NOV 17 1989

Ms. Joan Feinberg
1435 Lakeview Avenue
Minneapolis, Minnesota 55416

Dear Ms. Feinberg:

This letter is in response to your telegram of October 18, 1989, to Senator David Durenberger expressing concern over the safety of nuclear power plants in the event that a major earthquake occurs near a plant. Senator Durenberger referred your telegram to me for reply. I am enclosing a paper prepared by the NRC staff addressing seismic safety of nuclear plants in general, and that of the Diablo Canyon plant in particular. I trust the enclosed information is responsive to your concerns.

Sincerely,

Original signed by
James H. Sniezek
Thomas E. Murley, Director
Office of Nuclear Reactor Regulation

Enclosure:
As stated

cc w/enclosure:
Senator Durenberger

*See Previous Concurrence

OFC	:DRSP/PD5*	:DRSP/PD5*	:TECH EDITOR*	:DRSP/D:PD5*	:(A)AD/DRSP	:D:DRSP	:NRR/ADP
NAME	:JLee	:HRood:dr	:BCalure	:GKnighton	:JZwolinski	:GHolahan	:JPartlow
DATE	:11/14/89	:11/14/89	:11/14/89	:11/14/89	:11/14/89	:11/15/89	:11/15/89

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OFC	:DONRR	:	:	:	:	:	:
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Thomas E. Murley, Director
Office of Nuclear Reactor Regulation

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NAME	:JLee	:HRood:dr	:B.Calure	:GKnighton	:JZwolinski	:GHolahan	:JPartlow
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OFC	:DONRR	:	:	:	:	:	:
NAME	:TMurley	:	:	:	:	:	:
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I. SEISMIC ADEQUACY OF NUCLEAR POWER PLANTS

In the United States, nuclear power plants are designed, analyzed, and constructed to seismic criteria far more stringent than those used for structures such as bridges, highways, schools, hospitals, office buildings, and industrial facilities. The capability of each nuclear power plant to withstand severe earthquakes is evaluated by the U.S. Nuclear Regulatory Commission (NRC) before the plant is licensed to operate. NRC regulations (specifically, Part 100 of Title 10 of the Code of Federal Regulations, Appendix A, "Seismic and Geologic Siting Criteria for Nuclear Power Plants") require that nuclear power plants be able to safely withstand the maximum seismic vibratory ground motion that can reasonably be expected to occur in the vicinity of the plant. Appendix A to 10 CFR Part 100 specifies that this finding shall be based on an evaluation of the maximum earthquake potential considering the regional and local geology and seismology and specific characteristics of local subsurface material.

The maximum vibratory ground motion at a plant is determined by (1) evaluating all active earthquake faults within about 200 miles of the plant site, (2) determining the maximum earthquake that can reasonably be postulated to occur on each fault, (3) determining the ground motion that would result from the maximum earthquake on each fault if it occurred at the fault's closest approach to the plant site, and (4) determining the ground motion from each earthquake at the plant site based on the attenuation of the ground motion as it propagates from its source to the plant site. The design ground motion for the plant is a conservative estimate of the ground motion from each postulated earthquake that can affect the site.

When historic earthquakes in the region of the plant site cannot be associated with a specific fault, the maximum historic earthquake intensity in the site's tectonic province that is not associated with a fault is assumed to occur near the site, and the ground motion for the seismic design of the plant is based on this level of intensity.

Based on the above approach, nuclear power plants in the United States are not licensed to operate until their capability to withstand a severe earthquake has been established.

