



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

HT 4/19  
#1

APR 19 1984

MEMORANDUM FOR: Hugh L. Thompson, Jr., Director  
Division of Human Factors Safety

THRU: Harold R. Booher, Chief  
Licensee Qualifications Branch  
Division of Human Factors Safety

FROM: Lawrence P. Crocker, Section Leader  
Management Technology Section  
Licensee Qualifications Branch  
Division of Human Factors Safety

SUBJECT: EVALUATION OF DIABLO CANYON SHIFT ADVISORS

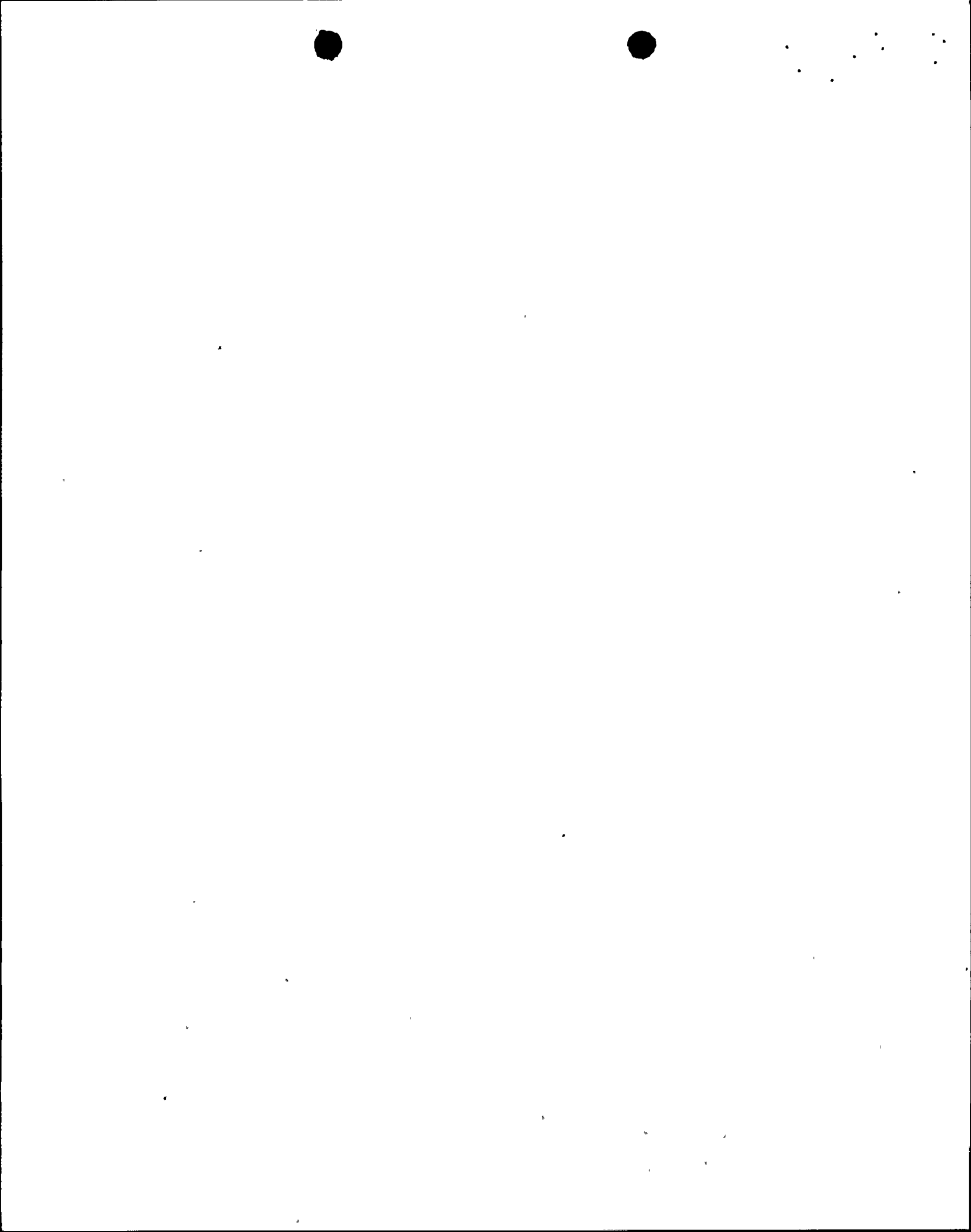
Attached is the evaluation of the Shift Advisors at Diablo Canyon,  
prepared by the evaluation team, based upon the team's visit to the plant on  
April 10-11, 1984.

Lawrence P. Crocker, Section Leader  
Management Technology Section  
Licensee Qualifications Branch  
Division of Human Factors Safety

Enclosures:  
As stated

Dupe  
~~8405020259~~  
PDR 16pp.

Enclosure 2



EVALUATION OF SHIFT ADVISORS  
DIABLO CANYON POWER PLANT

Introduction

On April 10-11, 1984, an evaluation team composed of three individuals from the Licensee Qualifications Branch, Division of Human Factors Safety, NRR, and a licensing examiner from Region V visited the Diablo Canyon Power Plant. The makeup of the team is shown in Enclosure 1.

The purpose of the visit was to evaluate the capabilities of the Diablo Canyon Shift Advisors to provide adequate advice to the operating shifts. The purpose and the plan for the team visit are described in Enclosure 2. The team members reviewed the procedure developed by the licensee which describes the duties and responsibilities of the Shift Advisors; reviewed the resumes of the Shift Advisors to determine whether they meet the industry criteria for Shift Advisors; reviewed the training program provided to the Shift Advisors; examined the weekly quizzes and the final written examination administered to the Shift Advisors; reviewed the available data relating to the oral examination administered to the Shift Advisors and interviewed three members of the station staff who had administered portions of the oral examination; interviewed eight of the nine Shift Advisors and Shift Advisor candidates; interviewed selected members of the plant staff regarding their knowledge of Shift Advisor duties and responsibilities; and interviewed the Senior Resident Inspector to determine his views regarding the Shift Advisor program.



### Program Status

At the time of the team visit, four Shift Advisors had completed the training program. Three were working with the plant operating shifts and the fourth was undergoing a week of training at the Zion simulator. Five Shift Advisor candidates, including one member of the plant staff, were in their third week of the four-week training program. The three individuals now serving as Shift Advisors are working 12-hour rotating shifts as contrasted to the licensee's five-shift rotation scheme for the operating shifts. The stated intent of the licensee is to assign an advisor to each operating shift such that the Shift Advisor will rotate as a shift member and will participate in periodic requalification training with the shift crew. The team endorses this intent of the licensee as highly desirable.

### Shift Advisor Procedure

The procedure governing the duties and responsibilities of the Shift Advisor is TP T0-8401, "Responsibilities and Duties of the Shift Advisor." Revision 1 of this procedure, dated April 5, 1984, currently is in effect. A copy is enclosed (Enclosure 3). While on shift duty, the Shift Advisor reports to the Shift Foreman (Shift Supervisor). When not on shift duty, Shift Advisors report to the Senior Power Production Engineer (Operations), who also directs the activities of the Shift Technical Advisors. The evaluation team considers these reporting arrangements to be acceptable. Our review of the



procedure found that it adequately describes the duties and responsibilities of the Shift Advisors.

Shift Advisor Qualifications

The evaluation team reviewed the resumes of the Shift Advisors. A summary of the experience of the Advisors is included as Enclosure 4. The top line of the table shown in Enclosure 4 is the minimum experience proposed by the industry for Shift Advisors. Succeeding lines of the table show the experience of the nine Shift Advisors (numbers 1 through 4) and Shift Advisor candidates (numbers 5 through 9) at Diablo Canyon. As can be seen from the table, all of the advisors have considerably more power plant and nuclear plant experience than the minimums proposed by the industry. In addition, three of the advisors have previous Navy experience and two hold degrees in engineering. Each of the advisors except number 4 has had previous licensed operating experience at the RO or SRO level, or both, at commercial nuclear plants using a Westinghouse nuclear steam supply system. The licensed experience of Advisor #4 was as an RO on a plant using a Combustion Engineering nuclear steam supply system. This advisor was the one who was attending simulator training at the Zion simulator at the time of the evaluation team visit. Upon completion of this simulator training, we consider that he should be adequately qualified to serve as a Shift Advisor at Diablo Canyon.





During the course of our review of the Shift Advisor qualifications, we noted that no provisions had been made to evaluate the medical status of candidates, although we found that three of the four present Shift Advisors had received a medical evaluation within the last year in connection with their NRC license renewal. To our knowledge, the subject of medical qualifications has not been raised before. However, we believe that the advisors should meet the same medical criteria as the licensed operators. We discussed this matter with the licensee and it was agreed that PG&E would arrange for medical examinations for the advisors.

#### Training Program

The training program administered to the Shift Advisor candidates consists of a four-week course covering plant procedures, technical specifications and plant safety-related systems. The training modules are drawn from the regular plant training program and each module is accompanied by a "Need-to-know" sheet which describes the learning objectives for that portion of the training. The evaluation team reviewed the training program and concluded that it is adequate to provide the Shift Advisors with the knowledge needed to successfully perform advisor duties at the Diablo Canyon plant.

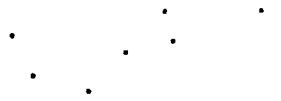


### Quizzes and Written Examination

Quizzes are administered at the end of the second and third weeks of the training program and a final written examination is administered at the end of the fourth week. The evaluation team reviewed the quizzes and the final examination and the results of these to determine their adequacy. The team concluded that the final written examination, which contained a ratio of 60/40% of RO-SRO/SRO level questions, provided an adequate measure of the student's knowledge of subject matter presented during the training.

### Oral Examination

In addition to the final, written examination of the Shift Advisors, each candidate also undergoes an oral examination conducted by a board of three members of the plant training and operations staffs, all of whom have SRO licenses at the plant. Based upon interviews with three of the oral examiners and review the available written records, the evaluation team concluded that the oral examination provided a valid check of the advisor's knowledge at the SRO level as related to the advisor's duties and responsibilities. The makeup of the oral examination boards varied from student to student. A total of five members of the plant staff conducted the oral examinations for the first four Shift Advisors.



### Interview of Shift Advisors

The evaluation team interviewed each of the Shift Advisors now at the plant and on shift. We also conducted a group interview of the five Shift Advisor candidates who were undergoing the training program. (As mentioned earlier, one of the Shift Advisors who had completed the plant training was away from the plant attending simulator training during the period of the evaluation team's visit.) Each of the three Shift Advisors interviewed understood his duties and responsibilities, felt that he had received adequate plant-specific training, and appeared confident in his role as Shift Advisor. All reported good working relationships with the operating shifts; these are expected to improve further when the advisors are assigned to specific shifts. Each of the advisors now on shift as well as the five candidates in the training program reported favorably on the training. While the training was intensive, it was adequate. The Advisors also stated that the instructors who conducted the course are very good. Several advisors mentioned that the training was among the best they had ever received.

### Interview of Selected Shift Crew Personnel

Several members of the evaluation team interviewed selected shift personnel, ranging from a Shift Foreman to a Control Operator. Formal training on the role of the Shift Advisors has not been presented to the shift crews, but the crews are being briefed by the Shift Foremen on the roles of the advisors and



each shift member is in the process of acknowledging his/her understanding of the advisor roles. All shift members had not received the briefing since all crews had not been on duty since the advisors started working with the shifts.

#### Interview of Senior Resident Inspector

The Senior Resident Inspector was interviewed by the evaluation team to determine his knowledge regarding the Shift Advisors. He was aware of the advisors' role and knew they were standing duty with the operating shifts. However, he had not had an opportunity to properly evaluate the Shift Advisor activities.

#### Conclusions

The evaluation team concluded that:

1. All Shift Advisors and Shift Advisor candidates more than meet the minimum qualifications recommended by the industry.
2. Procedure TP T0-8401 adequately describes the duties and responsibilities of the Shift Advisors.
3. The training program, including the quizzes and examinations, administered to the Shift Advisor candidates is adequate to assure that the advisors will have sufficient knowledge of the Diablo Canyon





procedures, technical specifications and safety-related plant systems to adequately perform their duties. Further, the training program adequately covers the duties and responsibilities, and the limitations, of the Shift Advisors.

4. The Shift Advisors are comfortable with and have a positive attitude toward their duties. They understand how they are to interface with the operating crew. Further, the operating crews know what to expect from the Shift Advisors.
  
5. Subject to implementation of the recommendations noted below, the evaluation team concludes that the Shift Advisors at Diablo Canyon are adequately qualified and trained to perform their assigned duties.

#### Recommendations

1. As soon as sufficient Shift Advisors are available, they should be assigned to specific shifts such that they can develop as part of the shift team, rotating with and undergoing requalification training with the shift crew. The licensee stated to the evaluation team that this was the intent.
  
2. A formal evaluation system should be established to assure continuing assessment of the Shift Advisor performance. Provisions also should be made to obtain the views of the Shift Advisors on a periodic, formal basis.
  
3. The Shift Advisors should meet the same medical criteria as required for licensed plant operators. The licensee has agreed with this recommendation.



6

7

8

9

EVALUATION TEAM

Lawrence P. Crocker - Team Leader,  
Section Leader, Management Technology Section  
Licensee Qualifications Branch  
Division of Human Factors Safety, NRR

Joseph J. Buzy - Senior Reactor Engineer (Training and Assessment),  
Personnel Qualifications Section  
Licensee Qualifications Branch  
Division of Human Factors Safety, NRR

Louis S. Bender - Training and Assessment Specialist  
Personnel Qualifications Section  
Licensee Qualifications Branch  
Division of Human Factors Safety, NRR

John O. Elin - Licensing Examiner  
Operator Licensing Section  
Region V

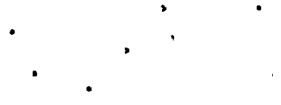


TRIP TO DIABLO CANYON

**Purpose:** To evaluate the capabilities of the Diablo Canyon shift advisors to provide adequate advice to the operating shifts.

**Plan:**

1. Review the procedures developed by the licensee which describe the duties of the advisors and the working relationships between the advisors and the operating shift personnel.
2. Examine and evaluate the adequacy of the training program provided to the shift advisors.
3. Review the written examination administered to the shift advisors and the results.
4. Review shift advisor oral examination data and results and discuss with the examiners the overall performance of the shift advisors on the examination.
5. Interview the shift advisors to obtain a subjective evaluation of their capabilities and attitudes and to determine that they understand their duties and their relationship to the operating crews.



6. Examine the training program given to the shift crews on the role of the shift advisors and interview selected operating shift personnel to ascertain that operators understand the role of the shift advisors.
7. Obtain observations as available from the Senior Resident Inspector regarding the current performance of the shift advisors and how they fit in with the operating crews.
8. Obtain from the Senior Resident Inspector his evaluation of the current performance of the operating crews.





