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November 2, 2015

PG&E Letter DCL-15-130

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-0001

Docket No. 50-275, OL-DPR-80
Docket No. 50-323, OL-DPR-82
Diablo Canyon Units 1 and 2
Response to NRC Request for Additional Information Regarding License Amendment Request 15-03, "Application of Alternative Source Term"

References:
1. PG&E Letter DCL-15-069, License Amendment Request 15-03, "Application of Alternative Source Term," dated June 17, 2015 (ADAMS Accession No. ML15176A539)
2. PG&E Letter DCL-15-105, Supplement to License Amendment Request 15-03, "Application of Alternative Source Term," dated August 31, 2015 (ADAMS Accession No. ML15243A363)
3. Email from NRC Project Manager Siva P. Lingam, "Diablo Canyon 1 and 2 – Requests for Additional Information for License Amendment Request 15-03 to Adopt the Alternative Source Term per 10 CFR 50.67 (TAC Nos. MF6399 and MF6400)," dated October 1, 2015

Dear Commissioners and Staff:

Pacific Gas and Electric (PG&E) Letter DCL-15-069, "License Amendment Request 15-03, 'Application of Alternative Source Term,'" dated June 17, 2015, and supplemented by PG&E Letter DCL-15-105, "Supplement to License Amendment Request 15-03, 'Application of Alternative Source Term,'" dated August 31, 2015, submitted License Amendment Request (LAR) 15-03, "Application of Alternative Source Term."

On October 1, 2015, the NRC Radiation Protection and Consequence Branch (ARCB) requested (Reference 3) additional information required to complete the review of LAR 15-03. PG&E's responses to the ARCB staff's questions are provided in the Enclosure.

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The Enclosure, Attachment 4 Contains
~~Security-Related Information – Withhold Under 10 CFR 2.390~~
When separated from Attachment 4, this document is decontrolled.

Attachment 1 provides Input Data for the EN-113 Dispersion Model, the description of input contained in the EN-113 User's Manual, the input files for the Unit 1 Exclusion Area Boundary (EAB), Unit 2 EAB, and the Units 1 and 2 Low Population Zone dispersion model runs. Attachment 2 summarizes the description of the Release-Receptor cases and the associated input/output file names. Attachment 3 provides various data files in response to the NRC requests for information.

Attachment 4 provides various plant drawings. Because the information contained in the drawings may be useful to adversaries, PG&E requests that Attachment 4 be withheld from public disclosure under 10 CFR 2.390.

This information does not affect the results of the technical evaluation or the no significant hazards consideration determination previously transmitted in PG&E Letters DCL-15-069 and DCL-15-105.

PG&E makes no regulatory commitments (as defined by NEI 99-04) in this letter. This letter includes no revisions to existing regulatory commitments.

If you have any questions, or require additional information, please contact Mr. Hossein Hamzehee at (805) 545-4720.

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

Executed on November 2, 2015.

Sincerely,

Barry S. Allen
Vice President, Nuclear Services

mjrm/4557/50307101
Enclosure
cc: Diablo Distribution
cc/enc: Marc L. Dapas, NRC Region IV Administrator
Thomas R. Hipschman, NRC Senior Resident Inspector
Siva P. Lingam, NRR Project Manager
Gonzalo L. Perez, Branch Chief, California Dept of Public Health

ENCLOSURE

ARCB Response

PG&E Response to NRC Request for Additional Information Regarding License Amendment Request 15-03, "Application of Alternative Source Term"

NRC Request for Additional Information General

1. *The licensee used the NRC-accepted ARCON96 dispersion model (based on NUREG/CR-6331, Rev. 1 as implemented by Regulatory Guide (RG) 1.194) to estimate onsite impacts to the Unit 1/Unit 2 Control Rooms (CRs) as well as the Technical Support Center (TSC). The licensee included the TSC pursuant to Supplement 1 to NUREG-0737 (Clarification of TMI Action Plan Requirements - dated January 1983) and RG 1.183. There are 58 source-receptor pairs evaluated for each unit.*

PG&E Response

This request for additional information (RAI) is a statement of fact. No response is necessary.

NRC RAI General

2. *The licensee used a (presumably) proprietary dispersion model referred to as EN-113 (Atmospheric Dispersion Factors), which is said to implement provisions in RG 1.145 for accident releases and from RG 1.111 for routine releases, to estimate short-term relative concentrations (X/Qs) and long-term (annual average) X/Qs at the Exclusion Area Boundary (EAB) and the outer boundary of the Low Population Zone (LPZ) similar to the NRC-accepted PAVAN and XOQDOQ dispersion models, respectively. Unlike PAVAN and XOQDOQ, however, the EN-113 code runs on hourly meteorological data and has, among other things, the ability to directly calculate X/Q values for the intermediate, short-term averaging intervals (i.e., 2-8 hours, 8-24 hours, 1-4 days, and 4-30 days). Because of conflicting discussions within the application package, it is not clear at this stage of the review how these provisions were implemented for this LAR. The licensee also cites other facilities where this code has been used and approved by the NRC staff. The licensee will need to provide justification for the use of the EN-113 code at the DCPP.*

PG&E Response

The following clarifies the discussion in Section 5.1 of Attachment 4 of License Amendment Request (LAR) 15-03:

- Regulatory Guide (RG) 1.145 provides the methodology to establish the 0-2 hour (hr) X/Q, as well as the intermediate, short-term averaging time period X/Qs, (i.e., 2-8 hrs, 8-24 hrs, 1-4 days, 4-30 days) - RG 1.145 calls out use of RG 1.111 methodology (which focusses on developing "long term, annual average" X/Qs).

- Short term (accident) ground level release X/Qs were developed for DCPP using RG 1.145, Revision 1 methodology, using CB&I computer code EN-113 utilizing 2007 through 2011 hourly average meteorological data.

- Intermediate averaging time X/Qs were developed for DCPP using RG 1.111, Revision 1 methodology, using CB&I computer code EN-113, utilizing logarithmic interpolation between the 0-2 hr and the annual average X/Q values. The "sliding average" methodology was not used for DCPP (see Section 5.1 of LAR 15-03), although the capability was discussed in Section 3.0, Attachment 4 of LAR 15-03.
- EN-113 calculates all of the X/Qs (0-2 hr, 2-8 hrs, 8-24 hrs, 1-4 days, 4-30 days) using hourly average meteorological data.
- EN-113 follows RG 1.145 methodology which intrinsically means that the intermediate, short-term averaging time period X/Qs are developed using RG 1.111 methodology
- EN-113 has the capability to calculate the intermediate, short-term averaging time period X/Qs using a) sliding average methodology OR b) logarithmic interpolation between the 0-2 hr and the annual average X/Q values.
- For DCPP, the EN-113 logarithmic interpolation methodology option was chosen to establish the intermediate, short-term averaging time period X/Qs
- PG&E is asking for NRC approval for use of EN-113 for development of accident X/Qs. The LAR does not address normal operation routine releases.

As justification for the usage of EN-113, Section 5.1 of Attachment 4 of LAR 15-03 provides a summary of how RG 1.145 methodology was implemented by EN-113 including the applicable equations used and the key assumptions made to ensure conservative results. Also included is a discussion of the selection process of the appropriate X/Q values for the 0-2 hour averaging time and intermediate period averaging times. As noted in Section 3.0 of Attachment 4 of LAR 15-03, EN-113 has been used in prior alternative source term (AST) licensing applications (e.g., Fort Calhoun Power Station [ML013030027]), and its results accepted by the NRC.

As depicted in Attachment 8 of LAR 15-03, the proposed update of Section 2.3.2 of the Updated Final Safety Analysis Report (UFSAR) reflects the use of the EN-113 computer code to provide short-term (i.e., accident) dispersion estimates. It includes the same level of detail as is provided in Attachment 4 of LAR 15-03.

NRC RAI General

3. *The licensee has updated the meteorological data set used to make its accident-related X/Q estimates (i.e., a more recent 5-year period of record (POR) consisting of data for calendar years 2007 through 2011). Data and summaries through Rev. 20 (November 2011) of the Updated Final Safety Analysis Report (UFSAR) - latest available on NRR's V:\ drive – are based on various 2- or 3-year PORs, which appear to be associated with the initial FSAR submittal for this facility. The purpose*

of some of those summaries appears to be related to the complicated meteorological conditions that characterize this coastal site, which includes complex terrain. It is not clear at this stage of the review how (or if) these previous studies, and the issues previously considered to be important as addressed by those studies, relate to the dispersion modeling analyses performed for this LAR.

PG&E Response

The referenced meteorological studies in the UFSAR with respect to X/Qs were provided by PG&E within the original license application since it pre-dated the availability of the NRC guidance documents. The previous meteorological studies conducted at DCPP in the 1970s are not related to the X/Q dispersion modeling/analyses performed in support of LAR 15-03. The X/Q analyses supporting LAR 15-03 followed the current NRC guidance available in RG 1.145, Revision 1, and uses the updated meteorological data set (i.e., a more recent 5-year period of record (POR) consisting of data for calendar years 2007 through 2011).

