

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

March 17, 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 MARCH 1-3, 1989 PUBLIC MEETING TO DISCUSS

SEISMIC GROUND MOTION, DIABLO CANYON LONG TERM SEISMIC PROGRAM

(LTSP) (TAC NOS. 55305 AND 68049)

On March 1-3, 1989 the NRC staff and its consultants met with PG&E in San Francisco, California to discuss PG&E's response to the ground motion questions transmitted by the NRC staff letter of December 13, 1988, as part of the staff review of the LTSP Final Report submitted by PG&E on July 31, 1988.

Attendees at the meeting are given in Enclosures 1, 2, and 3. The agenda for the meeting is given in Enclosure 4. A copy of all the viewgraphs presented at the meeting have been transmitted to the meeting participants by PG&E letter dated March 13, 1989. This material has been docketed and is available for inspection at the PDR and the LPDR.

Following the formal presentations by PG&E and its consultants, the staff and its consultants caucused in the afternoon of March 2. As a result of the caucus the staff provided PG&E with list of questions and issues related to ground motion which still need clarification. Among these are:

- 1. What are the potential effects on the ground motion regression analysis results of including the very hard rock sites in the empirical data set.
- 2. Provide a justification of the methods used for the selection and adjustment of the data used in the near-source ground motion and empirical ground motion estimates. The justification should demonstrate that the methods used do not bias the ground motion to the low side.
- 3. Identify the records which were used in each of the subsets of the empirical data set used for each of the various analyses.
- 4. The median and 84% spectra resulting from the numerical modeling studies have a dip in amplitude between 5 and 10 Hertz. PG&E stated that this is an artifact of the random number set used in the calculations. Substantiate this by providing spectra generated with a different sets of random numbers where this dip does not occur.
- 5. How much would the empirical ground motion estimates change if the type of faulting was assumed to be all oblique slip rather than 65% strike slip, 30% oblique slip, and 5% reverse slip?
- 6. Is the apparent magnitude dependence of the dispersion in the empirical ground motion analysis real or is it an artifact of the data set? For lower magnitudes the uncertainty may be due to inter-event dispersion while at larger magnitudes it may be due to intra-event dispersion.

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Memo 4

- 7. Provide a step-by-step discussion of the uncertainty in the numerical modeling study.
- 8. Show the effect of different assumptions of fault type (strike slip, oblique slip, and reverse slip) in the numerical modeling study.
- 9. Provide a comparison between the numerical modeling study and the frequency-wave number method of the 1.5 km and 3 km source depth contributions.
- 10. Provide the eleven three-component time series for bilateral rupture for both the Imperial Valley and Coalinga aftershock sources from the numerical modeling study.
- 11. The amplitudes of low frequency portion of the spectra generated in the numerical modeling study appear to be deficient. At what frequencies are these spectra dependable?
- 12. To aid in accessing the proposed lack of topographic effect at the Diablo Canyon site, provide a numerical study using vertically polarized shear waves with ground motion amplitude referenced to sea level.

In the morning of March 3 PG&E made presentations and there were discussions on questions 2, 4, 5, 6, 7. PG&E will provide written submittals for the other items and to document the presentations on these five items.

Harry Rood, Senior Project Manager Project Directorate V Division of Reactor Projects - III.

IV. V and Special Projects

#### Enclosures:

- 1. Meeting Attendees, 3/1/89
- 2. Meeting Attendees, 3/2/89
- Meeting Attendees, 3/3/89
- 4. Meeting Agenda

