August 1, 1989

DOCKET NOS.: 50-275
and 50-323

APPLICANT: PACIFIC GAS AND ELECTRIC COMPANY (PG&E)

FACILITY: DIABLO CANYON NUCLEAR POWER PLANT, UNITS 1 AND 2

SUBJECT: SUMMARY OF JUNE 12-16, 1989 PUBLIC MEETING TO DISCUSS GEOLOGY/SEISMOLOGY/GEOPHYSICS/TECTONICS, DIABLO CANYON LONG TERM SEISMIC PROGRAM (LTSP) (TAC NOS. 55305 AND 68049)

On June 12-16, 1989 the NRC staff and its consultants met with PG&E in San Francisco, California to discuss Chapter 2 of PG&E's Final Report on the Diablo Canyon Long Term Seismic Program, submitted for review on July 31, 1988. Attendees at the meeting are given in Enclosure 1. The agenda for the meeting is given in Enclosure 2. A copy of all the viewgraphs presented at the meeting have been transmitted to the meeting participants by PG&E letter dated July 25, 1989. This material will be docketed and available for inspection at the PDR and the LPDR.

Enclosure 3 contains comments and questions by the NRC staff and its consultants that have resulted from the meeting. We request that you consider the comments and respond to the questions as soon as possible, so that we may continue our review in this area. If you have any questions regarding this request, please contact me. Also included for your information are reports on the meeting from three NRC consultants.

original signed by
Harry Rood, Senior Project Manager
Project Directorate V
Division of Reactor Projects - III,
IV, V and Special Projects

Enclosures:
1. Meeting Attendees
2. Meeting Agenda
3. NRC Comments and Questions
4. Report by Robert D. Brown
5. Report by D. Burton Slemmons
6. Report by Keiiti Aki

cc: w/enclosures - see next page

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UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

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cc: w/enclosures - see next page

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ENCLOSURE 1

Attendees, Public Meeting on Geology/Seismology/Geophysics/Tectonics
Diablo Canyon Long Term Seismic Program
June 12 - 16, 1989

NAME	ORGANIZATION
K. Aki	University of Southern California (NRC)
Clarence R. Allen	Consultant to PG&E
Shan Bhattacharya	PG&E
Bruce Bolt	Consultant to PG&E
Frank W. Brady	PG&E
D. A. Brand	PG&E
Tom Brocher	USGS (NRC)
Bob Brown	USGS (NRC)
Glenda Chui	San Jose Mercury
Doug G. Clark	University of Nevada - Reno (NRC)
Lloyd S. Cluff	PG&E
Kevin J. Coppersmith	Geomatrix (PG&E)
Jim Crouch	Crouch, Bachman and Associates, Inc.
James Davis	California Division of Mines & Geology
P. R. Davis	Consultant to ACRS (NRC)
Jerry P. Eaton	USGS (NRC)
N. Timothy Hall	Geomatrix (PG&E)
Douglas H. Hamilton	Earth Science Associates (PG&E)
Kathryn L. Hanson	Geomatrix (PG&E)
I. M. Idriss	Consultant to PG&E
William R. Lettis	Geomatrix (PG&E)
Stephen Lewis	USGS (NRC)
Richard F. Locke	PG&E
Cole McClure	Consultant to PG&E
Dave McCulloch	USGS (NRC)
Marcia McLaren	PG&E
Richard McMullen	NRC/RES/SSEB
Jay Namson	Davis and Namson
Bruce Norton	TENERA (PG&E)
David W. Ogden	PG&E
Ben M. Page	Consultant to ACRS (NRC)
Leon Reiter	NRC/NRR/EGSB
Jan D. Rietman	Consultant to PG&E
Harry Rood	NRC/NRR/PDV
Robert L. Rothman	NRC/NRR/EGSB
Bimal Sarkar	Bechtel (PG&E)
George Sarkesian	PG&E
W. U. Savage	PG&E
Jean Savy	LLNL (NRC)
David P. Schwartz	USGS (NRC)
Gerald Shiller	Consultant to PG&E
Sandy Silver	Mothers for Peace
David B. Slemmons	University of Nevada - Reno (NRC)
David L. Smith	Earth Science Associates (PG&E)
Paul Somerville	Woodward-Clyde (PG&E)
George A. Thompson	Consultant to ACRS (NRC)
M. Tresler	PG&E
Yi-Ben Tsai	PG&E
C. Richard Willingham	ExploraMetrics (PG&E)