**PG&E****Pacific Gas and Electric Company**

NUMBER TP TO-8401

REVISION 1

DATE 4/5/84

PAGE 1 OF 3



DEPARTMENT OF NUCLEAR PLANT OPERATIONS

DIABLO CANYON POWER PLANT UNIT NO(S) 1 AND 2

TEMPORARY PROCEDURE

RESPONSIBILITIES AND DUTIES OF THE SHIFT ADVISOR

TITLE:

APPROVED: \_\_\_\_\_

PLANT MANAGER

DATE

SCOPE

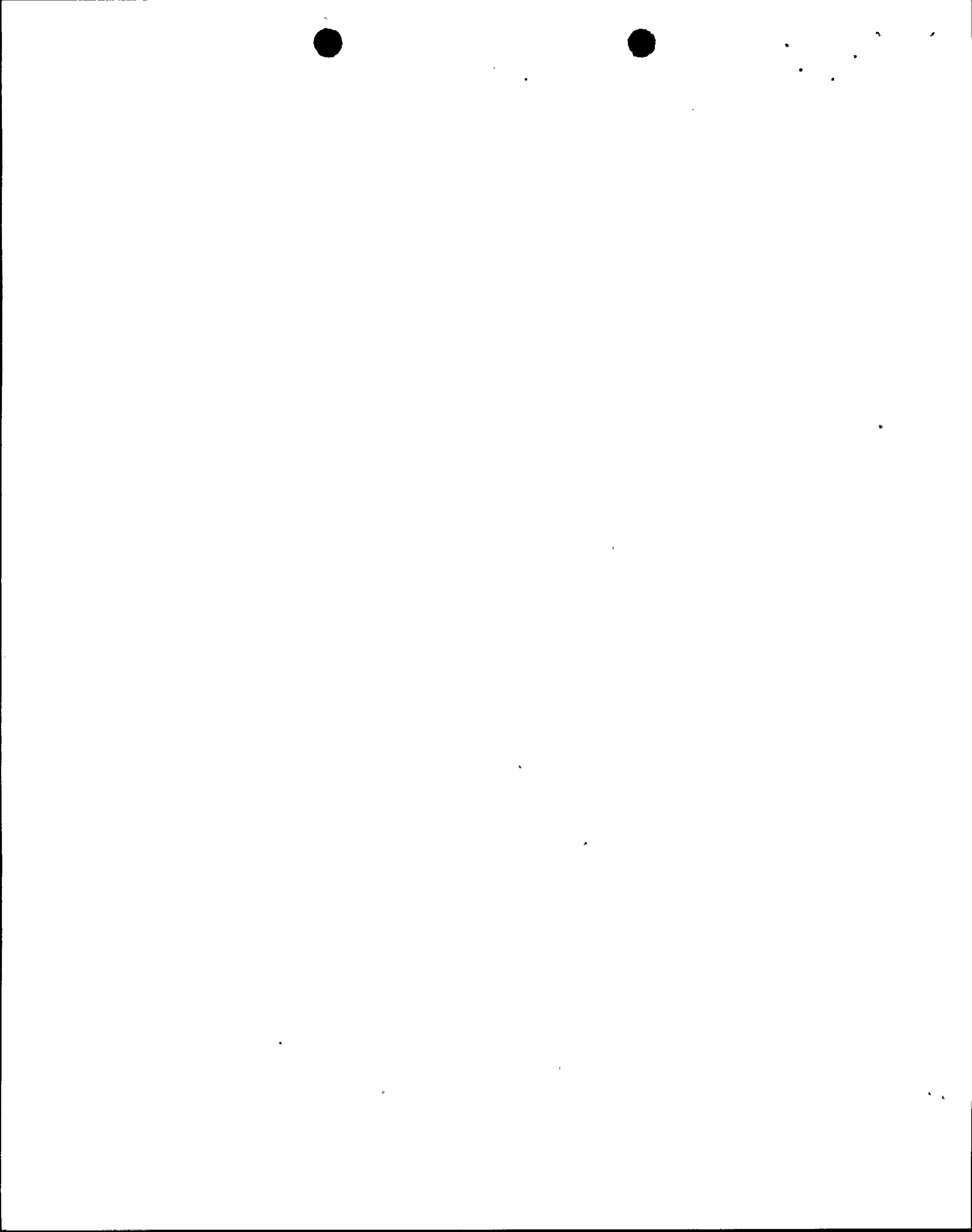
As part of our operating license (Item 2.c.8.c), PGandE will augment the plant staff by providing on each shift an individual experienced in comparable size PWR operation. In addition to this, PGandE will meet the requirements developed by the NTOL utility working groups position on shift operating experience. This procedure establishes the primary responsibilities, duties and working relationships of this individual (henceforth referred to as Shift Advisor). This procedure will be rescinded upon completion of the commitment. This procedure and changes thereto requires PSRC approval.

PROCEDURE1. Responsibilities:

- a. To provide advisory support to the operating shift crew. The Shift Advisor will review and assess the impact of significant shift activities that are scheduled or in progress and will keep control room personnel apprised of any potential problem areas. ~~The Shift Advisor should be involved in significant shift operating decisions and recommend appropriate actions (including plant shutdowns).~~
- b. To provide technical and administrative support to the Shift Technical-Advisor, Shift Foreman, Senior Control Operator and the Operations Manager.

2. Limitations:

- a. Responsibilities will not include direct manipulation of equipment.
- b. Responsibilities will also not include supervision of licensed operators in assignments which require an operator's license.



TITLE: RESPONSIBILITIES AND DUTIES OF THE SHIFT ADVISOR

### 3. Duties:

The Shift Advisor duties will include, the following tasks:

- a. Review and assess the impact of significant shift activities.
- b. Review startup procedures planned for the shift.
- c. Research any potential problems involving Technical Specifications and provide input based upon his experience.

The Shift Advisor duties may include the following tasks:

- a. Review shift turnover checklists.
- b. Review operator logs.
- c. Review equipment status in the Control Room.
- d. Assist in review of plant problem reports.
- e. Assist in the preparation of required reports.
- f. Review and recommend revisions to Operating and Emergency Procedures.
- g. Participate in shift turnover and shift briefings.
- h. Other tasks as assigned by the Shift Foreman.

### 4. Working Relationships

- a. The Shift Advisor assigned to a shift will report directly to the Shift Foreman during normal operation and plant testing, and to the Shift Technical Advisor (STA) during any plant emergency. The Shift Advisor will also work closely with all operations personnel as necessary to perform his duties.
- b. Shift Advisors not assigned to shift will report directly to the Senior Power Production Engineer (Operations).



TITLE: RESPONSIBILITIES AND DUTIES OF THE SHIFT ADVISOR

- c. The Shift Advisor will report any disagreements that cannot be resolved with the Shift Foreman (which may affect safe operation of the plant) to the General Operating Foreman, the Senior Power Production Engineer, Operations Manager or other appropriate plant management.

5. Miscellaneous

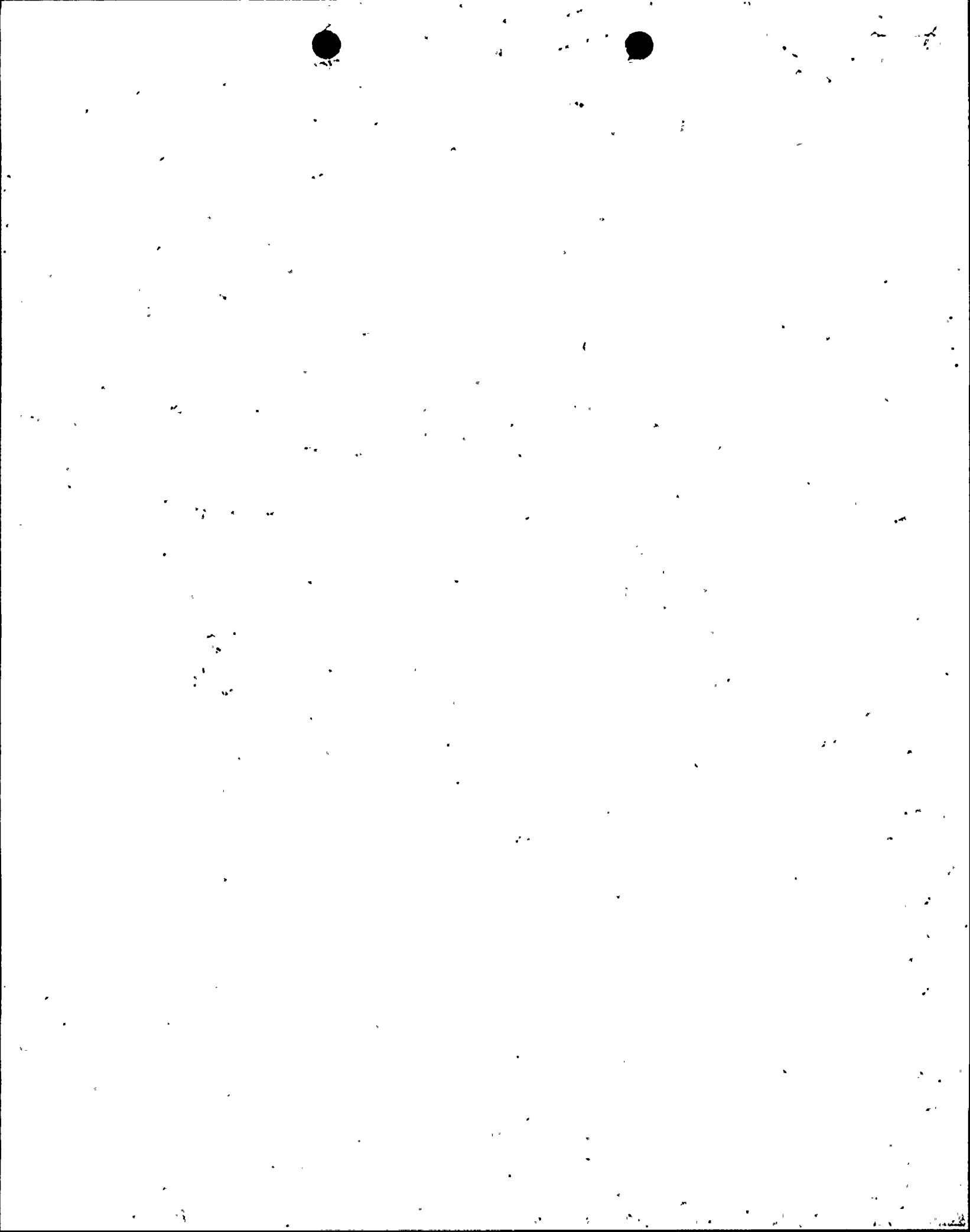
- a. At least one Shift Advisor shall be on duty on each shift whenever the reactor is not in a cold shutdown condition.
- b. In case of illness or otherwise, the "on shift" Shift Advisor will make arrangements for relief. The "on shift" person will stay until relieved.
- c. It should be understood that the Shift Advisors bear no direct responsibility for the operating crews actions. DCPP is responsible for all aspects of plant operations.



# SHIFT ADVISORS DIABLO CANYON

Enclosure 4

|                   | DEGREE | NAVY EXP. | POWER PLANT EXP. | NUCLEAR PLT. EXP. | RO              | SRO                                  | WHERE                                     |
|-------------------|--------|-----------|------------------|-------------------|-----------------|--------------------------------------|---|
| INDUSTRY CRITERIA | -      | -         | 4 yrs            | 2 yrs             | 12 months       |                                      | Similar Plant                             |
| DCCP ADVISORS     |        |           |                  |                   |                 |                                      |   |
| #1                | -      | -         | 8 yrs            | 8 yrs             | 21 mos.         | 23 mos                               | Sequoyah 1 (West.)                        |
| #2                | BSME   | 6 yrs.    | 5.8 yrs          | 3.3 yrs           | -               | 15 mos as STA (SRO)<br>11 mos as SRO | Farley 1 (West.)                          |
| #3                | -      | 7 yrs     | 5.5 yrs          | 5.5 yrs           | 24 mos          | 9 mos                                | Robinson (West.)                          |
| #4                | -      | 5.7 yrs   | 6.5 yrs          | 6.5 yrs           | 18 mos          | -                                    | AND-2 (CE)                                |
| #5                | -      | -         | 16 yrs           | 13 yrs            | 96 mos          | 48 mos                               | San Onofre 1 (West.)                      |
| #6                | -      | -         | 19 yrs           | 14 yrs            | 24 mos          | 15 mos                               | Beaver Valley 1 (West.)                   |
| #7                | BSEE   | -         | 10.7 yrs         | 10.7 yrs          | -               | 52 mos                               | Beaver Valley 1 (West.)                   |
| #8                | -      | -         | 10 yrs           | 10 yrs            | 40 mos<br>9 mos | 24 mos<br>6 mos                      | Mc Guire 1 (West.)<br>Marble Hill (West.) |
| #9                | -      | -         | 11 yrs           | 11 yrs            | 48 mos<br>-     | -<br>5 mos                           | D.C. Cook (West.)<br>Diablo Canyon        |





Docket  
Files  
50-323

JUN 24 1976

Mr. Paul Morton  
Room 642  
28 Civic Center Plaza  
Santa Ana, California 92701

Dear Mr. Morton:

At the request of Perry Animoto, I am forwarding copies of various reports relating to the Diablo Canyon Nuclear Power Station.

Enclosed is a copy of the Commission's Final Environmental Statement, with Addendum, and our Safety Evaluation Report with Supplements 1-4. We are in the process of locating other related documents and they will be sent to you in the near future.

