Distribution:
Docket File
NRC PDR
Local PDR
LWR #1 File
J. F. Stolz
D. P. Allison
E. G. Hylton
J. Tourtellotte
L. D. Davis
R. Goddard

AUG 04 1978

Docket Nos: 50-275
and 50-323

MEMORANDUM FOR: John F. Stolz, Chief, Light Water Reactors Branch No. 1, Division of Project Management

FROM: D. P. Allison, Project Manager, Light Water Reactors Branch No. 1, Division of Project Management

SUBJECT: INFORMAL QUESTIONS - DIABLO CANYON NUCLEAR POWER PLANT, UNITS 1 & 2

The attached draft questions on various subjects were provided informally to Pacific Gas and Electric Company during the past few months. Most have been resolved. Those dated 4/5/78 regarding seismic qualification are to be discussed with the applicant during our audits on this subject.

The purpose of this memorandum is to distribute the material to the parties and the public document rooms.

Original signed by:

D. P. Allison, Project Manager
Light Water Reactors Branch No. 1
Division of Project Management

Enclosure:
Draft Questions

cc:
See next page

M4
GD

| OFFICE➤ | DPM:LWR #1 | DPM:LWR #1 | | | | |
|---|---|---|---|---|---|---|
| SURNAME➤ | DPAllison:pcm | JFStolz | | | | |
| DATE➤ | 07/ /78 | 07/ /78 | | | | |

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| OFFICE | DPM:LWR #1 | DPM:LWR #1 | | | | |
|---|---|---|---|---|---|---|
| SURNAME | DPAllison:pcm | JFStolz | | | | |
| DATE | 8/1/78 | 8/03/78 | | | | |

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ECCS ANALYSIS 03/16/78

DRAFT QUESTIONS T

1) What is the corresponding flow reduction for such cell closure?

2) Does the reported cell closure represent average value or an upper-bound value?

3) How many tests were performed?

4) What was the load recorded in the load cell for the tests, and what was the corresponding kinetic energy and velocity of the pendulum at the time of impact?



5) What was the percent increase in equivalent kinetic energy and velocity above Per?

6) How many times was the impact repeated?

3/20/78 - DRAFT RESPONSE - ENVIRONMENTAL QUALIFICATION

1) Potential Problem with Containment Electrical Penetration Assemblies

Recent operating experience at Misstone Unit No. 2 has shown that the deterioration of the epoxy insulating between splices has caused electrical shorts between conductors within a containment electrical penetration assembly. Your response dated March 2, 1978 to IE Bulletin No. 77-07 implies that your design is dependent on the dielectric characteristics of this epoxy insulation. Indicate what tests and/or analysis that have been performed to demonstrate the acceptability of the design in this regard. Provide whatever information is required to perform an independent evaluation of this aspect of the electrical penetration design.

2) Qualification of Splices, Connectors, and Terminal Blocks for Class 1E Circuits

The Regulatory staff is currently evaluating all nuclear facilities to determine the adequacy of the environmental qualification testing of electrical splices connectors, and terminal blocks used in safety-related systems located inside or outside containment and required to function in an accident or post accident environment.

Identify each type of splices, connectors, and terminal block subject to accident environments. Describe how each is environmentally qualified.

3) Environmental Qualification

Provide a list of all Class 1E equipment located inside containment and outside containment that can be exposed to a severe environment such as LOCA or steam line break outside containment. This list should include the equipment function, location, manufactuer, manufacturer model number, manufacturer type number and citation as to where qualification is documented, i.e. WCAP xxxx, FSAR section xx, Test Report No. xxx at site, etc.

4) Seismic and Environmental Qualification of Steam Mounted Limit Switches

In a letter to NRC, J. F. Stolz, from Westinghouse, C. Eicheldinger, dated August 17, 1977, Westinghouse indicated that stem mounted limit switches associated with certain motor operated valves and certain air operated valves used for containment isolation and ECCS alignment should be designed as safety related and receive seismic and environmental qualification. In this regard, identify the subject limit switches and describe their seismic and environmental qualification.

