BROOKHAVEN NATIONAL LABORATORY
ASSOCIATED UNIVERSITIES, INC.

Structural Analysis Division
Department of Nuclear Energy
Building 129

Upton, Long Island, New York 11973

(516) 282-2447
FTS 666-

April 11, 1983

Dr. Mark Hartzman
Room No. P-520-A
Phillips Bldg.
US Nuclear Regulatory Commission
7920 Norfolk Avenue
Bethesda, MD 20014

Dear Mark:

The independent development of finite element models and the determination of natural frequencies for two piping problems from the Diablo Canyon Nuclear Power Plant Unit 1 (DCNNP-1) has been completed. The problems evaluation were:

Containment Spray Discharge Line 265-8,
PG&E Problem No. 8-118
Accumulator Loop 4
PG&E Problem Nos. 6-4, 6-7

The finite element model development was based on the information and drawings included in the Document Package for each problem provided by PG&E. The analyses were performed using the BNL developed PSAFE2 computer code and the BNL updated version of the SAP V computer code.

A brief summary of results is attached. This includes a computer generated drawing, a natural frequency; comparison table and a summary of comments for each model. The natural frequency comparison tables list both the BNL and applicant estimates of the natural frequencies for each problem. The comments summarize the bases for the BNL model development, differences between the BNL and applicant models and those instances where information was extracted by BNL from the computer listings supplied by the applicant for each problem.

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Computer listing information was primarily used to define those portions of problem 6-4, 6-7 beyond the scope of this study (Reactor System Primary Piping). However, it was also used if the desired information was not defined in the information package or that definition was inconsistent with other data or dimensions.

As per the discussions with Jim Knight on February 15, 1983, pertaining to the analysis to be performed for these piping systems, BNL has now satisfied the requirements for confirmatory analysis of these piping problems (i.e., Task 2, problems 3 and 4, FIN No. A-3357). If you want us to expand the verification efforts for these problems, please advise us thereof.

Sincerely yours,

Paul Bezler, Group Leader
Dynamic Response Evaluation
Group

PB:jm
Attachments (3)

ATTACHMENT-1

Problem 6-4, 6-7 Comments

1. Node labels taken consistent with Westinghouse labels. Relabeled for SAPV run.

2. Westinghouse model of reactor system, through node 4200, accepted. Westinghouse computer listing used.

3. Dimensions from PG&E DWG's 437985, Rev. 2 and 446484, Rev. 17.

4. Distributed mass model used (Westinghouse used concentrated masses throughout).

5. The definition of the bend defined by nodes 425 and 426 (5D bend, 6° angle) on DWG 437985 are inconsistent with pressurizer (1-4) centerline and accumulator (1-4) centerline locations shown on the same drawing. Westinghouse computer listing data (LR elbow, 16° angle) are consistent and were used.

6. The vertical dimensions of the pipe run from node 4200 to 4006 on DWG 437985 are inconsistent. Westinghouse computer listing used.

7. Modeling differences noted:

   a) Connectivity in vicinity of valve 8948-D adjusted to correspond to drawing.
   b) Location of node 4462 adjusted to reflect 3-1/2" lateral offset of valve 8808-D CG.
   c) Line of action of supports 12-99SL, 12-98SL, 13-27SL 13-30SL, 13-31SL and 56N-49R adjusted to correspond to support drawings. Angular changes of up to 10° required.
   d) Stiffness of support 58N-60R increased from 4.17×10^5 to 4.17×10^7 to conform with PG&E submittal.
   e) Wall thickness of valve 1-8818-D modeled as 2.154"(3t).

8. Insulation specification for line 1/S6/3847/6SPL from valve 1-8818-D to 8 x 6 reducer (node 33) undefined. Westinghouse computer listing used.