NRC RAI Meteorological (Met) Data – Offsite Impacts

1. *Need Met data for calendar years 2007 thru 2011*

   a. *Sequential hourly file(s) formatted in accordance with Appendix A to Revision 1 of RG 1.23 or equivalent with proper explanation;*

   b. *Explanation of any data formatting differences between RG 1.23 (Appendix A) and as input to EN-113 dispersion model;*

   c. *Whether Met data is input to the EN-113 dispersion model as a concatenated 5-year data set or run as individual years and if the latter how the modeling results are interpreted.*

PG&E Response

a. The 2007 through 2011 sequential hourly file(s), formatted in accordance with RG 1.23, Revision 1, Appendix A are provided in the following five Excel files in the enclosed Attachment 3 data disc:

   - NRC07
   - NRC08
   - NRC09
   - NRC10
   - NRC11

b. The RG 1.23, Revision 1, Appendix A format is different than that used in EN-113.

The RG 1.23, Revision 1, Appendix A format is focused on an hourly presentation, i.e., it provides all parameter values on an hourly basis on one line. Thus each line presents the wind speeds, wind directions, temperatures, etc. for the upper level, intermediate, and lower level tower measurements followed by other parameters such as temperature difference and solar radiation for that hour. This is repeated for each hour in the day and each day of the year.

The EN-113 format is focused on a daily presentation, i.e., 24 hourly values for each parameter of interest is presented on a line. Each parameter has a code associated with it such as "111" for 10-meter wind speed and "112" for 10-meter wind direction. Thus, hourly values for each parameter are provided on a daily basis and repeated for each day of the year.

Both formats record the days on a Julian day basis (i.e., Days 1 – 365).

c. The 2007 through 2011 onsite meteorological data are utilized by the EN-113 dispersion model as concatenated 5-year data set.

NRC RAI Meteorological (Met) Data – Offsite Impacts

2. *Joint frequency distributions (JFDs) of wind speed and wind direction by atmospheric stability class for indicated 5-year POR or, if EN-113 was run for individual years, JFDs for each year and for the composite 5-year POR;*

PG&E Response

As noted in PG&E response to NRC Radiation Protection and Consequence Branch (ARCB) RAI-2 (General) above, PG&E used hourly average meteorological data to develop the offsite atmospheric dispersion factors. JFDs of wind speed and wind direction by atmospheric stability class for the indicated 5-year POR have not been submitted to NRC since JFDs were not used to support LAR 15-03.

NRC RAI Meteorological (Met) Data – Offsite Impacts

3. *Bases for determining hourly stability class and if different methods were used throughout the data set(s) (e.g., depending on wind speed as suggested by UFSAR Table 2.3-41) an accounting of such hours when implemented and an explanation for having done so;*

PG&E Response

The hourly stability classes were based on the vertical temperature difference methodology (i.e., delta T) identified in RG 1.23, Revision 1. Temperatures were measured at an upper level of 76 meters and a lower level of 10 meters on the tower.

The delta T method was used to type stability class throughout the entire concatenated 5-year data base.

NRC RAI Meteorological (Met) Data – Offsite Impacts

4. *Summary of data recoveries by year and for the 5-year POR for individual Met parameters and as composite recovery of concurrent wind speed, wind direction, and atmospheric stability class for the same periods;*

PG&E Response

As depicted in Attachment 8 of LAR 15-03, the proposed update of Section 2.3.2 of the UFSAR reflects the use of the 2007 through 2011 onsite meteorological data for the calculation of accident diffusion estimates.

The summary of data recoveries for this period, in percent, is provided in the table below:

Meteorological Parameter	2007	2008	2009	2010	2011	2007-2011
10 m wind direction	99.2	96.9	91.0	91.3	95.2	94.7
10 m wind speed	99.2	96.9	91.0	91.3	93.8	94.4
Stability Class	99.2	96.9	91.0	91.3	95.2	94.7
76 m wind direction	99.1	96.8	90.8	90.9	95.2	94.6
76 m wind speed	99.1	96.8	90.8	91.3	92.4	94.1
Composite	99.1	96.8	90.8	90.9	92.4	94.0

The data recovery for each year of the 2007 through 2011 period and the entire 2007 to 2011 period meet or exceed the "greater than 90 percent data recovery" guidance identified in RG 1.23, Revision 1.

NRC RAI Meteorological (Met) Data – Offsite Impacts

5. *(Part 1) Whether any data substitution was implemented to supplement data recovery over the indicated 5-year POR and, if so, an accounting of hours and parameters substituted,*

PG&E Response

The following table summarizes the data substitutions for the DCPP Primary Tower for the period 2007 through 2011.

Substitution Summary

2007 Day/Time Substituted	Hrs	2008 Day/Time Substituted	Hrs	2009 Day/Time Substituted	Hrs	2010 Day/Time Substituted	Hrs	2011 Day/Time Substituted	Hrs	Totals	
100/1230-113/1245	312	98/1545-111/1700	313	29/1945-30/0030	5	123/1100-133/1345	242	5/1015-11/1345	148		
276/1245-299/1030	550	143/1230-153/1530	243	121/0000-135/1645	353	305/0000-313/0200	194	83/1400-90/1115	166		
		154/1115-157-0145	63			314/1330-315/0930	20	95/1145-106/1315	266		
		157/1445-158/2230	32					145/1415-145/1800	4		
		159/1230-228/0700	1651					216/1145-221/0815	117		
		229/1330-229/2330	10					262/1000-282/0030	471		
		230/0730-239/0700	216					287/0945-291/1345	100	***All Parameters Substituted***	
Total	862	Total	2528	Total	358	Total	456	Total	1272	Total Hrs Substituted	5476
Hrs in year	8760	Hrs in year	8784	Hrs in year	8760	Hrs in year	8760	Hrs in year	8760	Total Hrs 5 year period	43824
Percent Substituted	**9.84%**	**Percent Substituted**	**28.78%**	**Percent Substituted**	**4.09%**	**Percent Substituted**	**5.21%**	**Percent Substituted**	**14.52%**	**Total Percent Substituted**	**12.50%**

NRC RAI Meteorological (Met) Data – Offsite Impacts

5. *(Part 2) an explanation of why any substitutions were necessary, and the source of such data; and*

PG&E Response

The DCPP Primary Tower is taken out of service for calibration approximately every six months per Equipment Control Guideline (ECG) surveillance requirement (SR) 40.1.2. Each calibration period lasts from two to three weeks in duration. These calibration periods represent the majority of the time that data substitution was necessary. Additionally, in 2008 the DCPP Primary Tower was taken out of service for replacement due to damage inflicted by a boom truck. During 2011, in addition to calibrations, some instruments on the Primary Met Tower needed replaced, resulting in increased unavailability.

Primary Met Tower	Backup Met Tower (parameter substituted)
10M Temperature	10M Temperature
76-10M Delta T	60-10M Delta T
46-10M Delta T	None
10M Wind Speed	10M Wind Speed
76M Wind Speed	60M Wind Speed
10M Wind Direction	10M Wind Direction
76M Wind Direction	60M Wind Direction

Data substitution techniques were employed using back-up tower data when primary tower data were missing during calibrations and unscheduled meteorological monitoring outages. Stability class from the back-up tower was calculated from temperature difference measurements at the 60-meter and 10-meter levels.

NRC RAI Meteorological (Met) Data – Offsite Impacts

6. *Comparisons between the indicated 5-year POR and the PORs reflected in the current (or previous) UFSAR to establish the long-term representativeness of the 2007 through 2011 POR from an atmospheric dispersion standpoint.*

PG&E Response

Regulatory Position C.3.1 of RG 1.194 states that "the size of the data set used in the X/Q assessments should be sufficiently large such that it is representative of long-term meteorological trends at the site. The NRC staff considers 5 years of hourly observations to be representative of long-term trends at most sites." Therefore, the

2007 through 2011 onsite meteorological data base is sufficient in length to establish long-term representativeness from an atmospheric dispersion standpoint.

NRC RAI Met Data – Onsite Impacts (Control Room and Technical Support Center)

1. *Need Met data for calendar years 2007 thru 2011*

   a. *Sequential hourly file(s) formatted in accordance with NUREG/CR-6331 (PNNL-10521) (Rev. 1).*

   b. *Note that the cover sheet for Appendix A to Attachment 4 of the LAR submittal package (see Part 2 of 8, ML15176A528) states that "[t]he on-site meteorological data input to ARCON96 (January 1, 2007 through December 31, 2011), in the ARCON96 input data format, is embedded below)", followed by a list of the five individual calendar years. The phrase "is embedded below" suggests that this Met data may have already been provided with the LAR submittal package. If already in hand, copies of those files should be provided to my attention at NRO/DSEA/RHMB1/RMOT, and a separate request for that data is not necessary.*

PG&E Response

a. The 2007 through 2011 sequential hourly file(s), formatted in essentially the same format (with some differences in spacing) as NUREG/CR-6331 Revision 1, are provided in the following five Excel files in the enclosed Attachment 3 data disc:

   - DCPP_Primary_2007 (DIT 50503441-02-00).xls
   - DCPP_Primary_2008 (DIT 50503441-02-00).xls
   - DCPP_Primary_2009 (DIT 50503441-02-00).xls
   - DCPP_Primary_2010 (DIT 50503441-02-00).xls
   - DCPP_Primary_2011 (DIT 50503441-02-00).xls

   Note: Unavailable data for the given hour period is indicated by a "999."

b. It appears that due to the scanning approach used to package LAR 15-03 prior to submittal to the NRC, the meteorological data in ARCON96 format that were embedded in Appendix A of Attachment 4, were inadvertently omitted.