Sincerely,

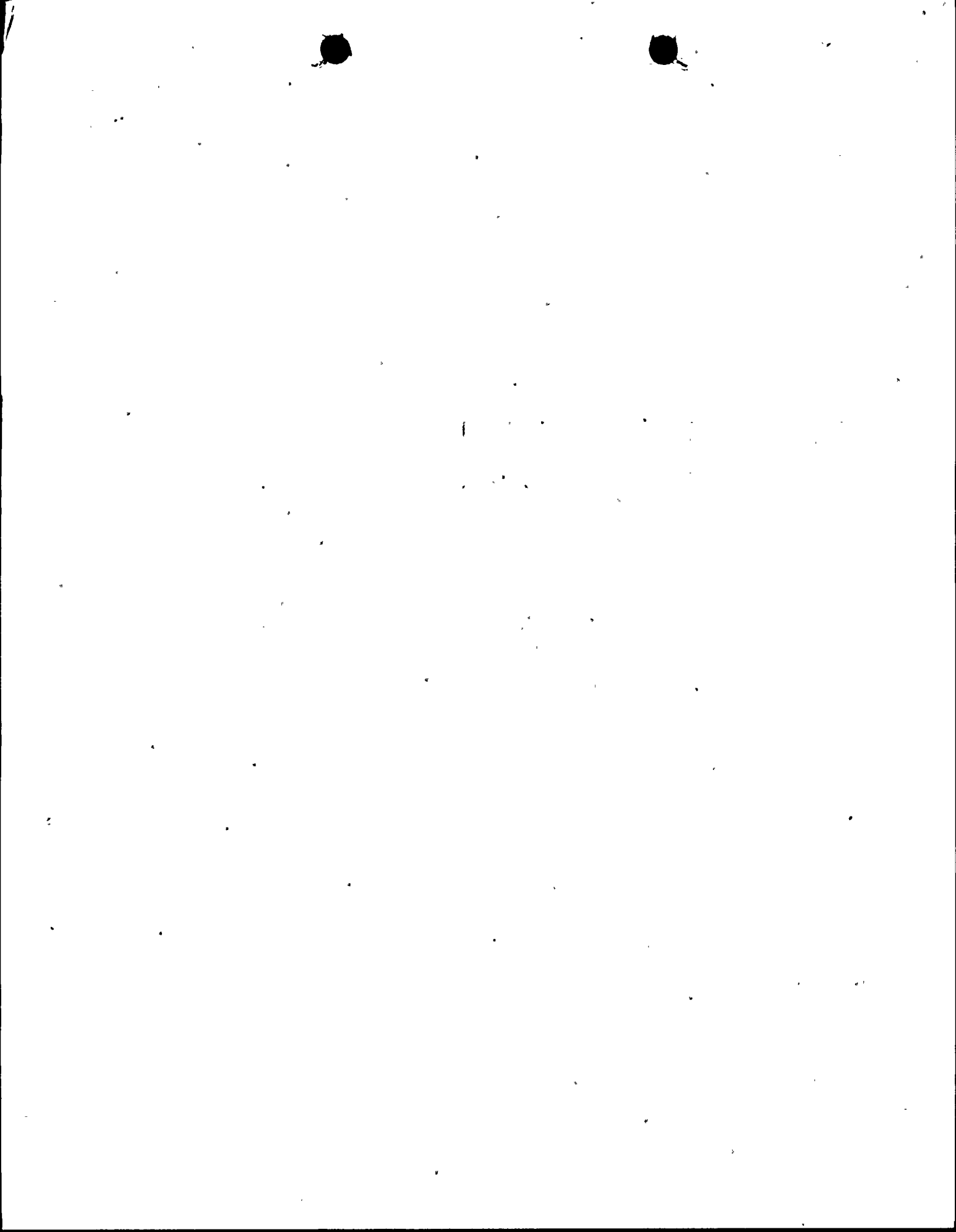
*H. L. Stepp*  
for  
J. C. Stepp, Chief  
Geology and Seismology Branch  
Division of Site Safety and  
Environmental Analysis

Enclosures:  
As stated

DIST:  
DOCKET FILES (50-275, 50-373)  
NRR Reading  
GSB Reading  
DSE Reading  
GWilliams.  
JStepp

cc  
1

|         |                        |                         |  |  |  |
|---------|------------------------|-------------------------|--|--|--|
| OFFICE  | DSE:ST <i>Williams</i> | DSE:ST:GSB <i>Stepp</i> |  |  |  |
| SURNAME | GWILLIAMS, TW          | JStepp                  |  |  |  |
| DATE    | 6/24/76                | 6/24/76                 |  |  |  |





CONFIDENTIAL

MEMORANDUM FOR THE DIRECTOR  
SUBJECT: [Illegible]

[Illegible text]

[Illegible text]

[Illegible text]

Very truly yours,  
[Illegible Signature]

[Illegible text]

[Illegible text]

**DISTRIBUTION**

Docket File 50-361 & 50-362  
50-275 & 50-323

L:Rdg  
L:AD/SS  
L:SAB

JAN 7 1974

Dr. Bob Whalen, Waterways Experiment Station, Corps of Engineers  
Li-San Hwang, Tetra Tech  
Martin Vitousek, University of Hawaii  
Hsiang Wang, University of Delaware  
N. R. Wallace, Bechtel Inc.  
Orville T. Magoon, Corps of Engineers  
R. Weggel, University of California  
G. Miller, National Oceanic & Atmospheric Administration  
B. Wilson, Consultant  
George Carayannis, U.S. Army Coastal Engineering Research Center

**AEC STAFF BACKGROUND MATERIAL ON TSUNAMIS**

Enclosed for your use are background material developed by the staff and their consultants relating to tsunamis for the San Onofre and Diablo Canyon sites. This information is in a form of excerpts from Safety Evaluation Reports on the subject nuclear power plant sites and a copy of staff summary analysis as follows:

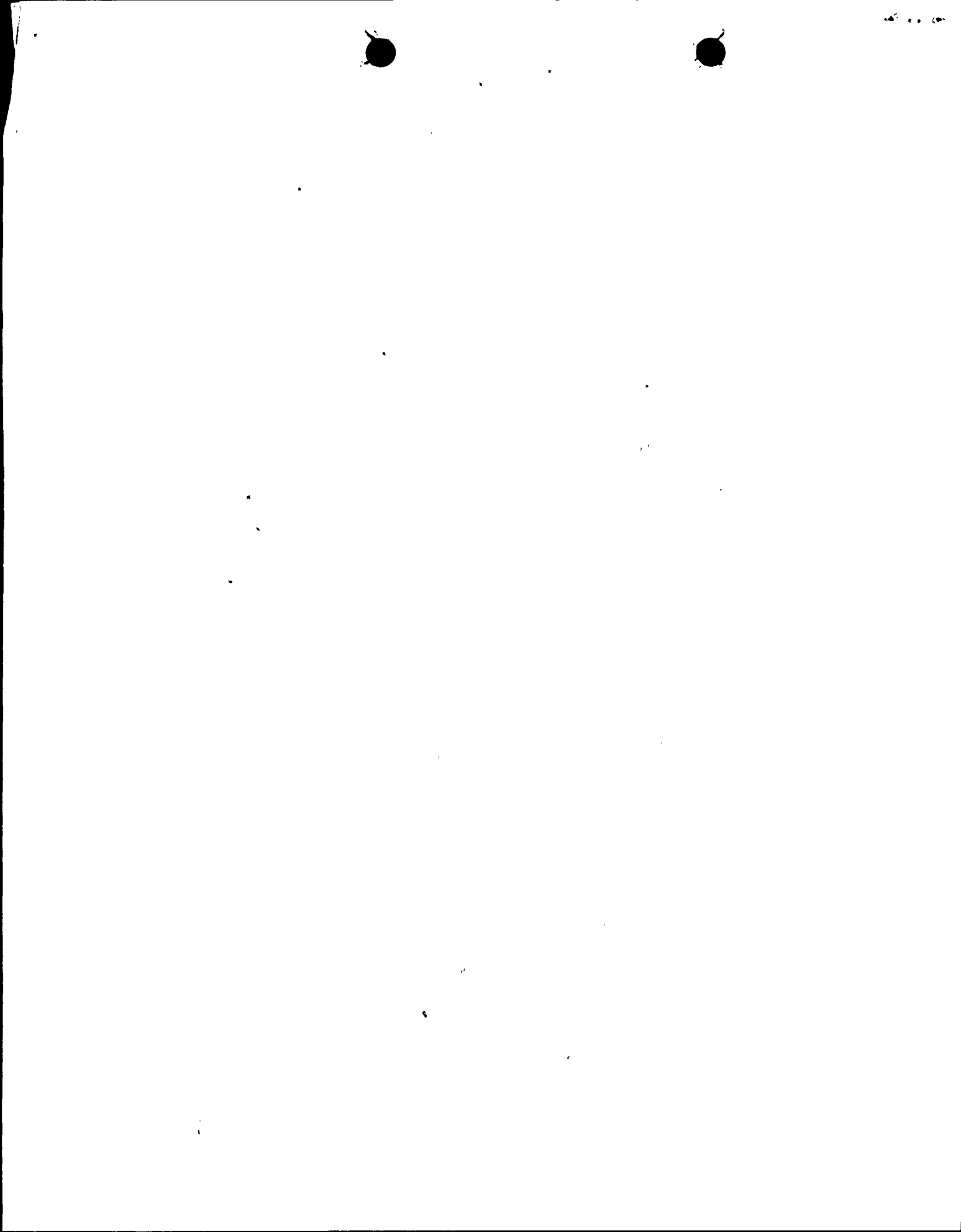
- (1) Safety Evaluation of the San Onofre Nuclear Generating Station Units 2 and 3; dated October 1972.
- (2) Staff Summary on Local Tsunami Potential, San Onofre Nuclear Generating Station Units 2 and 3; dated June 1973.
- (3) Summary Hazards Analysis of the San Onofre Nuclear Generating Station Unit 1; dated November 1963.
- (4) Safety Evaluation for the Diablo Canyon Nuclear Power Plant Unit 1; dated January 1968.
- (5) Safety Evaluation of the Diablo Canyon Nuclear Power Plant Unit 2; dated November 1969.

L. G. Hulman, Senior Hydraulic Engineer  
Site Analysis Branch  
Directorate of Licensing

Enclosures (5):  
As stated

See: w/o enclosures

|          |             |                   |            |  |  |  |         |
|----------|-------------|-------------------|------------|--|--|--|---------|
| OFFICE>  | W. Morrison | L: SAB            | L: SAB     |  |  |  | consult |
| SURNAME> |             | L. G. Hulman: jab | W. Gammill |  |  |  |         |
| DATE>    |             | 1/2/74            | 1/5/74     |  |  |  |         |



NOV 25 1969

Distribution:  
Docket  
DRL Reading  
RPB-5 Reading  
R. S. Boyd  
W. Haass  
S. M. Kari  
A. W. Dromerick

Docket No. 50-323

Dr. Nathan M. Newmark  
1114 Civil Engineering Building  
University of Illinois  
Urbana, Illinois 61801

Dear Dr. Newmark:

For your information, I am enclosing two copies of a Safety Evaluation prepared by the Division of Reactor Licensing concerning Pacific Gas and Electric Company's application for a construction permit for Unit No. 2 at its Diablo Canyon site, in San Luis Obispo County, California.

The comments furnished by Newmark and Hall are included as Appendix F.

Sincerely yours,

Original signed by  
Donald F. Knuth

for Roger S. Boyd, Assistant Director  
for Reactor Projects  
Division of Reactor Licensing

Enclosure:  
Safety Evaluation

|           |             |           |  |  |  |  |
|-----------|-------------|-----------|--|--|--|--|
| OFFICE ▶  | DRL/RPB-5   | DRL/RPB-5 |  |  |  |  |
| SURNAME ▶ | SMKari:kl's | DFKnuth   |  |  |  |  |
| DATE ▶    | 11/24/69    | 11/25/69  |  |  |  |  |

Director:  
Hockett  
DRR Reading  
PB-2 Reading  
F. S. Boyd  
W. Nass  
S. V. Katz  
A. W. Dromerick

DRR PB-2  
Skeptical  
11/15/68



OCT 2 1969

Distribution  
Docket ←  
DRL Reading  
RPB-5 Reading  
R. S. Boyd  
S. M. Kari  
W. Butler *Wass*  
A. W. Dromerick  
P. Howe

Docket No. 50-323

Dr. Nathan M. Newmark  
1114 Civil Engineering Building  
University of Illinois  
Urbana, Illinois 61801

Dear Dr. Newmark:

This supplements our previous correspondence to you concerning the proposed Diablo Canyon Unit No. 2 reactor. Two copies of Amendment No. 6, dated September 25, 1969, to the application submitted by Pacific Gas and Electric Company are enclosed for your use. This amendment consists of revised pages for incorporation in the Preliminary Safety Analysis Report and supplementary meteorological data on the site for the proposed plant.

Sincerely yours,

Original signed by  
Donald F. Knuth

*for* Roger S. Boyd, Assistant Director  
for Reactor Projects  
Division of Reactor Licensing

Enclosure:  
Amendment No. 6, dtd 9-25-69,  
for Diablo Canyon

Identical copies sent to: White  
Schneider  
Waldron  
Pack

|           |                   |                   |  |  |  |
|-----------|-------------------|-------------------|--|--|--|
| OFFICE ▶  | DRL/RPB-5         | DRL/RPB-5         |  |  |  |
| SURNAME ▶ | <i>SMKari:kls</i> | <i>DFKnuth</i>    |  |  |  |
| DATE ▶    | <i>1 / 19</i>     | <i>16 12 / 19</i> |  |  |  |

1 100

1 100

SECRET 100

SECRET 100

DBP 100-2

DBP 100-2

SECRET  
100-2  
SECRET 100

Identical copies sent to:

SECRET 100  
SECRET 100

B. H. H. H.  
V. M. D. R. O. S. T. I. C.  
H. B. H. H. H. H.  
S. M. K. H. H. H.  
B. H. H. H. H.  
DBP 100-2  
DBP 100-2  
SECRET 100  
SECRET 100

SECRET 100

September 12, 1969

Docket No. 50-323

Dr. Nathan M. Newmark  
 1114 Civil Engineering Building  
 University of Illinois  
 Urbana, Illinois 61801

Dear Dr. Newmark:

This supplements our previous correspondence to you concerning the proposed Diablo Canyon Unit 2.

Two copies of Amendment No. 5, dated September 8, 1969, to the application submitted by Pacific Gas and Electric Company are enclosed for your use. This amendment consists of revised pages for incorporation in the Preliminary Safety Analysis Report and responds in part to certain questions raised by us in our July meeting with Pacific Gas and Electric.