9. Insulation specification for lines 1/S1/1297/10 and 1/S6/256/10 undefined. Westinghouse computer listing used.

10. Elbow designations not shown. Westinghouse computer listing used.

ATTACHMENT-2

Problems 8-118 Comments

1. Node labels taken identical to PG&E's lablels.
2. Five nodes (98, 117, 245, 270 and 442) added to reduce span lengths.
3. All dimensions from PG&E DWG's 446540, Rev. 11 and 447117, Rev. 6.
4. Span length difference of 3' noted between nodes 85 and 95 (BNL span larger).
5. Span length differences of the order of 0.3' noted in vicinity of nodes 85, 125, 205 and 270 (BNL spans larger).
6. The X coordinates of nodes 90 and 93, supports 98/4R and 55S/162R, undefined. PG&E computer listing used.
7. Support 55S/162R not shown.

ATTACHMENT-3

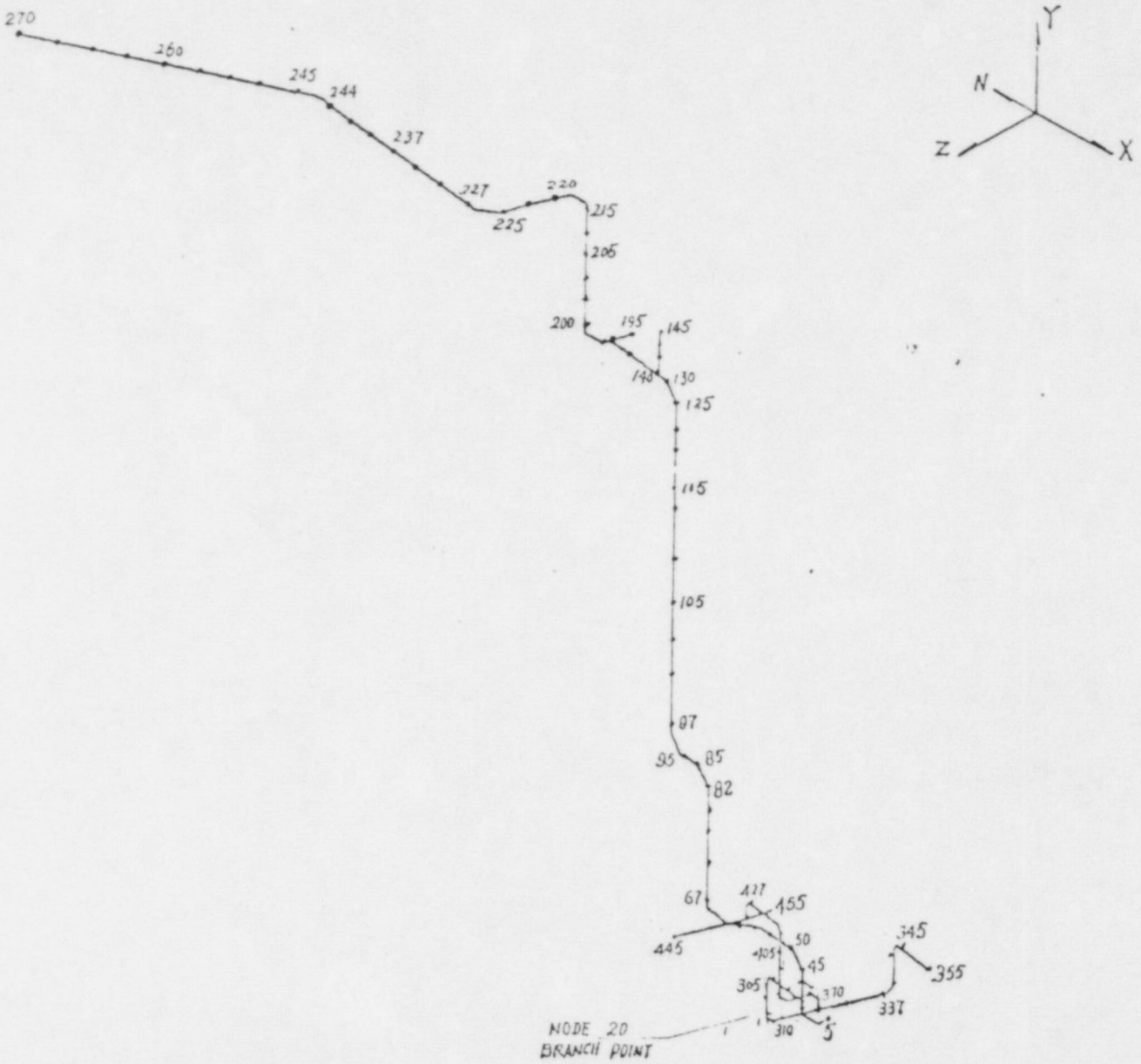
Tables and Drawings

PROBLEM 8-118 FREQUENCY COMPARISON

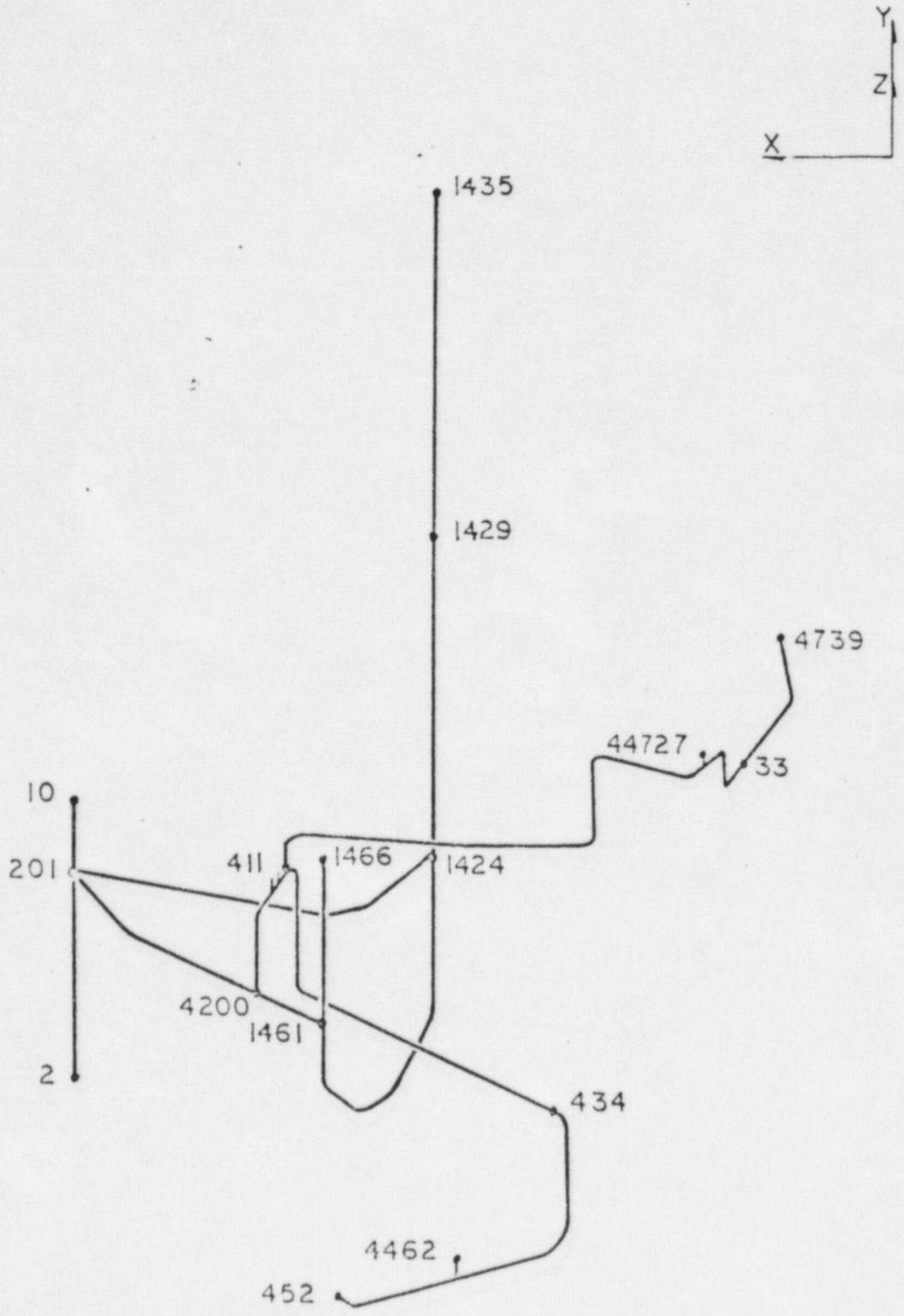
MODE	FREQUENCY BNL	FREQUENCY (HZ) PG&E
1	11.81	11.59
2	13.80	14.88
3	20.09	21.17
4	21.17	21.40
5	21.35	22.98
6	22.97	23.15
7	24.24	24.79
8	26.68	28.01
9	29.48	29.35
10	32.04	