II. SEISMIC ADEQUACY OF DIABLO CANYON

There are two nuclear power plants at Diablo Canyon, which are located on the central California coast in San Luis Obispo County, approximately 12 miles southwest of the city of San Luis Obispo. The seismic adequacy of the two nuclear plants at Diablo Canyon has been studied in detail over the past 20 years by the Diablo Canyon owner/operator, Pacific Gas and Electric Company (PG&E), by the NRC staff, and by the NRC's independent Advisory Committee on Reactor Safeguards. Diablo Canyon must meet the requirements of Appendix A to Part 100 of Title 10 of the Code of Federal Regulations, which require that all nuclear power plants be able to

safely withstand the maximum seismic vibratory ground motion that can reasonably be expected to occur in the vicinity of the plant. The NRC staff's evaluation of this issue is summarized in supplements to the NRC Safety Evaluation Report on Diablo Canyon, issued between 1975 and 1980.

On the basis of evaluations described in these and other reports and the results of extensive public hearings held to litigate seismic issues, the NRC concluded that there is reasonable assurance that the Diablo Canyon plants can safely withstand an earthquake that would produce the maximum vibratory ground motion at the plant site. For Diablo Canyon, this has been determined to be a magnitude 7.5 earthquake occurring on the Hosgri Fault, which is about 2-1/2 miles from the plants at its closest approach. Other earthquakes were evaluated such as a "great" earthquake (magnitude 8.5) on the San Andreas Fault, but this earthquake would result in less severe ground motion at the plants because of its greater distance from the plants. The San Andreas Fault is about 48 miles from Diablo Canyon at the point of closest approach. No nuclear power plant in the United States is located "on" a known, active earthquake fault such that the surface trace of the fault runs beneath the plant structures.

In summary, the NRC has concluded that the Diablo Canyon nuclear plants could withstand the earthquake producing the maximum vibratory ground motion at the plant sites without damage to the essential safety systems required to protect the health and safety of the public. This means that the plants could be safely shut down and maintained in a safe shutdown condition without significant release of radioactivity. Thus, the plants meet the requirements of 10 CFR Part 100. On the basis of this conclusion and the finding by the NRC that the Diablo Canyon plants meet all other applicable Federal safety and environmental regulations, the two nuclear plants at Diablo Canyon were licensed by the NRC to operate at full power on November 2, 1984 (Unit 1), and on August 26, 1985 (Unit 2).

III. RECENT SEISMIC REEVALUATION OF DIABLO CANYON

The NRC issued operating licenses for Diablo Canyon based, in part, on the finding that the seismic design of the two power plants was adequate to protect the health and safety of the public. However, it was recognized at that time that the state of knowledge in such fields as geology and seismology was increasing as new earthquake data and analysis techniques became available. Because future improvement in the state of earthquake knowledge was expected, a condition was included in the Diablo Canyon Unit 1 operating license that required PG&E to conduct a reevaluation of the Diablo Canyon seismic design basis by July 31, 1988.

To meet this license condition, PG&E conducted a 3-year, multidisciplinary study that reevaluated all aspects of the seismic design of Diablo Canyon, based on the current state of the art. In compliance with the license condition, on July 31, 1988, PG&E submitted a "Final Report of the Diablo Canyon Long Term Seismic Program for the Diablo Canyon Power Plant."

The NRC staff's review of PG&E's final report on the Diablo Canyon seismic reevaluation is currently under way. Because of the size and scope of the reevaluation program, the review is a major effort involving a number of technical experts on the NRC staff and a number of independent consultants hired by the NRC. The review is expected to be complete in the first half of 1990.

Based on the limited review of the final report summarizing the Diablo Canyon seismic reevaluation that has been completed to date, the NRC staff finds no reason to change its previous conclusion that Diablo Canyon is seismically adequate.

IV. EFFECT OF THE OCTOBER 17, 1989, LOMA PRIETA EARTHQUAKE ON DIABLO CANYON

The epicenter of the Loma Prieta earthquake was located in the Santa Cruz Mountains approximately 10 miles northeast of the city of Santa Cruz, California. The magnitude of this earthquake was 7.1. The epicenter was approximately 140 miles north of the two nuclear power plants at Diablo Canyon.

