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RELATED CORRESPONDENCE

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

ATOMIC SAFETY AND LICENSING BOARD

'93 JUN -8 P2:17

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

June 4, 1993

**Intervenor San Luis Obispo Mothers for Peace
Third Set of Supplemental Interrogatories and
Requests for the Production of Documents
to Pacific Gas and Electric Company Re: Aging**

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 to be answered by licensee Pacific Gas and Electric Company ("PG&E") under oath or affirmation according to the instructions and definitions contained in Attachment A of SLOMFP 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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Interrogatories and Requests for the Production of Documents Re: Aging

Note: PG&E has previously objected to all interrogatories relating to "environmental qualification." However, SLOMFP understands from the Atomic Safety and Licensing Board's decision on May 12, 1993 (not yet documented) that the maintenance of environments for environmentally qualified equipment is a maintenance issue. SLOMFP, therefore, requests that all interrogatories requesting information on environmental qualification of equipment be answered.

1. Answer interrogatories 1 through 9 below with respect to the following important-to-safety components located in a harsh environment:

check valves
Limitorque valve operators
cables with bonded Hypalon jackets
cables listed in Attachment 1 to Information Notice 93-33 (April 28, 1993) 1

a) Describe the method(s), if any, used by PG&E to determine whether the actual operating environment is bounded by the conditions to which the component was aged during environmental qualification testing, or which were assumed for purposes of environmental qualification. In addition, please provide the results of such method(s) as they have been applied to each component.

b) Provide the equipment qualification files for these components.

Aging Due to Temperature

2. 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. 2 The NRC noted that "It is important for licensees to

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1 Information Notice 93-33, re: Potential Deficiency of Certain Class 1E Instrumentation and Control Cables, was served on the Licensing Board and parties via Board Notification 93-11 (May 5, 1993).

2 A copy of NRC Information Notice No. 89-30 (March 15, 1989) is attached to SLOMFP Second Set of Supplemental Interrogatories Re: Cables (May 21, 1993)).

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 the methods, accuracy and situations under which PG&E measures local temperature to which important-to-safety equipment is subjected.

a) Provide a description of the method for measuring the temperature inside containment and a description of the method for measuring the temperature in other areas where important-to-safety equipment is located. Into what zones, if any, is the containment broken for purposes of temperature measurement? Please provide:

(i) the results of all such temperature measurements;

(ii) the results of any comparisons between these temperature measurements and environmental qualification specifications for important-to-safety equipment in each zone.

b) Provide copies of any documents generated in response to Temporary Instruction 2515/98, "Information of High Temperature Inside Containment/Drywell in PWR and BWR Plants: (June 30, 1988). (This document is referenced in Information Notice 89-30 at page 1.)

c) Information Notice 89-30 states that: "It is expected that recipients will review the information (provided in the Information Notice) for applicability to their facilities and consider actions, as appropriate, to avoid similar problems." Describe your evaluation of the applicability of this information Notice to Diablo Canyon Nuclear Power Plant ("DCNPP") and discuss any actions that have been taken or considered to avoid similar problems. In addition, please provide copies of any documents that discuss your analysis, as well as any changes that have been made or

contemplated. 3

3. In Information Notice No. 89-30, Supp. 1 [November 1, 1990] [attached], the NRC describes instances in which elevated temperatures had adverse effects on operability of emergency diesel generators and solid state protection system alarms. The Information Notice states that: "It is expected that recipients will review the information for applicability to their facilities and consider actions, as appropriate, to avoid similar problems." In addition, please provide copies of any documents that discuss your analysis, as well as any changes that have been made or contemplated.

Aging Due to Vibration

4. SLOMFP seeks to determine the methods, accuracy and situations under which PG&E measures vibration to which important-to-safety equipment is subjected. Provide a description of the method for measuring vibration inside containment and a description of the method for measuring vibration in other areas where important-to-safety equipment is located. Into what zones, if any, is the containment broken for purposes of vibration measurement? Please provide:

(i) the results of all such vibration measurements;

(ii) the results of any comparisons between these vibration measurements and environmental qualification specifications for important-to-safety equipment in each zone.

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3 SLOMFP acknowledges receipt of Memorandum dated June 14, 1989 regarding NRC IE Notice 89-30 and Memorandum dated February 13, 1989 regarding NRC Information Notice 87-65.

Aging Due to Humidity

5. SLOMFP seeks to determine the methods, accuracy and situations under which PG&E measures humidity to which important-to-safety equipment is subjected. Provide a description of the method for measuring humidity inside containment and a description of the method for measuring humidity in other areas where important-to-safety equipment is located. Into what zones, if any, is the containment broken for purposes of humidity measurement? Please provide:

(i) the results of all such humidity measurements;

(ii) the results of any comparisons between these humidity measurements and environmental qualification specifications for important-to-safety equipment in each zone.