PROBLEM 6-4, 6-7 FREQUENCY COMPARISON

MODE	FREQUENCY BNL	FREQUENCY (HZ.) PG&E (WESTINGHOUSE)
1	2.41	2.40
2	2.41	2.40
3	6.95	6.94
4	7.09	7.09
5	7.53	7.46
6	7.53	7.46
7	7.60	7.59
8	8.68	8.58
9	9.17	8.68
10	12.38	12.33
11	12.49	12.44
12	14.10	13.85
13	14.14	13.89
14	15.98	15.30
15	16.54	15.64
16	16.65	16.53
17	16.84	17.23
18	17.60	17.39
19	18.43	17.58
20	18.97	17.76



PROBLEM 8-118



PROBLEM 6-4, 6-7

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4/11/83

MEETING ANNOUNCEMENT

DEPARTMENT DCNPP-IDVP BY W.E. Cooper/J.Q. Cragin

SUBJECT: DCP Piping Program

LOCATION: 45 Fremont St., San Francisco, CA ROOM: 45/8/C32

DATE: Monday, April 11, 1983 TIME: 10:00 - 4:00

ORGANIZATION TES, RLCA, DCP

AGENDA:
1. Welded attachments for large bore piping
2. Welded attachments for small bore piping
3. Use of DCM-M9 and DCM-40 for small bore supports
4. Miscellaneous RFIs

Recipients:
G.A. Maneatis
H.R. Denton
R.H. Engelken
H.E. Schierling
R.R. Fray
E. Denison
R.F. Reedy
F. Sestak
M.J. Strumwasser
D.F. Fleischaker
J. Reynolds/J.R. Phillips
B. Norton
A.C. Gehr
R.B. Hubbard
J. Roesset

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W.S.

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TELEDYNE
ENGINEERING SERVICES

M. Hartzman

MEETING ANNOUNCEMENT

(too late to attend)

DEPARTMENT DCNPP-IDVP BY W.E. Cooper/J.Q. Cragin

SUBJECT: DCP Piping Program

LOCATION: 45 Fremont St., San Francisco, CA ROOM: 45/8/C32

DATE: [redacted] TIME: 10:00 - 4:00

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docket 4/11

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B. Norton
A.C. Gehr
R.B. Hubbard
J. Roesset

APR 1 2 1983

Ms. Pamela Vones
City Clerk
Office of the City Clerk
Post Office Box 321
San Luis Obispo, California 93406-0321

Dear Ms. Vones:

I am pleased to respond to your letter of March 7, 1983 to Chairman Palladino which has been referred to me for reply. Your letter transmitted Resolution No. 5056, which was adopted by the San Luis Obispo City Council, urging the Nuclear Regulatory Commission to defer the licensing of Diablo Canyon, Unit 1 until completion of the reverification program and associated safety studies and completion of all plant modifications to safety related structures, systems and components. Your letter also raised two areas of concern which we have addressed separately in the Enclosure.

