

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING APPEAL BOARD

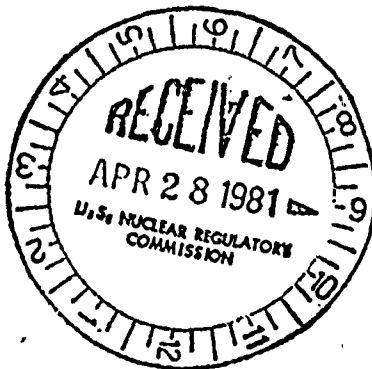
In the Matter of)

PACIFIC GAS AND ELECTRIC COMPANY)

(Diablo Canyon Nuclear Power Plant)
Unit Nos. 1 and 2)

Docket Nos. 50-275 O.L.
50-323 O.L.

NRC STAFF RESPONSE TO APPEAL BOARD'S REQUEST
FOR COMMENTS RE: USGS OPEN FILE REPORT 81-365



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April 27, 1981

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I. INTRODUCTION

On April 15, 1981, the Appeal Board requested the comments of the parties in this proceeding regarding United States Department of the Interior, Geological Survey Open-File Report 81-365 entitled "Peak Horizontal Acceleration and Velocity From Strong-Motion Records Including Records From The 1979 Imperial Valley, California, Earthquake," [March, 1981] by William B. Joyner, David M. Boore, and Ronald L. Porcella. The USGS Open File Report 81-365 was submitted to the Appeal Board by Joint Intervenors' Counsel by letter dated April 13, 1981.^{1/}

As indicated in the attached affidavits of Dr. Robert L. Rothman and Mr. James P. Knight, Open File Report 81-365 presents no significant new information warranting reopening the record for its receipt. Nor does the report provide information which would have caused a different result had it been considered originally.

^{1/} "Counsel's letter of April 13, 1981 asserts that the 'conclusions from this report support Joint Intervenors' contention that 0.75g is not a conservative estimate of peak acceleration for the Hosgri earthquake,' (Emphasis in original)." Appeal Board Order, p. 1.



If, however, the Appeal Board believes the record should be reopened for the limited purpose of receiving Open File Report 81-365 into evidence, the affidavits of Dr. Rothman and Mr. Knight commenting on Open File Report 81-365 should be received into evidence as well.

Joint Intervenors did not request any relief from the Appeal Board based on the report. Rather Joint Intervenors merely repeated arguments made in Joint Intervenors' findings of fact and conclusions of law which were filed on December 15, 1980.^{2/}

II. BACKGROUND

On September 27, 1979, the Atomic Safety and Licensing Board (Licensing Board) issued a favorable Partial Initial Decision with respect to seismic issues. Pacific Gas and Electric Company (Diablo Canyon Nuclear Power Plant, Units 1 and 2), LBP-79-26, 10 NRC 453 (1979). The Licensing Board found that the Diablo Canyon plant met the Commission's regulatory requirements with respect to the operating basis earthquake and would perform as required during the seismic loading of the safe shutdown earthquake that can be reasonably expected to occur on the Hosgri fault located approximately three miles from the site. Id.

On March 28, 1980, the San Luis Obispo Mothers for Peace, Scenic Shoreline Preservation Conference, Inc., Ecology Action Club, Sandra

^{2/} The final paragraph of Joint Intervenors' Counsel's letter presents additional argument as follows:

"The conclusions from this report support Joint Intervenors' contention that 0.75g is not a conservative estimate of peak acceleration for the Hosgri earthquake. The graph at page 42 establishes that for Mo [footnote omitted] = 7.5, the authors of this report expect accelerations to exceed 0.80g fifty percent of the time.



Silver, Gordon Silver, Elizabeth Apfelberg, John J. Forster (Joint Intervenors), moved to reopen the record in order to receive new information with respect to the seismic contentions, based on the Imperial Valley 6.9 magnitude (IV-79) earthquake that occurred on October 15, 1979 and a geological report by a Mr. Robert Bruce Leslie suggesting that the San Simeon Fault and Hosgri Fault are linked. They also moved for reopening with respect to the environmental qualification of safety-related equipment.^{3/}

On June 24, 1980, the Appeal Board granted Joint Intervenors' motion to reopen the record based on its determination that the IV-79 data do raise factual issues bearing on the safety of the plant that might lead it to a different result than the one reached by the Licensing Board.^{4/} Following hearings in the reopened proceeding held by the Appeal Board on October 20-25, 1980, in San Luis Obispo, California, filing of proposed findings of fact and conclusions of law by all parties was completed on January 16, 1981.