Sincerely yours,

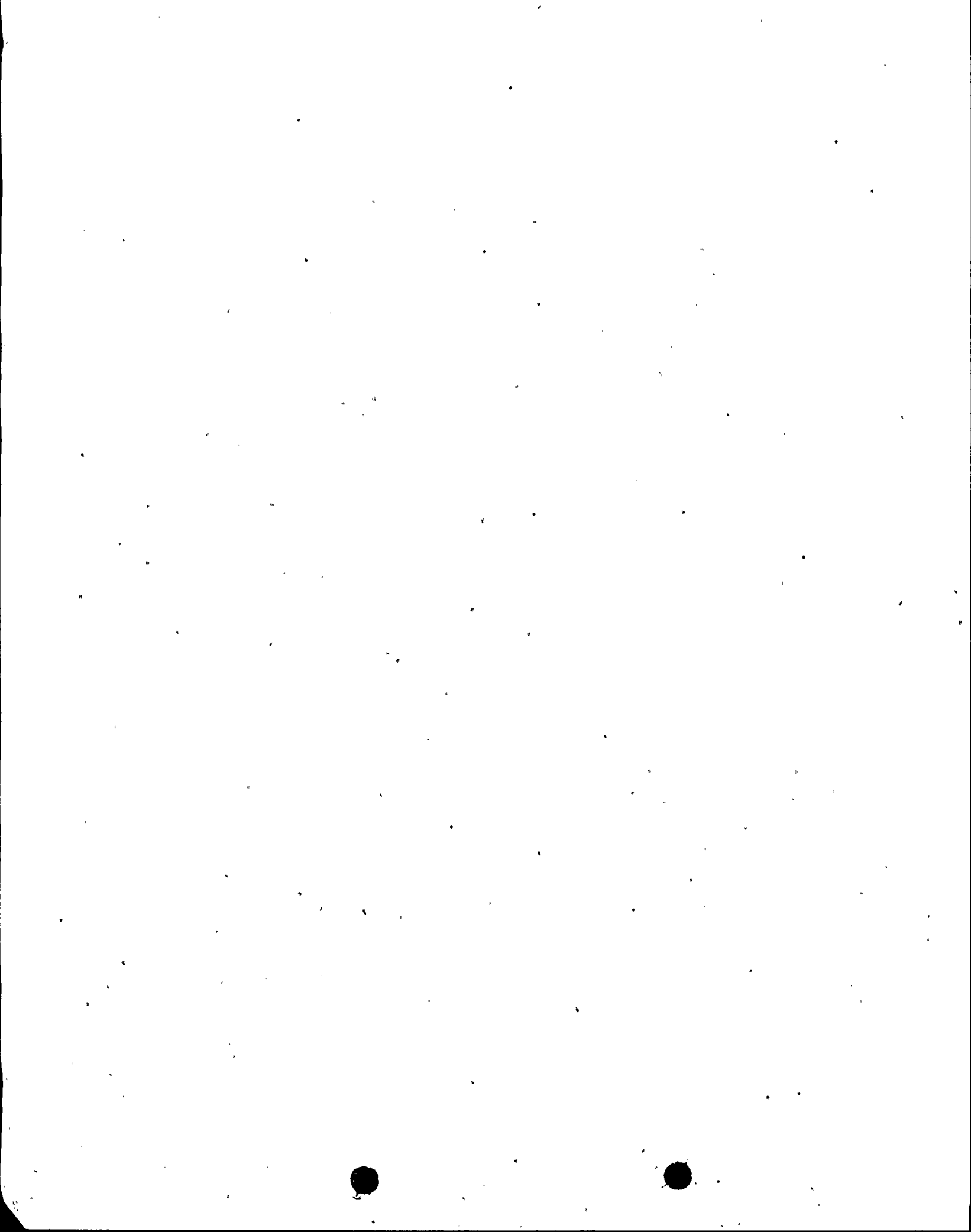


Roger S. Boyd, Assistant Director  
 for Reactor Projects  
 Division of Reactor Licensing

Enclosure:  
 Amendment No. 5, dtd 9-8-69  
 Diablo Canyon Unit 2

Distribution:  
 Docket ✓  
 RPB-5 Reading  
 DRL Reading  
 RSBoyd  
 SMKari  
 WHaass  
 AWDromerick

|           |                     |           |  |  |  |
|-----------|---------------------|-----------|--|--|--|
| OFFICE ▶  | DRL/RPB-5           | DRL/RPB-5 |  |  |  |
| SURNAME ▶ | SMKari:emm<br>x7791 | DFKnuth   |  |  |  |
| DATE ▶    | 9/12/69             | 9/12/69   |  |  |  |



FROM: Nathan M. Newark  
 Urbana, Illinois 61801

DATE OF DOCUMENT: 9-11-69  
 DATE RECEIVED: 9-15-69  
 NO.: 2908

TO: Dr Peter A. Morris

LTR.  MEMO:  REPORT:  OTHER:   
 ORIG.: 1 CC: 11 OTHER:   
 ACTION NECESSARY  CONCURRENCE  DATE ANSWERED:  
 NO ACTION NECESSARY  COMMENT  BY:

CLASSIF: U POST OFFICE REG. NO:

FILE CODE: 50-323

DESCRIPTION: (Must Be Unclassified)  
 Ltr trans the following:

| REFERRED TO                        | DATE    | RECEIVED BY | DATE |
|------------------------------------|---------|-------------|------|
| A. Dromerick<br>w/2 cys for ACTION | 9-16-69 |             |      |
| <b>DISTRIBUTION:</b>               |         |             |      |

ENCLOSURES:  
 Report - "Adequacy of the Structural Criteria for the Diablo Canyon Site Nuclear Unit 2".  
  
 (12 cys rec'd)

Regulatory file ←  
 H. Price & Staff  
 Boyd  
 Morris/Schroeder  
 Levine  
 P. Howe  
 OGC(T. Conner)  
 Knuth (W/Orig & 2 cys) (Original to be returned to 016)

REMARKS:  
*signed on page 3*

**DO NOT REMOVE** **ACKNOWLEDGED**  
 2908 fod

DO NOT REMOVE

NATHAN M. NEWMARK  
CONSULTING ENGINEERING SERVICES

1114 CIVIL ENGINEERING BUILDING  
URBANA, ILLINOIS 61801

11 September 1969

Dr. Peter A. Morris, Director  
Division of Reactor Licensing  
U. S. Atomic Energy Commission  
Washington, D.C. 20545

Re: Contract No. AT(49-5)-2667  
Nuclear Unit 2, Diablo Canyon Site  
Pacific Gas and Electric Company  
AEC Docket 50-323

Dear Dr. Morris:

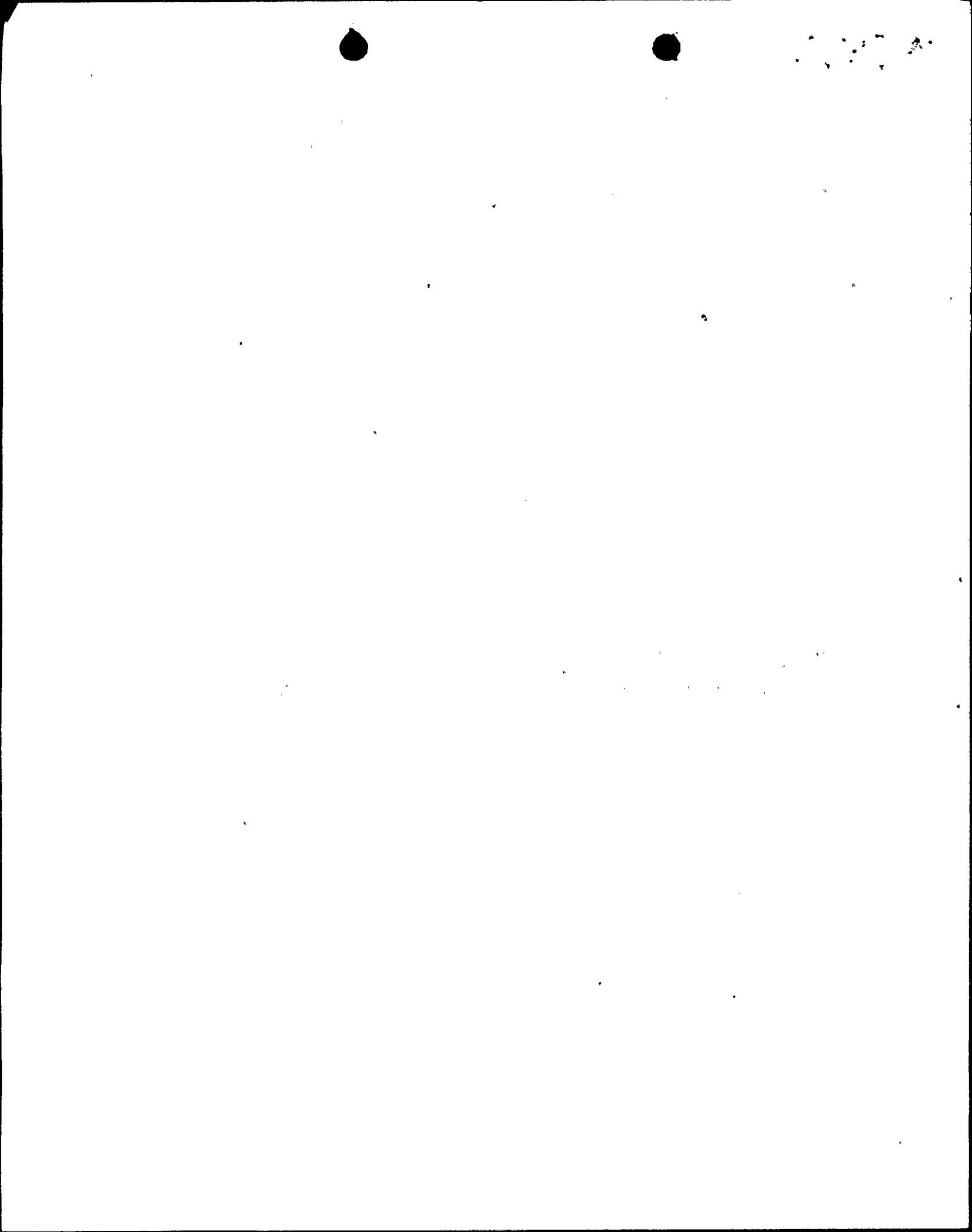
Drs. W. J. Hall, A. J. Hendron, and I have reviewed the PSAR for Diablo Canyon Site Nuclear Unit No. 2 and are submitting herewith our final report concerning this unit. The report has been prepared as a supplemental report to our earlier report of December 1967 on Diablo Canyon Site Nuclear Unit 1 (AEC Docket 50-275). The two units are essentially duplicates.

Respectfully submitted,

*N. M. Newmark*

N. M. Newmark

bjw  
Enclosure  
cc: W. J. Hall  
A. J. Hendron





NATHAN M. NEWMARK  
CONSULTING ENGINEERING SERVICES

1114 CIVIL ENGINEERING BUILDING  
URBANA, ILLINOIS 61801

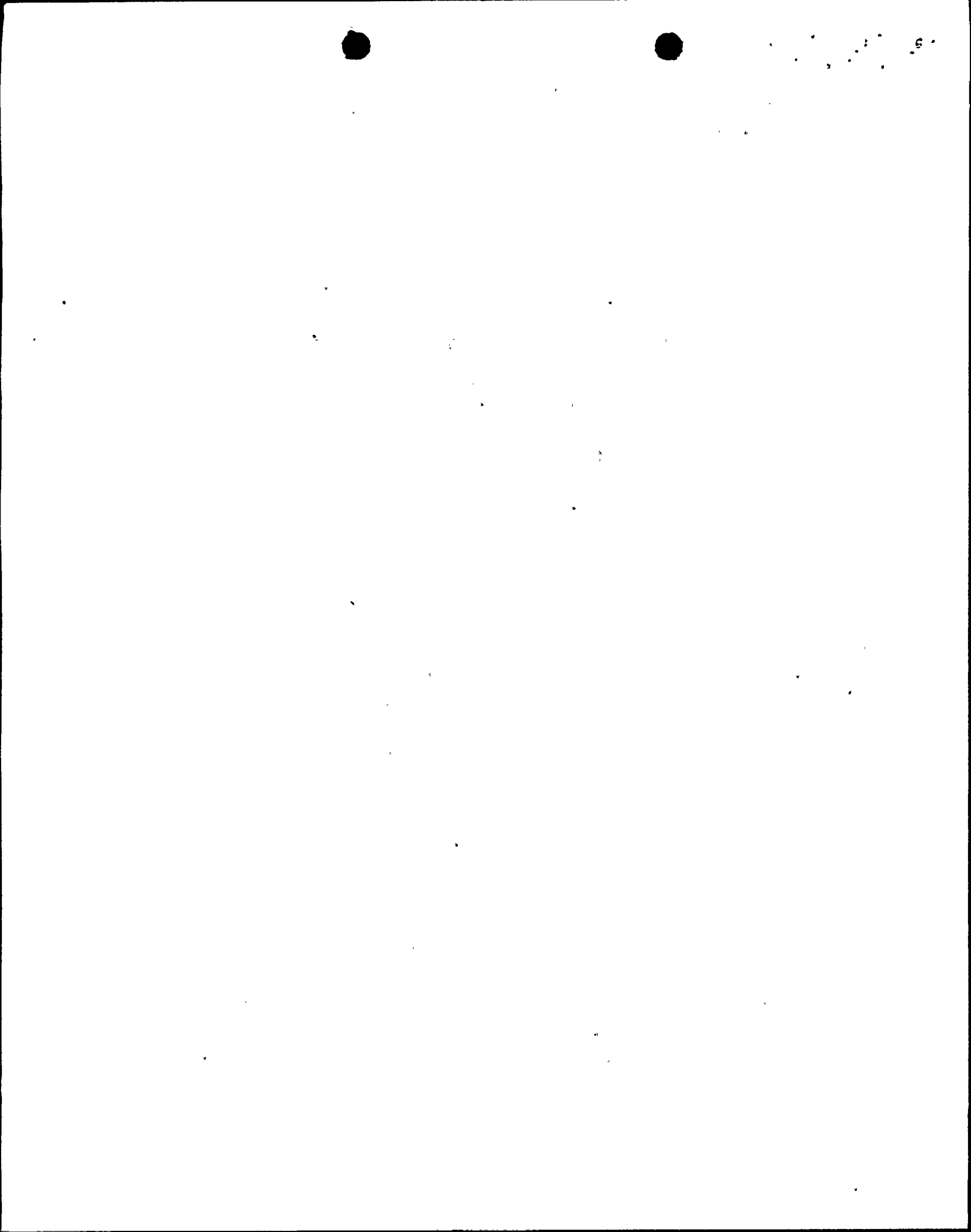
REPORT TO AEC REGULATORY STAFF  
ADEQUACY OF THE STRUCTURAL CRITERIA FOR  
THE DIABLO CANYON SITE NUCLEAR UNIT 2

Pacific Gas and Electric Company  
(AEC Docket 50-323)

by

N. M. Newmark  
W. J. Hall  
A. J. Hendron, Jr.

11 September 1969



ADEQUACY OF THE STRUCTURAL CRITERIA FOR THE  
DIABLO CANYON SITE NUCLEAR UNIT 2

by

N. M. Newmark, W. J. Hall, A. J. Hendron, Jr.

INTRODUCTION

This report concerns the adequacy of the containment structures and components, reactor piping and reactor internals, for the Diablo Canyon Site Nuclear Unit 2, for which application for a construction permit and operating license has been made to the U. S. Atomic Energy Commission (Docket No. 50-323) by the Pacific Gas and Electric Company. Diablo Canyon Site Nuclear Unit 2 is essentially a duplicate of Nuclear Unit 1. Accordingly, this report is a supplement to our earlier report on Diablo Canyon Site Nuclear Unit 1 (Ref. 1).