5) Qualification of Safety Related Cable

The Regulatory staff is currently requesting, of all plants in OL review, information on the use of poleythelene type cable in safety systems. These type cables were found to have degraded considerably after many years of installed operation at the Savnnah fuel processing plant.

Identify all safety related cable used in your design that has polyethelene in its construction. Provide the following information for each type of cable identified:

a) Type of cable by name and Cat. No.

b) Manufacturer

c) Type of polyethelene used

d) How is the polyethelene used in the cables construction, i.e., insulation and/or jacket.

e) Results of environmental qualification tests performed.

6) Qualification of Penetrations

Describe how your design meets the recommendations of Regulatory Guide 1.63, Revision 1.

Identify each type of electrical circuit that penetrates containment. Describe the primary and backup over current protection systems provided for each type of circuit. Describe the fault-current-versus-time for which the primary and backup protection systems and the penetrations are designed and qualified.

Provide coordinated curves which demonstrate, for each circuit identified, that the maximum fault-current-versus-time condition to which the penetration and cable were qualified will not be exceeded.

Describe the provision for periodic testing under simulated fault conditions.

7). Qualification of Westinghouse Fan Cooler Motor Units

The results of a heat transfer analysis, have been requested to demonstrate that the Fan Cooler motors heat exchanger has the capability of maintaining the motor's air inlet temperature below 57°C for normal, 75°C for DBA, and 58°C for post DBA operation.

In response to our request for a heat transfer analysis information for only post DBA operation was provided with PG&E letter to NRC dated February 10, 1978. The information is incomplete and therefore unacceptable.

Provide the subject heat transfer analysis.

## ECCS ANALYSIS ON COOLABILITY

1. The blockage effect due to deformed grids may be concentrated in one or two rows of rods. Analysis of flow conditions for these rods with bundle average blockage is non-conservative. Provide analyses assuming that the maximum blockage applies to the entire bundle.

2. Provide the basis for assuming that FLECHT data from "typical" bundles is applicable to deformed bundles.

## SYSTEMS FOR SAFE SHUTDOWN

1. Describe how operator has sufficient indication in control room to perform shutdown. Include rationale for why redundant indication not required for valve position, etc.

PART 2 OF 3 MIS
SEISMIC QUALIFICATION

4/5/78

1) (10.3.2) (3.10.2)

Seismic Qualification: Auxiliary Safeguards Cabinet

The Auxiliary Safeguards Cabinet contains relays that receive signals from the Solid State Protection System and upon actuation, close or open contacts that operate safeguards devices, mostly valves.

Not specifically in Bergs report. could be part of SSPS page 36, 39, 40, 41

Information in regard to the electrical operability during seismic tests of the Auxiliary Safeguards Cabinet and associated relays has not been described in Section 10.3.2 of the FSAR amendment 50 or in Section 3.10 of the FSAR. The Auxiliary Safeguards Cabinet may be structurally identical to the safeguard test cabinet; however, they are not electrically identical. Provide information in regard to the electrical functions monitored during seismic shaking in order to demonstrate the seismic adequacy of the Auxiliary Safeguards Cabinet.

2) (10.3.10) (3.10.2)

Seismic Qualification: Instrument AC Inverter (Static Inverter)

page 14 & 15 of Civil report acceptable

The static inverters' function is to supply uninterrupted 118-volt, 60 Hz power to the vital AC instrument bus. The inverter operates from two power sources: a DC voltage source or a 480 volt AC source. In normal operation, the 480 volt AC source supplies power to the inverter. In the event of an AC power failure, the DC voltage source supplies power to the inverter.

It appears from the information in the FSAR that the power source's to the inverter were not changed from the AC source to the DC source during seismic shaking. Provide justification that the tests performed demonstrate the seismic adequacy of the static inverter.

3) (10.3.15) (3.10.2) Seismic Qualification: Main Control Board

Provide information in regard to the seismic qualification of individual Class 1E instruments and/or controls mounted on the Main Control board.

