Evaluation of the Procedures Proposed by the Pacific Gas and Electric Company in their Emergency Plans to Consider Meteorological Conditions in the Diablo Canyon Plant Coastal Environment

by

Isaac Van der Hoven
National Oceanic and Atmospheric Administration
Air Resources Laboratories

October 8, 1982

I. The review which follows is in response to Task Order No. 1 of Interagency Agreement No. NRC-03-81-099 which requires an evaluation of the procedures proposed by the Pacific Gas and Electric Company in their emergency plans to consider meteorological conditions in the coastal environment at the Diablo Canyon Units 1 and 2 nuclear reactor site.

II. The documents reviewed which were submitted under NRC Docket No. 50-275 and 50-323 are as follows:

1. Upgraded Meteorological Program for Emergency Preparedness, February 17, 1981.

2. Chi/Q Calculations for Exclusion Area Determination, (no date given).

III. The reviews of the documents listed are as follows:

1. "Upgraded Meteorological Program for Emergency Preparedness"

The document lists a number of site specific factors affecting plume concentration estimates at the Diabloe Canyon site, one of which is "an extensive series of tracer tests conducted at the plant site". The report entitled "Diffusion Studies at the Diablo Canyon Site" by H.E. Cramer and F.A. Record of the GCA Corp., prepared for the utility in June 1970, is part of the Final Safety Analysis Report, Appendix 2.3B, pages 2.3B-1 to 2.3B-51 of Docket Number 50-275 and 50-323. Based on my analysis of the concentration data found in Appendix 2.3B, I would agree that "the net effect of the site specific influence is to enhance dispersion along highly channeled flow trajectories roughly paralleling the coast." In the attached table, I have taken the data from the 16 tracer tests with winds from the NW and calculated the ratio of the computed versus measured relative maximum concentration. Measured sigma theta values were used to classify the Pasquill diffusion category which specifies the value of sigma-y and sigma-z as a function of distance. It was also assumed that the measured maximum concentrations were along the plume centerline. In a number of cases the actual peak concentration may not have been sampled because the plume centerline may have been over the water. Nevertheless, with an average computed versus measured ratio of 18, I would assume that on the whole, computed concentration values using the straight, centerline Gaussian model would be greater than the maximum measured values. This is not surprising because of the added turbulence created by the rough terrain.

2. "Chi/Q Calculations for Exclusion Area Determination"

In order to compare the minimum acceptable concentration level of each radionuclide with computed centerline concentrations, the report outlines the steps necessary to obtain the relative concentration (Chi/Q) from measured meteorological data. Then, to compute the centerline concentration (Chi), the instructions are to multiply the Chi/Q value by the source term, Q. The question then is, how is the source term determined? Is the source term pre-determined depending on the type of accident or is there a radiological monitoring network

that can define the plume centerline location and concentration? Determining the Q value from the Gaussian model requires a measurement of wind speed, stability, and concentration plus a knowledge of where the monitored concentration measurement was made with regard to its "y" distance from the centerline of the plume. The latter will not be known if one does not have a measured concentration isopleth pattern.

IV. Conclusions regarding the documents as listed and numbered above are as follows:

1. The meteorological program described in the document is acceptable from an emergency planning standpoint.

2. I do not believe that the methodology described in the document adequately determines the value of the source term, Q. If Q is not known, then Chi cannot be determined from Chi/Q and it follows that the exclusion area cannot then be determined.

Isaac Van der Hoven

Isaac Van der Hoven
Air Resources Laboratories, NOAA
October 8, 1982

DIABLO CANYON TRACER TESTS

Flow From Northwest

Test #	Max. $u\chi/Q$ (measured) m^{-2}	Distance m	Sigma Theta deg.	u mph	Pasquill Type	Max. $u\chi/Q$ (computed) m^{-2}	Computed/Measured Ratio**
1	4.8 (-6)*	1800	9.0	11	D	6.0 (-5)	12
2	5.6 (-6)	8000	6.2	15	E	1.2 (-5)	2
3	2.3 (-6)	4400	8.0	20	D	1.6 (-5)	7
4	7.5 (-6)	1800	9.0	19	D	6.0 (-5)	8
9	4.2 (-6)	1800	4.8	16	E	1.2 (-4)	28
10	4.0 (-6)	6000	3.1	26	F	5.0 (-5)	12
11	1.4 (-5)	1800	3.8	16	E	1.2 (-4)	9
12	1.4 (-5)	1800	3.1	14	F	2.8 (-4)	20
15	1.8 (-5)	1800	4.8	15	E	1.2 (-4)	7
16	9.4 (-6)	1600	3.2	18	F	3.3 (-4)	35
17	2.1 (-5)	1800	2.5	24	F	2.8 (-4)	13
18	3.0 (-5)	1600	2.2	20	F	3.3 (-4)	11
20	5.6 (-6)	1800	3.8	27	E	1.2 (-4)	21
22	1.2 (-5)	1800	3.4	16	F	2.8 (-4)	23
24	8.4 (-6)	1800	1.4	24	G	6.4 (-4)	76
25	7.5 (-6)	4000	2.4	20	F	3.9 (-5)	5

*(-6) means x 10^{-6}

** ASSUMES MEASURED MAX WAS AT CENTERLINE