succeeding year at the start or end, respectively, of the modeling period.

3) For hours not filled by step 2, fill the missing data with the maximum of the 30-day rolling period for the preceding or succeeding hour.

4) Any hours not filled by steps 1−3, are likely periods with more than a month of missing data for all hours. These will be filled on a case-by-case basis.

5) Check all filled hours for which the filled concentration is higher than the maximum monitored concentration recorded for that day (for a complete day of missing data, the maximum monitored concentration is considered zero for purposes of this comparison). If the filled concentration is higher than the appropriate nth highest daily maximum monitored concentration for the calendar year for determining compliance with federal 1-hour standard (e.g., for 351 or more days of valid data, the $8^{th}$ highest daily maximum is

the appropriate value), then replace filled concentration with the appropriate nth highest daily maximum to fill that hour. Note: This prevents the filling procedure from changing the nth highest daily maximum for the year.

# Appendix C

# In-Stack $NO_2$/NOx

NOx emitted from combustion emission sources is comprised of both nitric oxide (NO) and nitrogen dioxide ($NO_2$). Impacts from an emission source include impacts from both directly emitted $NO_2$ and from NO converted to $NO_2$ in the atmosphere by ozone. The amount $NO_2$ directly emitted at the exit of the stack is determined by the total NOx emitted and the in-stack $NO_2$ to NOx ratio ($NO_2$/NOx). The directly emitted $NO_2$ can be important for periods with low ozone levels or when impacts are relatively close to the source and there is little time for conversion of emitted NO to $NO_2$.

Except for the two new combined cycle turbines previous analyses of the project's air quality impacts were based on a default in-stack $NO_2$/NOx of 0.1, which is the default used by the AERMOD modeling software. Consideration of the new federal 1-hour $NO_2$ standard has raised the awareness of the need to use ratios different from the default in some situations and support the $NO_2$/NOx used in modeling exercises.

The District based the in-stack $NO_2$/NOx, 0.25, used to model the new, large combined cycle turbines for normal operations on several annual source tests conducted at another large combined cycle facility. For startup and commissioning, the in-stack ratio, 0.4, was based on the approximate maximum ratio the District has observed during startups of the same large combined cycle turbine. These ratios were used in the previous modeling documented in the 2009 final review report for CECP demonstrating compliance with the state 1-hour $NO_2$ standard and the state and federal annual $NO_2$ standards. The default in-stack $NO_2$/NOx of 0.1 was used for the rest of the equipment because, it was standard procedure at the time and no information had been developed by the District to support a different ratio.

For determining compliance with federal 1-hour $NO_2$ standard, $NO_2$/NOx ratios for the auxiliary equipment (new emergency fire pump engine and existing peaking turbine) were developed and used in the AQIA. For the new emergency fire pump engine, an in-stack $NO_2$/NOx of 0.16 was used based on the average of two source tests the District has conducted on emergency fire pump engines. For the existing peaking turbine, an in-stack ratio of 0.19 was used based on the average of 10 source tests of the existing peaking turbine at the facility.

Due to a lack of source test information for $NO_2$ (as opposed to NOx), an in-stack $NO_2$/NOx of 0.1 was retained for the two existing utility boilers since the default value was originally derived from source tests on this type of equipment. However, preliminary results from a recent source test of one of the two boilers indicate an in-stack $NO_2$/NOx of less than 0.05.

To check the sensitivity of the results to the auxiliary equipment in-stack $NO_2$/NOx, the District conducted two additional modeling runs, the results of which are shown in Table C-1. The emergency engine $NO_2$/NOx is likely the most important contributor to the result sensitivity since its emissions dominate the impacts from the new equipment (see Table C-2) and its

relatively low level release makes the in-stack $NO_2$/NOx more important. However, since this engine is limited to only 50 hours per year of operation it is likely its impacts are greatly overestimated as a practical matter by the modeling which assumed it was operating every hour of the year (except during commissioning when it was assumed not to be operated).

Table C-1. Auxiliary Equipment, In-Stack $NO_2$/NOx Sensitivity, Unfilled Background.

| Operation Mode | Auxiliary Equipment | $NO_2$/NOx | Project Impact Plus Background, 98th Percentile, ppbv | Maximum Project Impact, µg/m$^3$ |
|---|---|---|---|---|
| Normal Operations, New Equipment | Emergency Engine | 0.21[a] | 86.5 | 135.2 |
| Normal Operations, New Equipment | Emergency Engine | 0.16[b] | 85.7 | 133.2 |
| Normal Operations, New Plus Existing Equipment | Emergency Engine | 0.16[b] | 91.3 | 133.2 |
| | Peaking Turbine | 0.19[b] | | |
| Normal Operations, New Plus Existing Equipment | Emergency Engine | 0.1[c] | 90.5 | 129.5 |
| | Peaking Turbine | 0.1[c] | | |

[a]Highest value of two District source tests of diesel emergency fire pump engines used to calculated the average value used in the air quality impact analysis. Another recent source test of a diesel emergency fire pump engine indicated an in-stack $NO_2$/NOx of about 0.18 for that engine. Review of source tests on other diesel powered engines without add-on emission controls did not indicate any in-stack $NO_2$/NOx greater than 0.21.

