

PACIFIC GAS AND ELECTRIC COMPANY

PG&E + 77 BEALE STREET • SAN FRANCISCO, CALIFORNIA 94106 • (415) 781-4211 • TWX 910-372-6587

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December 28, 1981

Mr. Stanley Scott
Chairman, Seismic Safety Commission
900 K Street, Suite 100
Sacramento, California 95814



Dear Mr. Scott:

This is in response to Mr. George Mader's letter of October 28, and your letter of December 11, 1981, to Mr. B. W. Shackelford which express the concern of the Seismic Safety Commission regarding the recent seismic analysis discrepancies at our Diablo Canyon Nuclear Power Plant, and ask certain questions regarding the independent review of that facility. Our comments on these discrepancies and responses to Mr. Mader's questions are set forth below.

The discrepancies at Diablo Canyon, which have been the subject of very extensive media coverage, first came to light when a Pacific Gas and Electric Company engineer discovered an error in past analyses. The error he discovered involved the use of inappropriate acceleration response spectra in the determination of the vertical component of the seismic response of certain piping and equipment in the annulus area of the containment building. Subsequent investigation turned up other discrepancies in the same area, including the use of superseded response spectra, and some inaccuracies in the calculation of piping and equipment weights which were used for dynamic analyses. These were promptly reported to the U. S. Nuclear Regulatory Commission by PGandE. Studies to date indicate that had these discrepancies gone undetected, no failures would have resulted.

The discrepancies were caused by deviations from either acceleration response spectra application procedures or design-related quality assurance procedures. They are not related to a breakdown in on-site inspection during construction, as Mr. Mader's letter suggested. Also, they are not related to geological considerations, nor to the seismic design level for the plant.

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First, by way of background information, immediately upon discovery of these discrepancies, PGandE contracted with Robert L. Cloud Associates, Inc. to perform an independent review and reverification program of the Hosgri analyses performed in 1977. The objective of this program is to assure that there are no other errors which would affect the seismic qualification of safety-related structures, equipment or piping. R. L. Cloud Associates personnel are experienced in seismic qualification methods, but had not previously been involved in these Diablo Canyon analyses. The Cloud program includes the following elements:

1. Review of the applicability of seismic design information through the seismic design chain, including external PGandE interfaces.
2. Independent calculation of seismic design data and independent seismic qualification of equipment.
3. Field verification that seismically qualified systems and equipment are built and installed according to design.
4. Review of applicability of seismic design information associated with the URS/Blume interface.

The first step in the review is to define the seismic design information chain applicable to Diablo Canyon. The entire flow of information for the Hosgri requalification is being diagrammed. This diagram will illustrate all interfaces, describe the information passing between interfaces, and list responsible organizations for the seismic design work. For this task, the seismic design information passing a representative sample of the interfaces will be thoroughly reviewed for correctness.

The requalification of safety-related structures, equipment, piping, pipe supports, and conduit supports is being done on a sampling basis. One of the major plant structures has been chosen for detailed review. The dynamic model for this structure will be reviewed for appropriateness, and the model properties such as masses and stiffnesses will be independently calculated from the drawings. The completed model properties will be compared to those used for the Hosgri analysis. For piping, a sample of 10 piping analyses are being chosen for reverification. Beginning with the drawings, new models will be developed in a completely independent manner. The models will be analyzed with a different computer program from that used for the Hosgri analyses, and the resulting pipe stresses, support loads, and nozzle loads will be compared with the Hosgri analyses. Samples of pipe supports, conduit supports, and mechanical equipment will be similarly requalified.

If required, additional sampling will be done until the desired level of confidence has been obtained. We expect that this review and reverification program by R. L. Cloud Associates will be an effective means of restoring public and NRC confidence in our seismic design for Diablo Canyon.

In addition, the NRC Staff has requested that Brookhaven National Laboratories perform an independent seismic analysis of the Diablo Canyon containment annulus area. PGandE has supplied appropriate weights and structural properties for the analysis.

On November 19, 1981, the NRC issued an order requiring an even broader independent design verification program by a company or companies approved by the NRC, including a review of quality assurance procedures and controls used by service contractors and by the Company for all safety-related structures, systems and components. Prior to authorization to proceed with fuel loading, the NRC must be satisfied with the results of the program and with any plant modifications resulting from that program that may be necessary. Other reports covering non-seismic safety-related activities and Company internal design activities, together with any required plant modifications, must be completed prior to the NRC authorizing the Company to exceed 5% of rated power.

