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RELATED CORRESPONDENCE

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UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

ATOMIC SAFETY AND LICENSING BOARD

In the matter of
Pacific Gas and Electric Company
Diablo Canyon Nuclear Power Plant
Units 1 and 2
Facility Operating Licenses
No. DPR-80 and DPR-82

Docket Nos. 50-275-OLA-2
50-323-OLA-2
ASLBP No. 92-669-03-OLA-2

May 21, 1993

**Intervenor San Luis Obispo Mothers for Peace
Second Set of Supplemental Interrogatories and Requests
for the Production of Documents to Pacific Gas and Electric Company
Re: Cable Failures at Diablo Canyon Nuclear Power Plant**

Pursuant to 10 CFR 2.740b, Intervenor San Luis Obispo Mothers for Peace ["SLOMFP"] hereby propounds written interrogatories and requests for the production of documents hereto, to be answered by licensee Pacific Gas and Electric Company ["PG&E"] under oath or affirmation according to the schedule established by the Atomic Safety and Licensing Board. The responses to the interrogatories should conform to the instructions and definitions contained in Attachment A to the First Set of Written Interrogatories and Requests for the Production of Documents to PG&E [February 16, 1993].

Respectfully Submitted,

Nancy Culver

Nancy Culver, President
San Luis Obispo Mothers for Peace
P.O. Box 164
Pismo Beach, CA 93448

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Attachment 1

1. Provide a copy of the specifications or other similar document[s] under which PG&E purchased the 4kV cable for which three failures are described in Diablo Canyon Nuclear Power Plant ["DCNPP"] Licensee Event Report ["LER"] 50-275/93-005 [April 23, 1993].

2. Provide copies of any "Nuclear Notebook" entries generated by PG&E concerning the 4kV cable failures described in LER 50-275/93-005.

3. Provide a copy of any documentation prepared by Okonite [or others] which describe the design service conditions for the 4kV cable for which three failures are described in DCNPP LER 50-275/93-005.

4. Describe how the actual service conditions for the as-installed 4kV cable compare or contrast with the design service conditions as described by the cable vendor.

5. Identify and provide copies of any procedures which PG&E utilizes to ensure that the design service conditions of the 4kV cables for the Auxiliary Salt Water ["ASW"] system are not exceeded in actual service.

6. Identify and provide copies of any quality assurance and/or quality control audits [or similar documents such as quality surveillances or observations] which have been performed on the installation, operation, and/or maintenance of the 4kV ASW system cable.

7. Indicate whether PG&E believes that the three ASW 4kV cable failures described in LER 50-275/93-005 have the same root and contributing causes. Describe in detail the bases for PG&E's beliefs in this regard, and if the root and contributing causes are believed to be the same, please address whether [and why or why not] PG&E believes the three failures should be considered to be "common mode" failures [within the meaning of "common mode failures" as that term is generally used in the practice of reliability and risk assessment].

8. Identify the nature of any lubricant employed in the installation of the 4kV ASW system cable for which three failures are described in LER 50-275/93-005, and indicate whether the use of this lubricant was approved by the cable vendor.

9. Indicate whether, for any of the three 4kV ASW system cable failures described in LER 50-275/93-005, the outer neoprene jacket for the cable was observed to be degraded in any way [e.g., abraded, scraped, peeled, etc.].

10. Describe the design and function of the cable pull box sump pumps mentioned on page 3 of 14 of LER 50-275/93-005.

11. Identify each occasion on which any of the cable pull box sump pumps mentioned on page 3 of 14 of LER 50-275/93-005 have been found to be inoperable, and provide copies of any reports which were generated to document these instances of inoperability.

12. Page 3 of 14 of Ler 50-275/93-005 indicates that the ASW system 4kV cables are installed in duct bank conduits with 480V power cables, 120V ac control cables, 125V dc control cables, and instrument cables. Please indicate whether any of these additional cables are associated with the ASW system and, if so, whether these additional cables have experienced any degradation and/or failures. Please provide copies of any reports documenting such failures.

13. Provide copies of all reports received from Okonite and/or the PG&E Testing and Ecological Services ["TES"] Laboratory concerning the 4kV ASW system cable failure which occurred on October 29, 1989, as reported in LER 50-275/005, page 4 of 14.

14. Provide copies of all reports received from Okonite and/or the PG&E TES Laboratory concerning the 4kV ASW system cable failure which occurred on May 3, 1992, as reported in LER 50-275/93-005, page 4 of 14.

15. Provide copies of all reports received from Okonite, Cable Technologies Laboratory ["CTL"], and/or the PG&E TES Laboratory or any other entity or person[s] concerning the 4kV ASW system cable failure which occurred on October 31, 1992, as reported in LER 50-275/93-005, pages 4-5 of 14.