NRC RAI Met Data – Onsite Impacts (Control Room and Technical Support Center)

2. *If different from the sequential hourly Met data sets input to the EN-113 dispersion model, bases for determining hourly stability class and if different methods were*

used throughout the data set(s) (e.g., depending on wind speed as suggested by UFSAR Table 2.3-41) an accounting of such hours when implemented and an explanation for having done so;

PG&E Response

The sequential hourly meteorological data input into ARCON96 to determine the onsite atmospheric dispersion factors are the same as the sequential hourly meteorological data input into the EN-113 dispersion model; the only difference being the format of the data that is input into the respective computer codes.

NRC RAI Met Data – Onsite Impacts (Control Room and Technical Support Center)

3. *Atmospheric stability class appears to have been based, at least in part, on the temperature difference between the 76- and 10-m measurement levels on the primary Met tower. Except for the Unit 1 and Unit 2 Plant Vent release scenarios (Release Height = 74.1 m), all other source release heights for estimating CR and TSC impacts are no greater than 32.0 m (and most are less than that height). Explain the basis for not having defined atmospheric stability based on the temperature difference between the 46- and 10-m measurement levels on the primary Met tower for those release scenarios with source-receptor pairs within that 46- to 10-m surface boundary layer. This comment also applies to the Met data input to the EN-113 dispersion modeling analyses to estimate impacts at the EAB and LPZ.*

PG&E Response

The DCPP licensing basis for stability class has always been based on the temperature difference (delta-T) of the 10-meter and 76-meter measurements. The 91 JFD tables currently presented in UFSAR Section 2.3 provide stability classes from delta-T data based on the 76-meter to 10-meter difference, and there is no reference made to the 46 meter to 10 meter delta-T. Stability class based on the 46-meter to 10-meter delta-T values has never been a part of the DCPP licensing basis.

At the time of the original license when Safety Guide 23 was in force, PG&E as well as NRC, may have likely focused on the parenthetical statement "plant vent height" when locating meteorological instrumentation to determine stability classes for atmospheric dispersion factors. At that time, Regulatory Position C.(2) of Safety Guide 23 stated that "...the upper set should sense wind speed and direction and temperature at the height of release of radioactive material (plant vent height) but should be positioned not less than 30 meters above the lower sensor height."

In accordance with the current plant licensing basis and design, the primary meteorological tower is instrumented to provide temperature difference between the

76-meter and 10-meter elevations and the 46-meter and 10-meter elevations, and the backup meteorological tower is instrumented to provide temperature difference between the 60-meter and 10-meter elevations.

Additionally, Section 5.6.1 of DOE-HDBK-1216-2015, "DOE Handbook Environmental Radiological Effluent Monitoring and Environmental Surveillance," states that "If a vertical temperature difference (i.e., $\Delta T/\Delta z$) is used along with solar radiation to determine atmospheric stability, the temperature difference should be determined over an interval of sufficient thickness to avoid undue influence of the ground (typically at least 50 meters). The temperature monitoring levels should be selected and spaced such that the profile is representative and characterizes the magnitude of atmospheric turbulence at the potential release height(s)."

Thus, the 46-meter to 10-meter levels is deemed insufficiently distant from each other to provide a vertical temperature difference that would support a valid stability class methodology.

Accordingly, it is PG&E's position that the delta-T used to determine stability class at DCPP to determine all short-term (accident) atmospheric dispersion factors is in accordance with its current licensing basis, as well as current regulatory guidance, with respect to recommended locations for temperature instrumentation to determine stability class.

NRC RAI EN-113 (Atmospheric Dispersion Factors) Model Input Information

1. *Need input files for EN-113 model runs along with a key explaining file format and identification of model input parameters so that equivalent input data files can be developed for NRC staff confirmatory modeling runs using NRC-accepted PAVAN dispersion model.*

PG&E Response

Attachment 1 provides the description of input contained in the EN-113 User's Manual and the input files for the Unit 1 EAB, Unit 2 EAB and the Units 1 and 2 LPZ dispersion model runs.

NRC RAI EN-113 (Atmospheric Dispersion Factors) Model Input Information

2. *Since this appears to be the first use of the EN-113 dispersion model at the DCPP and the licensee indicates that the code's provisions implement certain guidance from RG 1.145 and RG 1.111, provide documentation that demonstrates the equivalency of EN-113 results to the output from the NRC-accepted PAVAN and XOQDOQ dispersion models, which implement the guidance in RGs 1.145 and 1.111, respectively, with the understanding that EN-113 operates on sequential*

hourly Met data whereas the PAVAN and XOQDOQ dispersion models operate on JFDs of wind speed and wind direction by atmospheric stability class.

PG&E Response

As noted in PG&E response to RAI 2 in the General section, Section 5.1 of Attachment 4 of LAR 15-03 which provide the technical assessment supporting the application, and Attachment 8 of LAR 15-03 which provides the proposed update of Section 2.3.2 of the UFSAR, both reflect the use of the EN-113 computer code to provide short-term (accident) dispersion estimates.

The referenced sections of LAR 15-03 describe how EN-113 follows the methodology of RG 1.145, Revision 1, including the equations used and the selection of the appropriate X/Q values for the 0-2 hour averaging time and intermediate averaging times. EN-113 uses the RG 1.111 Revision 1 methodology guidance to calculate the annual average X/Q used for the intermediate averaging times calculation.

Thus, the methodology used by PG&E to determine the short-term (accident) dispersion estimates are equivalent to that used by NRC-accepted PAVAN and XOQDOQ dispersion models, which also implement the guidance in RGs 1.145 and 1.111, respectively.

NRC RAI EN-113 (Atmospheric Dispersion Factors) Model Input Information

3. *Confirm whether the X/Q values for the 0- to 2-hour averaging time and the other intermediate averaging intervals (i.e., 2-8 hours, 8-24 hours, 1-4 days, and 4-30 days) and annual average are determined as sliding averages or interpolated between the 0- to 2-hour and annual average X/Qs. The text in different parts of the application package appears to be inconsistent such that it is not clear which approach has been used and which discussions may only be intended to describe the capabilities of the EN-113 dispersion model.*

PG&E Response

The 0-2 hr X/Q calculation followed the methodology in RG 1.145, Revision 1, and the annual average X/Q calculation followed the methodology in RG 1.111, Revision 1. The X/Q values for the 0-2-hr averaging time and the other intermediate averaging intervals (i.e., 2-8 hrs, 8-24 hrs, 1-4 days, and 4-30 days) were determined by logarithmic interpolation between the 0-2-hr and annual average X/Qs. Only hourly average meteorological data is used as input in EN-113. For additional detail see PG&E response to RAI 2 in the 'General' section.

NRC RAI ARCON96 Dispersion Model Input / Output Files

1. *Need input and output files for all ARCON96 model runs.*

PG&E Response

The ARCON96 input/output files are provided in in the enclosed Attachment 3 data disc. Attachment 2 summarizes the description of the Release-Receptor cases and the associated input/output file names.

NRC RAI ARCON96 Dispersion Model Input / Output Files

2. *In addition to Figure A-1 in Appendix A to Attachment 4 of the LAR submittal package, need legible drawings of all structures used to determine building wake-related parameters as input to the ARCON96 model runs, as well as drawings that illustrate release and receptor heights. This comment also applies to the EN-113 dispersion modeling analyses if building wake has been accounted for as part of those analyses.*

PG&E Response

The following drawings are provided in in the enclosed Attachment 4 data disc:

Drawing No	Sheet	Rev.	Title	Filename
57727[(2)]	1	41	Equipment Location; Plan at Elevation 140'-0"; Aux., Containment and Fuel Handling Bldgs.	DWG 57727-1 (r41).pdf
57728[(2)]	1	12	Equipment Location; Section A-A Auxiliary Building	DWG 57728-1 (r12).pdf
57732[(1)(2)]	1	17	Mechanical; Equipment Location; Section 'E-E' – Auxiliary, Turbine & Fuel Handling Buildings	DWG 57732-1 (r17).pdf
59353[(2)]	1	10	Mechanical; Air Conditioning Area "K" Elev. 154'-6" Auxiliary Building	DWG 59353-1 (r10).pdf
101942[(1)(2)]	3	35	[Local Instrument Panel Index; Coordinate-Column Line Cross Reference sheet] (note that the drawing has no title block)	DWG 101942-3 (r35).pdf
438040[(2)]	1	43	Civil; Finished Grading Plan; Plant Area	DWG 438040-1 (r43).pdf
438042[(2)]	1	27	Civil; Finish Grading Plan; Plant Area	DWG 438042-1 (r27).pdf
443115[(2)]	1	10	Architectural; Ladder Details; Exhaust Vent Containment Structure	DWG 443115-1 (r10).pdf
471124[(2)]	1	11	Civil; Plot Plan	DWG 471124-1 (r11).pdf
500059[(2)]	1	15	Piping & Mechanical; Area G, GW and GE; Plan at Elevation 140'-0"	DWG 500059-1 (r15).pdf
501551[(2)]	1	9	Piping & Mechanical; Areas GE & GW; Plan Above El. 140'-0"	DWG 501551-1 (r9).pdf
508917[(2)]	1	9	Mechanical; Outdoor Storage Tanks; Piping Modification; Sections	DWG 508917-1 (r9).pdf

Drawing No	Sheet	Rev.	Title	Filename
511155[(2)]	1	16	Mechanical; Plans & Sections; Air Conditioning Control Room Pressurization Fan Arrangements; Area "A" Elevation 140'-0"	DWG 511155-1 (r16).pdf
512905[(2)]	1	22	Mechanical; Plans, Sections, and Schedule; Onsite Technical Support Center and Laboratory	DWG 512905-1 (r22).pdf
663071[(2)]	129	6	Refueling Water Storage Tank; Elevation and Orientation Details	DWG 663071-129 (r6).pdf
UFSAR Figure 2.1-2		11	Site Plan and Gaseous/Liquid Effluent Release Points	UFSAR Figure 2.1-2.pdf
UFSAR Figure 2.1-15		22	Low Population Zone (Historical)	UFSAR Figure 2.1-15.pdf

(1): Drawings 101942 and 57732 were used to develop cross-sectional building areas to account for building wake effect in ARCON96 and EN-113.