ENCLOSURE 2

NRC/PG&E MEETING ON GEOLOGY/SEISMOLOGY/GEOPHYSICS/TECTONICS
DIABLO CANYON LONG TERM SEISMIC PROGRAM
ONE CALIFORNIA STREET, ROOM 440
SAN FRANCISCO, CALIFORNIA, 94106
JUNE 12 - 16, 1989

AGENDA

MONDAY, JUNE 12, 1989

8:30 a.m.	Introduction	NRC/PG&E
9:00 a.m.	Regional Terminology: Locations and Definitions of Geologic Structures	
9:30 a.m.	University of Nevada Presentation Discussion	
10:30 a.m.	U.S. Geological Survey (USGS) Presentation	
12:00 noon	Lunch	
1:00 p.m.	USGS Presentation (Continued) Discussion	
2:00 p.m.	Regional Seismicity	PG&E
	1927 Earthquake Recent Instrumental Seismicity	
4:00 p.m.	Tectonic History of the San Gregorio/ San Simeon/Hosgri Fault System	
5:00 p.m.	Adjourn	

TUESDAY, JUNE 13, 1989

8:30 a.m.	Logic Tree Elements	PG&E
10:00 a.m.	Hosgri Fault Zone Sense of Slip Slip Rate Down-dip Geometry	
12:00 noon	Lunch	
1:00 p.m.	Hosgri Fault Zone (Continued)	
5:00 p.m.	Adjourn	

LSC/WUS:sjm
6/7/89

NRC/PG&E MEETING ON GEOLOGY/SEISMOLOGY/GEOPHYSICS/TECTONICS
DIABLO CANYON LONG TERM SEISMIC PROGRAM
ONE CALIFORNIA STREET, ROOM 440
SAN FRANCISCO, CALIFORNIA, 94106
JUNE 12 - 16, 1989

AGENDA

WEDNESDAY, JUNE 14, 1989

8:30 a.m.	Hosgri Fault Zone (Continued)	
12:00 noon	Lunch	
1:00 p.m.	Segmentation Definition Hosgri Fault Zone	
5:00 p.m.	Adjourn	

THURSDAY, JUNE 15, 1989

8:30 a.m.	Characteristics of Other Faults (PG&E) Los Osos Wilmar Avenue San Luis Bay	
12:00 noon	Lunch	
1:00 p.m.	Characteristics of Other Faults (Continued)	
2:00 p.m.	Regional Tectonic Setting	PG&E
3:00 p.m.	USGS Invited Presentation	Jay Namson
4:00 p.m.	Discussion	
5:00 p.m.	Adjourn	

FRIDAY, JUNE 16, 1989

8:30 a.m.	Discussion and Summary of Meeting
9:30 a.m.	NRC Caucus
10:30 a.m.	Discussion
11:30 a.m.	Close of Meeting

LSC/WUS:sjm
6/7/89

ENCLOSURE 3

NRC Comments and Questions Resulting from the Diablo Canyon Meeting
LTSP Geology/Seismology/Geophysics/Tectonics, June 12-16, 1989.

1. The logic tree used to characterize the Hosgri fault zone seems to capture the suite of differences of opinion about the style of faulting. There are, however, opinions other than PG&E's with respect to the weighting of the various parameters. In certain areas along the fault zone the interpretations based on the geological information and the interpretations based on some geophysical (seismic reflection) interpretations appear to differ. The dip of the Hosgri is a case in point. PG&E's interpretation of its geophysical data is that it shows the Hosgri as a mainly steeply dipping fault. This, along with the geologic information, is interpreted as being indicative of predominant strike slip faulting. J. Crouch presented seismic reflection data which he interprets as showing the Hosgri fault to be a low angle thrust. Has PG&E looked at this information? What is PG&E's interpretation? Does PG&E agree with Crouch's dipping fault? How does PG&E reconcile this with the hypothesis of strike slip faulting? Could the differences in the geophysical data be due to the data processing methods? Also, many of PG&E's interpretations of vertical faults appear to be based on shallow high resolution data and there may not be strong evidence to extend them in depth as vertical. Provide PG&E's basis for determining the down dip geometry and the differences with those mentioned above.

2. D. B. Slemmons proposed that the Hosgri may be experiencing oblique fault motion at seismogenic depths and that this is being partitioned into strike slip and dip slip on the near surface faults. As stated by George Thompson, this region may be responding similarly to the San Andreas region with the horizontal strike slip component of strain being accommodated on the Hosgri system and the compressional component being accommodated on the sub-parallel reverse faults and folds. Provide a discussion of these models their appropriateness and any implications of these concepts to the LTSP.