It is to be noted that all of the comments presented in our earlier report (Ref. 1) are also applicable to this particular unit of the facility. However, in addition to the comments made in the earlier report we wish to offer the following.

SUPPLEMENTAL COMMENTS ON ADEQUACY OF DESIGN

Foundation Design

The additional information concerning the site presented in the PSAR (Ref. 2) indicates that the site evaluation presented in the original PSAR for Diablo Canyon Site Unit No. 1 is still applicable. In general the foundation conditions appear adequate. The proposed slopes behind Reactor Units 1 and 2 are shown in Fig. 1-1 of the PSAR. As noted in Section 2.4.4 of the PSAR, extensive excavation will be undertaken for the reactor and turbine generator. It is further noted "... , but it is not expected that any difficulties with sliding ground will be created." No information as to slope stability



100

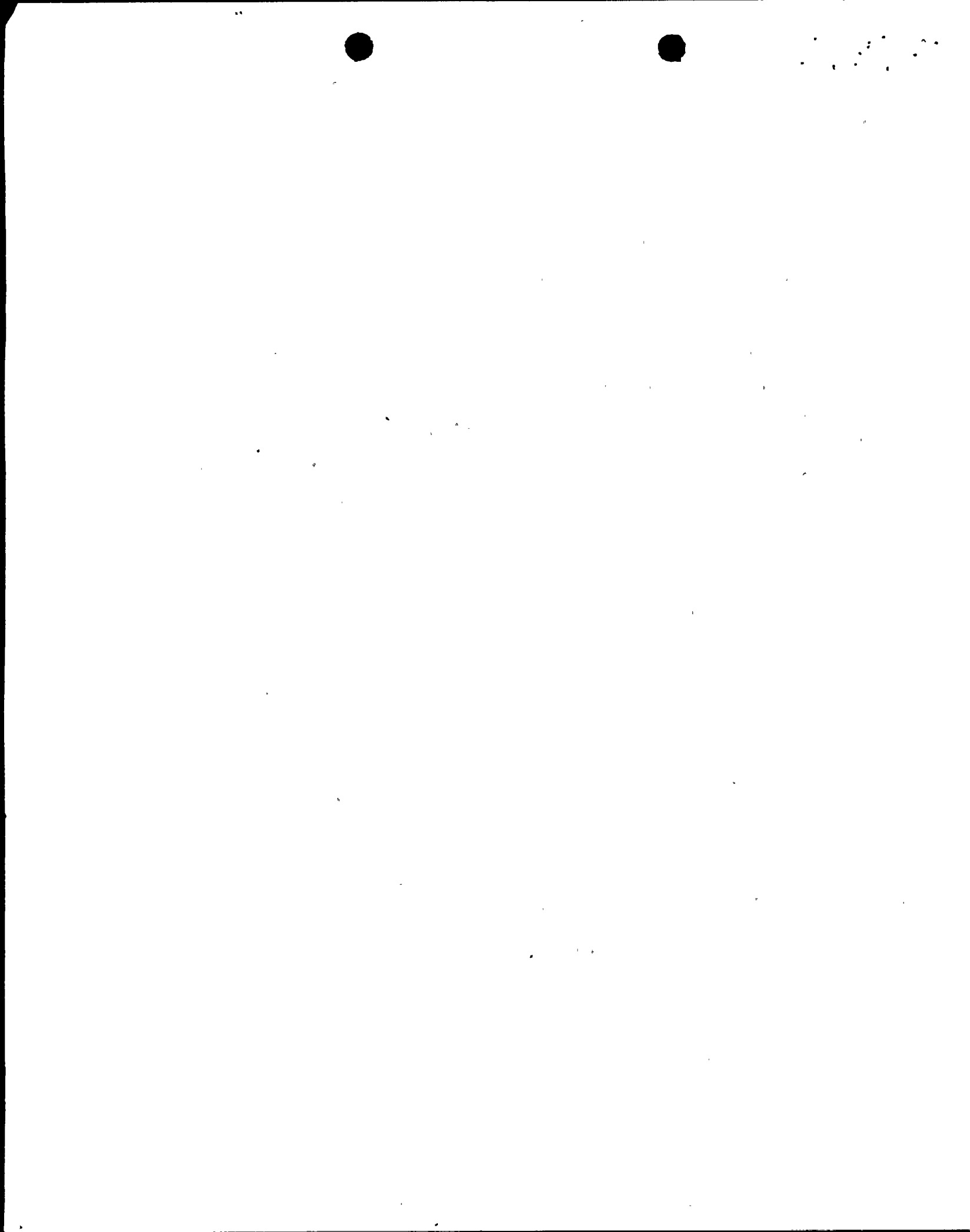
analyses of slopes that might present a hazard are presented in the PSAR. We believe that this matter requires review at some stage in the design process.

It will be noted also in Section 2.4.4 of the PSAR that several old land slides have been observed upstream of the switchyard, but these do not appear to us to represent a serious hazard.

#### Seismic Design

Our report on Diablo Canyon Unit No. 1 (Ref. 1) includes considerable comment concerning the method of dynamic analysis to be employed by the applicant. These comments are applicable to Diablo Canyon Nuclear Unit 2 in every respect. It is to be noted that Appendix D of the PSAR contains a report dated June 24, 1968 relating to the seismic design of the plant. The Third Supplement for Diablo Canyon Unit No. 1 indicates that the revised spectra in this report are those used for Unit No. 1. The statement on page 2-24 of Amendment 2 for Unit 2 states that "In all respects the seismic, dynamic and structural criteria for Unit 1 and Unit 2 are identical." On this basis we concur in the approach adopted.

It is further noted in the PSAR on page 2-31a that "Class II Items" are to be designed using a static seismic horizontal coefficient of 0.20 with allowable stresses in accordance with applicable code requirements. We shall interpret the term "Items" to mean structures and equipment. Furthermore, for lack of additional clarification we shall assume that the coefficient noted is a static force coefficient that is to be employed for the design of Class II structures in accordance with the working stresses and force distributions in the Uniform Building Code. However, no Zone is indicated. Precisely how such a coefficient is applied to the design and/or procurement of equipment is not discussed and needs review at an early stage during design.



It is indicated on page 5-39 of the PSAR that the load transfer across large openings will be achieved by the use of a structural steel ring to which reinforcing bars are welded. Further details on the methods of analysis employed for the large penetration, base slab, and liner are presented on pages 5-31 et. seq. and the criteria outlined appear generally acceptable.

We have noted with interest and gratification that two sections in the PSAR are new in format compared to the PSAR on Diablo Canyon Unit No. 1, namely Appendix 3-C, "Seismic Effects on the Reactor" and Appendix 4-C, "Support Structures..." These are extremely helpful in explaining the applicant's intentions and procedures.

We suggest that further review of the adequacy of the seismic evaluation for Class I critical instrumentation and controls be undertaken at an early stage in the design process.

#### CONCLUDING COMMENTS

In line with the design goal of providing structures and components with a reserve of strength and ductility, and on the basis of information presented by the applicant, we believe the design criteria outlined for the containment and other Class I components can provide an adequate margin of safety for seismic resistance. Our basis for arriving at this conclusion is presented partly in this report and partly in our earlier report on Diablo Canyon Unit 1 (Ref. 1). We have noted herein several items which we believe should receive further attention during the design and construction stages, including slope stability, design procedures and criteria for Class II structures and equipment, and especially for Class I instrumentation and controls.

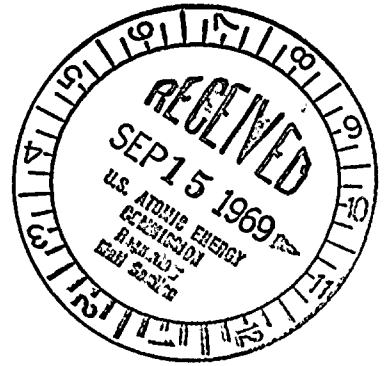
*N. M. Newmark*





REFERENCES

1. "Adequacy of the Structural Criteria for the Diablo Canyon Site Nuclear Plant, Pacific Gas and Electric Company," AEC Docket 50-275, Report to AEC Regulatory Staff, prepared by N. M. Newmark and W. J. Hall, December 1967.
2. "Preliminary Safety Analysis Report, Volumes 1, 2, and 3," Nuclear Unit 2, Diablo Canyon Site, Pacific Gas and Electric Company, 1968.



NATHAN M. NEWMARK  
CONSULTING ENGINEERING SERVICES

1114 CIVIL ENGINEERING BUILDING  
URBANA, ILLINOIS 61801

11 September 1969

Dr. Peter A. Morris, Director  
Division of Reactor Licensing  
U. S. Atomic Energy Commission  
Washington, D.C. 20545

Re: Contract No. AT(49-5)-2667  
Nuclear Unit 2, Diablo Canyon Site  
Pacific Gas and Electric Company  
AEC Docket 50-323

Dear Dr. Morris:

Drs. W. J. Hall, A. J. Hendron, and I have reviewed the PSAR for Diablo Canyon Site Nuclear Unit No. 2 and are submitting herewith our final report concerning this unit. The report has been prepared as a supplemental report to our earlier report of December 1967 on Diablo Canyon Site Nuclear Unit 1 (AEC Docket 50-275). The two units are essentially duplicates.

Respectfully submitted,

*N. M. Newmark*

N. M. Newmark

bjw  
Enclosure  
cc: W. J. Hall  
A. J. Hendron



Small, illegible markings or artifacts in the top right corner.

NATHAN M. NEWMARK  
CONSULTING ENGINEERING SERVICES

1114 CIVIL ENGINEERING BUILDING  
URBANA, ILLINOIS 61801

REPORT TO AEC REGULATORY STAFF  
ADEQUACY OF THE STRUCTURAL CRITERIA FOR  
THE DIABLO CANYON SITE NUCLEAR UNIT 2

Pacific Gas and Electric Company  
(AEC Docket 50-323)

by

N. M. Newmark  
W. J. Hall  
A. J. Hendron, Jr.

11 September 1969



ADEQUACY OF THE STRUCTURAL CRITERIA FOR THE  
DIABLO CANYON SITE NUCLEAR UNIT 2

by

N. M. Newmark, W. J. Hall, A. J. Hendron, Jr.

INTRODUCTION

This report concerns the adequacy of the containment structures and components, reactor piping and reactor internals, for the Diablo Canyon Site Nuclear Unit 2, for which application for a construction permit and operating license has been made to the U. S. Atomic Energy Commission (Docket No. 50-323) by the Pacific Gas and Electric Company. Diablo Canyon Site Nuclear Unit 2 is essentially a duplicate of Nuclear Unit 1. Accordingly, this report is a supplement to our earlier report on Diablo Canyon Site Nuclear Unit 1 (Ref. 1).

It is to be noted that all of the comments presented in our earlier report (Ref. 1) are also applicable to this particular unit of the facility. However, in addition to the comments made in the earlier report we wish to offer the following.

SUPPLEMENTAL COMMENTS ON ADEQUACY OF DESIGN

Foundation Design

The additional information concerning the site presented in the PSAR (Ref. 2) indicates that the site evaluation presented in the original PSAR for Diablo Canyon Site Unit No. 1 is still applicable. In general the foundation conditions appear adequate. The proposed slopes behind Reactor Units 1 and 2 are shown in Fig. 1-1 of the PSAR. As noted in Section 2.4.4 of the PSAR, extensive excavation will be undertaken for the reactor and turbine generator. It is further noted "... , but it is not expected that any difficulties with sliding ground will be created." No information as to slope stability





analyses of slopes that might present a hazard are presented in the PSAR. We believe that this matter requires review at some stage in the design process.

It will be noted also in Section 2.4.4 of the PSAR that several old land slides have been observed upstream of the switchyard, but these do not appear to us to represent a serious hazard.

#### Seismic Design

Our report on Diablo Canyon Unit No. 1 (Ref. 1) includes considerable comment concerning the method of dynamic analysis to be employed by the applicant. These comments are applicable to Diablo Canyon Nuclear Unit 2 in every respect. It is to be noted that Appendix D of the PSAR contains a report dated June 24, 1968 relating to the seismic design of the plant. The Third Supplement for Diablo Canyon Unit No. 1 indicates that the revised spectra in this report are those used for Unit No. 1. The statement on page 2-24 of Amendment 2 for Unit 2 states that "In all respects the seismic, dynamic and structural criteria for Unit 1 and Unit 2 are identical." On this basis we concur in the approach adopted.

It is further noted in the PSAR on page-2-31a that "Class II Items" are to be designed using a static seismic horizontal coefficient of 0.20 with allowable stresses in accordance with applicable code requirements. We shall interpret the term "items" to mean structures and equipment. Furthermore, for lack of additional clarification we shall assume that the coefficient noted is a static force coefficient that is to be employed for the design of Class II structures in accordance with the working stresses and force distributions in the Uniform Building Code. However, no Zone is indicated. Precisely how such a coefficient is applied to the design and/or procurement of equipment is not discussed and needs review at an early stage during design.



Small, faint, illegible marks or characters in the top right corner.

It is indicated on page 5-39 of the PSAR that the load transfer across large openings will be achieved by the use of a structural steel ring to which reinforcing bars are welded. Further details on the methods of analysis employed for the large penetration, base slab, and liner are presented on pages 5-31 et. seq. and the criteria outlined appear generally acceptable.

We have noted with interest and gratification that two sections in the PSAR are new in format compared to the PSAR on Diablo Canyon Unit No. 1, namely Appendix 3-C, "Seismic Effects on the Reactor" and Appendix 4-C, "Support Structures..." These are extremely helpful in explaining the applicant's intentions and procedures.

We suggest that further review of the adequacy of the seismic evaluation for Class I critical instrumentation and controls be undertaken at an early stage in the design process.

#### CONCLUDING COMMENTS

In line with the design goal of providing structures and components with a reserve of strength and ductility, and on the basis of information presented by the applicant, we believe the design criteria outlined for the containment and other Class I components can provide an adequate margin of safety for seismic resistance. Our basis for arriving at this conclusion is presented partly in this report and partly in our earlier report on Diablo Canyon Unit 1 (Ref. 1). We have noted herein several items which we believe should receive further attention during the design and construction stages, including slope stability, design procedures and criteria for Class II structures and equipment, and especially for Class I instrumentation and controls.

*M M Newman*



Small, illegible marks or characters in the top right corner.

REFERENCES

1. "Adequacy of the Structural Criteria for the Diablo Canyon Site Nuclear Plant, Pacific Gas and Electric Company," AEC Docket 50-275, Report to AEC Regulatory Staff, prepared by N. M. Newmark and W. J. Hall, December 1967.
2. "Preliminary Safety Analysis Report, Volumes 1, 2, and 3," Nuclear Unit 2, Diablo Canyon Site, Pacific Gas and Electric Company, 1968.