16. Provide copies of any other reports concerning the 4kV ASW cable failures which occurred on October 29, 1989, May 3, 1992 and October 31, 1992.

17. Provide copies of any PG&E documents which comment on the reports generated by Okonite, CTL, and/or the PG&E TES Laboratory, or any other entity or person[s] concerning the 4kV ASW system cable failures which occurred on October 29, 1989, May 3, 1992, and October 31, 1992, as reported in LER 50-275/93-005, pages 4-5 of 14.

18. Describe why the DCNPP Unit 1 Bus 14D 4kV cable is considered by PG&E to be "non-safety-related" as identified in LER 50-275/93-005, page 7 of 14.

19. Indicate whether PG&E believes that the 4kV ASW system cables which failed on October 29, 1989, and October 31, 1992 [as identified in LER 50-275/93-005, pages 4-5 and 7 of 14], were safety-related, and, if not, please explain in detail why not.

20. Explain in detail the bases for PG&E's belief that the 4kV cable failures discussed in LER 50-275/93-005 were not caused by "manufacturing defects" [page 8 of 14], and provide copies of the documents which form the bases for PG&E's belief.

21. Provide copies of the document[s] which describe the 4kV ASW system cable design basis for wet and/or dry conditions as discussed in LER 50-275/93-005, page 8 of 14.

22. Explain in detail the bases for PG&E's belief that 4kV cable failures discussed in LER 50-275/93-005 were not caused by "chemical degradation"

[page 8 of 14], and provide copies of the documents which form the bases for PG&E's belief.

23. Provide a copy of the root cause evaluation for the 4kV ASW system cable failures [as discussed in LER 50-275/93-005]. If the root cause evaluation is not now completed, please provide notes or drafts that have been completed. In addition, please provide a copy of the root cause evaluation when it is completed.

24. Describe in detail the bases for PG&E's opinion, as expressed on page 10 of 14 of LER 50-275/93-005, that "The ground detection system, as well as additional control room indication [i.e., red/green lights associated with the motors], provide sufficient time to identify and correct a problem prior to another failure causing a portion of a mutually redundant system from becoming inoperable." Please provide copies of all documents which discuss this issue and/or which form all or part of the basis for PG&E's opinion.

25. Provide copies of all nonconformance reports associated with 4kV cable failures in the ASW system at DCNPP, Units 1 and 2. If some of these reports have already been provided to SLOMFP, please identify them by number and date.

26. Explain how the ASW system at DCNPP Units 1 and/or 2 can be operated if the 120V ac control or instrument circuits are lost [see page 11 of 14 of LER 50-275/93-005].

27. Please indicate whether the ASW pumps can be operated "for a limited time" with a ground on a 4kV cable, and, if so, please identify the length of time and the number of cycles of operation for which such operation is possible.

28. At page 10 of LER 50-275/93-005, PG&E states that "In all cases, DCPP has ground detection alarms that provide indication that a potential cable problem exists." Please indicate whether there are any safety-related electrical power, control, or instrumentation cables which are not equipped with ground detection alarms, and, if so, please identify the affected components and trains of systems.

29. At page 10 of LER 50-275/93-005, PG&E states that "The 12kV, 4kV, and 480V systems have high-resistance grounding, which allows continued operation for a limited time in the event of a single-line-to-ground fault." Please quantify, for each type of cable, what is meant by "limited time." In each case, what is the longest time that the cable would need to operate during an accident? Please describe the basis for your answer.

30. Identify all other safety-related applications of the 4kV cable that is described in LER 50-275/93-005.

a] Are the cables in these applications submerged at any time? If so, please describe any and all steps that have been tak[illegible] to verify their operability.

b] Are any of these safety-related applications of 4kV cable subject to the requirements of 10 CFR 50.49 due to their location in a harsh accident environment? If so, please describe all steps that have been taken to determine whether the environment in which they have been installed [i.e., temperature, radiation, humidity], is within the bounds of the conditions to which the cable was aged for purposes of environmental qualification, or which were assumed for purposes of environmental qualification. Please supply copies of all records compiled in making this determination.

c] For all such cable located in a harsh environment, please discuss whether ground detection alarms are used. If so, please discuss the extent to which they would be effective in predicting cable failure in the event of a LOCA.