Aging Due to Radiation Exposure

6. SLOMFP seeks to determine the methods, accuracy and situations under which PG&E measures radiation exposure to which important-to-safety equipment is subjected. Provide a description of the method for measuring radiation exposure inside containment and a description of the method for measuring radiation exposure in other areas where important-to-safety equipment is located. Into what zones, if any, is the containment broken for purposes of radiation exposure measurement? Please provide:

(i) the results of all such radiation exposure measurements;

(ii) the results of any comparisons between these radiation exposure measurements and environmental qualification specifications for important-to-safety equipment in each zone.

Aging Due to Corrosion

7. SLOMFP seeks to determine the methods, accuracy and situations under

which PG&E measures corrosion to which important-to-safety equipment is subjected. Provide a description of the method for measuring corrosion inside containment and a description of the method for measuring corrosion in other areas where important-to-safety equipment is located. Into what zones, if any, is the containment broken for purposes of corrosion measurement? Please provide:

(i) the results of all such corrosion measurements;

(ii) the results of any comparisons between these corrosion measurements and environmental qualification specifications for important-to-safety equipment in each zone.

Aging Due to Submergence

8. SLOMFP seeks to determine the methods, accuracy and situations under which PG&E measures submergence to which important-to-safety equipment is subjected. Provide a description of the method for measuring submergence inside containment and a description of the method for measuring submergence in other areas where important-to-safety equipment is located. Into what zones, if any, is the containment broken for purposes of submergence measurement? Please provide:

(i) the results of all such submergence measurements;

(ii) the results of any comparisons between these submergence measurements and environmental qualification specifications for important-to-safety equipment in each zone.

Aging Due to a Combination of Factors (such as a combination of vibration and corrosion)

9. SLOMFP seeks to determine the methods, accuracy and situations under which PG&E measures a combination of factors (such as vibration and corrosion) to which important-to-safety equipment is subjected. Provide a

description of the method for measuring a combination of factors inside containment and a description of the method for measuring a combination of factors in other areas where important-to-safety equipment is located. Into what zones, if any, is the containment broken for purposes of combination of factors measurement? Please provide:

(i) the results of all such combination of factors measurements

(ii) the results of any comparisons between these combination of factors measurements and environmental qualification specifications for important-to-safety equipment in each zone.

Steam Generators

10. When DCNPP was first constructed, what was the expected qualified life of the steam generator tubes which constitute part of the primary pressure boundary?

11. How has your maintenance program measured the environment of the tubes to see if they are within their quality environment?

12. What has been the experience with steam generator tube failures in terms of the mean time to degrade or fail?

13. As of this date, for each of the steam generators, what number of tube out of the total have been plugged? Give the answer in number and percent

14. How does the failure rate experienced to date on steam generator tubes compare to the estimated qualified life?

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

November 1, 1990

NRC INFORMATION NOTICE NO. 89-30, SUPPLEMENT 1: HIGH TEMPERATURE ENVIRONMENTS AT NUCLEAR POWER PLANTS

Addressees:

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

Purpose:

This information notice supplement is being provided to present additional information regarding the effects of elevated room temperature on the operability of safety related equipment as discussed in NRC Information Notice 89-30, issued March 15, 1989. 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:

Information Notice No. 89-30 described events where elevated temperatures and high humidity within the drywell or containment adversely impacted the operability of safety related equipment. This supplement describes events where high ambient temperatures in areas other than the containment or the drywell caused the failure or degradation of safety related equipment.

On June 25, 1990, the Omaha Public Power District (the licensee) conducted a full load test on the No. 1 emergency diesel generator (EDG) at Fort Calhoun Unit 1. This test was conducted to establish a temperature profile for the EDG room. The test was terminated when the output from the generator became erratic as a result of the failure of a transistor in the static exciter circuitry.

The licensee's investigation revealed that the transistor had failed because of the effects of elevated temperatures in the static exciter/voltage regulator cabinet which was located in the EDG room. Temperatures in the cabinet had reached 140 degrees Fahrenheit (F) during the test. The transistor was replaced and the EDG was returned to operable status. The licensee also discovered elevated temperatures in the static exciter/voltage regulator cabinet for the No. 2 EDG. In a recently completed engineering analysis, the licensee verified that because of inadequate cabinet ventilation, a potential common mode failure of both EDGs exists. The analysis also concluded that this condition has likely existed since plant startup.

To reduce the potential for heat buildup in the cabinets, the cabinet doors were temporarily removed until a long term solution to the problem can be formulated. The licensee's investigation of this event also revealed that elevated room temperatures significantly impact the operating efficiency of the EDGs and could lead to accelerated degradation.