^{3/} Information about the Imperial Valley Earthquake was submitted to the Appeal Board on December 17, 1979 in accordance with established board notification procedures. BN-79-43, Memorandum, "Transmittal of USGS Strong-Motion Record and Staff Reconnaissance Report - Imperial Valley Earthquake," from Robert E. Jackson, Geoscience Branch, OSS, dated December 17, 1979. See generally: Consolidated Edison Company of New York (Indian Point Station, Units 1, 2 & 3), CLI-77-2, 5 NRC 13 (1977); Virginia Electric and Power Co. (North Anna Power Station, Units 1 and 2), CLI-76-22, 4 NRC 480 (1976); Duke Power Company (William B. McGuire Nuclear Station, Units 1 and 2), ALAB-143, 6 AEC 623, 625-26 (1973). The Appeal Board denied the motion to reopen with respect to the Hosgri Fault - San Simeon Fault linkage and the matter of environmental qualification of safety-related equipment. ALAB-598, 11 NRC, pp. 885, 887.

^{4/} Pacific Gas and Electric Company (Diablo Canyon Nuclear Power Plant, Units 1 and 2), ALAB-598, 11 NRC 876, 881 (1980).



Although a motion to reopen the record in this proceeding has not been filed, it is evident that Joint Intervenors are implicitly suggesting that the Appeal Board should on its own motion consider the open file report in reaching a decision. Accordingly, the Staff is addressing the standards applicable to motions to reopen a record to consider new information so that another round of responses can be avoided should one of the parties seek to reopen the record in response to the Appeal Board's request for comments.

III. DISCUSSION

A. Legal Requirements

The standards for reopening a record in Commission proceedings are defined in Kansas Gas & Electric Company (Wolf Creek Generating Station, Unit No. 1), ALAB-452, 7 NRC 320, 338 (1978):

As is well settled, the proponent of a motion to reopen the record has a heavy burden. Duke Power Co. (Catawba Nuclear Station, Units 1 and 2), ALAB-359, 4 NRC 619, 620 (1976). The motion must be both timely presented and addressed to a significant safety or environmental issue. Vermont Yankee Nuclear Power Corp. (Vermont Yankee Nuclear Power Station), ALAB-138, 6 AEC 520, 523 (1973); id., ALAB-167, 6 AEC 1151-52 (1973); Georgia Power Co. (Alvin W. Vogtle Nuclear Plant, Units 1 and 2), ALAB-291, 2 NRC 404, 409 (1975). Beyond that, it must be established that "a different result would have been reached initially had [the material submitted in support of the motion] been considered." Northern Indiana Public Service Co. (Bailly Generating Station, Nuclear-1), ALAB-227, 8 AEC 416, 418 (1974).

These standards were reiterated in Public Service Company of Oklahoma et al. (Black Fox Station, Units 1 and 2), ALAB-573, 10 NRC 775, 804 (1979):

To be sure, "a matter may be of such gravity that the motion to reopen should be granted notwithstanding that it might have been presented earlier." A board need not reopen the record, however, if the issues sought to be presented are not



of "major significance". *** ...and there was no need to reopen absent a "showing that the outcome of the proceeding might be affected thereby." (footnotes omitted).