To assist Robert L. Cloud Associates, Inc., in performing the expanded design and quality assurance procedures review requested by the NRC, the Company has retained R. F. Reedy, Inc., as subcontractor to Cloud to review quality assurance activities, and Dr. William E. Cooper of Teledyne Engineering Services who will independently review the activities performed by Robert L. Cloud Associates, Inc., and its subcontractors. The work is to be done in two phases: Phase I is the work required to be completed before fuel load; Phase II is the work required to be completed before proceeding to power levels above 5% of rated power. We estimate that the Phase I work can be completed by the end of January 1982 and the Phase II work by the end of April 1982.

The questions you asked and our responses are as follows:

1. Q - Do you believe the process of independent review set up for Diablo Canyon was truly independent as delineated by the Seismic Safety Commission Policy for independent review?

A - Yes. The Diablo Canyon design has been the subject of a number of reviews, several of them "independent" within the definition of the Seismic Safety Commission

Policy. Initially, the site geology and plant design were developed by PGandE engineers and independent consultants. Then the site geology and plant design were reviewed by the NRC Staff, which has a technical expertise of its own, and by consultants to the Staff including the U. S. Geological Survey and Dr. Nathan M. Newmark. Subsequently the site geology and plant design were reviewed by the Advisory Committee on Reactor Safeguards (ACRS), an independent group of experts appointed by the Nuclear Regulatory Commission to advise the Commission and the Congress on the hazards of proposed or existing reactor facilities and safety standards. The ACRS itself retained consultants to assist it in reviewing the Diablo Canyon application. These reviews have included siting considerations such as geology, seismology, and the level of design earthquake, the analytical methods used for design of the plant, acceptance criteria, and on-site inspection during construction. These reviews included design audits, review of sample calculations, and in a limited number of cases, performance of alternative calculations.

When the Hosgri Fault was identified, a major effort by the various entities and their consultants was instituted to determine the plant's compliance with revised design criteria. In addition, many days of public hearings were held and testimony was had, not only from the Company and its consultants and the Staff and its consultants, but also from intervenors and their consultants. The result, as noted by the Licensing Board in its decision, is that Diablo Canyon is the most exhaustively reviewed plant in history. I might add that the favorable rulings by the Licensing Board have been affirmed by the Appeal Board and the matter is now pending before the Nuclear Regulatory Commission (NRC)¹. In any event we believe these reviews by the NRC Staff, the ACRS, and their various consultants fully meet the requirements for independent review as stated in the Seismic Safety Commission Policy Statement and SSC 81-01.

2. Q - Since errors apparently arose, where in the process do you believe weaknesses existed which allowed for such errors?

¹For your further information attached as Appendix A is a copy of a more detailed description of the design review to date.

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- A - Based on our preliminary evaluation, it appears that problems arose where our calculations were not subjected to the prescribed checking procedures, and where information was transmitted outside of established engineering quality control procedures. We will have a more definitive answer on conclusion of the design audit and reverification program.
3. Q - What if any steps have you taken thus far to correct the problem in your review process which would be applied to other facilities.
- A - Our efforts to date have been directed towards detection and correction of the errors in seismic design at Diablo Canyon, and conducting a thorough review of the procedures which may have contributed to these problems. Further, the R. L. Cloud Associates program will look for other problem areas before we proceed. It is anticipated that one result of these efforts will be that improvements in certain areas of our design procedures will be made.

With respect to the specific points raised in your letter of December 11, 1981, as you can see from the above, extensive independent reviews of the plant have already been made and yet another independent review of the Diablo Canyon plant will be made. It is our intent to make the results of the review available to you. I am enclosing a copy of all correspondence between PGandE and the NRC since September, when the seismic analysis problems were first discovered. In addition, we will include you on the service list for all such future correspondence. This will include the interim and final Cloud report.

I appreciate having the opportunity to comment directly on these concerns of the Seismic Safety Commission. I trust the information contained herein is responsive to your questions.

Sincerely,

R.V. BETTINGER

R. V. BETTINGER
Chief Civil Engineer

Attachments

cc: John A. Blume
Nu:izio J. Palladino ✓
G. A. Maneatis
D. A. Brand
P. A. Crane
J. O. Schuyler
J. B. Hoch