The nuclear plants at Diablo Canyon were designed to withstand much stronger earthquake motion than that produced by the Loma Prieta earthquake at Diablo Canyon. The seismic analysis used by the NRC as a basis for licensing of Diablo Canyon assumed a magnitude 7.5 earthquake on the Hosgri Fault, and the peak ground acceleration at the plant was estimated to be 0.75 g. The plants were licensed on the basis of their ability to withstand this peak ground acceleration and still achieve a safe shutdown.

By contrast, the Loma Prieta earthquake had a magnitude of 7.1 and was located on the San Andreas fault about 140 miles north of Diablo Canyon. The NRC staff seismologists estimated that this earthquake would produce a peak ground acceleration at Diablo Canyon of less than 0.01 g. In fact, the earthquake was barely felt at Diablo Canyon, and seismic instruments at the plants recorded a peak acceleration of 0.0044 g, which is 170 times less than the 0.75 g acceleration used in the seismic analysis of the plant.

At about 5:03 p.m. PDT on October 17, 1989, the Diablo Canyon operators became aware that an earthquake had occurred. At this time, Unit 1 had been shut down for refueling and Unit 2 was operating at full power. In accordance with plant procedures, the licensee (Pacific Gas and Electric Company) declared an unusual event condition to be in effect. State and local emergency services were notified, fuel movement at Unit 1 was halted, and plant operators performed a physical inspection of both units and found no abnormalities. Unit 2 operated at full power during and after the earthquake. At 7:30 p.m. PDT, after verifying that no damage was sustained by either unit, the licensee terminated the unusual event condition. No safety requirements were compromised and no radioactive material was discharged to the environment.

The NRC staff will include any new or unexpected effects resulting from the Loma Prieta earthquake in its review of the Diablo Canyon seismic reevaluation. However, the NRC staff has already reviewed a report by the California Department of Conservation, Division of Mines and Geology, Office of Strong Motion Studies, entitled "Quick Report on CSMIP [California Strong Motion Instrumentation Program] Strong-Motion Records from the October 17, 1989 Earthquake in the Santa Cruz Mountains." NRC staff geophysicists who have reviewed this report and have observed the effects of the earthquake in the San Francisco area see no indication that the ground motions recorded from this event were surprising, anomalous, or unprecedented.

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

ACTION

EDO Principal Correspondence Control

FROM:

DUE: 11/22/89

EDO CONTROL: 0004885
DOC DT: 10/24/89
FINAL REPLY:

Sen. Dave Durenberger

TO:

Chairman Carr

FOR SIGNATURE OF: ** GRN **

CRC NO: 89-1205

Murley

ROUTING:

DESC:

ENCLOSES TELEGRAM FROM JOAN FEINBERG CONCERNING NUCLEAR REACTORS LOCATED ON FAULT LINES

DATE: 11/06/89

ASSIGNED TO: NRR CONTACT: Murley

SPECIAL INSTRUCTIONS OR REMARKS:
REPLY DIRECT TO CONSTITUENT
W/CC TO SEN. DURENBERGER.

Knighton / Rood
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Gwt 11/7

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ACTION

DUE TO NRR DIRECTOR'S

BY 11/17/89

OFFICE OF THE SECRETARY
CORRESPONDENCE CONTROL TICKET

PAPER NUMBER: CRC-89-1205 LOGGING DATE: Nov 3 89

ACTION OFFICE: EDO

AUTHOR: Dave Durenberger--Con Ref
AFFILIATION: UNITED STATES SENATE

LETTER DATE: Oct 24 89 FILE CODE:

SUBJECT: Nuclear power plants located on earthquake faults

ACTION: Direct Reply

DISTRIBUTION: OCA to Ack

SPECIAL HANDLING: None

NOTES: Joan Feinberg

DATE DUE: Nov 22 89

SIGNATURE: DATE SIGNED:
AFFILIATION:

Rec'd Off. EDO
Date 11-6-89
Time 10:30 AM

EDO---004885