cc: w/enclosures - see next page

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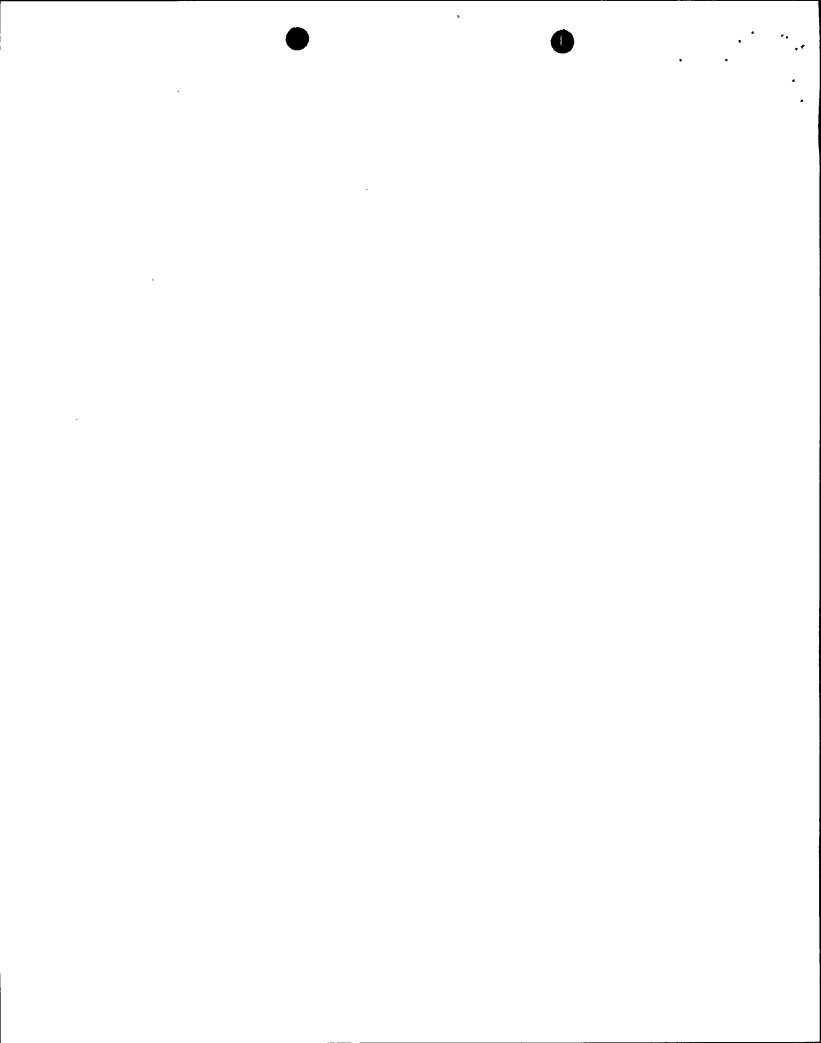
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- 2 - Diablo Canyon

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Pacific Gas and Electric Company Long Term Seismic Program