With respect to the Resolution, the NRC Order of November 19, 1981, clearly sets forth the requirements that must be met and procedures that are to be followed for the authorization of fuel loading. In Section 5 of Attachment 1, the Order states:

> "Prior to authorization to proceed with fuel loading the NRC shall be satisfied with the results of the seismic design verification program referred to in paragraph 1, and with any plant modification resulting from that program that may be necessary prior to fuel loading. The NRC may impose additional requirements prior to fuel loading necessary to protect health and safety based upon its review of the program or any of the information provided by PG&E pursuant to paragraph 4. This may include some or all of the requirements specified in the letter to PG&E, dated November 14, 1981."

Our approval of a two-step process for a decision regarding reinstatement of the license does not permit any deviation from these requirements. The approval is limited to the concept of two steps for decisions regarding reinstatement of the license, but is in no way restricted to the target schedule proposed by PG&E. At this time, PG&E and the independent design verification program (IDVP) are providing us with such information in the form of semi-monthly reports, interim technical reports, and sections of their final reports on the various facets of the design verification effort. Although we intend to give substantial weight in our decision to the findings, conclusions, and recommendations of the IDVP, under no condition will we consider the IDVP to take the place of the necessary and adequate NRC

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review. We will not be restricted in our own review efforts by the specific schedule proposed but will take the time necessary to assure ourselves and the public that there are no deficiencies that would prevent safety-related structures, systems and components from performing their intended safety functions.

Let me assure you that under no condition will we authorize the Diablo Canyon facility to begin operation until we have reasonable assurance that the public health and safety is adequately protected. More specifically we will require a high level of confidence that no significant design or construction deficiencies affecting safety at any authorized level of operation exist at the facility before reaching a decision to authorize that level of operation.

Sincerely,

Harold R. Denton, Director
Office of Nuclear Reactor Regulation

Enclosure:
As stated

*See previous concurrence.

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Enclosure
Response to Two Concerns

The first concern is that "the NRC recently adopted a licensing schedule which permits restoration of the plant's license and fuel loading before the reverification program is completed, before the results are analyzed, and before any corrective action called for in that program, if any, can be implemented." We have not adopted a licensing schedule, we have approved a process for reinstatement of the license consistent with the Commission Order. The Commission Order of November 19, 1981, which suspended the low power license, sets forth the requirements that must be completed prior to reinstatement of the license. These requirements relate to seismic analyses and design activities performed prior to June 1978 by PG&E and its contractors (i.e., service-related activities) and to the implementation of the quality assurance program for those efforts. The activities associated with the Commission Order have become known as Phase I of the independent design verification program (IDVP) and will be completed in two steps. In addition, the NRC Office of Nuclear Reactor Regulation required PG&E in a letter, also dated November 19, 1981, to initiate an independent design verification effort of safety-related structures, systems and components with respect to seismic analyses and design activities performed after 1978 and with respect to non-seismic analyses and design efforts performed by PG&E and its contractors. These efforts have become known as Phase II of the design verification program. By the Commission's approval of the program plan on December 8, 1982, the utility is required to submit a status report on all Phase II activities prior to any decision regarding restoration of the license. Such work must be sufficiently complete to ensure that all major deficiencies were detected.

The design verification efforts for Phase I and Phase II are well underway. The activities that we require now to be completed prior to a fuel load decision exceed those originally specified in our Order. We have expanded the program to include the following additional IDVP activities: (1) audit of the implementation of the Diablo Canyon Project quality assurance program (2) audit of a sample of quality assurance program implementation of construction activities, (3) review of the PG&E/Westinghouse design interface, and (4) verification of the appropriate Hosgri and non-Hosgri spectra.

At the time of authorization for fuel loading all efforts required for reinstatement of the license will be completed except for modifications to those structures, systems and components that are not required for Step 1, in order to protect the public health and safety. In addition, the Phase II activities (i.e., non-seismic, safety-related analysis and design) of PG&E and the IDVP will have proceeded to an extent that will allow us to reach a conclusion with respect to any additional design verification that might be required. At this time the IDVP has completed its review of those structures, systems and components that comprise the initial sample to be verified under Phase II. Prior to fuel loading, PG&E and the IDVP will both submit to the NRC a report on the status of their respective Phase II activities. Again, we will require a high degree of assurance, at the time of a decision regarding fuel loading, that any further design verification efforts in the seismic and non-seismic area will not reveal any major deficiency in Diablo Canyon Unit 1.