(2): Note: These drawings are considered Security Sensitive and should be withheld under 10 CFR 2.390.

Input Data for EN-113 Dispersion Model

EN-113 Input Description

D. Selection of Type of Calculation and Output Format

READ1 Input Data

Card 1 (11A4,3A4)

CLIENT - Client's name (left-justified). (11A4)
JOBNO - Job Number (left-justified). (3A4)

Card 2 (11A4,5A4)

SITE - Site Name (left-justified).
CALCNU - Calculation number.

Card 3 (4I5,F5.0,I5)

ISTART - Start date (on) (year and Julian date) if other than start of data.
ISTOP - Stop date (after) (year and Julian date) if other than end of data.
NDYSDT - Number of days input data.
METSTB - Method of determining stability class:
1 - Radiation index (WBAN tape)
2 - Split sigma (3 and 4 or 5 below)
3 - Delta temperature (must have DHT)
4 - Wind direction range
5 - Wind direction standard deviation.
DHT - Height difference for delta temperature:
If temperature is in deg F then DHT must be in feet
If temperature is in deg C then DHT must be in meters.
IREDIS - Redistribution of CALMS switch:
0 - Previous good wind direction
1 - Calm speed - 1.5 mph speed class sector frequency distribution
2 - Calm speed - 1.5 mps (3.3557 mph) speed class sector frequency distribution make Device 11 available.

Card 4 (9(2X,A3),2I5)

ID - Met data three-character ID:
ID(1) - Wind speed
ID(2) - Wind direction
ID(3) - Temperature
ID(4) - Wind direction range
ID(5) - Wind direction standard deviation
ID(6) - Delta temperature
ID(7) - Wind speed (upper level)
ID(8) - Wind direction (upper level)
ID(9) - Temperature (upper level)

ISPUNT - Wind speed units indicator:
If input data is in mph, ISPUNT is 0
If input data is in knots, ISPUNT is 1
If input data is in mps, ISPUNT is 2.

ITPUNT - Temperature units indicator:
If input data is in Deg F, ITPUNT is 0
If input data is in Deg C, ITPUNT is 1.

Card 4A (9F5.0,6F5.0)

PARMUL - Parameter Multiplier:

PARMUL(1) - Wind speed	Default 1.0
PARMUL(2) - Wind direction	Default 1.0
PARMUL(3) - Temperature	Default 1.0
PARMUL(4) - Wind direction range	Default 1.0
PARMUL(5) - Wind direction standard deviation	Normally 0.1
PARMUL(6) - Delta temperature	Default 1.0
PARMUL(7) - Wind speed (upper level)	Default 1.0
PARMUL(8) - Wind direction (upper level)	Default 1.0
PARMUL(9) - Temperature (upper level)	Default 1.0.

IPGRAD - Specified temperature gradients (6) for specific tower height differentials to be used to determine stability classes (hourly data LE specified gradient sets stability class). Specified gradient should include parameter multiplier. Desired gradient of -3.0 and parameter multiplier of 0.1 should give IPGRAD of -30. If all are set to zero default classes of -1.9, -1.7, -1.5, -0.5, 1.5 and 4.0 deg C/100 meters, will be used.

READ2 Input Data

Card 5 (I5,11A4)

IRETYP - Release point and calculation type switch:
(χ/Q) (1) ground (2) elevated
(D/Q) (3) ground (4) elevated

RELSID - Release Point ID (left-justified) (11A4)

Card 6 (I5,F10.0,5F5.0,2F10.0,I1,I4I5,2F5.0)

ISITYP - Station type 1 - nuclear, 2 - fossil
fossil - No more than two downwind distances when calculating hourly and annual averages together. Ten downwind distances when calculating annual averages only.

WFLUE - Stack gas flow. (lb/hr)
SIKHT - Stack height. (ft)
SIKDIA - Stack exit diameter. (ft)

GASVEL - Stack exit velocity (fps).
TS - Stack exit temperature (°F).
HLID - Limited mixing LID height (meters).
WFUEL - Fuel flow (Lucas and Moore Plume Rise) (lb/hr).
HVALUE - Heat value of fuel (Lucas and Moore) (Btu/hr).
ISTRLN - Calculate hourly averages from straight line On log-log paper:
(0) - no calculation
(positive number) - Limiting Index of DO loop.
Will calculate averages with straight lines starting at 1 and going to the limit (ISTRLN). Must make the 1-hour average calculation and the annual calculation at the same time. If the 1-hour, 50 percent χ/Q values is to be used, set the left-most digit to 1. Normally the 50 percent equal risk value is used. (IEQ50)
ICALM - Switch to allow wind speed or height corrected wind speed to be reset to calm speed if wind speed falls below calm speed:
Default (0) - W/S reset
(1) - W/S not reset.
UCU - Unstable and neutral W/S height correction factor (Stabilities A - D)
Default UCU = 1.0.
UCS - Stable W/S height correction factor (Stabilities E - G)
Default UCS = 1.0.

Card 7 (7I5,2(3X,7I1),3I5,2F5.0)

ISECVG - Sector average:
0 - with correction
1 - without correction.
MESHT - Height of wind speed measurement (ft).
MESHT = 0. Speed modification with height not made (ASME).
IAECSG - Dispersion coefficient:
0 - AEC (POLYN) Gifford's
1 - S&W (SIGY, SIGZ) Turner's
2 - AEC (POLYND) Desert.
IBWEFF - Building wake effect (short-term):
0 - Not used (if not 0, read Cards 9 and 10)
1 - Meandering plume method. If stability E, F or G and wind speed LE 2.5 mph, 2*PI*SIGY*SIGZ is increased four times.
2 - AEC method (Sagendorf)
χ/Q = 1/(U*(PI*SIGY*SIGZ+C*A))
3 - Sigma Squared method
χ/Q = 1/(PI*U*SIGY*SIGZ)
SIGY = (SIGY**2+C*A/PI)**0.5
SIGZ = (SIGZ**2+C*A/PI)**0.5

4 - Abbey Plume Meander method. CPRIM must be specified. If CPRIM = 0.0, there is no building wake effect
5 - Rancho Seco ('77) building wake meander.

ITOPO - Number of directions with inputted topographic data (1-16):
0 - No topography

ITERIN - Terrain adjustment factor selection switch (annual). If input data cards are needed, they will be read in by Subroutine TERAIN after all other READ2 Cards.
(0) - No adjustment
(1) - Plain (point)
(2) - Desert (point)
(3) - Plain (curve)
(4) - Desert (curve)
(5) - Valley (input data required see Card 30 below)
(6) - Coast
(7) - Meandering valley
(8) - Read in data for (5, 6, and 7)
(9) - Read only site-specific ground release factors
(10) - Read only site-specific elevated release factors
(11) - Read both site-specific ground and elevated release factors. (Input of this data is in the same format as topographic input, 16 directions and up to 12 downwind distances. Reading sequence is the same as Cards 30 - 32; ground first and elevated second.)
(12) - Use site specific ground-level release recirculation factors in calculation.
(13) - Use site specific elevated release recirculation factors in calculation.

ISIGMA - Sigma printout print control:
0 - no printout
1 - printout.

ISIABY - Horizontal dispersion coefficient selection array. The seven locations of this array represent stability classes A - G. By inserting a number 1 - 7 in a location the sigma curve (1 - 7) will be used for that particular stability class. If the array is left blank, the normal sigma curves will be used for the stability classes. Set ISIGMA to (1).

ISIABZ - Vertical dispersion coefficient selection array. Other comments are the same as ISIABY above.

NHR72 - Number of hours to be slid for 72-hour sliding average.

NHR624 - Number of hours to be slid for 624-hour sliding average. NHR72 and NHR624 default to 1 if not specified. Values used must divide 72 or 624 without remainder.

LIMXQR - χ/Q limit write switch:
0 - no printout
1 - printout. (Supply XQLIM values on Card 8A.)