# - 4 - Diablo Canyon

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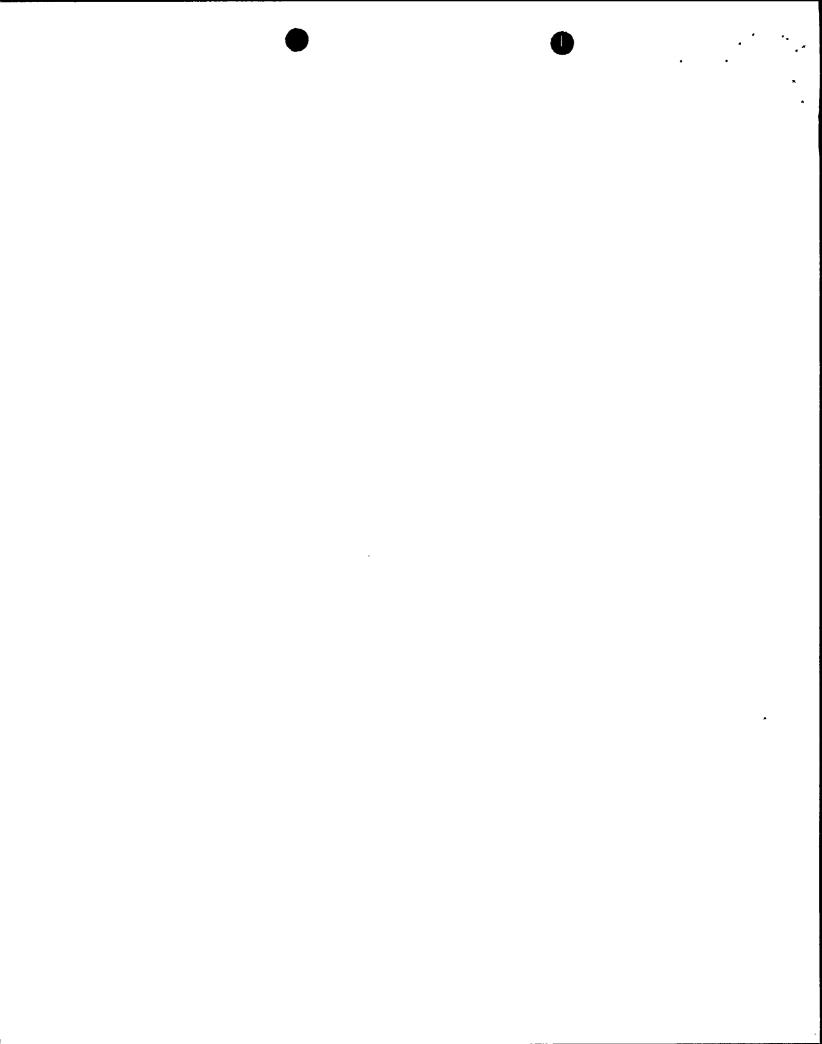
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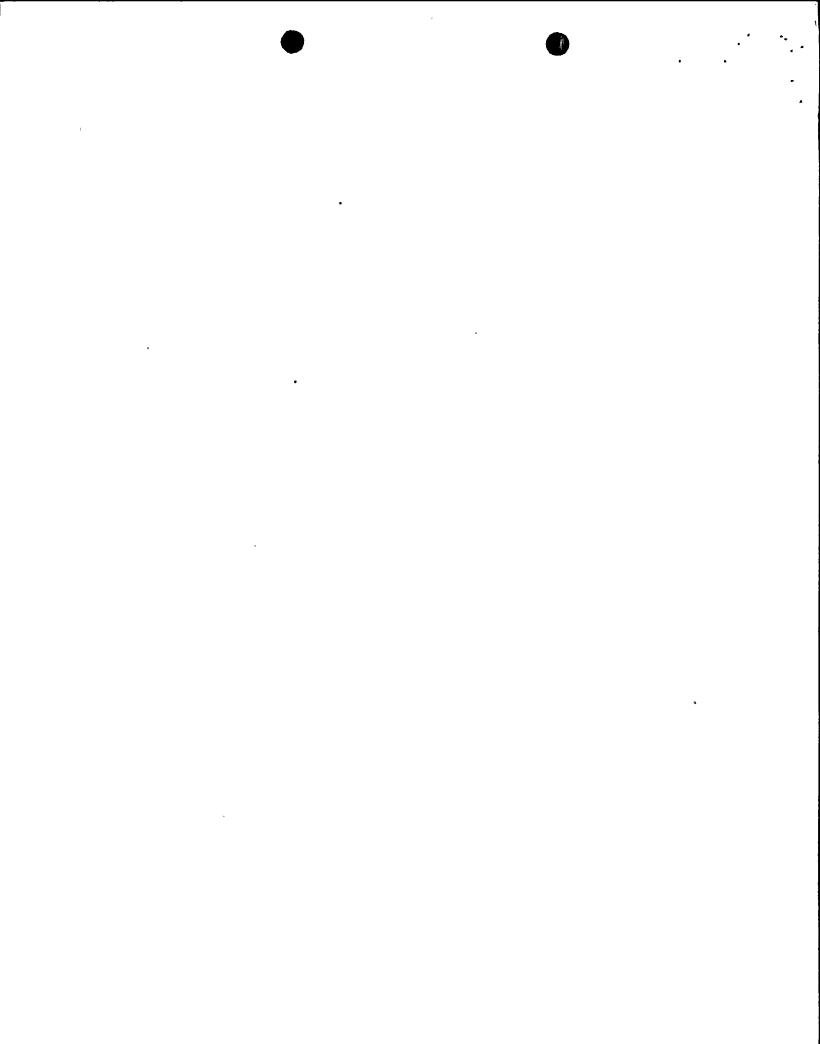
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#### **ENCLOSURE 1**

#### **ATTENDEES**

Public Meeting on Seismic Ground Motion Diablo Canyon Long Term Seismic Program Wednesday, March 1, 1989

#### NAME

# Norm Abrahamson

K. Aki

Ralph J. Archuleta

Bruce Bolt Frank W. Brady D. A. Brand

Kenneth Campbell Nilesh Chokshi Lloyd S. Cluff

Kevin J. Coppersmith

James Davis
Steven M. Day
Don Helmberger
I. M. Idriss
J. J. Johnson
Faiz Makdisi
Robin K. McGuire
David W. Ogden
David Ovadia
Ben M. Page