The second concern is "the licensing schedule for the plant also has no provision for the completion of studies of three plant safety systems ordered by the NRC, nor for the analysis of those studies, nor for the implementation of their recommendations." The results of the seismic design analyses that have been ongoing at Brookhaven National Laboratory (BNL) since late 1981 will be fully taken into consideration in the NRC evaluation and determination regarding the seismic design adequacy of Diablo Canyon Unit 1. The first BNL effort involved the containment annulus structure and selected associated piping systems and was documented in a report. We have requested the IDVP to review this report, consider the results in its own design verification efforts, and provide us with its conclusions. The NRC staff is evaluating the BNL report in parallel and will have the additional benefit of the independent view provided by the IDVP.

In mid 1982 the NRC requested continued participation by BNL to undertake a horizontal seismic analysis of the containment annulus structure, seismic and stress analyses of a buried tank, and additional analyses of piping systems. The purpose of the BNL analyses is to provide the NRC with additional insight as to the character of results obtainable by use of current state-of-the-art analytical techniques without regard to methods or procedures previously approved in the licensing process for Diablo Canyon. These analyses are therefore not intended as a substitute for the design and evaluation efforts now underway nor are they a substitute for the analytical effort being performed by the IDVP. Our experience has been, however, that such analyses often provide insights to assist in our review. The BNL analyses will be sufficiently completed and taken into consideration prior to any decision regarding restoration of the license.

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APR 13 1983

The Honorable Douglas H. Bosco
United States House of Representatives
Washington, D. C. 20515

Dear Congressman Bosco:

I am pleased to respond to your letter of March 23, 1983 to Chairman Palladino which has been referred to me for reply. In your letter, you urged the Nuclear Regulatory Commission to fully resolve the seismic and other safety issues prior to the reinstatement of the low power license.

As you know, the NRC Order of November 19, 1981, (copy attached) clearly sets forth the requirements that must be met and procedures that are to be followed for the authorization of fuel loading. In Section 5 of Attachment 1, the Order states:

> "Prior to authorization to proceed with fuel loading, the NRC shall be satisfied with the results of the seismic design verification program referred to in paragraph 1, and with any plant modification resulting from the program that may be necessary prior to fuel loading. The NRC may impose additional requirements prior to fuel loading necessary to protect health and safety based upon its review of the program or any of the information provided by PG&E pursuant to paragraph 4. This may include some or all of the requirements specified in the letter to PG&E, dated November 19, 1981."

Our approval of a two-step process for a decision regarding reinstatement of the license does not permit any deviation from these requirements. The approval is limited to the concept of two steps for decisions regarding reinstatement of the license, but is in no way restricted to the schedule proposed by PG&E. At this time, PG&E and the independent design verification program (IDVP) are providing us with much information in the form of semi-monthly reports, interim technical reports, and sections of their final reports on the various facets of the design verification efforts. Although we intend to give substantial weight in our decision to the findings, conclusions, and recommendations of the IDVP, under no condition will we consider that it is to take the place of the necessary and adequate NRC review. We will not be restricted in our own review efforts by the specific schedule proposed but will take the time necessary to assure ourselves and the public that there are no deficiencies that would prevent safety-related structures, systems and components from performing their intended safety functions.

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Let me assure you that under no condition will we authorize the Diablo Canyon facility to begin operation until we have reasonable assurance that the public health and safety is adequately protected. More specifically we will require a high level of confidence that no significant design or construction deficiencies affecting safety at any authorized level of operation exist at the facility before reaching a decision to authorize that level of operation.

I hope this letter provides information responsive to your concerns.

Sincerely,

(Signed) William J. Dircks

William J. Dircks
Executive Director for Operations

Enclosure:
As stated

OELD
LChandler
4/5/83

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