Distribution:  
 Docket ←  
 DRL Reading  
 RPB-5 Reading  
 R. S. Boyd  
 S. M. Kari  
 W. Haass  
 P. Howe

JUL 18 1969

Docket No. 50-323

Dr. Nathan M. Newmark  
 1114 Civil Engineering Building  
 University of Illinois  
 Urbana, Illinois 61801

Dear Dr. Newmark:

This supplements our previous correspondence to you concerning the proposed Diablo Canyon Unit 2 nuclear reactor. Two copies of Amendment No. 4, dated July 10, 1969, to the application submitted by Pacific Gas and Electric Company are enclosed for your use. This amendment consists of revised pages for incorporation in the Preliminary Safety Analysis Report.

Sincerely yours,

Original signed by  
 Walter Butler

(for) Roger S. Boyd, Assistant Director  
 for Reactor Projects  
 Division of Reactor Licensing

Enclosures:  
 Amendment No. 4, dated  
 July 10, 1969, Diablo  
 Canyon Unit 2

Similar Letter to: White, Waldron

|           |             |           |  |  |  |
|-----------|-------------|-----------|--|--|--|
| OFFICE ▶  | DRL/RPB-5   | DRL/RPB-5 |  |  |  |
| SURNAME ▶ | SMKari:klis | DFKnuth   |  |  |  |
| DATE ▶    | 7/16/69     | 7/18/69   |  |  |  |

Handwritten notes and markings at the top left of the page, including a list of items and a date.

1952 21 100

Original document  
of the...

Handwritten notes at the bottom left, possibly a signature or date.

Handwritten notes at the bottom right, possibly a signature or date.



MAY 16 1969

Distribution:  
Docket ~~XXXXXXXXXX~~  
DRL Reading  
RPB-5 Reading  
R. S. Boyd  
S. M. Kari (2)  
P. Howe  
N. W. Dromerick  
W. Haass

Docket No. 50-323

Dr. Nathan M. Newmark  
1114 Civil Engineering Building  
University of Illinois  
Urbana, Illinois 61801

Dear Dr. Newmark:

This supplements our previous letters to you concerning the proposed Diablo Canyon Nuclear Power Plant, Unit No. 2.

Two copies of Amendment No. 1, dated May 12, 1969, to the application submitted by Pacific Gas and Electric Company are enclosed for your use. This amendment transmits revised pages to be inserted in the Preliminary Safety Analysis Report.

Sincerely yours,

Original Signed by  
Donald F. Knuth

*20*  
Roger S. Boyd, Assistant Director  
for Reactor Projects  
Division of Reactor Licensing

Enclosure:  
As stated above

Identical letters to:  
White (four copies)  
Schneider  
Waldron  
Snoke  
Pack  
Murphy

|           |                         |                       |  |  |  |  |
|-----------|-------------------------|-----------------------|--|--|--|--|
| OFFICE ▶  | RPB-5                   | RL/RPB-5              |  |  |  |  |
| SURNAME ▶ | <i>dmk</i><br>SMKari:dm | <i>DMK</i><br>DFKnuth |  |  |  |  |
| DATE ▶    | 5/15/69                 | 1/6/69                |  |  |  |  |

MAY 1 1961

SECRET  
 (S) [illegible]  
 [illegible]

Original signed by  
 Donald E. Knuth

[illegible]  
 (S) [illegible]  
 [illegible]  
 [illegible]  
 [illegible]

[illegible]  
 [illegible]  
 [illegible]

|  |  |   |                                      |
|--|--|---|--------------------------------------|
| FROM: <b>Nathan M. Newark<br/>Urbana, Ill.</b>   | DATE OF DOCUMENT:<br><b>11-6-68</b>          | DATE RECEIVED<br><b>11-12-68</b>          | NO.:<br><b>4901</b>                  |
| TO: <b>Morris</b>  | LTR. <input checked="" type="checkbox"/>     | MEMO:                                     | REPORT: OTHER:                       |
| CLASSIF.: <b>U</b>   | POST OFFICE                                  | ORIG.: <b>2</b>                           | CC: OTHER:                           |
| REG. NO.:  | FILE CODE:<br><b>50-323</b>                  | ACTION NECESSARY <input type="checkbox"/> | CONCURRENCE <input type="checkbox"/> |
| DESCRIPTION: (Must Be Unclassified)<br><b>Ltr Furnishing comments &amp; questions<br/>on review of PG&amp;E (Diablo Canyon<br/>Site Unit # 2</b> | NO ACTION NECESSARY <input type="checkbox"/> | COMMENT <input type="checkbox"/>          | DATE ANSWERED:<br>BY:                |
| ENCLOSURES:  | REFERRED TO                                  | DATE                                      | RECEIVED BY                          |
|  | <b>DeYoung<br/>W/2 cys for action</b>        | <b>11-12-68</b>                           |                                      |
|  | <b>INFO CYS TO</b>                           |   |                                      |
|  | <b>H. Price &amp; Staff</b>                  |   |                                      |
|  | <b>Morris/Schroeder</b>                      |   |                                      |
|  | <b>Boyd</b>                                  |   |                                      |
|  | <b>Irvine</b>                                |   |                                      |
|  | <b>Skovholt</b>                              |   |                                      |
|  | <b>H. Steele/ Knuth ( Orig &amp; 3 cys</b>   |   |                                      |
| REMARKS:<br><b>DIST: 1- Suppl file until orig returned<br/>1- CGC (T.COMNER)</b>   |  |   | <b>4901</b>                          |

SECRET

NATHAN M. NEWMARK  
CONSULTING ENGINEERING SERVICES

1114 CIVIL ENGINEERING BUILDING  
URBANA, ILLINOIS 61801

6 November 1968

Dr. Peter A. Morris, Director  
Division of Reactor Licensing  
U. S. Atomic Energy Commission  
Washington, D.C. 20545

Re: Contract No. AT(49-5)-2667  
Nuclear Unit 2, Diablo Canyon Site  
Pacific Gas and Electric Company  
AEC Docket 50-323

Dear Dr. Morris:

Dr. W. J. Hall, Dr. A. J. Hendron and I have reviewed the PSAR for Diablo Canyon Site Nuclear Unit 2. In general the design described therein appears to be essentially identical to that for Diablo Canyon Site Unit No. 1. We note that in many places the applicant has updated the PSAR to reflect the information developed in the review of Diablo Canyon Unit No. 1, although not in all places. For the most part we are not asking questions about those items which we believe we can interpret in the light of the discussion that ensued as a part of the application for Diablo Canyon Unit No. 1, although we are requesting clarification on one or two points that fall in this category.

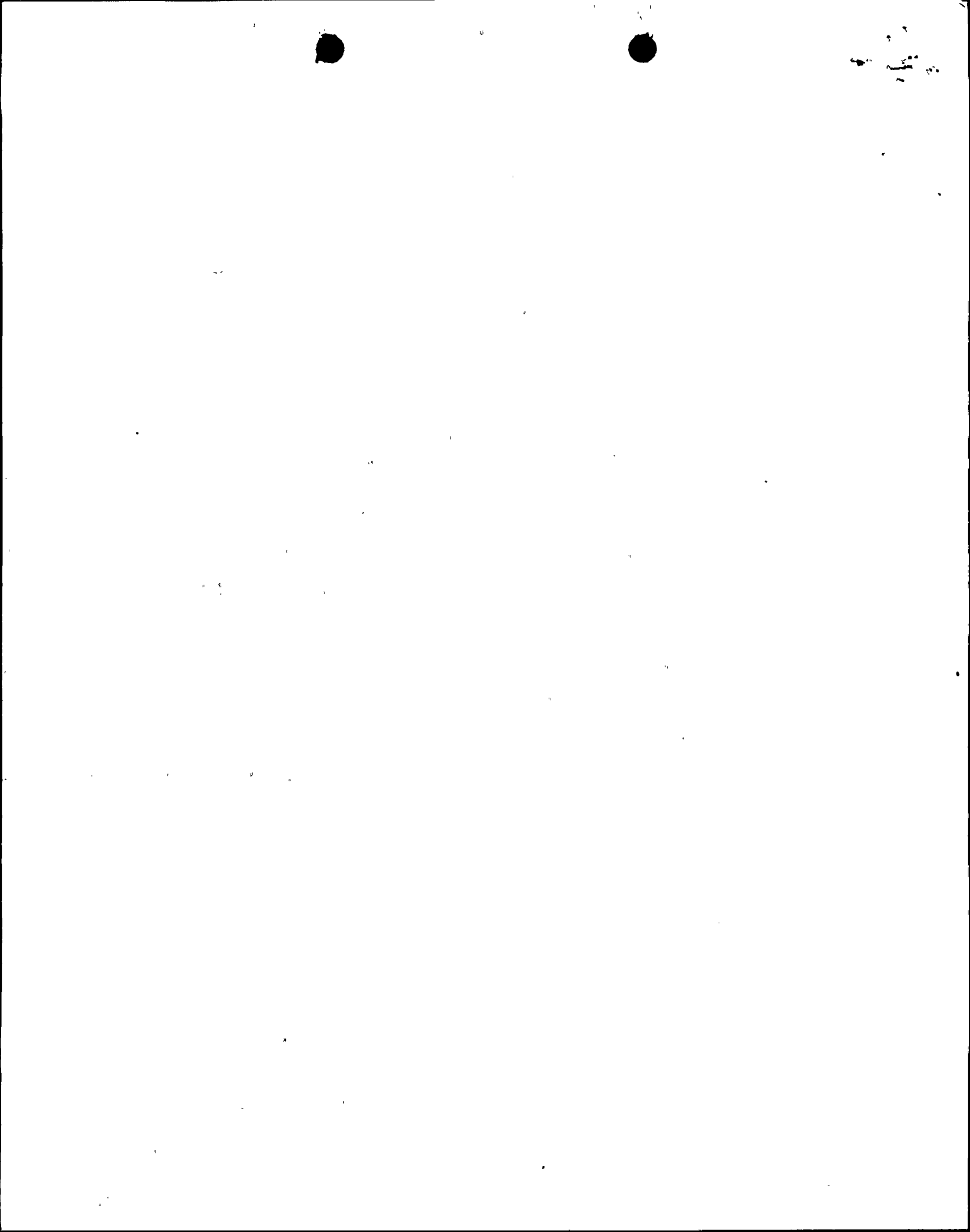
Our questions and comments follow.

1. With reference to the foundation design of Diablo Canyon Units 1 and 2, the following information is requested:

(a) A plan view delineating the proposed slopes behind and/or to the sides of reactor units 1 and 2.

(b) Profiles through each slope surface.

2. It is noted that Class II items taken to mean structures and equipment) are to be designed using a static seismic horizontal coefficient of



0.20 with allowable stresses in accordance with applicable code requirements. The applicant is requested to clarify whether this is the static force for which the design of Class II structures is to be made, in accordance with the working stresses and force distributions in the Uniform Building Code. If this is not what is meant, we should like a description of the procedures planned to be used for the design of Class II structures.

3. Appendix D of the PSAR contains two reports relating to the seismic design of the plant, one dated June 24, 1968, which pertains to Diablo Canyon Unit No. 2, and a report dated January 12, 1967, which evidently dealt with the original Diablo Canyon Unit No. 1 PSAR. Comparison of these two reports indicates that the spectra presented are slightly different. For example, a comparison of the spectra presented in Plate 1 of both reports, which is for Earthquake D, shows that these are not the same. We find no comment in the reports to indicate why there has been a change in the spectra. Clarification of this point is requested, indicating which is to be used for what purposes.

4. The design of the large penetrations is discussed in Section 5 of the PSAR. It is indicated on page 5-39 that the load transfer across the large openings will be achieved by the use of a structural steel ring to which reinforcing bars are welded. The detail provided in the PSAR is not sufficient to evaluate fully the proposed design concept, and the applicant is requested to describe in more detail the nature of the proposed design for the large penetrations.

5. The Class I design procedures presented on page 2-28 of the PSAR and elsewhere indicate that "all modes having a period greater than 0.08 sec. will be included in the analysis." and that in no case will less than 3 modes be considered. This matter was discussed in connection with the Diablo Canyon



10  
11  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25  
26  
27  
28  
29  
30  
31  
32  
33  
34  
35  
36  
37  
38  
39  
40  
41  
42  
43  
44  
45  
46  
47  
48  
49  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60  
61  
62  
63  
64  
65  
66  
67  
68  
69  
70  
71  
72  
73  
74  
75  
76  
77  
78  
79  
80  
81  
82  
83  
84  
85  
86  
87  
88  
89  
90  
91  
92  
93  
94  
95  
96  
97  
98  
99  
100



Unit 1 application, but we should like confirmation from the applicant of our inference that for multiple-degree-of-freedom systems all significant modes will be considered irrespective of whether they fall above or below a period of 0.08 sec.

6. We note with interest and gratification the new section, Appendix 3-C "Seismic Effects on the Reactor," and 4-C, "Support Structures...", which are most helpful in explaining the applicant's intentions and procedures.

Respectfully submitted,

N. M. Newmark

bjw

cc: W. J. Hall  
A. J. Hendron, Jr.  
J. D. Haltiwanger  
W. H. Walker

UNIVERSITY OF CALIFORNIA  
DIVISION OF ENGINEERING  
BERKELEY, CALIF.

NOV 13 1963

U.S. ATOMIC ENERGY COMM.  
REGULATORY  
MAIL & RECORDS SECTION

1968 NOV 12 AM 10 42

RECEIVED

Docket No. 50-323

EST 1 0 1968

Dr. Nathan M. Newmark  
1114 Civil Engineering Building  
University of Illinois  
Urbana, Illinois 61801

RE: Contract No. AT(49-5)-2667

Dear Dr. Newmark:

Nathan M. Newmark Consulting Engineering Services is hereby requested, pursuant to the conditions of Contract No. AT(49-5)-2667, to provide the following services for the Commission concerning the proposed construction of the Diablo Canyon Unit 2 nuclear power unit by the Pacific Gas and Electric Company on its Diablo Canyon site in San Luis Obispo County, California:

1. Analysis of the engineering factors included in the proposed design to minimize damage from seismically-induced ground actions.
2. Preparation of a report on (1) above
3. Serving as an expert witness in the public hearing on this facility.