Harry Rood Robert L. Rothman

Ross Sadigh
Bimal Sarkar
W. U. Savage
Jean Savy
Paul Somervil

Paul Savy
Paul Somerville
Yi-Ben Tsai
Andy S. Veletsos
W. H. Wallace
W. H. White

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University of California Santa Barbara (NRC)

PG&E Consultant

PG&E PG&E

US Geological Survey - Golden (NRC)

NRC/RES/PRAB

PG&E

Geomatrix (PG&E)

California Division of Mines & Geology

San Diego State University (NRC)

Consultant to PG&E Consultant to PG&E Consultant to NRC Consultant to PG&E

Risk Engineering, Inc. (PG&E)

PG&E PG&E

Consultant to ACRS (NRC)

NRC/NRR/PDV NRC/NRR/EGSB Geomatrix (PG&E) Bechtel (PG&E)

PG&E

LLNL (NRC)

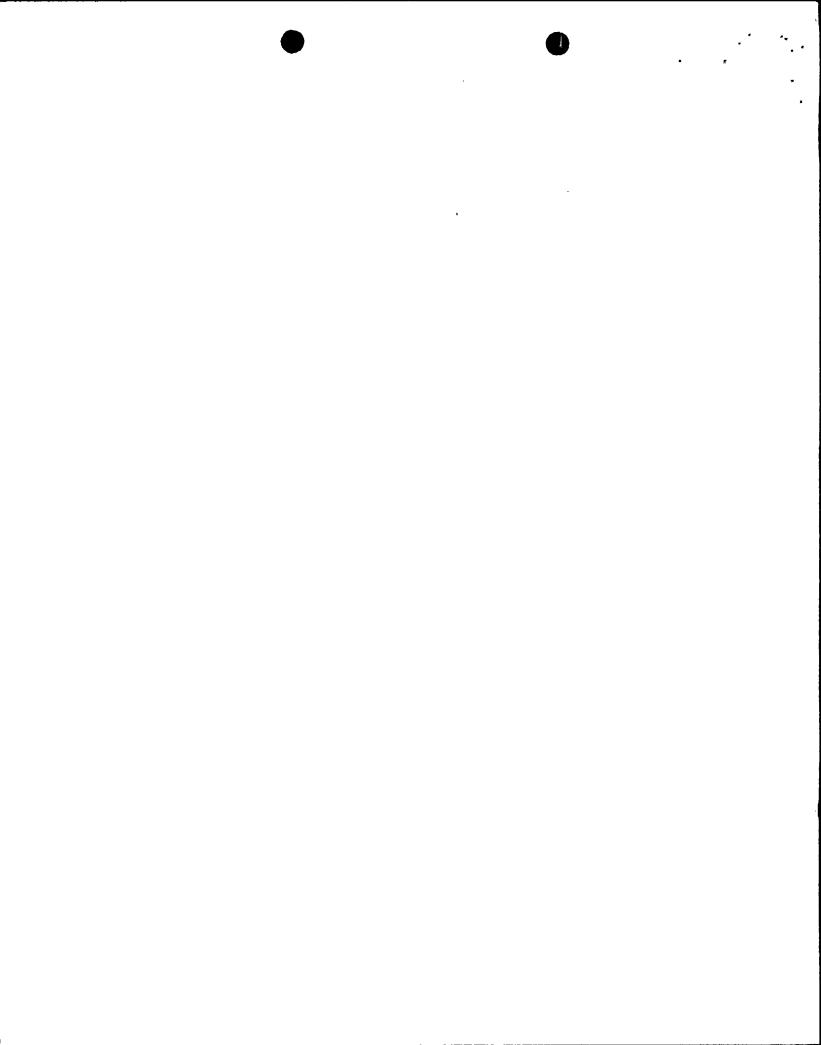
Consultant to PG&E

PG&E

Rice University (BNL/NRC)

PG&E

Bechtel (PG&E)