PRGHRS - Number of hours intermittent (purge) release.
(must not be set to 0.0)

RFCWSP - Wind speed below which terrain recirculation fraction will be applied (mph).

NOTE: PRGHRS and RFCWSP used only for intermittent release calculation which must have special GNCHIQ and OUTCHQ subroutines.

Card 8 (7I5,5F5.0,15X,I5)

JHRARY - Time period control: (6I5)

Nuclear	1	8	16	72	624	1000
Fossil	1	3	8	24	1000	0

Blank or zero - no calculation
1000 - Annual Average (one level of winds)
2000 - Annual Average (use upper level winds if ground to elevated shift is to be made)

JHRARY(1) - If used, can only be for 1 hour. 1001 or 2001 ground to elevated shift (Regulatory Guide 1.111 proporations) using 1 or 2 levels of winds. 3001 or 4001 same as above plus aerodynamic downwash.

JHRARY(2-5) Nuclear - If used can range from 2 to 624 hrs

JHRARY(6) Nuclear - If used can only be 1000, 1001, 2000 or 2001

JHRARY(2-4) Fossil - If used can range from 2 to 624 hrs

JHRARY(5) Fossil - If used can only be 1000 or 2000

NOTES:
1. Any average of 8 hours or less will use short-term equations.
2. To obtain only undecayed annual χ/Q printout use 1001 or 2001 as a control.

IPLMEQ - Plume Rise Equation:
1 - Holland (Empirical Equation Eq 4.1, Briggs 1969)
2 - Lucas and Moore (HVALUE)
3 - Optimized Concawe

4 - Optimized Csanady
5 - Clarke
6 - Briggs
7 - 2/3 Power Law
8 - Zero Plume Rise
9 - Specified Plume Rise (PLUMRS)
10 - Briggs (Revised 1970)
11 - Holland (Eq 4.1, Turner's Workbook)
12 - Briggs (Revised 1972)
13 - Briggs (Briggs - Sagendorf, Non-Buoyant Plume)
14 - Briggs (Revised 1975).

The following parameters (X) are needed for the equation number at the top:

N	1	2	3	4	5	6	7	8	9	10	11	12	13	14	N
WFUEL	-	X	-	-	-	-	-	-	-	-	-	-	-	-	WFUEL
WFLUE	-	X	X	-	X	X	-	-	-	X	X	X	-	X	WFLUE
GASVEL	X	-	-	X	-	-	X	-	-	-	X	-	X	-	GASVEL
TSS	X	X	X	X	X	X	X	-	-	X	X	X	-	X	TSS
STKHT	-	X	-	-	X	X	-	X	-	-	-	-	-	-	STKHT
STKDIA	X	-	-	X	-	-	X	-	-	-	X	-	X	-	STKDIA
TA	X	X	X	X	X	X	X	-	-	X	X	X	X	X	TA
WNDSPD	X	X	X	X	X	X	X	-	-	X	X	X	X	X	WNDSPD
HVALUE	-	X	-	-	-	-	-	-	-	-	-	-	-	-	HVALUE

where

WFUEL = Fuel Flow
WFLUE = Flue Gas Flow
GASVEL = Stack Gas Exit Velocity
TSS = Stack Gas Exit Temperature
STKHT = Stack Height
STKDIA = Stack Exit Diameter
TA = Ambient Air Temperature
WNDSPD = Wind Speed
HVALUE = Heat Value of Fuel.

PLUMRS - Specified Plume Rise (ft).
CALMAC - Wind speed (mph) assigned to calm observation for accident χ/Q calculation. Stop 6, if needed and not given.
CALMAN - Wind speed (mph) assigned to calm observation for annual χ/Q calculation. Stop 6, if needed and not given.
BHT - Building height wake effect (long-term) (Annual). If zero defaults to long-term ground release (Meters). (NOTE: BHT must be zero when SPDBWE is -3.0.)

SPDBWE - Ground to elevated release shift and stack downwash switch (annual).
- Zero (0) - No shift or downwash.
- Positive - SPDBWE is wind speed (mph) below which shift from ground to elevated release will be made. (Stack height (STKHT) must be specified.)
- Negative (-1.0) - ground to elevated proportional shift (Regulatory Guide 1.111 2B) is made. (Stack gas exit velocity (GASVEL) and (STKHT) must be specified.)
- Negative (-3.0) - Aerodynamic downwash (Regulatory Guide 1.111, Eq (5) is used). (Stack diameter (STKDIA), (STKHT) and (GASVEL) must be specified.)
- Negative (-2.0) - will apply aerodynamic downwash (-3.0) to elevated portion of ground to elevated release (-1.0).

IAJDIR - Adjacent downwind distance switch (short-term only); (0) - not used, (GT.0) - used.

Card 8A (2E10.0) (Card not needed if LIMXQR=0)

XQLIM - Array containing lower and upper χ/Q values for and between which, the date, time and meteorology (speed, direction and vertical stability class) are printed out. READ2 will limit release points to the first non-zero time period and the LPZ distances. If all meteorology is desired, set the lower limit = 0.0 and the upper limit = 1.0 or greater.

Card 9 (3F5.0) (Card not needed if IBWEFF=0.)

WSPEED - Wind speed above which building wake effect will be considered (mph).

C - Constant (0.5 Normally).

CPRIM - Constant used in Abbey Plume Meander method. CPRIM = 0.0 removes building wake effect.

Card 10 (16F5.0) (Card not needed if IBWEFF=0.)

A - Building wake effect area by direction:
1 - wind from the north - area on the south side of building.

Card 11 (16F5.0)

DISITE - Site boundary distance by direction (meters):
1 - wind from north - distance south of release point.

Card 12 - (16F5.0)

DISLPZ - Low population zone boundary distance by direction (meters):
1 - wind from north - distance south of release point.

NOTE: For Cards 10, 11 and 12, if the values for all directions are the same, punch the value in location (1) and 99999 in location (2).

Card 13 (I5,10F5.0)

IDSLP - Number of downwind distances other than site boundary or low population zone boundary.
DISTAN - Downwind distances (1-10) (meters)

Cards 14 - 29 (I5,12F5.0) (Cards not needed if ITOPO=0)

IDR - Wind direction index - wind blowing from (1-16).
TOPOHT - Ground elevation above stack base downwind from the release point (feet).
(If IDR = 1 (north), elevation should be those south of the release point.)

Cards 30 - 32 (I2,6(I2,2F5.0)/2X,6(I2,2F5.0)/2X,4(I2,2F5.0))

* * These data cards will be read in by Subroutine TERAIN when the ITERIN switch is set to 3, 4 or 5.

INUM - Number of condition groups (IDR,DISTM,XQMULT).
IDRA - Wind direction identification (1 - wind from north). (Direction not given means no adjustment.)
DISTMX - Downwind distance (miles) beyond which no adjustments are made. For up-valley set distance to 1000.0.

XQMULT - X/Q adjustment value.

* * Typical values are -

- Down-Valley	XQMULT = 5	DISTMX = 20 Miles
- Up-Valley	XQMULT = 1.5	DISTMX = 1000
- Cross-Valley	XQMULT = 1	DISTMX = 1000

Unit 1 EAB EN-113 Run

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1CHI/Q - D/Q PROGRAM                    EN-113  VERSION 6 LEVEL 8   DATE 20121102   PAGE    2

                                        CALCULATION NUMBER  14078104-C-M-00002
Pacific Gas & Electric Company              Diablo Canyon Nuclear Power Plant Unit 1          14078104
 GROUND LEVEL  (X/Q)