Discussion:

The Fort Calhoun Station has two General Motors EMD 20-645E4 diesel generator sets. The cooling system for each EDG consists of an engine radiator, an engine-driven fan, and a pump that circulates cooling water through the engine and radiator. Outside air is drawn into the EDG room by the fan, is blown across the radiator, and exits through the roof of the building through air ducts. Inlet air for the diesel turbocharger is drawn directly from the EDG room.

In June 1988 the licensee modified the hangers on the diesel exhaust headers. These modifications required that the insulating material on the headers be removed. After removing the insulating material, the licensee was aware that ambient temperature would increase. Therefore, the licensee performed an analysis to support a design change that would allow the exhaust headers to remain uninsulated. The analysis concluded that bulk temperature in the EDG rooms would rise by only 9 degrees F and that this increase would not have an adverse effect on the operability of the EDGs. The analysis did not specifically address the effect of elevated room temperature on other equipment located in the room.

When test runs were made during the summer months of 1989, the licensee found that bulk room temperatures actually increased approximately 20 degrees F, or more than twice the increase predicted by the licensee's analysis. This elevated room temperature likely accelerated the degradation of the exciter component that failed. However, the potential for the temperature buildup in the unvented cabinet probably existed since the cabinets were installed.

The licensee also has determined that the 20 degree rise in ambient temperature resulted in an increase in jacket water temperature and turbocharger inlet air temperature. These temperature increases adversely affect engine operating efficiency. Depending on the amount of increase, elevated jacket water temperature and/or turbocharger inlet air temperature, combined with heavy loading, may lead to accelerated degradation of the engine. This degradation could result in engine failure or prevent the engine from meeting its designed run time as assumed in the Final Safety Analysis Report. To reduce the potential for engine degradation while operating during periods of high ambient temperatures, unit loading would have to be limited. Derating the EDG could result in the unit's dependable output capability being less than required for design basis accident loads.

Because of variations in the configurations of intake air systems, turbocharger inlet air may be preheated significantly. The temperature of the air entering the turbocharger may be much higher than air temperature elsewhere. Also, water-to-air heat exchangers are more sensitive to changes in ambient temperature

than are water-to-water heat exchangers. However, an increase in service water temperature in water-to-water heat exchangers may also result in the derating of an EDG. The NRC is aware of other instances in which elevated ambient temperatures resulted in the failure or degradation of safety related components.

To avoid excessive cabinet temperatures and subsequent component failures, the licensee for the Washington Nuclear Project, Unit 2, has instituted administrative procedures to remove the doors from the static exciter voltage regulator cabinet when the EDG room temperature exceeds 90 degrees F. The licensee performed an analysis which concluded that internal temperatures in the cabinets would exceed the long-term (greater than 24 hours) thermal rating of the cabinet components if the EDG room temperature were to exceed 90 degrees F. Extended operation at or above this temperature would significantly increase the probability of a component failure.

On December 16, 1985, the failure of a fan in an engineered safety features (ESF) cabinet at Palo Verde Unit 1 resulted in the spurious actuation of several ESF signals. These signals initiated the automatic start of the Train A EDG, caused loads to be shed from the Train A vital bus, and initiated the operation of the ESF load sequencer. The load shed signal did not clear, prohibiting the automatic or manual sequencing of ESF electrical loads. The licensee installed a control room alarm that annunciates on cabinet exit air high temperature.

On June 4, 1984, at the McGuire Station, a total loss of control area ventilation resulted in temperature build-up in instrumentation cabinets. The elevated temperatures initiated several spurious solid state protection system alarms and resulted in the operators having to reduce output from both generating units. This event is described in detail in IE Information Notice No. 85-89, "Potential Loss of Solid State Instrumentation Following Failure of Control Room Cooling."

On September 21, 1982, a similar event occurred at Davis-Besse Unit 1, and involved the failure of a 48-volt power supply in the Steam and Feedwater Rupture Control System (SFRCS). The failure of the power supply was attributed to heat buildup in the SFRCS cabinets. The licensee installed fans in the cabinets to ensure more effective cooling.

This information notice requires no specific action or written response. If you have any questions about the information in this notice, please contact one of the technical contacts listed below or the appropriate NRR project manager.

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

Technical Contacts: C. Paulk, Region IV
(817) 860-8236

N. Fields, NRR
(301) 492-1173

Attachment: List of Recently Issued NRC Information Notices

Certificate of Service

'93 JUN -8 P2:18

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

Office of Commission Appellate Adjudication
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Washington, DC 20555

Administrative Judge
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Atomic Safety and Licensing Board
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Administrative Judge
Charles Bechhoefer, Chairman
Atomic Safety and Licensing Board
U.S. Nuclear Regulatory Commission
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Administrative Judge
Frederick J. Shon
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Secretary of the Commission
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Pacific Gas and Electric Co.
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Jill ZamEk

Jill ZamEk
Dated June 4, 1993, San Luis Obispo County, CA