#### **ENCLOSURE 2**

#### **ATTENDEES**

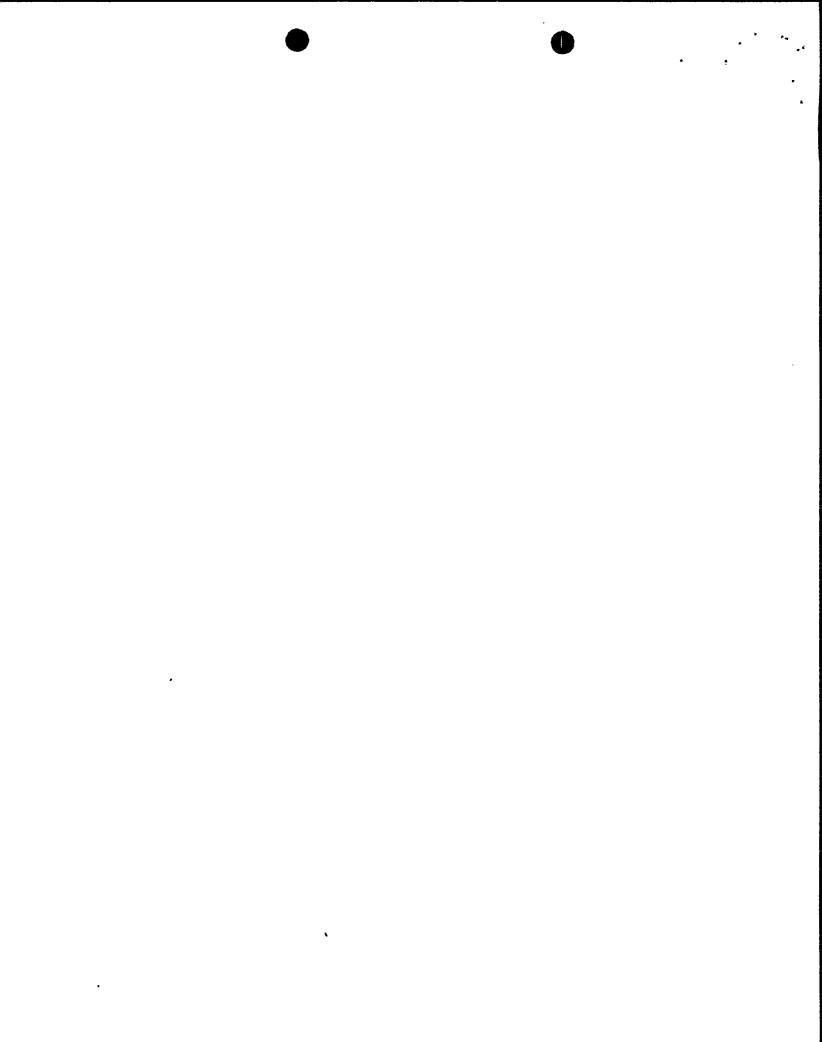
Public Meeting on Seismic Ground Motion Diablo Canyon Long Term Seismic Program Thursday, March 2, 1989

#### NAME

Norm Abrahamson K. Aki Ralph J. Archuleta Frank W. Brady Kenneth Campbell Nilesh Chokshi Lloyd S. Cluff James Davis Steven M. Day Don Helmberger I. M. Idriss J. J. Johnson Faiz Makdisi David W. Ogden Harry Rood Robert L. Rothman Ross Sadigh Bimal Sarkar W. U. Savage Jean Savy Paul Somerville Yi-Ben Tsai Andy S. Veletsos W. H. White

#### ORGANIZATION

Consultant to PG&E University of Southern California (NRC) University of California Santa Barbara (NRC) PG&E US Geological Survey - Golden (NRC) NRC/RES/PRAB PG&E California Division of Mines & Geology San Diego State University (NRC) Consultant to PG&E Consultant to PG&E Consultant to NRC Consultant to PG&E PG&E NRC/NRR/PDV NRC/NRR/EGSB Geomatrix (PG&E) Bechtel (PG&E) PG&E LLNL (NRC) Consultant to PG&E PG&E Rice University (BNL/NRC) Bechtel (PG&E)



#### **ENCLOSURE 3**

#### **ATTENDEES**

Public Meeting on Seismic Ground Motion Diablo Canyon Long Term Seismic Program Friday, March 3, 1989

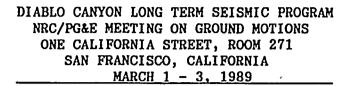
#### NAME

Norm Abrahamson K. Aki 'Ralph J. Archuleta Frank W. Brady Kenneth Campbell Nilesh Chokshi Lloyd S. Cluff Steven M. Day Don Helmberger I. M. Idriss Richard F. Locke Faiz Makdisi David Ovadia Ben M. Page Harry Rood Robert L. Rothman Ross Sadigh Bimal Sarkar W. U. Savage Jean Savy Harry Seed Yi-Ben Tsai Andy S. Veletsos W. H. Wallace