4) (10.3.16) (3.10.2) Seismic Qualification: Nuclear Instrumentation System

The Nuclear Instrumentation System monitors the neutron flux level and provides reactor trip signals if certain power limits are exceeded.

a) Only the power range channel was energized and monitored during seismic testing. Therefore, it appears that the source range and intermediate range channels, required for reactor start-up and shutdown protection, have not been seismically qualified. Provide justification.

Section 7.5 of the FSAR indicates that the occurrence of a seismic event does not render the source and intermediate range channels inoperative. However, Section 3.10.2 of the FSAR (page 3.10-4) indicates that the source and intermediate range channels

are not required to be seismically qualified since any design basis accident described in the FSAR can be terminated within acceptable limits by the power range channels. Provide justification for this apparent inconsistency.

b) Section 3.10.2 of the FSAR (page 3.10-4) indicates that neutron detectors for the nuclear instrumentation system power range channel are seismically qualified. However, the seismic information for neutron detectors does not appear to be in WCAP-7821, WCAP-8021, or the seismic evaluation for postulated 7.5M Hosgri earthquake. (Amendment 50 to the FSAR). Provide the seismic qualification test information for neutron detectors associated with the power range channel as well as those detectors associated with the source and intermediate range channels.

c) Westinghouse committed to retesting an entire typical channel of the nuclear instrumentation system (including signal conditioning circuits and bistables) to verify that the bistables have the capability to change state during a seismic event. Section 10.3.16.2 of the FSAR amendment 50 implies that only bistables have undergone additional testing versus an entire typical channel. Justify the retesting of only the bistables.

d) Two tests were performed to demonstrate the functional operability of bistables as documented in WCAP-8831, Seismic operability demonstration testing of the Nuclear Instrumentation System Bistable Amplifiers. Test 1 (referenced as test 2 in WCAP-8831 Section 5-15) indicates all bistables tripped as required except for the negative rate bistable. The negative bistable was not

tested during the seismic shaking. Test 2 (referenced as test 5 in WCAP-8831 section 5-18) indicates 5 of 6 bistables operated as required during the test; however, it appears that the bistables were not tripped and therefore not tested during the seismic shaking as required. The overpower-high range bistable experienced an unexplained trip. And the negative rate bistable was (again as in test 1) not tested. Provide justification that these two tests demonstrate the seismic adequacy of the Nuclear Instrumentation System.

5) (10.3.17) (3.10.1) Seismic Qualification: Pressure and Differential Pressure Transmitters

Pressure and Differential Pressure Transmitters sense the pressurizer level and pressure, and the steam generator feedwater/system level, pressure, and flow. The output from these transmitters are sent to the process control system equipment which generates the various reactor trips and safeguards actuation signals.

page 23.2.1-1 Davis report

a) PG&E's response dated October 3, 1977 to an NRC Question Number 3.104 states that certain instruments are to be replaced, Steam Generator Narrow Range Level and Pressurizer Level. Confirm that these instruments are in fact the Pressure and Differential Pressure Transmitters being replaced. Provide the seismic qualification information for the replacement instruments, Steam Generator Narrow Range Level, Pressure Level, Reactor Coolant System Pressure, and Containment Sump Level.

b) The electric test results for the transmitters, described in Section 10.3.17.2 of the FSAR Amendment 50, demonstrated that the output oscillated around the normal signal level. These oscillations could cause trips depending on the monitored variables and the trip point. The tests do not demonstrate that the equipment is capable of meeting its performance specifications under service conditions (during seismic shaking). Provide justification that the tests performed demonstrate the seismic adequacy of the transmitters. (Dan reviewed and found acceptable).

c) The Fischer & Porter transmitter, No. 13D2495 measures Steam Generator Level, was not tested, but was qualified by comparison to the Steam Generator Flow transmitter No. 10B2496, that was tested. Justify the assumption, made on page 4-7 of WCAP-8021, Seismic Testing and Electrical and Control Equipment (PG&E plants), that the output of 13D2495 would offset in a similar fashion under seismic excitation as 10B2496.

d) The transmitter were only tested at ~~since~~ some normal valve as indicated in section 10.3.17.2 of the FSAR Amendment 50. Define normal value and justify not testing over the full range of pressures, levels, or flows that these transmitters would be expected to operate.