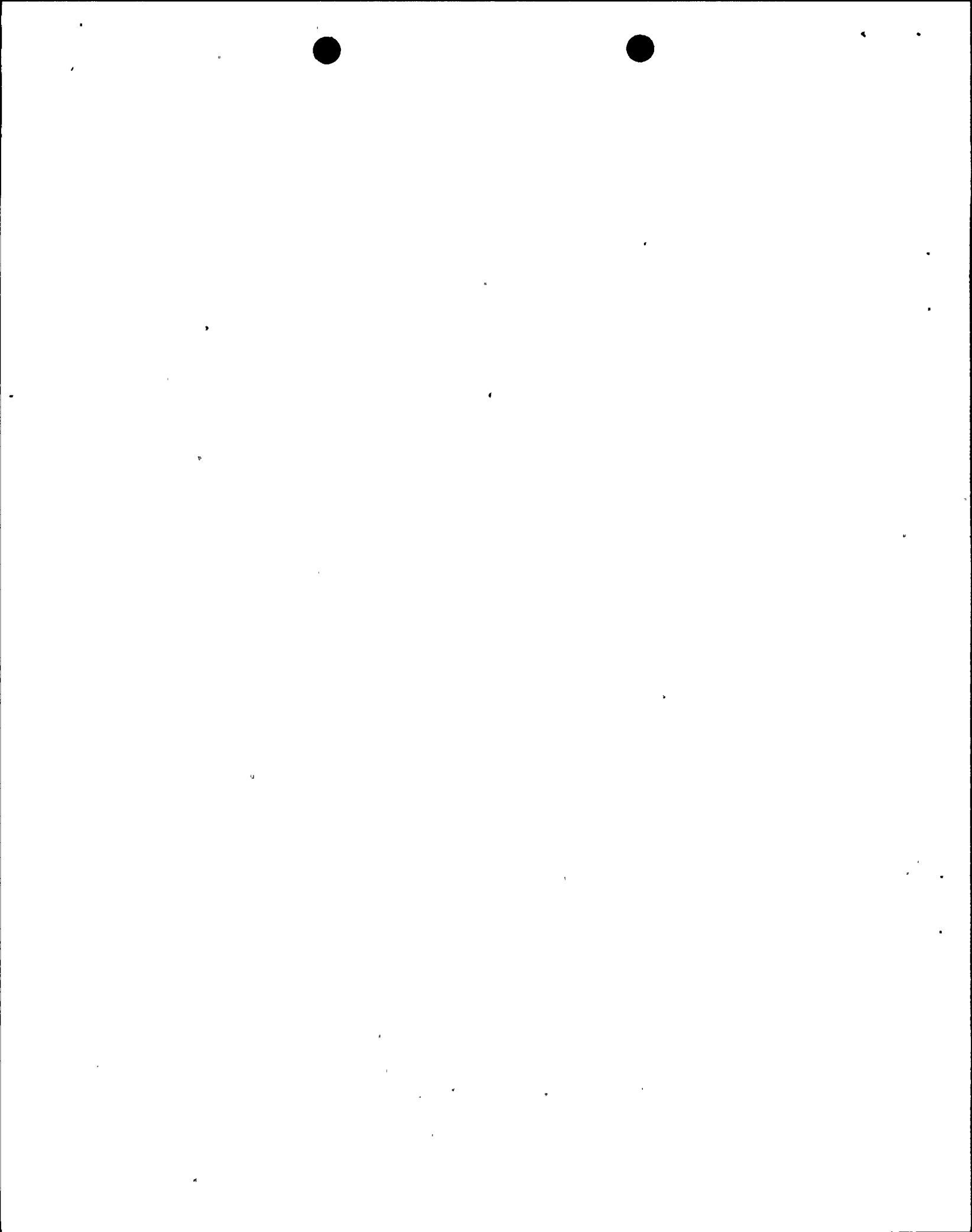
These standards were applied by this Board in ALAB-598, 11 NRC 876, (supra) granting in part Joint Intervenors' motion to reopen the record following the IV-79 earthquake. This Board found that the reopening standards depend on (i) whether such motion is timely, (2) whether it addresses significant safety (or environmental) issues, and (3) whether a different result might have been reached had the newly proffered material been considered initially. Id., 879-881. The decision in ALAB-598 denying reopening on environmental qualifications apply equally well to continuing efforts underway in seismological research for developing acceptable tools for prediction of earthquake forces:

*** The fact that a new proposal is in the wind does not perforce warrant reopening a record. For that result, there must be indication in the "new evidence" that the decision on the existing record would permit the use of unsafe equipment or create some other situation similarly fraught with danger to the public that merits immediate attention. Intervenors do not suggest this to be the case here and the Board specifically stated that it was not. 10 NRC at 506. Moreover, in the event the new standards are adopted, they provide for their application to existing reactors. In the circumstances, we find no cause in Joint Intervenors' submissions that warrant reopening the record on this subject. (footnote omitted.)

ALAB-598, p. 887.

B. The Facts Do Not Indicate Reopening

1. Timeliness - With respect to the first criterion for reopening a record, Joint Intervenors' letter on its face shows that Open File Report 81-365 issued in March 1981 was submitted in a timely fashion on April 13, 1981 after the report came to Counsel's attention on April 10, 1981.