[b]Average value of District source tests.

[c]Default value.

Table C-2. Emergency Engine Impacts.

| Operation Mode | $NO_2/NOx$ | Project Impact 98th Percentile, ppbv | Maximum Project Impact, µg/m$^3$ |
|---|---|---|---|
| Startup and Shutdown, New Equipment, with Emergency Engine | 0.16 | 86.0 | 133.2 |
| Startup and Shutdown, New Equipment, w/o Emergency Engine | N/A | 71.9 | 86.6 |

Based on the information, the District finds that the in-stack $NO_2/NOx$ ratios used in the modeling are an adequate basis for its compliance determination.

# Appendix D

# Hour-by-Hour Pairing

# District Interim Hour-by-Hour Pairing Methodology Used to Determine Compliance with the Federal 1-Hour $NO_2$ Standard

## Nomenclature

$A_{rhd}$ is the model impact for the *r*th receptor in the *h*th hour of the *d*th day in a year.

$B_{hd}$ is the $NO_2$ background for the *h*th hour of the *d*th day in a year.

$C_{rhd}$ is the sum of the model impact and background for the *r*th receptor in the *h*th hour of the *d*th day in a year.

$C(max\text{-}avg)_{(8)}$ is the maximum among all the receptors of the 3-year average of the 8th highest daily maximum of model impact plus the background for each hour of the day calculated at each receptor.

Other intermediate variables and variables for the District's intermediate procedure are defined below. For clarity, a prime ( ) is used to denote the District interim method when necessary.

## Refined Methodology (Not Used for the Carlsbad Energy Center Project Determination)

1) Calculate $C_{rhd}$ for each receptor for each hour in each day.

   $C_{rhd} = A_{rhd} + B_{hd}$

2) Find the maximum impact for the day at each receptor, $C(max)_{rd}$.

   $C(max)_{rd} = \max(C_{rhd})$ over all $h$.

3) From the daily maximums, calculate the 8th high daily maximum at each receptor for the year, $C_{r(8)}$.

   $C_{r(8)}$ = the 8th largest $C(max)_{rd}$ over all $d$.

4) Average the 8th high daily maximums for the year at each receptor over three years.

   $C(avg)_{r(8)} = \text{avg}(C_{r(8)})$ over all three years.

5) Find the maximum 3-year average 8th high daily maximum among all the receptors.

   $C(max\text{-}avg)_{(8)} = \max(C(avg)_{r(8)})$ over all $r$.

6) Compare the maximum 3-year average 8th high impact from among all the receptors, $C(max\text{-}avg)_{(8)}$ , to the standard to determine compliance.

**Screening Hourly-by-Hour Pairing Methodology (Used for the Carlsbad Energy Center Project Determination)**

The screening methodology was used because for much of the review period the District did not have a post-processor that it considered able to perform the calculations of the refined analysis in a manner acceptable to the District and because the interim procedure facilitated dealing with the evolving nature of the methodology being used to determine compliance (e.g., gap filling) without continuous post-processor reruns. The intermediate procedure calculations beyond the first step can be carried out with a large spreadsheet.

1) Find the maximum model impact for each hour of the day among all the receptors, $A\ (max)_{hd}$.

   $A\ (max)_{hd} = \max(A_{rhd})$ over all $r$.

2) Find the maximum model plus background impact for each hour of the day among all the receptors, $C\ (max)_{hd}$.

   $C\ (max)_{hd} = A\ (max)_{hd} + B_{hd}$

   Since the background is assumed representative for all receptors, and hence is a constant for each hour, steps 1 and 2 are equivalent to finding the maximum of $A_{rhd} + B_{hd}$ among all the receptors in each hour.

3) From the hourly maximum impacts among all the receptors, determine the daily maximum impacts, $C\ (max)_{d}$.

   $C\ (max)_{d} = \max(C\ (max)_{hd})$ over all $h$.

4) From the daily maximums calculate the 8th highest daily maximum for the year, $C_{(8)}$.

   $C_{(8)}$ = the 8th largest $C\ (max)_{d}$ over all $d$.

5) Average the 8th highest daily maximums for each year over three years.

   $C\ (avg)_{(8)} = \text{avg}(C_{(8)})$ over all three years.

6) Compare the 3-year average, $C\ (avg)_{(8)}$ , to the standard to determine compliance.

Note that:

$$C\ (max)_{d} \geq C(max)_{rd}$$

since $C\ (max)_{d}$ is the maximum for the day among all the receptors. Thus $C\ (max)_{d}$ only equals $C(max)_{rd}$ at one receptor for each day.

Also:

$C_{(8)} \geq C_{r(8)}$ for all $r$ in each year.