31. Identify all other safety-related applications of the 12kV cable that is described in LER 50-275/93-005.

a] Are the cables in these applications submerged at any time? If so, please describe any and all steps that have been taken to verify their operability.

b] Are any of these safety-related applications of 12kV cable subject to the requirements of 10 CFR 50.49 due to their location in a harsh accident environment? If so, please describe all steps that have been taken to determine whether the environment in which they have been installed [i.e., temperature, radiation, humidity], is within the bounds of the conditions to which the cable was aged for purposes of environmental qualification, or which were assumed for purposes of environmental qualification. Please supply copies of all records compiled in making this determination.

c] For all such cable located in a harsh environment, please discuss whether ground detection alarms are used. If so, please discuss the extent to which they would be effective in predicting cable failure in the event of a LOCA.

32. In NRC Information Notice No. 89-30 [March 15, 1989], the NRC alerted licensees to "potential problems resulting from high temperature environments in areas that contain safety-related equipment or electrical cables." Id. at 1 [copy attached]. The NRC noted that "It is important for licensees to be aware that there are areas within the plant where the local temperature may exceed equipment qualification specifications even when the bulk temperature, as measured by a limited number of sensors, is indicating that it is lower than the qualification temperature." Id. at 3. SLOMFP seeks to determine, for any safety-related applications of 4kV cable or 12kV cable in a harsh environment, whether PG&E measures local temperature with reasonable accuracy. Please describe PG&E's method for measuring the temperature to which safety-related cable is subjected. Into what zones, if any, is the containment broken for purposes of temperature measurement? Please provide the results of all such temperature measurements. Please provide the results of any comparisons between these temperature measurements and environmental qualification specifications for cable.

33. Please provide copies of any documents which describe PG&E's evaluation of or response to NRC Information Notice 89-30 ["High Temperature Environments at Nuclear Power Plants", March 15, 1989].

34. At page 4 of 14 of LER 50-275/93-005, PG&E states that the testing laboratories "determined the [October 29, 1989] failure to be an isolated

event." Please explain whether PG&E now agrees with these assessments, and provide the basis for PG&E's current beliefs and conclusions in this regard.

35. In LER 50-275/93-005 [page 11 of 14], PG&E stated that, "Furthermore, since the failures have been separated in time, and diagnostic examinations of the failed cables and the additional 'non-failed' cables show no evidence that additional failures are imminent, the probability of a design basis accident followed by a random 4kV failure is considered to be very low." Did the laboratory and visual examinations of the "failed" and "non-failed" cables show any differences? If so, please describe the differences in detail. If not, please explain how PG&E can reach the conclusion quoted above. Morevover, please explain in quantitative terms what PG&E means by "very low" in the context of the probability of a design basis accident followed by a random 4kV cable failure.

36. Provide copies of the documents which describe the "formal preventive maintenance program" which has been established for the "sump pumps and drains immediately outside the turbine building" [LER 50-275/93-005, page 11 of 14].

37. In LER 50-275/93-005 [page 8 of 14], PG&E indicates that it made inquiries of other nuclear power plants regarding medium voltage EPR insulated cable failures. Please provide copies of documents which describe the substance of those inquiries, or, if no such documents are available, please identify whether any other failures have occurred and, if so, please describe the circumstances [type of cable, system affected,

plant name, date, method of discovery of the failure, and the assessed root cause for the failure].

Attachment 2

UNITED STATES
NUCLEAR REGULATORY COMMISSION
OFFICE OF NUCLEAR REACTOR REGULATION
WASHINGTON, D.C. 20555

March 15, 1989

NRC INFORMATION NOTICE NO. 89-30: HIGH TEMPERATURE ENVIRONMENTS AT NUCLEAR POWER PLANTS

Addressees:

All holders of operating licenses or construction permits for nuclear power reactors.

Purpose:

This information notice is being provided to alert addressees to potential problems resulting from high temperature environments in areas that contain safety-related equipment or electrical cables. It is expected that recipients will review the information for applicability to their facilities and consider actions, as appropriate, to avoid similar problems. However, suggestions contained in this information notice do not constitute NRC requirements; therefore, no specific action or written response is required.

Description of Circumstances:

In November 1988, while Duane Arnold Energy Center (DAEC) was shut down for refueling, the licensee for DAEC discovered 1 pinhole leak, 2 through-wall cracks, and 30 flaw indications on the control rod drive (CRD) insert lines inside the drywell. The defects were caused by externally induced chloride stress corrosion cracking. The area near the defects contained Rockbestos Firewall III radiation, cross-linked, polyethylene-insulated, electrical cable with a Hypalon (Neoprene Chloroprene) jacket. The cable had previously been degraded by exposure to local drywell temperatures in excess of 270°F. When the damaged electrical cable was replaced, loose degraded insulation lodged in the conduit and the field junction box. Moisture from steam leaks condensed in and dripped through the conduit onto the CRD piping. The condensate contained chlorides that were leached from the insulation lodged in the conduit and the junction box. There are several areas at a reactor facility where degradation of cables and leaching of chloride may occur because of high temperature and humidity. In addition to the drywell, the licensee for DAEC also found indications of chlorides leaching on the steam tunnel.