2. Significant New Information - Joint Intervenors' April 13, 1981 letter indicates the information in Open File Report 81-365 is relevant to the Diablo Canyon proceedings now pending before the Appeal Board. However, study and seismological research regarding the data from IV-79 will likely proceed for some time, and more such reports are likely to be forthcoming. This was clearly stated earlier in this proceeding in the Joint Affidavit of Robert L. Rothman and Pao-Tsin Kuo, dated May 5, 1981, p. 2 in support of "NRC Staff Response To Joint Intervenors' Motion To Reopen," dated May 5, 1980. Dr. Rothman indicates in the attached affidavit,^{5/} that "Open File Report 81-365 is the latest in a series of reports on continuing research by U.S. Geological Survey scientists on the subject of strong ground motion resulting from earthquakes." Rothman Affidavit, p. 1. Publication of the results of further research based on IV-79 data will continue for some time without necessarily reaching a consensus with respect to the results. Rothman Affidavit, p. 3. As Dr. Rothman points out, "strong ground motion seismology is a state-of-the-art science and its results are subject to assumptions and interpretation on which there is not always a complete consensus among researchers." Rothman Affidavit, p. 3.

Furthermore, Open-File Report 81-365 does not contain new information but rather is an attempt by the seismological researchers who developed Open File Report 81-365 to develop a new analytical technique based on existing data and using questionable assumptions. Rothman

^{5/} Affidavit of Robert L. Rothman, April 27, 1981 (Rothman Affidavit). The professional qualifications of Dr. Rothman are bound into the reopened proceedings following Tr. 536. (Reopened Seismic Processing.)



Affidavit, p. 3. Thus, Dr. Rothman points out that Open File Report 81-365 "took advantage of the recently available data from IV-79 and the more limited data sets from other recent earthquakes, in addition to the data previously used in Circular 795, to derive new attenuation relations." Rothman Affidavit, p. 3.

As indicated on page 2 of Joint Intervenors' April 13, 1981 letter, "Open File Report 81-365 expressly considers data from the IV-79 earthquake as well as other recent earthquakes." It is clear from the report that the "new data" is that data generated by IV-79, Livermore Valley (January 27, 1980), Horse Canyon (February 25, 1980), and Coyote Lake (August 6, 1979) earthquakes. New statistical techniques have been applied to the data that was available, and the previous efforts by Page and others, 1972; and Boore and others (1978; 1980) have been updated. (OFR 81-365, pp. 31, 35-37.)