********** READ1 (6.8) INPUT DATA **********
               CLIENT(11)                                          JOBNO(3)
Pacific Gas & Electric Company                                     14078101
                SITE(11)                                           CALCNU(5)
Diablo Canyon Nuclear Power Plant Unit 1                     14078104-C-M-00002
  ISTART   ISTOP  NDYSDT  METSTB     DHT  IREDIS
   87001   91365    1826        3   100.0       2
                                                ELEVATED CONDITIONS
   SPEED     DIR    TEMP   RANGE STD DEV DELTA T   SPEED     DIR    TEMP  ISPUNT  ITPUNT
     131     132       0       0       0     136       0       0       0       0       1
                          PARMUL(9)                                                TPGRAD(6)
    0.10    1.00    1.00    1.00    1.00    0.10    1.00    1.00    1.00    0.00    0.00    0.00    0.00    0.00    0.00
********** READ2 (6.8) INPUT DATA **********
  IRETYP                RELSID(11)
       1 GROUND LEVEL  (X/Q)
  ISTTYP          WFLUE   STKHT  STKDIA  GASVEL      TS    HLID          WFUEL          HVALUE  ISTRLN  ICALM     UCU     UCS
       1             0.    0.00    0.00    0.00      0.      0.            0.              0.   0   2       0    0.00    0.00
  ISECVG   MESHT  IAECSG  IBWEFF  ITOPO  ITERIN  ISIGMA         ISTABY         ISTABZ  NHR72  NHR624  LIMXQR  PRGHRS  RFCWSP
       1       0       0       5       0       1       0        0000000        0000000      0       0       0     0.0     0.0
                JHRARY(6)                       IPLMEQ  PLUMRS  CALMAC  CALMAN     BHT  SPDBWE                          IAJDIR
       1       0       0       0       0    1001       8     0.0     0.5     0.3    66.5     0.0                             0
  WSPEED       C   CPRIM
    0.00    0.50    0.00
           A(16)
  2745.0  2745.0  2745.0  2745.0  2745.0  2745.0  2745.0  2745.0  2745.0  2745.0  2745.0  2745.0  2745.0  2745.0  2745.0  2745.0
           DISITE(16)
   830.0   830.0   780.0   780.0   750.0   750.0   750.0   750.0   730.0   730.0   740.0   740.0   890.0   890.0   920.0   830.0
           DISLPZ(16)
     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
   IDSLP   DISTAN(10)
       0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
********** TERRAIN ADJUSTMENT FACTORS USED **********
     IDR      FACTORS ( 1)
       1   4.000
       2   4.000
```

3	4.000
4	4.000
5	4.000
6	4.000
7	4.000
8	4.000
9	4.000
10	4.000
11	4.000
12	4.000
13	4.000
14	4.000
15	4.000
16	4.000

Unit 2 EAB EN-113 Run

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1CHI/Q - D/Q PROGRAM                EN-113  VERSION 6 LEVEL 8   DATE 20121102   PAGE    2

                                        CALCULATION NUMBER  14078101-ME-003
 Pacific Gas & Electric Company              Diablo Canyon Nuclear Power Plant Unit 2          14078101
  GROUND LEVEL  (X/Q)

 ********** READ1 (6.8) INPUT DATA **********
                 CLIENT(11)                                          JOBNO(3)
 Pacific Gas & Electric Company                                      14078101
                   SITE(11)                                          CALCNU(5)
 Diablo Canyon Nuclear Power Plant Unit 2                        14078101-ME-003
   ISTART    ISTOP  NDYSDT  METSTB     DHT  IREDIS
    87001    91365    1826       3   100.0       2
                                                  ELEVATED CONDITIONS
    SPEED     DIR    TEMP   RANGE STD DEV DELTA T   SPEED     DIR    TEMP  ISPUNT  ITPUNT
      131     132       0       0       0     136       0       0       0       0       1
                                PARMUL(9)                                        TPGRAD(6)
     0.10    1.00    1.00    1.00    1.00    0.10    1.00    1.00    1.00    0.00    0.00    0.00    0.00    0.00    0.00
 ********** READ2 (6.8) INPUT DATA **********
   IRETYP                  RELSID(11)
        1 GROUND LEVEL  (X/Q)
   ISTTYP           WFLUE   STKHT   STKDIA  GASVEL      TS    HLID          WFUEL          HVALUE  ISTRLN   ICALM     UCU     UCS
        1              0.    0.00    0.00    0.00      0.      0.            0.              0.   0   2       0    0.00    0.00
   ISECVG   MESHT  IAECSG  IBWEFF   ITOPO  ITERIN  ISIGMA         ISTABY         ISTABZ  NHR72  NHR624  LIMXQR  PRGHRS  RFCWSP
        1       0       0       5       0       1       0        0000000        0000000      0       0       0     0.0     0.0
                  JHRARY(6)                       IPLMEQ  PLUMRS  CALMAC  CALMAN     BHT  SPDBWE                          IAJDIR
        1       0       0       0       0    1001       8     0.0     0.5     0.3    66.5     0.0                             0
   WSPEED       C   CPRIM
     0.00    0.50    0.00
             A(16)
   2745.0  2745.0  2745.0  2745.0  2745.0  2745.0  2745.0  2745.0  2745.0  2745.0  2745.0  2745.0  2745.0  2745.0  2745.0  2745.0
            DISITE(16)
    730.0   730.0   740.0   780.0   780.0   780.0   830.0   830.0   830.0   830.0   820.0   820.0   870.0   870.0   850.0   730.0
            DISLPZ(16)
      0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
    IDSLP   DISTAN(10)
        0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
 ********** TERRAIN ADJUSTMENT FACTORS USED **********
      IDR      FACTORS ( 1)
        1   4.000
        2   4.000
```

3	4.000
4	4.000
5	4.000
6	4.000
7	4.000
8	4.000
9	4.000
10	4.000
11	4.000
12	4.000
13	4.000
14	4.000
15	4.000
16	4.000

Unit 1/2 LPZ EN-113 Run

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1CHI/Q - D/Q PROGRAM                    EN-113  VERSION 6 LEVEL 8   DATE 20121102   PAGE    2

                                                CALCULATION NUMBER  14078101-ME-003
 Pacific Gas & Electric Company                     Diablo Canyon Nuclear Power Plant Unit 1          14078101
  GROUND LEVEL  (X/Q)