Monetary ceiling: \$5,000

Period of performance: October 10, 1968 through June 30, 1969

Reporting Requirements: All costs shall be itemized and requests for reimbursement shall be submitted pursuant to Article III of Contract No. AT(49-5)-2667

Other applicable requirements: None

This constitutes a Work Directive pursuant to Article I, paragraph (b) of Contract No. AT(49-5)-2667.

|           |  |  |  |  |  |  |
|-----------|--|--|--|--|--|--|
| OFFICE ▶  |  |  |  |  |  |  |
| SURNAME ▶ |  |  |  |  |  |  |
| DATE ▶    |  |  |  |  |  |  |

to the ...  
...  
...

( )

...

...  
...  
...  
...  
...

...  
...  
...

( )

...  
...

...  
...  
...  
...  
...

( )

( )

Dr. Nathan M. Newmark

2

A copy of Volumes I, II, and III of the Preliminary Safety Analysis Report is enclosed for your review.

Sincerely yours,

Original Signed by  
Peter A. Morris

Peter A. Morris, Director  
Division of Reactor Licensing  
(Authorized Representative for the  
Contracting Officer)

Enclosures:  
Volumes I, II, and III of PSAR  
for Diablo Canyon Unit 2

bcc:  
S. A. Teets, DR  
R. Hart, DC  
H. Jordan, OC  
OGC

Distribution:  
Suppl. ✓  
DR Reading  
DRL Reading  
RPB-5 Reading  
Orig: FWKaras (2)  
P. A. Morris  
R. S. Boyd

(see attached yellow sheet for concurrences)

| OFFICE ▶  | RPB-3/DRL   | DRL     | OGC     | RPB-5/DRL | RP:DRL  | DRL/     |
|-----------|-------------|---------|---------|-----------|---------|----------|
| SURNAME ▶ | FWKaras:emh | NDube   |         | DFKnuth   | RSBoyd  | PAMorris |
| DATE ▶    | 10/10/68    | 10/ /68 | 10/ /68 | 10/ /68   | 10/ /68 | 10/ /68  |

OGC  
H. Jordan, OC  
R. Hart, DC  
S. A. Teets, DR

Distribution:  
N. S. Boyd  
P. A. Morris  
Orig: FWKars (2)  
RFB-2 Reading  
DRL Reading  
DR Reading  
Suppl.

(see attached yellow sheet for concurrences)

|          |            |           |     |     |           |        |        |          |
|----------|------------|-----------|-----|-----|-----------|--------|--------|----------|
| 10/10/68 | FWKars:emh | RFB-3\DRJ | DRL | OGC | RFB-2\DRJ | RSB:yb | RP:DRJ | DRL      |
| 10/10/68 | INDube     |           |     |     | DEKnuth   |        |        | PAMorris |
| 10/10/68 |            |           |     |     |           |        |        |          |

OCT 9 1968

A copy of Volumes I, II, and III of the Preliminary Safety Analysis Report is enclosed for your review.

Sincerely yours,

*Frank Schroeder, Deputy*

*for* Peter A. Morris, Director  
Division of Reactor Licensing  
(Authorized Representative for the Contracting Officer)

Enclosures:  
Volumes I, II, and III of PSAR  
for Diablo Canyon Unit 2

bcc:  
S. A. Teets, REG  
R. Hart, DC  
H. Jordan, OC  
OGC

DISTRIBUTION:  
Suppl. *←*  
DR Reading  
DRL Reading  
RPB-5 Reading  
Orig: FWKaras (2)  
P. A. Morris  
R. S. Boyd

*This Copy is Void due to signature by Frank Schroeder who is Not Authorized to sign for Dr. Peter A. Morris - FWKaras 10/10/68*

*subject to full time blank on p. 1*

|           |                         |                     |                  |                             |                         |                                 |
|-----------|-------------------------|---------------------|------------------|-----------------------------|-------------------------|---------------------------------|
| OFFICE ▶  | RPB-3/DRL<br><i>FWK</i> | DRL<br><i>NDube</i> | OGC<br><i>AM</i> | RPB-5/DRL<br><i>DFKnuth</i> | RP-DRL<br><i>RSBoyd</i> | DRL <sup>FS</sup><br><i>PAM</i> |
| SURNAME ▶ | FWKaras/peg             | NDube               |                  | DFKnuth                     | RSBoyd                  | PAMorris                        |
| DATE ▶    | 10/7/68                 | 10/ /68             | 10/9/68          | 10/8/68                     | 10/9/68                 | 10/9/68                         |

*[Faint, illegible handwritten text]*

*[Faint, illegible handwritten text]*

*[Faint, illegible text]*

*[Faint, illegible text]*

*[Faint, illegible text at the bottom of the page]*



OCT 9 1968

Docket No. 50-323

Dr. Nathan M. Newmark  
1114 Civil Engineering Building  
University of Illinois  
Urbana, Illinois 61801

RE: Contract No. AT(49-5)-2667.

Dear Dr. Newmark:

Nathan M. Newmark Consulting Engineering Services is hereby requested, pursuant to the conditions of Contract No. AT(49-5)-2667, to provide the following services for the Commission concerning the proposed construction of the Diablo Canyon Unit 2 nuclear power unit by the Pacific Gas and Electric Company on its Diablo Canyon site in San Luis Obispo County, California:

1. Analysis of the engineering factors included in the proposed design to minimize damage from seismically-induced ground actions.
2. Preparation of a report on (1) above
3. Serving as an expert witness in the public hearing on this facility.

Monetary ceiling: \$5,000

Period of performance:

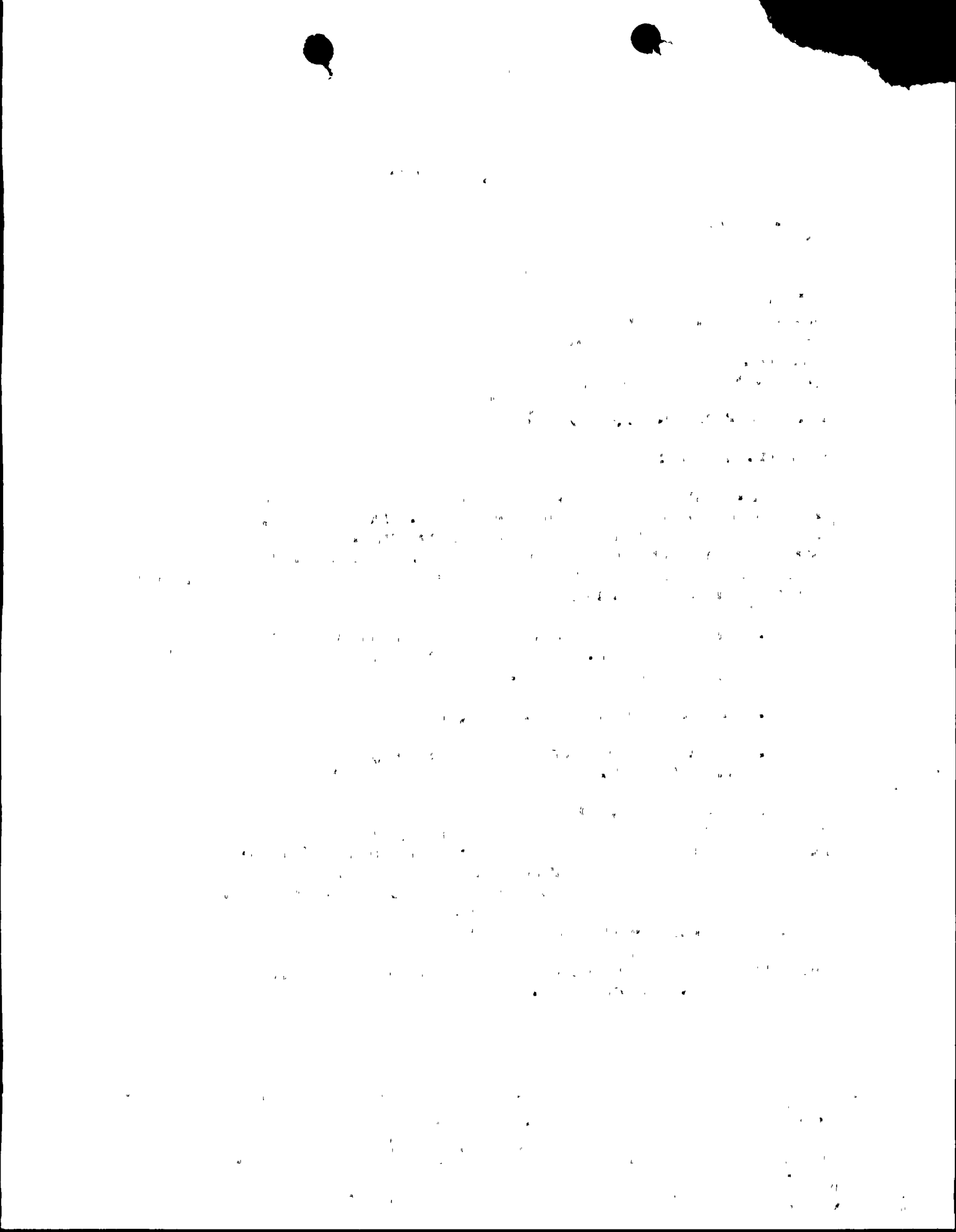
through June 30, 1969

Reporting Requirements: All costs shall be itemized and requests for reimbursement shall be submitted pursuant to Article III of Contract No. AT(49-5)-2667

Other applicable requirements: None

This constitutes a Work Directive pursuant to Article I, paragraph (b) of Contract No. AT(49-5)-2667.

|           |  |  |  |  |  |  |
|-----------|--|--|--|--|--|--|
| OFFICE ▶  |  |  |  |  |  |  |
| SURNAME ▶ |  |  |  |  |  |  |
| DATE ▶    |  |  |  |  |  |  |



FROM: U.S. Dept of Commerce  
 ESSA, Coast & Geodetic Survey  
 Don A. Jones

DATE OF DOCUMENT:  
 6-12-70

DATE RECEIVED  
 6-15-70

NO.:  
 2294

LTR.  MEMO: \_\_\_\_\_ REPORT: \_\_\_\_\_ OTHER: \_\_\_\_\_  
 X

TO: H.L. Price

ORIG.: 1 CC: \_\_\_\_\_ OTHER: \_\_\_\_\_

ACTION NECESSARY  CONCURRENCE  DATE ANSWERED:  
 NO ACTION NECESSARY  COMMENT  BY:

CLASSIF: U POST OFFICE REG. NO:

FILE CODE: 50-323 *Consol.*

DESCRIPTION: (Must Be Unclassified)  
 Ltr furnishing suppl comments on  
 Seismicity for Pacific Gas & Electric  
 Co. Diablo Canyon Unit # 2 & trans  
 (1cys)

| REFERRED TO                   | DATE    | RECEIVED BY | DATE |
|-------------------------------|---------|-------------|------|
| P. Howe<br>W/2 cys for action | 7-22-70 |             |      |

ENCLOSURES:  
 Suppl to the Seismic Evaluation of  
 Diablo Canyon, Unit # 2.

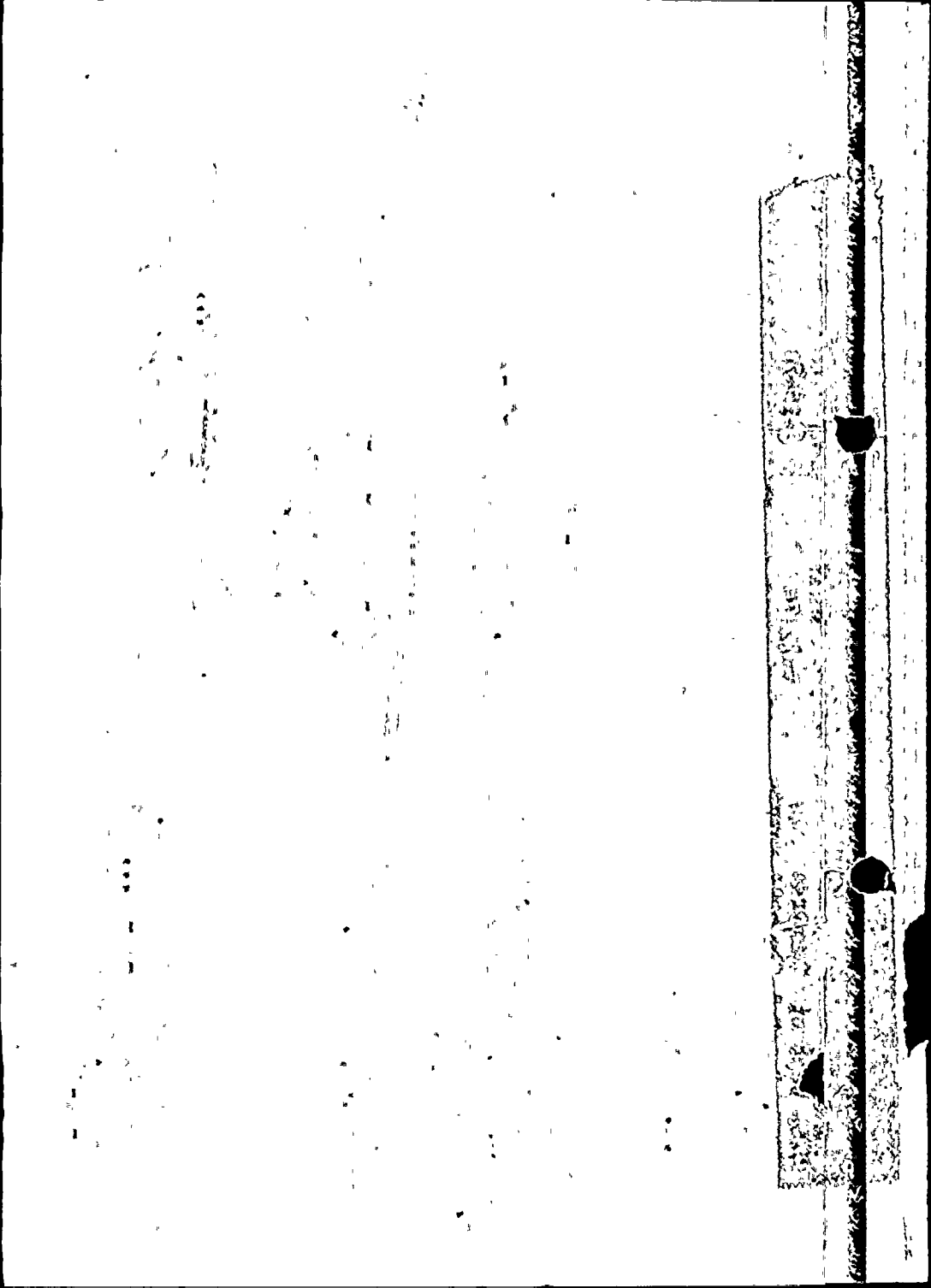
**DISTRIBUTION:**  
 Reg file cy  
 OGC - Room P-506-A  
 H. Price & Staff  
 Norris/Schroeder  
 Case/Maccary  
 Boyd  
 DeYoung  
 Karl/Knuth ~~Orig. to be returned~~

*Do Not Remove*

REMARKS:  
 NOTE: Above hand carried to Mr.  
 Malsch, OGC 6-15-70...rec'd  
 in Reg. file room for docketing  
 7-22-70

~~Orig. to be returned to room 016~~  
*no existent.*

FEL





U.S. DEPARTMENT OF COMMERCE  
Environmental Science Services Administration  
COAST AND GEODETIC SURVEY  
Rockville, Md. 20852

JUN 12 1970

Reply to  
Attn of: C23

Mr. Harold L. Price  
Director of Regulation  
U. S. Atomic Energy Commission  
Washington, D. C. 20545

Dear Mr. Price:

In accordance with your request, we are forwarding the supplement to our report on the seismicity of the Diablo Canyon, California, area. The Coast and Geodetic Survey has reviewed and evaluated the recent geological and seismological information concerning the region around the Diablo Canyon Nuclear Station, Unit 2, and we are submitting our conclusions as to its significance.