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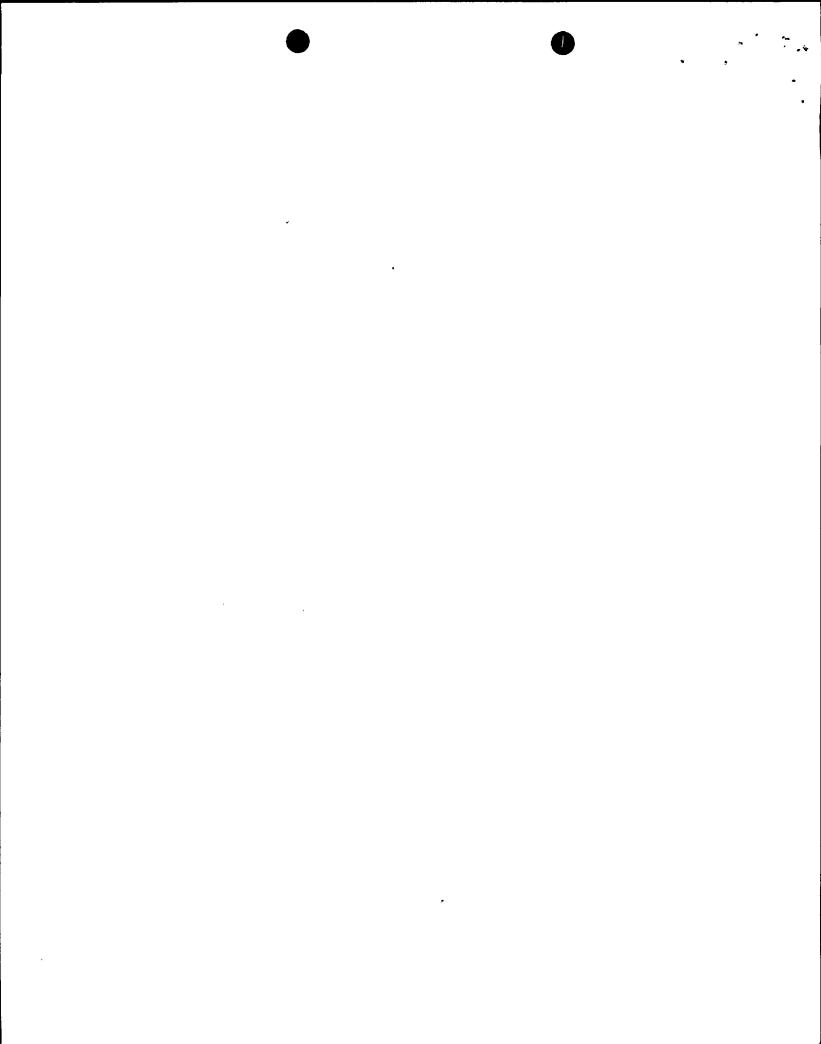




# **AGENDA**

# WEDNESDAY, MARCH 1, 1989

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8:00	a.m.	PG&E Pre-meeting Review - Room 271
8:00	a.m.	NRC Caucus - Room 202
8:15	a.m.	Introduction - NRC/PG&E
8:25	a.m.	Empirical Ground Motion Studies - K. W. Campbell
9:15	a.m.	Response Spectra Sensitivity Studies - A. S. Veletsos
10:00	a.m.	Break
10:15	a.m.	Review of Seismic Source Characterization
10:30	a.m.	Review of Empirical Ground Motions Program (Questions 4, 23, and 28)
11:30	a.m.	Discussion
12:00	noon	Lunch
1:00	p.m.	Questions and Responses (Questions 5 through 11, and 17 Parts (b) and (c))
2:45	p.m.	Break
3:00	p.m.	Seismic Hazards (Ground Motion Aspects)
3:45	p.m.	NRC Caucus
4:30	p.m.	Discussion



# DIABLO CANYON LONG TERM SEISMIC PROGRAM NRC/PG&E MEETING ON GROUND MOTIONS ONE CALIFORNIA STREET, ROOM 271 SAN FRANCISCO, CALIFORNIA MARCH 1 - 3, 1989