 ********** READ1 (6.8) INPUT DATA **********
                  CLIENT(11)                                                JOBNO(3)
 Pacific Gas & Electric Company                                             14078101
                    SITE(11)                                                CALCNU(5)
 Diablo Canyon Nuclear Power Plant Unit 1                                   14078101-ME-003
   ISTART    ISTOP  NDYSDT  METSTB     DHT  IREDIS
    87001    91365    1826       3   100.0       1
                                                    ELEVATED CONDITIONS
    SPEED     DIR    TEMP   RANGE STD DEV DELTA T   SPEED     DIR    TEMP  ISPUNT  ITPUNT
      131     132       0       0       0     136       0       0       0       0       1
                                PARMUL(9)                                          TPGRAD(6)
     0.10    1.00    1.00    1.00    1.00    0.10    1.00    1.00    1.00    0.00    0.00    0.00    0.00    0.00    0.00
 ********** READ2 (6.8) INPUT DATA **********
   IRETYP                  RELSID(11)
        1 GROUND LEVEL  (X/Q)
   ISTTYP           WFLUE   STKHT   STKDIA  GASVEL      TS    HLID           WFUEL          HVALUE  ISTRLN   ICALM     UCU     UCS
        1              0.    0.00    0.00    0.00      0.      0.             0.              0.   0   2       0    0.00    0.00
   ISECVG   MESHT  IAECSG  IBWEFF   ITOPO  ITERIN  ISIGMA          ISTABY          ISTABZ  NHR72  NHR624  LIMXQR  PRGHRS  RFCWSP
        1       0       0       5       0       1       0         0000000         0000000      0       0       0     0.0     0.0
                    JHRARY(6)                       IPLMEQ  PLUMRS  CALMAC  CALMAN     BHT  SPDBWE                          IAJDIR
        1       0       0       0       0    1001       8     0.0     0.5     0.3    66.5     0.0                               0
   WSPEED       C   CPRIM
     0.00    0.50    0.00
             A(16)
   2745.0  2745.0  2745.0  2745.0  2745.0  2745.0  2745.0  2745.0  2745.0  2745.0  2745.0  2745.0  2745.0  2745.0  2745.0  2745.0
             DISITE(16)
   9650.0  9650.0  9650.0  9650.0  9650.0  9650.0  9650.0  9650.0  9650.0  9650.0  9650.0  9650.0  9650.0  9650.0  9650.0  9650.0
             DISLPZ(16)
      0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
    IDSLP    DISTAN(10)
        0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
 ********** TERRAIN ADJUSTMENT FACTORS USED **********
      IDR      FACTORS ( 1)
        1   1.250
        2   1.250
```

3	1.250
4	1.250
5	1.250
6	1.250
7	1.250
8	1.250
9	1.250
10	1.250
11	1.250
12	1.250
13	1.250
14	1.250
15	1.250
16	1.250

Release-Receptor Cases

TABLE 1: Input / Output File Names
Atmospheric Dispersion Factors (X/Qs) at Control Room Receptors for Post- Accident LOCA Radiological Releases

File Name	Description of Release-Receptor Cases	X/Q (sec/m^3)				
		0 - 2 hours	2 - 8 hours	8 - 24 hours	1 - 4 days	4 - 30 days
dccase01	Unit 1 CB Edge to Unit 1 CR Normal Intake	1.28E-03	7.12E-04	2.87E-04	2.90E-04	2.84E-04
dccase02	Unit 1 CB Edge to Unit 1 CR Emergency Intake	4.11E-04	2.30E-04	9.62E-05	8.69E-05	7.03E-05
dccase03	Unit 1 CB Edge to Unit 2 CR Emergency Intake	1.67E-04	7.95E-05	2.63E-05	2.81E-05	2.34E-05
dccase04	Unit 1 CB Edge to CR Center	8.85E-04	4.43E-04	1.75E-04	1.77E-04	1.65E-04
dccase05	Unit 1 PV to Unit 1 CR Emergency Intake	5.59E-04	3.38E-04	1.32E-04	1.12E-04	8.38E-05
dccase06	Unit 1 PV to Unit 2 CR Emergency Intake	2.26E-04	1.48E-04	5.40E-05	5.47E-05	4.45E-05
dccase07	Unit 1 PV to CR Center	1.26E-03	8.96E-04	3.44E-04	3.44E-04	2.99E-04
dccase08	Unit 1 RWST Vent to Unit 1 CR Emergency Intake	3.27E-04	1.90E-04	7.13E-05	6.99E-05	5.76E-05
dccase09	Unit 1 RWST Vent to Unit 2 CR Emergency Intake	2.10E-04	9.83E-05	3.73E-05	3.53E-05	2.86E-05
dccase10	Unit 1 RWST Vent to CR Center	1.07E-03	4.86E-04	1.99E-04	1.75E-04	1.43E-04
dccase11	Unit 2 CB Edge to Unit 2 CR Normal Intake	1.96E-03	9.42E-04	4.48E-04	3.98E-04	3.18E-04
dccase12	Unit 2 CB Edge to Unit 1 CR Emergency Intake	1.70E-04	1.06E-04	4.23E-05	3.81E-05	2.95E-05
dccase13	Unit 2 CB Edge to Unit 2 CR Emergency Intake	3.85E-04	1.47E-04	5.94E-05	5.84E-05	4.84E-05
dccase14	Unit 2 CB Edge to CR Center	1.08E-03	5.46E-04	2.47E-04	2.12E-04	1.68E-04
dccase15	Unit 2 PV to Unit 1 CR Emergency Intake	2.03E-04	1.29E-04	5.13E-05	4.32E-05	3.19E-05
dccase16	Unit 2 PV to Unit 2 CR Emergency Intake	5.71E-04	2.96E-04	1.20E-04	1.04E-04	8.19E-05
dccase17	Unit 2 PV to CR Center	1.13E-03	7.08E-04	2.85E-04	2.39E-04	1.70E-04
dccase18	Unit 2 RWST Vent to Unit 1 CR Emergency Intake	1.91E-04	1.21E-04	4.58E-05	4.39E-05	3.53E-05
dccase19	Unit 2 RWST Vent to Unit 2 CR Emergency Intake	3.29E-04	1.61E-04	6.10E-05	5.53E-05	4.45E-05
dccase20	Unit 2 RWST Vent to CR Center	1.07E-03	5.80E-04	2.18E-04	2.19E-04	1.79E-04
dccase21	Unit 1 140' Leakage to Unit 1 CR Normal Intake	6.84E-03	3.08E-03	1.21E-03	1.12E-03	8.75E-04
dccase22	Unit 1 140' Leakage to Unit 1 CR Emergency Intake	3.75E-04	2.33E-04	9.12E-05	8.45E-05	6.62E-05
dccase23	Unit 1 140' Leakage to Unit 2 CR Emergency Intake	2.55E-04	1.25E-04	4.42E-05	4.38E-05	3.55E-05
dccase24	Unit 1 140' Leakage to CR Center	3.22E-03	1.42E-03	5.54E-04	5.20E-04	4.21E-04
dccase25	Unit 1 PL to Unit 1 CR Normal Intake	4.90E-03	3.45E-03	1.37E-03	1.37E-03	1.28E-03
dccase26	Unit 1 PL to Unit 1 CR Emergency Intake	8.20E-04	5.40E-04	2.15E-04	1.87E-04	1.43E-04
dccase27	Unit 1 PL to Unit 2 CR Emergency Intake	2.58E-04	1.54E-04	4.95E-05	5.26E-05	4.48E-05
dccase28	Unit 1 PL to CR Center	2.59E-03	1.81E-03	7.29E-04	7.15E-04	6.64E-04
dccase29	Unit 2 140' Leakage to Unit 2 CR Normal Intake	6.71E-03	3.12E-03	1.21E-03	1.22E-03	1.02E-03

TABLE 1: Input / Output File Names
Atmospheric Dispersion Factors (X/Qs) at Control Room Receptors for Post- Accident LOCA Radiological Releases

File Name	Description of Release-Receptor Cases	X/Q (sec/m^3)				
		0 - 2 hours	2 - 8 hours	8 - 24 hours	1 - 4 days	4 - 30 days
dccase30	Unit 2 140' Leakage to Unit 1 CR Emergency Intake	2.28E-04	1.60E-04	6.25E-05	5.52E-05	4.21E-05
dccase31	Unit 2 140' Leakage to Unit 2 CR Emergency Intake	3.97E-04	1.76E-04	6.93E-05	6.44E-05	5.27E-05
dccase32	Unit 2 140' Leakage to CR Center	3.16E-03	1.85E-03	7.17E-04	6.84E-04	5.43E-04
dccase33	Unit 2 PL to Unit 2 CR Normal Intake	3.55E-03	1.19E-03	4.82E-04	4.56E-04	3.03E-04
dccase34	Unit 2 PL to Unit 1 CR Emergency Intake	2.28E-04	1.62E-04	6.58E-05	5.43E-05	3.99E-05
dccase35	Unit 2 PL to Unit 2 CR Emergency Intake	8.64E-04	4.23E-04	1.50E-04	1.48E-04	1.20E-04
dccase36	Unit 2 PL to CR Center	2.21E-03	1.17E-03	4.70E-04	3.90E-04	2.61E-04
dccase37	Unit 1 PV to Unit 1 CR Normal Intake	1.67E-03	1.22E-03	4.90E-04	4.90E-04	4.44E-04
dccase38	Unit 2 PV to Unit 2 CR Normal Intake	1.51E-03	9.41E-04	3.86E-04	3.23E-04	2.23E-04
dccase39	Unit 1 CB Edge to Unit 2 CR Normal Intake	6.52E-04	3.51E-04	1.51E-04	1.49E-04	1.37E-04
dccase40	Unit 2 CB Edge to Unit 1 CR Normal Intake	6.93E-04	3.84E-04	1.67E-04	1.42E-04	1.08E-04
dccase41	Unit 1 PV to Unit 2 CR Normal Intake	9.10E-04	6.57E-04	2.68E-04	2.62E-04	2.45E-04
dccase42	Unit 2 PV to Unit 1 CR Normal Intake	7.88E-04	4.86E-04	2.01E-04	1.69E-04	1.17E-04
dccase43	Unit 1 140' Leakage to Unit 2 CR Normal Intake	2.24E-03	1.15E-03	3.98E-04	3.89E-04	3.20E-04
dccase44	Unit 1 PL to Unit 2 CR Normal Intake	1.38E-03	9.83E-04	3.92E-04	3.88E-04	3.65E-04
dccase45	Unit 2 140' Leakage to Unit 1 CR Normal Intake	2.14E-03	1.39E-03	5.72E-04	4.83E-04	3.62E-04