6) Seismic Qualification: Process Control and Protection Equipment

(10.3.19)
(3.10.2)

The Process Control and Protection equipment contains signal conditioning equipment for monitoring pressurizer water level and pressure, containment pressure, reactor coolant flow and temperature, and steam generator water level and pressure, etc.

a) Confirm that the process control and protection equipment referenced in Section 10.3.19 of the FSAR Amendment 50, and page 3.10-6 of the FSAR is the same as Westinghouse CID Process Equipment referenced in WCAP-8021 Section 2-4.

b) Westinghouse committed to retesting entire typical channels of the process control and protection equipment (including signal conditioning circuits and bistables) to verify that the bistables have the capability to change state during a seimsic event. Section 10.3.19.1 of the FSAR amendment 50 implies that only bistables have undergone additional testing versus an entire typical channel. Justify that the retesting of only bistables demonstrates the seismic adequacy of the process control and protection equipment.

7) Seismic Qualification: Reactor Trip Switchgear

(10.3.20)
(3.10.2)

This equipment consists of two circuit breakers in series which interrupt power to the control rod drives. This interruption of power releases the rods, which fall by gravity to shut down the nuclear reactor.

page 37 Items Repl

The basis for determining the functional integrity of the equipment (as indicated in WCAP 7821 supplement #4) was that all breaker outputs, including secondary contact outputs to the various protection systems, electrically maintain proper contact condition of open or closed position. It appears that the capability of the contacts to change position during a seismic event was not tested. Provide justification for monitoring only proper contact conditions of open or closed versus tests with contacts open, with contacts closed, and with contacts changing position.

8) (10.3.22) (3.10.2) Seismic Qualification: Solid State Protection System

The solid state protection system provides reactor trip and/or engineered safety feature action. The equipment tested consists of three cabinets and represent one logic train of the protection system. The input cabinet containing relays, the logic cabinet, and the output cabinet containing master and slave relays.

Dow's report page 38, 39, 40, 41

a) The solid state protection system also consists of process instrumentations bistables and field contacts that appear not be contained in the three cabinets tested as indicated in Section 10.3.22 of the FSAR amendment 50. Describe the seismic qualification for the subject process instrumentations bistables and field contacts.

b) The functional integrity of the solid state protection system was demonstrated, as indicated in Section 10.3.22 of the FSAR amendment 50, contacts that provide signals for undervoltage trip, train ~~turnible~~ trouble, and safety injection. Justify how the functional integrity of the solid state protection system is demonstrated by only monitoring three relay contacts.

c) Provide the seismic qualification test results which demonstrates the electrical functionability for the relays located in the input cabinet and for the master relays located in the output cabinet of the solid state protection system.

d) Provide the seismic qualification test results which demonstrate the electrical functionability of the solid state protection system logic cabinet.

9) (10.3.27) (No FSAR Reference) Seismic Qualification: Resistance Temperature Detectors

Resistance temperature detectors sense the temperature in the main coolant loops.

a) Sections 3.10 of the FSAR and 10.3.2.8 of the FSAR Amendment 50 do not provide descriptive information as to this safety function of resistance temperature detectors installed at Diablo Canyon. Provide descriptive information.

pg's 43, 44, 45 & Dmnt report

b) Identify by manufacturer and model number Class 1E Resistance Temperature Detectors (RTD) being used at Diablo Canyon.

c) Section 10.3.27 of the FSAR amendment 50 implies that a much more severe function-verification test was performed on resistance temperature detectors than was reported in WCAP-8234A, Seismic testing and Functional Verification of By-Pass Loop Reactor Coolant RTD's. For this much more severe test, provide the test set up details and test results.

d) Verify that RTD's at Diablo Canyon are installed in the Reactor Coolant By-Pass Loop.

e) Verify that Ref. 62 finds WCAP 8234A acceptable for high seismic plants (0.4g).