#### **AGENDA**

# THURSDAY, MARCH 2, 1989

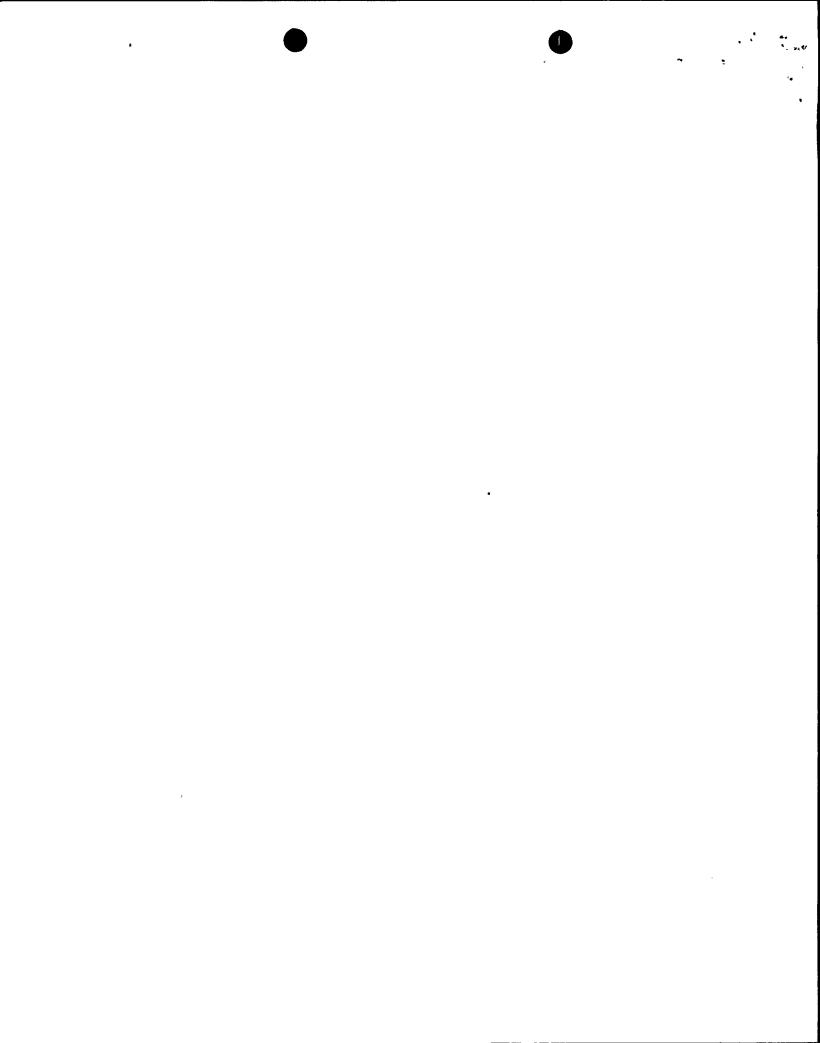
8:00	a.m.	Overview of Numerical Modeling Method and Results
8:45	a.m.	Questions and Responses (Questions 12 and 15)
10:00	a.m.	Break
10:15	a.m.	Questions and Responses (Questions 13, 14, 17 Part (a), & 20)
12:00	noon ,	Lunch
1:00	р.ш.	Questions and Responses (Questions 13, 16, and 18)
2:45	p.m.	Break
3:00	<b>p.m.</b>	NRC Caucus
3:30	p.m.	Discussion

#### FRIDAY, MARCH 3, 1989

8:00 a.m.

Discussion and Summary of Ground Motions Resolution of Issues and Clarification of any Remaining Issues

Closing Remarks



- Provide a step-by-step discussion of the uncertainty in the numerical 7. modeling study.
- 8. Show the effect of different assumptions of fault type (strike slip. oblique slip, and reverse slip) in the numerical modeling study.
- 9. Provide a comparison between the numerical modeling study and the frequency-wave number method of the 1.5 km and 3 km source depth contributions.
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/s/

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

#### Enclosures:

Meeting Attendees, 3/1/89
 Meeting Attendees, 3/2/89

3. Meeting Attendees, 3/3/89

4. Meeting Agenda

cc: w/enclosures - see next page

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