3. Provide the new information presented at the meeting on the uplift rates across the Hosgri fault zone, based on relative displacement of the basement, top of Miocene, the mid-Pliocene discontinuity, and the post-Wisconsin low stand, including the uncertainties in the analysis. Also, clarify the apparent conflict regarding the elevation of the 18 thousand year, late Wisconsin, low stand. This is given as -120 meters in Table 3 and Plate 5 of the Response to Question 431, but as -140 and -160 meters in the discussion, at the meeting on June 14, of the north Estero Bay slope break. If the lower value is correct, provide the published source or other supporting data for this departure from globally established values. If evidence supports both the lower value to the west of the surface scarp of the Hosgri, and the mapped -120 meter level near the Hosgri scarp, discuss the rate of vertical fault slip thereby implied.

4. Provide the analysis of the uplift rates across the Hosgri versus the lateral rate of displacement, and the variations along the length of the Hosgri as discussed at the meeting. Include the basis for their measurement, the uncertainties, and a discussion of the geometry of the fault and its effects upon the evaluation of the vertical and horizontal displacements. Also, summarize the evidence for strike-slip and dip-slip along the 16 kilometer reach of the Hosgri fault that extends from the westernmost scarp at 59-meter ridge northward across the north Estero Bay slope break and explain how the geometry of the 30-meter high, scarp-like, part of the north Estero Bay slope break can be derived by right-lateral strike-slip.

5. Provide the tsunami analysis used to determine the location, moment, and magnitude of the 4 November 1927 "Lompoc" earthquake including the uncertainties, and the letter from Dr. Abe pertaining to his tsunami magnitude determination and the Hilo tide gauge recording. Discuss potential timing errors that arise from clock error, marking error, or other causes inherent in the San Diego or San Francisco marigrams. Describe how the tsunami analysis technique has been calibrated against data.

6. Provide a discussion of the felt data for the 4 November 1927 mainshock and the aftershocks and how they relate to the proposed locations. The isoseismal maps of the 4 November 1927 and the 29 May 1980 earthquakes were compared and, based on the comparison, arguments about the location of the 1927 event were made. It may be inappropriate to make this kind of comparison since the strikes of the faults as determined from the focal mechanism studies appear to be different. The differences in the radiation patterns for the two events could cause different felt data geometry even if the events were in the same location.

7. In U.S. Geological Survey Professional Paper 1223, "Seismic Intensities of Earthquakes of Conterminous United States--Their Prediction and Interpretation," Everenden, Kohler, and Clow used the observed intensity data from the 4 November 1927 earthquake and their predictive model to evaluate several estimates of the epicenter, fault length, and fault orientation of this event. The authors conclude that, if the general applicability of the predictive model is accepted, the intensity data from the Lompoc earthquake require a location on or very near the Hosgri fault. Provide a discussion of the conclusion from this study in light of PG&E's analysis of the earthquake.

8. If the seismograms from the Santa Barbara Wood-Anderson instruments are available for the 4 November 1927 earthquake, it may be possible to get an accurate azimuth from a vector analysis of these horizontal instruments to help in establishing the epicenter. Also, re-read the S-P times from all the Santa Barbara records for this earthquake.

9. The seismogenic structure on which the 4 November 1927 earthquake occurred should be identified and evaluated for maximum earthquake potential and its closest approach to the Diablo Canyon site. Account for this in both the probabilistic and the deterministic analyses.

10. Provide a critique of the presentation made by Jay Namson. Discuss and evaluate any consistencies or inconsistencies of his model with the PG&E geologic and geophysical field data.

11. Provide probabilistic and deterministic analyses (including a logic tree) for the hypothesis of a blind thrust and the inclusion of a Namson type model in the analysis of the compression of the San Luis-Pismo Block.

12. Provide the new information which was presented at the meeting about the pull-apart basin at the San Simeon-Hosgri stepover.

13. Trenching on the San Simeon fault zone indicates that there is an important strike slip component on the Hosgri fault of about 1 to 3 mm/year contributed by the San Simeon fault. There may also be a contribution from the Piedras Blancas zone. Provide a discussion as to whether there is such a contribution and, if so, its size and sense of slip.

14. Displacements of 2 meters per event on the Los Osos fault would suggest rupture lengths longer than those presented. Provide the information used to determine the rupture lengths and discuss any inconsistency with 2 meter displacements.

15. The fault segmentation-rupture length presentation made at the meeting for the Hosgri fault zone is in question. Other segmentation points are possible. Provide any new information presented at the meeting so that it can be reviewed prior to the source characterization meeting.

16. Provide the new information presented at the meeting on the southwestern boundary zone of the San Luis-Pismo Block.