10) Seismic Qualification: Safeguards Test Cabinet

(10.3.28)
-(3.10)

Selected relays, switches, and components were continuously monitored during seismic testing as indicated in WCAP-8021, Supplement 1 Seismic Testing of Electrical and Control Equipment (Engineered Safeguards test Cabinet for PG&E Plants), May 1977.

Dain report page 32 & 33

Provide electrical schematic diagrams of the test cabinet circuitry, describe the test set up, and identify the selected relays, switches, and components monitored during testing. Justify the seismic adequacy of relays, switches, and components that were not monitored during seismic testing.

DRAFT QUESTIONS

DATA SUBMITTED WAS NOT SUFFICIENT

## REQUEST FOR ADDITIONAL FINANCIAL INFORMATION

1.a. Indicate the estimated annual cost by year to operate the subject facility for the first five full years of commercial operation. The types of costs included in the estimates should be indicated and include (but not necessarily be limited to) operation and maintenance expense (with fuel costs shown separately), depreciation, taxes and a reasonable return on investment. (Enclosed is a form which should be used for each year of the five year period.) Indicate the projected plant capacity for the unit each year.

b. Detail costs similar to response to questions 1(a) above, but using a postulated 50 percent plant capacity factor for each of the first five years of operation.

c. Indicate the unit price per KWH experienced by each applicant on system wide sales of electric power to all customers for the most recent twelve month period.

2. Indicate the estimated costs of permanently shutting down the facility, a listing of what is included in such costs, the assumptions made in estimating the costs, the type of shutdown contemplated, and the source of funds to cover these costs.

3. Provide an estimate of the annual cost to maintain the shutdown facility in a safe condition. Indicate what is included in the estimate, assumptions made in estimating costs, and the source of funds to cover these costs.

4.a. Provide for each participant, copies of the prospectus for the most recent security issue and copies of the most recent SEC Form 10-K. Provide copies of the preliminary prospectus for any pending security issue. Submit copies of the Annual Report to Stockholders each year as required by 10 CFR 50.71(b).

b. Describe aspects of each participant's regulatory environment including, but not necessarily limited to, the following: prescribed treatment of allowance for funds used during construction and construction work in progress; form of rate base (original cost, fair value, other); accounting for deferred income taxes and investment tax credits; fuel adjustment clauses in effect or proposed; historical, partially projected, or fully projected test year.

c. Describe the nature and amount of each participant's most recent rate relief action(s). In addition, indicate the nature and amount of any pending rate relief action(s). Use the attached form to

provide this information. Provide copies of the submitted financially-related testimony and exhibits of the staff and company in the most recent rate relief action or pending action. Furnish copies of the hearing examiner's report and recommendation, and final opinion last issued with respect to each participant.

d. Complete the enclosed form entitled, "Financial Statistics," for the calender years 1977, 1976, and 1975.

ATTACHMENT FOR 1.a.

ESTIMATED ANNUAL COST OF OPERATING NUCLEAR GENERATING
UNIT: Diablo Canyon Unit No. 2
FOR THE CALENDAR YEAR 19___

(thousands of dollars)

| | |
|---|---|
| Operation and maintenance expenses | |
| Nuclear power generation | |
| Nuclear fuel expense (plant factor _____%) | $_____ |
| Other operating expenses | _____ |
| Maintenance expenses | _____ |
| Total nuclear power generation | _____ |
| Transmission expenses | _____ |
| Administrative and general expenses | |
| Property and liability insurance | _____ |
| Other A.&G. expenses | _____ |
| Total A.&G. expenses | _____ |
| TOTAL O&M EXPENSES | _____ |
| Depreciation expense | _____ |
| Taxes other than income taxes | |
| Property taxes | _____ |
| Other | _____ |
| Total taxes other than income taxes | _____ |
| Income taxes - Federal | _____ |
| Income taxes - other | _____ |
| Deferred income taxes - net | _____ |
| Investment tax credit adjustments - net | _____ |
| Return (rate of return: _____%) | _____ |
| TOTAL ANNUAL COST OF OPERATION | $_____ |