Sincerely,

*Don A. Jones*

Don A. Jones  
Rear Admiral, USESSA  
Director, C&GS

Enclosure

2294d



Supplement to the Seismic Evaluation of the Diablo Canyon  
Nuclear Power Plant Unit #2, AEC Docket 50-323

This supplement is in response to the request of the Atomic Energy Commission to evaluate the significance of some recent geological and seismological information concerning the region around the Pacific Gas and Electric Company's Diablo Canyon Nuclear Station, Unit 2. Reference has been made by an intervener to two features that have come to light since the completion of the geologic and seismologic evaluation of the site. The first feature consists of a number of moderate earthquakes that have occurred in the offshore region southwest of the Diablo Canyon site that appear to be defining a north-east trending seismic zone. The second feature referred to is the Edna Fault Zone which is located north and east of the site. The Coast and Geodetic Survey has reviewed the data on file, conferred with Geological Survey geologists and marine geophysicists, and has considered the possible effect of these two features on the seismic evaluation of the Diablo Canyon Nuclear Station, Unit 2.

Offshore Earthquakes

Since June 12, 1969, the Coast and Geodetic Survey has routinely located 25 earthquakes in this offshore region. Their magnitudes range from 3.7 to 5.9 and the

1945-1946

1945-1946

1945-1946

1945-1946

1945-1946

1945-1946

1945-1946

1945-1946

1945-1946

1945-1946

1945-1946

1945-1946

1945-1946

1945-1946

1945-1946

1945-1946

1945-1946

1945-1946

1945-1946

1945-1946

1945-1946

1945-1946

1945-1946

1945-1946

1945-1946



locations are computed from readings of 6 to 131 seismic stations. While the depths of these events are difficult to determine accurately, it is believed that none are greater than 25-33 km and some are as shallow as 10 km. Their distances from the Diablo Canyon site range southwardly and approximately 20 miles to 120 miles. The attached table gives the location, depth, magnitude, and the number of stations reporting for each earthquake.

In the past, two other earthquakes, including the 1927 magnitude 7.3 event, have occurred within the area described by the recent events. In addition, the historical record shows that 10 additional earthquakes with magnitudes less than 5, have occurred in a 120 mile alignment near the shoreline and trend in a general NW-SE direction with the closest approach about 15 miles from the Diablo Canyon site. This alignment includes one of the 1969 events.

The conclusion of the Geological Survey's report on this subject states that "The major structural patterns of offshore and onshore geology consist of NW-SE trending parallel belts of folds, faults, and basement rock highs." This report further states that "There is no geologic evidence to support a northeastward structural trend in the offshore area of earthquake epicenters."

[The text on this page is extremely faint and illegible, appearing to be a series of lines of typed or printed text.]

Although an examination of the alignment of the recent offshore seismic activity suggests an apparent NE-SW lineation of the earthquake locations, there is no basis for concluding that they delineate a NE-SW trending fault in view of the geologic structural information presented by the Geological Survey. On the contrary it is logical to conclude that they are associated with the established NW trending structural features because the above mentioned 25 earthquakes may be aligned with them, thereby substantiating sources for the origins of these earthquakes.

Since there is no geological structure trending in a NE direction from the source of the 1927 earthquake, there is no basis for concluding that a 1927 offshore type earthquake could occur near the plant site.

#### Edna Fault Zone

A review of the seismicity of the onshore area around the Diablo Canyon site by the Coast and Geodetic Survey indicates that this particular region of California is devoid of activity as reported in historical files or as instrumentally determined by close-in seismic stations. Therefore, there is no apparent correlation of seismic events with the Edna Fault Zone.



It is the conclusion of the Coast and Geodetic Survey that the offshore earthquake activity and Edna Fault Zone do not have a significant bearing on the earthquake potential for this site because they present a hazard much less than that already considered in the evaluation of the site.

U. S. Coast and Geodetic Survey  
Rockville, Maryland 20852

June 11, 1970

... ..  
... ..  
... ..  
... ..  
... ..

... ..  
... ..  
... ..

PRELIMINARY DETERMINATION OF EPICENTERS

| DAY<br>GMT | ORIGIN TIME |    |      | GEOGRAPHIC<br>COORDINATES |         | DEPTH<br>KM. | MAGNITUDE | NO.<br>STA |
|------------|-------------|----|------|---------------------------|---------|--------------|-----------|------------|
|            | HR          | MN | SEC  | LAT                       | LONG    |              |           |            |
| 1969       |             |    |      |                           |         |              |           |            |
| JUNE       |             |    |      |                           |         |              |           |            |
| 12         | 11          | 18 | 53.2 | 34.2 N                    | 121.0 W | 22           | 4.3       | 6          |
| SEPT.      |             |    |      |                           |         |              |           |            |
| 6          | 13          | 44 | 46.1 | 35.2 N                    | 121.1 W | 13           | 4.0       | 22         |
| OCT.       |             |    |      |                           |         |              |           |            |
| 22         | 17          | 34 | 13.2 | 34.6 N                    | 121.7 W | 15G          | 4.7       | 14         |
| 22         | 22          | 51 | 33.5 | 34.8 N                    | 121.3 W | 15G          | 5.9       | 131        |
| 23         | 00          | 03 | 34.4 | 34.9 N                    | 121.3 W | 10           | 5.0       | 28         |
| 23         | 02          | 05 | 47.2 | 34.9 N                    | 121.3 W | 10           | 3.9       | 16         |
| 23         | 03          | 43 | 14.9 | 34.8 N                    | 121.5 W | 10           | 4.0       | 15         |
| 23         | 04          | 33 | 22.8 | 34.6 N                    | 121.6 W | 16           | 4.2       | 10         |
| 23         | 06          | 41 | 21.0 | 34.6 N                    | 121.6 W | 15G          | 4.0       | 12         |
| 23         | 07          | 19 | 02.9 | 34.5 N                    | 121.6 W | 15G          | 4.0       | 10         |
| 23         | 16          | 38 | 03.0 | 34.6 N                    | 121.5 W | 10           | 4.6       | 16         |
| 24         | 13          | 12 | 09.7 | 34.8 N                    | 121.3 W | 15G          | 4.6       | 15         |
| 24         | 19          | 13 | 07.4 | 34.8 N                    | 121.4 W | 15G          | 3.7       | 14         |
| 28         | 00          | 22 | 33.7 | 34.3 N                    | 121.9 W | 26           | 4.5       | 22         |
| 30         | 15          | 36 | 19.1 | 34.2 N                    | 120.8 W | 10           | 4.2       | 10         |
| 31         | 09          | 12 | 13.6 | 34.6 N                    | 121.5 W | 10           | 5.0       | 17         |

100-100000

UNITED STATES DEPARTMENT OF JUSTICE

| REPORT MADE AT | DATE MADE | NAME OF PERSON OR CONCERN | CHARACTER OF BUSINESS | REPORT MADE BY |
|----------------|-----------|---------------------------|-----------------------|----------------|
|----------------|-----------|---------------------------|-----------------------|----------------|

4



NOV.

|    |            |        |         |   |     |     |
|----|------------|--------|---------|---|-----|-----|
| 4  | 00 40 46.4 | 34.8 N | 121.3 W | N | 4.9 | 23  |
| 5  | 17 54 13.6 | 34.8 N | 121.2 W | N | 5.8 | 109 |
| 5  | 18 48 48.9 | 34.8 N | 121.2 W | N | 5.1 | 33  |
| 8  | 00 33 19.9 | 34.2 N | 122.3 W | N | 4.7 | 18  |
| 9  | 01 27 40.8 | 34.4 N | 121.6 W | N | 4.7 | 11  |
| 10 | 19 21 27.3 | 34.6 N | 121.5 W | N | 4.6 | 20  |

DEC.

|   |            |        |         |   |     |    |
|---|------------|--------|---------|---|-----|----|
| 3 | 22 10 37.1 | 34.6 N | 121.5 W | N | 4.5 | 21 |
|---|------------|--------|---------|---|-----|----|

1970

JAN.

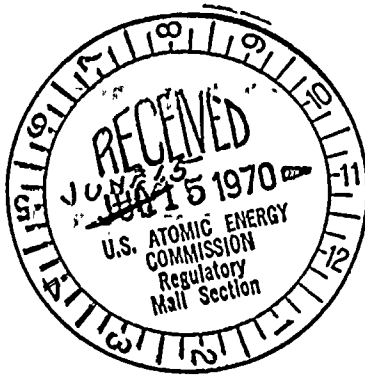
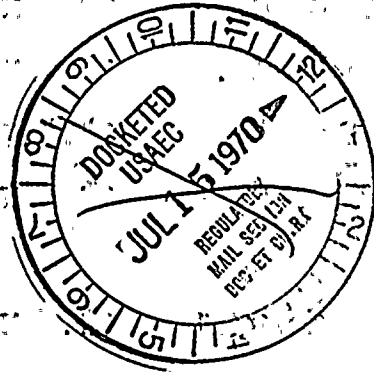
|   |            |        |         |   |     |    |
|---|------------|--------|---------|---|-----|----|
| 8 | 17 00 33.2 | 34.4 N | 121.7 W | N | 4.4 | 18 |
|---|------------|--------|---------|---|-----|----|

FEB.

|    |            |        |         |     |     |    |
|----|------------|--------|---------|-----|-----|----|
| 23 | 07 52 11.9 | 34.5 N | 121.8 W | 10G | 4.3 | 19 |
|----|------------|--------|---------|-----|-----|----|

G - Depth held by Geophysicists

N - Normal depth - 25 km



June 4, 1969

Docket No: 50-323

Distribution:  
Docket  
DRL Reading  
RPB-5 Reading  
R. S. Boyd  
S. M. Kari  
P. Howe  
A. W. Dromerick  
W. Haass

Mr. Howard H. Waldron  
U. S. Geological Survey  
Engineering Geology Branch  
Denver Federal Center  
Denver, Colorado 80225

Dear Mr. Waldron:

This supplements our previous letters to you concerning the proposed Diablo Canyon Nuclear Power Plant, Unit No. 2.

A copy of Amendment No. 2, dated May 28, 1969, to the application submitted by Pacific Gas and Electric Company is enclosed for your use. This amendment transmits revised pages to be inserted in the Preliminary Safety Analysis Report.

Sincerely yours,

Original Signed by  
Donald F. Knuth

*for*

Roger S. Boyd, Assistant Director  
for Reactor Projects  
Division of Reactor Licensing

Enclosure:  
As stated above

Identical letters to:  
White (F&WS) - 4 copies  
Newmark - 2 copies

|           |                         |                        |  |  |  |  |
|-----------|-------------------------|------------------------|--|--|--|--|
| OFFICE ▶  | RPB-5/DRL<br><i>smk</i> | RPB-5/DRL<br><i>DK</i> |  |  |  |  |
| SURNAME ▶ | SMKari: smk             | DFKnuth                |  |  |  |  |
| DATE ▶    | 6/3/69                  | 6/3/69                 |  |  |  |  |

1  
2  
3  
4  
5  
6  
7  
8  
9  
10  
11  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25  
26  
27  
28  
29  
30  
31  
32  
33  
34  
35  
36  
37  
38  
39  
40  
41  
42  
43  
44  
45  
46  
47  
48  
49  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60  
61  
62  
63  
64  
65  
66  
67  
68  
69  
70  
71  
72  
73  
74  
75  
76  
77  
78  
79  
80  
81  
82  
83  
84  
85  
86  
87  
88  
89  
90  
91  
92  
93  
94  
95  
96  
97  
98  
99  
100

101  
102  
103  
104  
105  
106  
107  
108  
109  
110  
111  
112  
113  
114  
115  
116  
117  
118  
119  
120  
121  
122  
123  
124  
125  
126  
127  
128  
129  
130  
131  
132  
133  
134  
135  
136  
137  
138  
139  
140  
141  
142  
143  
144  
145  
146  
147  
148  
149  
150  
151  
152  
153  
154  
155  
156  
157  
158  
159  
160  
161  
162  
163  
164  
165  
166  
167  
168  
169  
170  
171  
172  
173  
174  
175  
176  
177  
178  
179  
180  
181  
182  
183  
184  
185  
186  
187  
188  
189  
190  
191  
192  
193  
194  
195  
196  
197  
198  
199  
200

201  
202  
203  
204  
205  
206  
207  
208  
209  
210  
211  
212  
213  
214  
215  
216  
217  
218  
219  
220  
221  
222  
223  
224  
225  
226  
227  
228  
229  
230  
231  
232  
233  
234  
235  
236  
237  
238  
239  
240  
241  
242  
243  
244  
245  
246  
247  
248  
249  
250  
251  
252  
253  
254  
255  
256  
257  
258  
259  
260  
261  
262  
263  
264  
265  
266  
267  
268  
269  
270  
271  
272  
273  
274  
275  
276  
277  
278  
279  
280  
281  
282  
283  
284  
285  
286  
287  
288  
289  
290  
291  
292  
293  
294  
295  
296  
297  
298  
299  
300

301  
302  
303  
304  
305  
306  
307  
308  
309  
310  
311  
312  
313  
314  
315  
316  
317  
318  
319  
320  
321  
322  
323  
324  
325  
326  
327  
328  
329  
330  
331  
332  
333  
334  
335  
336  
337  
338  
339  
340  
341  
342  
343  
344  
345  
346  
347  
348  
349  
350  
351  
352  
353  
354  
355  
356  
357  
358  
359  
360  
361  
362  
363  
364  
365  
366  
367  
368  
369  
370  
371  
372  
373  
374  
375  
376  
377  
378  
379  
380  
381  
382  
383  
384  
385  
386  
387  
388  
389  
390  
391  
392  
393  
394  
395  
396  
397  
398  
399  
400