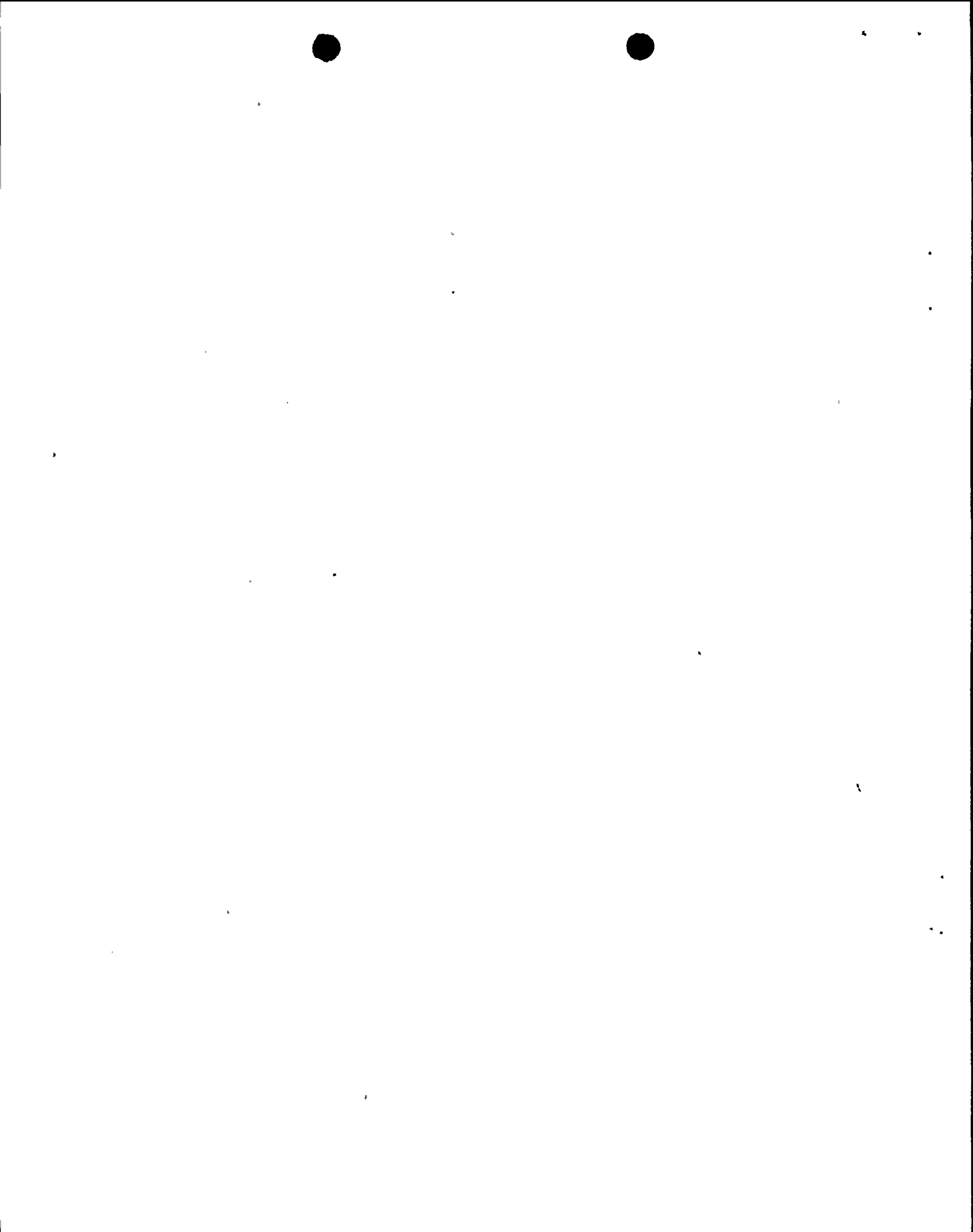
Whether Open File 81-365 provides significant new information must be treated in the context of the reopened proceedings where the opportunity to fully explore the significance of IV-79 and other earthquakes was fully provided. In that context, although any information that deals with seismological design is arguably significant, the information in Open File Report 81-365 is not of such gravity or major significance that a motion to reopen the record to admit the material would lie. Black Fox, supra, p. 804.

Moreover, Open File Report 81-365 is based on two challengeable assumptions which affect the report's results and which are made by experts who are not among those testifying in this proceeding. Dr. Rothman's



affidavit identifies those assumptions as: (1) the shape of the attenuation curve is independent of magnitude and (2) plotting near field acceleration data as a simple function of moment magnitude. Rothman Affidavit, pp. 3, 5-6, 7-8. The author's of Open File Report 81-365 presented no quantitative argument that the shape of the attenuation curve they use is magnitude independent but simply state that there is no reason for not making the assumption. Rothman Affidavit, pp. 5-6. However, this assumption predetermines that the acceleration keeps increasing to ever higher values with increasing magnitude. Rothman Affidavit, p. 6. Other studies of attenuation of acceleration with distance have been performed that show attenuation curves whose shapes are magnitude dependent -- i.e., accelerations tend to saturate with increasing magnitude at small distance. Id., p. 6.

Similarly, with respect to the second assumption, plotting of near field acceleration as a simple function of moment magnitude raises questions about the results. Rothman Affidavit, p. 1. The saturation of the "short period" M_L scale and its non-linear relation to the larger period magnitude scale above $M_L=6$ argue strongly against the assumption that short period acceleration, particularly those in the near field, can be assumed to scale simply with M for magnitudes in the range of magnitudes of interest to the DCNPP (7.5). Thus, plotting near field acceleration data as a simple function of moment magnitude may result in the over estimation of peak acceleration in the near field for large earthquakes. Rothman Affidavit, pp. 7-8.



Since Open File Report 81-365 has not been shown to be of such gravity or major significance to the overall consideration of IV-79 record in the reopened Diablo Canyon proceeding, the Diablo Canyon record does not need to be reopened to receive this material.