ATTACHMENT FOR ITEM NO. 4(c)

RATE DEVELOPMENTS

| | Electric | Gas | Steam |
|---|---|---|---|
| **Granted** | | | |
| Test year utilized | | | |
| Annual amount of revenue increase requested-test year basis (000's) | | | |
| Date petition filed | | | |
| Annual amount of revenue increase allowed-test year basis (000's) | | | |
| Percent increase in revenues allowed | | | |
| Date of final order | | | |
| Effective date | | | |
| Rate base finding (000's) | | | |
| Construction work in progress included in Rate base (000's) | | | |
| Rate of return on rate base authorized | | | |
| Rate of return on common equity authorized | | | |
| **Revenue Effect (000's)** | | | |
| Amount received in year granted | | | |
| Amount received in subsequent year (If not available, annualize amounts received in year granted) | | | |
| **Pending Requests** | | | |
| Test year utilized | | | |
| Amount (000's) | | | |
| Percent increase | | | |
| Date petition filed | | | |
| Date by which decision must be issued | | | |
| Rate of return on rate base requested | | | |
| Rate of return on common equity requested | | | |
| Amount of rate base requested | | | |
| Amount of construction work in progress requested for inclusion in rate base | | | |

ATTACHMENT FOR ITEM NO. 4(d)
FINANCIAL STATISTICS

| | 12 months ended 1977 | 1976 | 1975 |
|---|---|---|---|
| | (dollars in millions) | | |
| Earnings available to common equity | | | |
| Average common equity | | | |
| Rate of return on average common equity | | | |
| Times total interest earned before FIT: Gross income (incl. AFDC) + current and deferred FIT ÷ total interest charges + amortization of debt discount and expense | | | |
| Times long-term interest earned before FIT: Gross income (incl. AFDC) + current and deferred FIT ÷ long-term interest charges + amortization of debt discount and expense | | | |
| Bond ratings (end of period) | | | |
| Standard and Poor's | | | |
| Moody's | | | |
| Times interest and preferred dividends earned after FIT: Gross income (incl. AFDC) ÷ total interest charges + amortization of debt discount and expense + preferred dividends | | | |
| AFUDC | | | |
| Net income after preferred dividends | | | |
| % | | | |
| Market price of common | | | |
| Book value of common | | | |
| Market-book ratio (end of period)* | | | |
| Earnings avail. for common less AFDC + depreciation and amortization, deferred taxes, and invest. tax credit adjust.- deferred | | | |
| Common dividends | | | |
| Ratio | | | |
| Short-term debt | | | |
| Bank loans | | | |
| Commercial paper | | | |
| Capitalization (Amount & Percent) | | | |
| Long-term debt | | | |
| Preferred stock | | | |
| Common equity | | | |

*If subsidiary company, use parent's data.

DRAFT QUESTIONS

SUBJ: SYSTEMS FOR COLD SHUTDOWN

DATE UNKNOWN

The Auxiliary Systems Branch has reviewed the Diablo Canyon Systems required for safe shutdown following an earthquake in the areas ~~that it has~~ of its review responsibility.

The design approach is acceptable but the following information will be required for us to complete our review:

1) Description of the final design of the interconnection between the source of saltwater and the auxiliary feedwater pumps.

2) A commitment to provide redundant hoses for connecting the Raw Water Reservoir to the Auxiliary Feedwater System. Futhermore the ~~hose~~ applicant must commit to storing these hoses in a Seismic Category I structure.

3) A description of the method for isolating the non-seismic piping connections to the Raw Water Reservoir.

4) Periodic testing, inspection, replacement of hoses.

DRAFT QUESTIONS

SUBJ: ECCS ANALYSIS DATE: UNKNOWN

1. The blockage effect due to deformed grids may be concentrated in one or two rows of rods. Analysis of flow conditions for these rods with bundle average blockage is non-conservative. Provide analyses assuming that the maximum blockage applies to the entire bundle.

2. Provide the basis for assuming that FLECHT data from "typical" bundles is applicable to deformed bundles.