During a refueling outage in November 1988, the licensee for Dresden Unit 2 discovered evidence that paint inside the upper region of the drywell had been exposed to elevated temperatures. Further investigation revealed that the Limitorque operators on the steam supply valves to the high-pressure coolant injection system and the isolation condenser (located in the same area) had indications of exceeding their environmental qualification (EQ) design temperature. Grease samples taken from these valves showed significant degradation, and the lower main bearing of one valve operator was damaged. Other equipment affected by the high temperature included two vessel head vent valves and a standby liquid control valve. Also, the electrical insulation on about 50 cables was cracked. The root cause for the elevated temperature at Dresden was attributed to a deficiency in procedures that resulted in the ventilation ducts in the upper region of the drywell being left closed for about 18 months while the plant was in operation.

In August 1987, the NRC became aware that Arkansas Nuclear One, Unit 1 (ANO-1), had probably operated since it was licensed in 1974 with containment temperatures ranging from 90°F to 180°F. The bulk average temperature was roughly 140°F. Safety-related electrical equipment is environmentally qualified to operate at temperatures up to 120°F. Also, design basis accident scenarios had been analyzed assuming an initial containment temperature of 110°F. Over the years, the licensee for ANO-1 attempted to reduce the high containment temperature by installing improved insulation on the reactor coolant system and by acid cleaning of the chillers used for the containment cooling units. These efforts resulted in a very limited temperature reduction.

Discussion:

In the boiling-water reactor events described above, elevated drywell temperature was responsible for degradation of safety-related equipment. Electrical cables are vulnerable to degradation when exposed to high temperatures that exceed their design EQ temperature even for a short period. Regarding the DAEC event, the elevated temperature along with high humidity led to the degradation of safety-related components.

In the ANO-1 event, the higher local temperatures exceeded some of the EQ temperatures for some of the safety and non-safety equipment and components. Also, the higher bulk temperature exceeded the ambient temperature assumed in some of the accident analyses. Three of the analyses that were affected were:

1. The reactor building peak pressure analysis.
2. The inadvertent initiation of the containment spray system analysis.
3. The internal containment subcompartment differential pressure analysis.

There has been a history of reports since 1982 of boiling-water reactors (BWRs) and pressurized-water reactors (PWRs) experiencing excessive heat load problems within the drywell and localized high temperature areas within containment. On June 30, 1988, the NRC issued Temporary Instruction (TI) 2515/98, "Information of High Temperature Inside Containment/Drywell in PWR and BWR Plants." The objective of this TI was to determine whether or not high containment or drywell temperatures were a plant-specific problem or generic to all PWRs and BWRs. Preliminary findings from the TI showed that:

1. BWRs, especially Mark I and II containments, routinely operate very close to their EQ temperature limit.

2. In the drywells of BWRs there may be substantial temperature gradients (i.e., 100°F or more) that may or may not be detected depending on the location of instrumentation and circulation of the drywell air.

3. The BWR drywell head region seems most susceptible to high temperature.

4. Some PWRs experienced high containment temperatures but the licensees failed to recognize the safety significance and take corrective actions.

It is important for licensees to be aware that there are areas within the plant where the local temperature may exceed equipment qualification specifications even when the bulk temperature, as measured by a limited number of sensors, is indicating that it is lower than the qualification temperature.

No specific action or written response is required by this information notice. If you have any questions about this matter, please contact one of the technical contacts listed below or the Regional Administrator of the appropriate regional office.

Charles E. Rossi

Charles E. Rossi, Director
Division of Operational Events Assessment
Office of Nuclear Reactor Regulation

Technical Contacts: R. Anand, NRR
(301) 492-0805

T. Greene, NRR
(301) 492-1176

Attachment: List of Recently Issued NRC Information Notices

'93 MAY 26 P2:49

Certificate of Service

I hereby certify that copies of the foregoing **Intervenor San Luis Obispo Mothers for Peace Second Set of Supplemental Interrogatories and Requests for the Production of Documents to Pacific Gas and Electric Company Re: Cable Failures at Diablo Canyon Nuclear Power Plant** have been served upon the following persons by U.S. mail, first class or by FAX as indicated [*].

Office of Commission Appellate Adjudication
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Administrative Judge
Charles Bechhoefer, Chairman
Atomic Safety and Licensing Board
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Administrative Judge
Jerry Kline
Atomic Safety and Licensing Board
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Administrative Judge
Frederick J. Shon
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Jill ZamEk

Jill ZamEk
Dated May 21, 1993, San Luis Obispo County, CA