3. Effect on the Outcome of the Proceeding - The outcome of this proceeding should not be affected by a reopening of the record to admit Open File Report 81-365. Comparison of peak accelerations of Table 1 of Dr. Rothman's affidavit (Table 2 of USGS Circular 672, Intervenor Exhibit 45, Tr. 8680, see Partial Initial Decision, 10 NRC, p. 466), with curves of Figure 1 of Dr. Rothman's affidavit (which is Figure 3 of OFR 81-365) shows that the results of the new study do not in general exceed those of the earlier study. Rothman Affidavit, p. 8. Furthermore, OFR 81-365 clearly indicates that for magnitudes greater than 6.6 in the near field (less than 40 km) of earthquakes may result in incorrect accelerations. Rothman Affidavit, p. 8. This is particularly true because of the use of the controversial assumptions that the shape of the attenuation curve in the analysis is magnitude independent (Rothman Affidavit, pp. 5, 8) and that near field accelerations may be plotted as a simple function of moment magnitude. Rothman Affidavit, pp. 5, 8. In addition, peak acceleration values in the new analysis, although useful for comparison, do not in general exceed the results of the earlier USGS Circular 672 study and, therefore, do not affect the Staff analysis set forth in the reanalysis of Diablo Canyon nor cause the Staff testimony to be modified. Rothman Affidavit, p. 8.



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Staff testimony is not affected by OFR 81-365 with respect to effective design acceleration. Circular 672 is not inconsistent with Dr. Newmark's effective design acceleration. Rothman Affidavit, pp. 2, 7-8.

Although Joint Intervenors letter of April 13, 1981 transmitting USGS 81-365 to the Appeal Board implies that the value of peak instrumental acceleration is somehow pivotal in determining the adequacy of the seismic design at Diablo Canyon, this is not the case. Knight Affidavit, pps. 1-2. The random peak accelerations that occur during seismic events have little if any significance from the standpoint of damage (ASLB Tr. 8634). Id., p. 2.

From the standpoint of engineering design at nuclear power plants including Diablo Canyon it is the prediction of the total energy that will be efficiently input (i.e. at frequencies of response) to the structures, systems and components from a seismic event that will determine the strength necessary to assure safety. The elastic response spectrum as typically employed for nuclear power plant design and used at Diablo Canyon is an accepted measure of this energy. For engineering design purposes peak acceleration in and of itself was not the significant factor in establishing the total seismic design at Diablo Canyon. Knight Affidavit, pp. 1-2.

The record of this proceeding contains extensive expert testimony that provides the basis for the development of the design response spectra employed in the assessment of seismic adequacy at Diablo Canyon. This testimony clearly demonstrates that peak instrumental acceleration values neither were, nor should have been explicitly used, in the