dccase46	Unit 2 PL to Unit 1 CR Normal Intake	1.22E-03	6.26E-04	2.53E-04	2.12E-04	1.41E-04

Notes:
File names = Input (.rsf), Output (.log)
CR = Control Room
CB = Containment Building
PV = Plant Vent
140' Leakage = Containment Penetration (GE Area)
RWST = Refueling Water Storage Tanks
PL =Containment Penetration (GW/FW Area)

TABLE 2 - Input / Output File Names Atmospheric Dispersion Factors (X/Qs) at Control Room Receptors for FHA Radiological Releases		
File Name	**Description of Release-Receptor Case**	**X/Q (sec/m^3)**
		0 - 2 hours
dcfhc1	Unit 1 FHB to Unit 1 CR Normal Intake	6.98E-03
dcfhc2	Unit 1 FHB to Unit 2 CR Normal Intake	2.93E-03
dcfhc3	Unit 1 FHB to Unit 2 CR Emergency Intake	2.56E-04
dcfhc4	Unit 1 FHB to CR Center	3.78E-03
dcfhc5	Unit 1 EH to Unit 1 CR Normal Intake	2.61E-02
dcfhc6	Unit 1 EH to Unit 2 CR Normal Intake	2.88E-03
dcfhc7	Unit 1 EH to Unit 2 CR Emergency Intake	2.64E-04
dcfhc8	Unit 1 EH to CR Center	5.51E-03
dcfhc9	Unit 2 FHB to Unit 1 CR Normal Intake	2.72E-03
dcfhc10	Unit 2 FHB to Unit 2 CR Normal Intake	6.98E-03
dcfhc11	Unit 2 FHB to Unit 1 CR Emergency Intake	2.49E-04
dcfhc12	Unit 2 FHB to CR Center	3.71E-03
dcfhc13	Unit 2 EH to Unit 1 CR Normal Intake	2.49E-03
dcfhc14	Unit 2 EH to Unit 2 CR Normal Intake	2.51E-02
dcfhc15	Unit 2 EH to Unit 1 CR Emergency Intake	2.49E-04
dcfhc16	Unit 2 EH to CR Center	5.19E-03
dcfhc17	Unit 1 FHB to Unit 1 CR Emergency Intake	3.31E-04
dcfhc18	Unit 2 FHB to Unit 2 CR Emergency Intake	3.50E-04
dcfhc19	Unit 1 EH to Unit 1 CR Emergency Intake	4.36E-04
dcfhc20	Unit 2 EH to Unit 2 CR Emergency Intake	4.68E-04

Notes:
File names = Input (.rsf), Output (.log)
CR = Control Room
FHB = Fuel Handling Building
EH = Equipment Hatch

TABLE 3 - Input / Output File Names Atmospheric Dispersion Factors (X/Qs) at Control Room Receptors for Radiological Releases from MSSVs/ADVs/MSLB						
File Name	**Description of Release-Receptor Cases**	**X/Q (sec/m^3)**				
		0 - 2 hours	**2 - 8 hours**	**8 - 24 hours**	**1 - 4 days**	**4 - 30 days**
	Unit 1 MSSVs to Unit 1 CR Normal Intake	N/A	N/A	N/A	N/A	N/A
dcmssv02	Unit 1 MSSVs to Unit 2 CR Normal Intake	4.29E-03	2.76E-03	1.04E-03	1.06E-03	9.46E-04
dcmssv03	Unit 1 MSSVs to Unit 2 CR Emergency Intake	3.14E-04	1.53E-04	5.12E-05	5.29E-05	4.38E-05
dcmssv04	Unit 1 MSSVs to CR Center	1.39E-02	7.40E-03	2.38E-03	2.56E-03	2.15E-03
dcmssv05	Unit 2 MSSVs to Unit 1 CR Normal Intake	3.87E-03	2.42E-03	9.89E-04	8.17E-04	6.09E-04
	Unit 2 MSSVs to Unit 2 CR Normal Intake	N/A	N/A	N/A	N/A	N/A
dcmssv07	Unit 2 MSSVs to Unit 1 CR Emergency Intake	2.89E-04	1.91E-04	7.45E-05	6.62E-05	5.08E-05
dcmssv08	Unit 2 MSSVs to CR Center	1.22E-02	8.10E-03	3.27E-03	2.76E-03	2.08E-03
	Unit 1 ADVs to Unit 1 CR Normal Intake	N/A	N/A	N/A	N/A	N/A
dcmssv10	Unit 1 ADVs to Unit 2 CR Normal Intake	4.30E-03	2.79E-03	1.05E-03	1.06E-03	9.49E-04
dcmssv11	Unit 1 ADVs to Unit 2 CR Emergency Intake	3.13E-04	1.54E-04	5.13E-05	5.30E-05	4.39E-05
dcmssv12	Unit 1 ADVs to CR Center	1.39E-02	7.45E-03	2.39E-03	2.59E-03	2.15E-03
dcmssv13	Unit 2 ADVs to Unit 1 CR Normal Intake	3.88E-03	2.43E-03	9.94E-04	8.19E-04	6.10E-04
	Unit 2 ADVs to Unit 2 CR Normal Intake	N/A	N/A	N/A	N/A	N/A
dcmssv15	Unit 2 ADVs to Unit 1 CR Emergency Intake	2.87E-04	1.92E-04	7.48E-05	6.61E-05	5.07E-05
dcmssv16	Unit 2 ADVs to CR Center	1.22E-02	8.16E-03	3.28E-03	2.78E-03	2.09E-03
	Unit 1 MSLB to Unit 1 CR Normal Intake	N/A	N/A	N/A	N/A	N/A
dcmssv18	Unit 1 MSLB to Unit 2 CR Normal Intake	4.23E-03	2.90E-03	1.13E-03	1.11E-03	1.02E-03
dcmssv19	Unit 1 MSLB to Unit 2 CR Emergency Intake	3.06E-04	1.54E-04	5.19E-05	5.32E-05	4.38E-05
dcmssv20	Unit 1 MSLB to CR Center	1.24E-02	7.10E-03	2.24E-03	2.43E-03	2.07E-03
dcmssv21	Unit 2 MSLB to Unit 1 CR Normal Intake	3.81E-03	2.40E-03	1.01E-03	8.09E-04	5.88E-04
	Unit 2 MSLB to Unit 2 CR Normal Intake	N/A	N/A	N/A	N/A	N/A
dcmssv23	Unit 2 MSLB to Unit 1 CR Emergency Intake	2.75E-04	1.91E-04	7.45E-05	6.53E-05	4.86E-05
dcmssv24	Unit 2 MSLB to Control Room Center	1.09E-02	7.35E-03	3.01E-03	2.48E-03	1.86E-03
dcmssv25	Unit 1 MSSVs to Unit 1 CR Emergency Intake	4.66E-04	2.92E-04	1.16E-04	1.04E-04	8.08E-05
dcmssv26	Unit 2 MSSVs to Unit 2 CR Emergency Intake	4.90E-04	2.29E-04	8.24E-05	8.07E-05	6.49E-05
dcmssv27	Unit 1 ADVs to Unit 1 CR Emergency Intake	4.66E-04	2.92E-04	1.16E-04	1.04E-04	8.07E-05
dcmssv28	Unit 2 ADVs to Unit 2 CR Emergency Intake	4.90E-04	2.29E-04	8.24E-05	8.08E-05	6.48E-05
dcmssv29	Unit 1 MSLB to Unit 1 CR Emergency Intake	4.35E-04	2.94E-04	1.15E-04	1.01E-04	7.76E-05

TABLE 3 - Input / Output File Names
Atmospheric Dispersion Factors (X/Qs) at Control Room Receptors for Radiological Releases from MSSVs/ADVs/MSLB

File Name	Description of Release-Receptor Cases	X/Q (sec/m^3)				
		0 - 2 hours	2 - 8 hours	8 - 24 hours	1 - 4 days	4 - 30 days
dcmssv30	Unit 2 MSLB to Unit 2 CR Emergency Intake	4.76E-04	2.24E-04	8.14E-05	7.94E-05	6.40E-05

Notes:
File names = Input (.rsf), Output (.log)
N/A = Not applicable due to the source-receptor distance being much less than 10 meters, outside of the applicability of ARCON96.
CR = Control Room
MSSVs = Main Steam Safety Valves
ADVs = Atmospheric Dump Valves
MSLB = Main Steam Line Break

TABLE 4 - Input / Output File Names
Atmospheric Dispersion Factors (X/Qs) at TSC Receptors for LOCA Radiological Releases

File Name	Release-Receptor Case Description	X/Q (sec/m^3)				
		0 - 2 hours	2 - 8 hours	8 - 24 hours	1 - 4 days	4 - 30 days
dctsc01	Unit 1 CB Edge to TSC Normal Intake	2.57E-04	1.18E-04	4.27E-05	4.24E-05	3.50E-05
dctsc02	Unit 1 CB Edge to TSC Center	2.90E-04	1.33E-04	4.98E-05	4.83E-05	4.02E-05
dctsc03	Unit 1 PV (ECCS Leakage) to TSC Normal Intake	3.12E-04	1.77E-04	6.91E-05	6.29E-05	5.21E-05
dctsc04	Unit 1 PV(ECCS Leakage) to TSC Center	3.54E-04	1.95E-04	7.71E-05	6.70E-05	5.67E-05
dctsc05	Unit 1 RWST Vent to TSC Normal Intake	2.72E-04	1.27E-04	4.80E-05	4.49E-05	3.71E-05
dctsc06	Unit 1 RWST Vent to TSC Center	2.94E-04	1.38E-04	5.40E-05	4.89E-05	3.97E-05
dctsc07	Unit 1 140' Elevation Area Leakage to TSC Normal Intake	3.64E-04	1.74E-04	6.55E-05	6.14E-05	5.00E-05
dctsc08	Unit 1 140' Elevation Area Leakage to TSC Center	4.27E-04	1.91E-04	7.45E-05	6.84E-05	5.62E-05
dctsc09	Unit 1 PL to TSC Normal Intake	4.80E-04	2.51E-04	8.31E-05	8.64E-05	6.95E-05
dctsc10	Unit 1 PL to TSC Center	5.98E-04	3.03E-04	1.04E-04	1.03E-04	8.46E-05
dctsc11	Unit 2 CB Edge to TSC Normal Intake	5.48E-04	2.00E-04	8.52E-05	8.37E-05	6.84E-05
dctsc12	Unit 2 CB Edge to TSC Center	5.57E-04	2.01E-04	8.81E-05	8.89E-05	6.92E-05
dctsc13	Unit 2 PV (ECCS Leakage) to TSC Normal Intake	5.52E-04	2.35E-04	1.06E-04	8.71E-05	6.95E-05
dctsc14	Unit 2 PV (ECCS Leakage) to TSC Center	5.43E-04	2.16E-04	9.97E-05	8.11E-05	6.58E-05
dctsc15	Unit 2 RWST Vent to TSC Normal Intake	3.63E-04	1.68E-04	6.47E-05	6.04E-05	4.91E-05
dctsc16	Unit 2 RWST Vent to TSC Center	3.72E-04	1.68E-04	6.64E-05	6.17E-05	5.10E-05
dctsc17	Unit 2 140' Elevation Area Leakage to TSC Normal Intake	5.47E-04	2.41E-04	9.36E-05	8.83E-05	7.02E-05
dctsc18	Unit 2 140' Elevation Area Leakage to TSC Center	5.72E-04	2.43E-04	9.75E-05	9.12E-05	7.52E-05
dctsc19	Unit 2 PL to TSC Normal Intake	1.80E-03	7.72E-04	3.07E-04	2.87E-04	2.33E-04
dctsc20	Unit 2 PL to TSC Center	1.83E-03	7.49E-04	3.16E-04	2.92E-04	2.41E-04

Notes:
File names = Input (.rsf), Output (.log)
CB = Containment Building
PV = Plant Vent
RWST = Refueling Water Storage Tanks
PL = Penetration Leakage

Enclosure
Attachment 3
PG&E Letter DCL-15-130

Data Disc 1

Enclosure
Attachment 4
PG&E Letter DCL-15-130

Data Disc 2
(10 CFR 2.390)