In fact, except for the unlikely possibility of ties in the top eight values of $C(max)_{rd}$ among receptors, the only case when $C_{(8)}$ equals $C_{r(8)}$ is if the top eight daily highs in a year among all the receptors all occur at the same receptor—a very unlikely possibility. In all other cases, $C_{(8)}$ is larger than $C_{r(8)}$.

It follows that:

$C\ (avg)_{(8)} \geq C(avg)_{r(8)}$ for all $r$.

and

$C\ (avg)_{(8)} \geq C(max\text{-}avg)_{(8)}$

$C\ (avg)_{(8)}$ is guaranteed to be at least equal to $C(max\text{-}avg)_{(8)}$. Moreover, $C\ (avg)_{(8)}$ is almost always going to be greater than $C(max\text{-}avg)_{(8)}$, because, except for the unlikely possibility for ties in $C(max\text{-}avg)_{(8)}$ among the receptors, the only case when $C\ (avg)_{(8)}$ can equal $C(max\text{-}avg)_{(8)}$ is if $C(max\text{-}avg)_{(8)}$ in each of the three years occurs at the same receptor. Therefore, the District's screening hour-by-hour pairing methodology in general gives a conservatively high estimate of the value used to determine compliance.

**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 *CARLSBAD ENERGY CENTER PROJECT***

**Docket No. 07-AFC-6**
***PROOF OF SERVICE***
**(Revised 1/24/2011)**

APPLICANT
*Jennifer Hein
George Piantka, PE.
NRG Energy, Inc., West Region
5790 Fleet Street, Ste. 200
Carlsbad, CA 92008
*jennifer.hein@nrgenergy.com
george.piantka@nrgenergy.com

APPLICANT'S CONSULTANTS
Robert Mason, Project Manager
CH2M Hill, Inc.
6 Hutton Centre Drive, Ste. 700
Santa Ana, CA 92707
Robert.Mason@ch2m.com

Megan Sebra
CH2M Hill, Inc.
2485 Natomas Park Drive, Ste. 600
Sacramento, CA 95833
Megan.Sebra@ch2m.com

COUNSEL FOR APPLICANT
John A. McKinsey
Stoel Rives, LLP
500 Capitol Mall, Suite 1600
Sacramento, CA 95814
jamckinsey@stoel.com

INTERESTED AGENCIES
California ISO
*E-mail Preferred*
e-recipient@caiso.com

INTERVENORS
Terramar Association
Kerry Siekmann & Catherine Miller
5239 El Arbol
Carlsbad, CA 92008
siekmann1@att.net

City of Carlsbad
South Carlsbad Coastal
Redevelopment Agency
Allan J. Thompson
21 "C" Orinda Way #314
Orinda, CA 94563
allanori@comcast.net

City of Carlsbad
South Carlsbad Coastal
Redevelopment Agency
Joseph Garuba,
Municipals Project Manager
Ronald R. Ball, Esq., City Attorney
1200 Carlsbad Village Drive
Carlsbad, CA 92008
*E-mail Preferred*
Joe.Garuba@carlsbadca.gov
ron.ball@carlsbadca.gov

California Unions for Reliable Energy (CURE)
Marc D. Joseph
Adams Broadwell Joseph & Cardozo
601 Gateway Boulevard, Suite 1000
South San Francisco, CA 94080
gsmith@adamsbroadwell.com
mdjoseph@adamsbroadwell.com

Center for Biological Diversity
c/o William B. Rostov
EARTH JUSTICE
426 17th Street, 5th Floor
Oakland, CA 94612
wrostov@earthjustice.org

Power of Vision
Julie Baker & Arnold Roe, Ph.D.
4213 Sunnyhill Drive
Carlsbad, California 92013
powerofvision@roadrunner.com

Rob Simpson
Environmental Consultant
27126 Grandview Avenue
Hayward, CA 94542
rob@redwoodrob.com

ENERGY COMMISSION
JAMES D. BOYD
Vice Chair and Presiding Member
jboyd@energy.state.ca.us

Paul Kramer
Hearing Officer
pkramer@energy.state.ca.us

Mike Monasmith
Siting Project Manager
mmonasmi@energy.state.ca.us

Dick Ratliff
Staff Counsel
dratliff@energy.state.ca.us

Jennifer Jennings
Public Adviser's Office
*E-mail Preferred*
publicadviser@energy.state.ca.us

*indicates change

## DECLARATION OF SERVICE

I, Chester Hong, declare that on March 29, 2011, I served and filed copies of the attached STAFF RESPONSE TO CITY OF CARLSBAD'S MOTION TO REOPEN PROCEEDING, dated _, 2011. 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/carlsbad/index.html].

The documents have 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:

__X__ sent electronically to all email addresses on the Proof of Service list;

____ by personal delivery;

__X__ 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:

__X__ 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-6
1516 Ninth Street, MS-4
Sacramento, CA 95814-5512
docket@energy.state.ca.us

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.

/S/

*indicates change