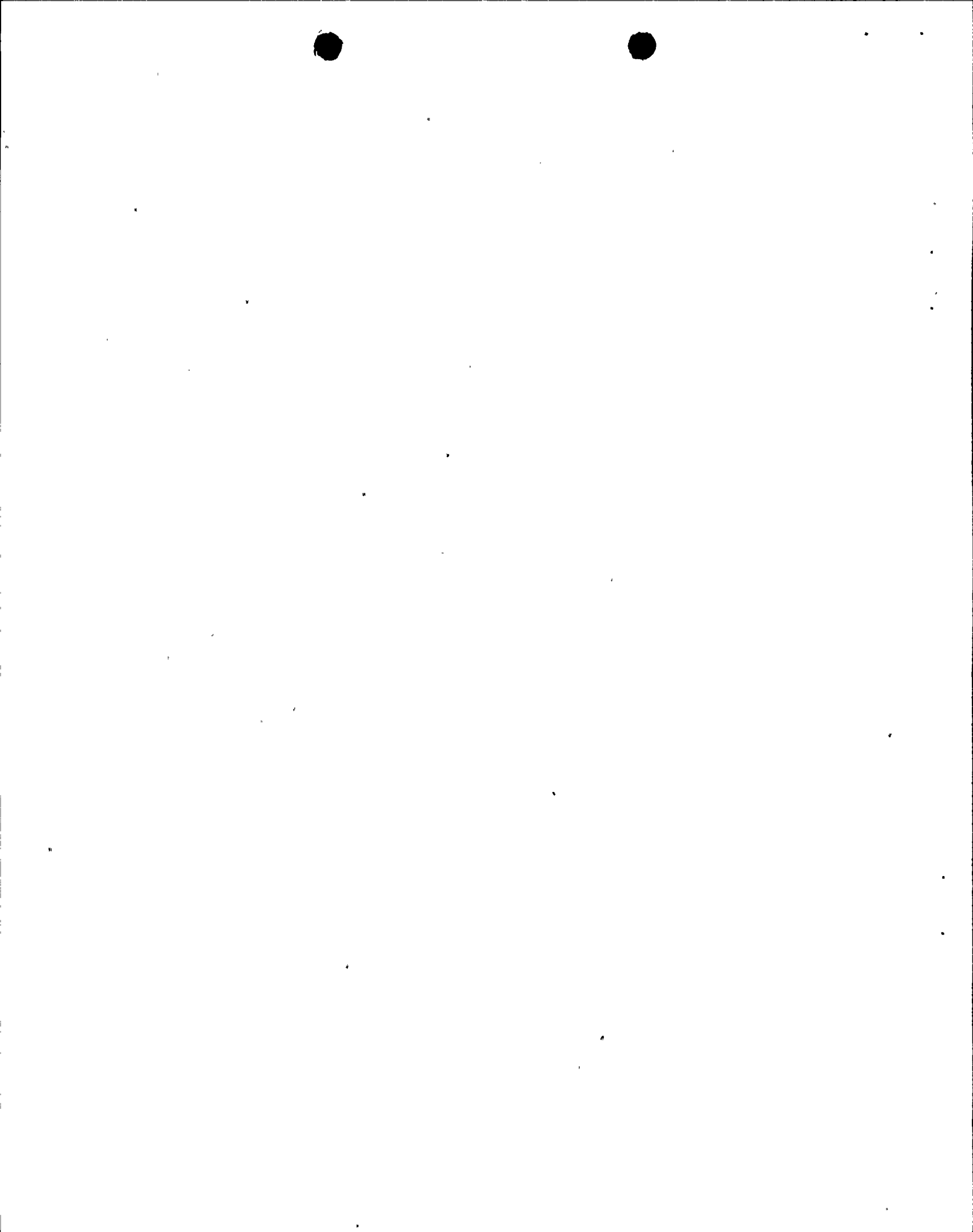
development of the Diablo Canyon design response spectra (ASLB Tr. 8539-8635, also Testimony of Dr. Nathan M. Newmark, direct testimony following ASLB Tr. 8552). Knight Affidavit, p. 2. This same expert testimony also demonstrates that the design spectra employed at Diablo Canyon is a very conservative representation of a magnitude 7.5 earthquake for design purposes (ASLB, Tr. 8615). Id., p. 3.

Finally, it is noted that qualified experts for all parties have appeared before this Board subject to cross-examination and board questioning. There are obviously many other qualified seismologists who did not appear who may have different approaches to the same data. However, it is the specific testimony of the experts who applied the data to Diablo which is relevant. Analysis of the same data for some other purpose should not be weighed in reaching judgment on this record.

Based on the above analysis OFR 81-365 should not change the results of either the ASLB Partial Decision or affect matters now pending before the Appeal Board since (1) peak horizontal acceleration values are only indirectly related to engineering design for nuclear power plants and (2) the assumptions used in 81-365 with respect to (a) magnitude-acceleration dependence and (b) the methodology for measurement of moment magnitude are questionable, and (3) the values for peak horizontal acceleration in OFR 81-365 do not in general exceed the results of earlier studies in USGS Circular 672.

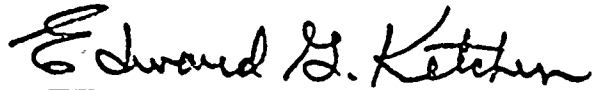
IV. CONCLUSION

Based on the above considerations the Appeal Board should not consider OFR 81-365 in its deliberations regarding the reopened seismic

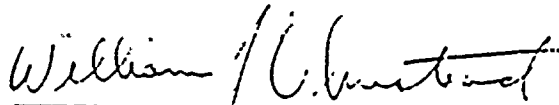


proceeding now pending before it. If, however, the Appeal Board should decide to admit the report as part of the record, the Staff requests the affidavits of Dr. Rothman and Mr. Knight be admitted as well.

Respectfully submitted,



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Counsel for NRC Staff



William J. Olmstead
William J. Olmstead
Assistant Chief Hearing Counsel

Dated at Bethesda, Maryland
this 27th day of April, 1981.

