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SUBJECT: Forwards addl info re environ qualification status of core exit thermocouple sys & justification for interim operation until completion of qualification testing.

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JAMES D. SHIFFER
VICE PRESIDENT
NUCLEAR POWER GENERATION

March 13, 1985

PGandE Letter No.: DCL-85-111

Mr. George W. Knighton, Chief
Licensing Branch No. 3
Division of Licensing
Office of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Washington, D.C. 20555

Re: Docket No. 50-275, OL-DPR-80
Docket No. 50-323
Diablo Canyon Units 1 and 2
Environmental Qualification of Core Exit Thermocouple System - Justification For Interim Operation

Dear Mr. Knighton:

PGandE letter DCL-85-068, dated February 15, 1985, informed the NRC Staff of problems experienced by Westinghouse in completing the generic environmental qualification test program for the core exit thermocouple system (CETS) reference junction boxes and thermocouple connectors. The letter also provided PGandE's plan to test and demonstrate qualification of the junction boxes and connectors by March 31, 1985. The enclosure to this letter provides additional information concerning the qualification status of the CETS and provides the justification for operation until completion of qualification testing.

Kindly acknowledge receipt of this material on the enclosed copy of this letter and return it in the enclosed addressed envelope.

Sincerely,

B. Hoch

For J. D. Shiffer

Enclosure

cc: R. T. Dodds
J. B. Martin
H. E. Schierling
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ENCLOSURE

JUSTIFICATION FOR INTERIM OPERATION (ENVIRONMENTAL QUALIFICATION OF CORE EXIT THERMOCOUPLE SYSTEM)

The Class 1E connectors and reference junction boxes located inside containment form part of a core exit temperature monitoring system. The qualification program for this equipment is presently incomplete. The status of testing and the justification for interim operation of the system and plant are provided below.

Thermocouple Connectors

The thermocouple connectors, as installed on the reactor head at Diablo Canyon, are presently being tested for 5 years of operation and subsequent worst-case accident conditions. The testing follows the requirements of IEEE Standard 323-1974 using the plant-specific parameters for the Diablo Canyon installation.

Seismic testing has been successfully performed in accordance with IEEE Standard 344-1975. The shake-table testing was performed after the test specimens were irradiated and aged. No anomalies occurred during or after the testing. The thermocouple connections are, therefore, qualified for 5 years of normal service and for any postulated seismic event.

A test specimen is presently in day 15 of the 30-day design basis environmental test program. It has undergone the additional peak transient and actual transient of the design event, with margins for both pressure and temperature, in accordance with IEEE 323-1974. As part of the testing, the connectors were also exposed to chemical spray for 24 hours. To date, the connectors continue to function adequately and, based upon prior experience with other equipment, there is every expectation that the thermocouple connectors will successfully complete the qualification testing which is scheduled to be completed by March 29, 1985. In the interim, the results of testing to date demonstrate acceptable seismic qualification and short-term post-accident environmental operation of the thermocouple connectors for the Diablo Canyon application.

Reference Junction Box

The thermocouple reference junction box (RJB) has been successfully aged, irradiated, and seismically tested. The seismic simulation test was conducted on a shake-table using multifrequency test inputs. The equipment was subjected to five operating basis earthquake (OBE) and four safe shutdown earthquake (SSE) events. The RJB was mounted to a rigid test fixture utilizing procedures provided in the technical manual for the Model WX-34072 T/C RJB. Throughout the entire test sequence, no structural damage was observed and the RJB functioned properly.

However, a problem discovered prior to the loss-of-coolant-accident (LOCA) test altered the test program. During an external pressurization test, it was discovered that the NEMA enclosure was not leaktight and would allow steam to enter the box during the LOCA test. Previous tests had revealed that resistance temperature detector (RTD) lead wires exposed to a steam environment would result in a substantial drop in the insulation resistance subsequently affecting the accuracy of the RTD. Attempts were made to seal the entire box with a silicone potting compound and to perform a confidence test. If the potting method proved to be successful during the LOCA test, a new box was to be modified with the potting compound and the test program repeated.

During the confidence test of the potted box, the measured insulation resistance (IR) dropped substantially on all three RTDs indicating that the potting had not sealed the box and that the RTD lead wires were being exposed to steam and caustic spray. However, a review of the data revealed little effect on the accuracy (approximately 1%) of the system. Westinghouse is continuing the investigation of the apparent independence of insulation resistance and RTD performance. Present areas of investigation include the significance of data acquisition circuit variations and possible electrochemical effects resulting from test measurement voltages in the presence of an electrolyte, such as the H_3BO_3/NaOH caustic spray. Similar results are described by N. J. Selley in "Experimental Approach to Electrochemistry." In conjunction with the investigation, the validity of existing IR measurement techniques used in establishing performance is being evaluated.

The confidence test performed on the potted box demonstrated that the probability of obtaining a true environmental seal on the box by this method was low and was not required for successful system performance. After removal of the potting material from the qualification test unit, the LOCA test was repeated and followed by a 168-hour post-accident simulation at 230°F.

Because of the inadequate seal, a concern has been raised over long-term corrosion effects and potential hydrogen build up to volatile levels due to containment spray reacting with the internal aluminum structure. However, confidence testing with steam and chemical spray has not shown evidence of chemical residue in the box, which is believed to be due to the rapid equalization of pressure in the box. Therefore, this is a postulated concern not demonstrated to occur during previous qualification testing.

The PGandE installation utilizes a second, larger, outer stainless steel, water and dust resistant enclosure to house the RJBs. These outer boxes are mounted to withstand seismic forces and provide additional physical protection for the RJBs against chemical spray. This further diminishes the possibility of the electrochemical effects discussed above.

As described in PGandE letter DCL-85-068, dated February 15, 1985, PGandE is developing and testing a design to modify the junction box to be leaktight to external pressure. This modified design is expected to be installed in Unit 1

during the plant outage immediately following the 100-hour nuclear steam supply system (NSSS) performance test currently scheduled for the latter part of March 1985. The installation in Unit 2 is scheduled for completion prior to fuel load.

In the interim, the results of testing to date demonstrate acceptable seismic qualification and short-term post-accident environmental operation of the existing box design for the Diablo Canyon application.

Justification For Interim Operation

The core exit thermocouple system (CETS) is not used to achieve safe shutdown of DCPP. Diablo Canyon Unit 1 has at least one path to safe shutdown using fully-qualified equipment. When Unit 2 begins operation, it will also have at least one path to safe shutdown using fully-qualified equipment. Although the environmental qualification of the CETS junction boxes and connectors has not been completed, PGandE has determined that interim operation with this equipment will not degrade the function of the engineered safety feature systems in the unlikely event of exposure to an adverse environment. As previously stated, the environmental qualification testing of the CETS junction boxes and connectors at Wyle Laboratories is scheduled for completion by the end of March 1985.