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RECIP.NAME RECIPIENT AFFILIATION
STOLZ,J.F. Light Water Reactors Branch 1

SUBJECT: Forwards addl info re environ qualification of reactor coolant temp detectors & containment pressure transmitters in response to NRC 791108 request. Requests notification of receipt of addl info.

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Mr. John F. Stolz, Chief
Light Water Reactors Branch No. 1
Division of Project Management
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Re: Docket No. 50-275
Docket No. 50-323
Diablo Canyon Units 1 and 2

Dear Mr. Stolz:

In your November 8, 1979 letter, you requested that we provide additional information on the subject of environmental qualification of reactor coolant temperature detectors and containment pressure transmitters. The attached material contains our response.

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

Very truly yours,

Philip A. Crane, Jr.

Attachments (40)

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A

ENVIRONMENTAL QUALIFICATION
Response to NRC Letter
of
November 8, 1979

REQUEST

1. Provide results of calculations using the guidelines for calculating acceptable qualified life in a radiation environment to determine acceptable qualified life of resistance temperature detectors to be used to measure reactor coolant temperature.

RESPONSE

1. Qualified life of RTDs: Using the provided guidelines, the qualified life of the wide range RTDs is 14.3 years. The narrow range RTDs are qualified for more than 40 years using the same operational requirements as for the wide range RTDs. (This is more conservative than required by the guidelines.) Appendix I contains the calculations which support this conclusion.

REQUEST

2. Provide results of tests or analyses to demonstrate acceptable environmental qualification of field connections for resistance temperature detectors to be used to measure reactor coolant temperature.

RESPONSE

2. Qualification of field connections: All connections for safety related equipment inside containment use splices which are post-LOCA qualified as described in Paragraph 3.11.3-5 of our FSAR. The narrow range and wide range RTDs are connected with these splices.

REQUEST

3. Provide results of tests or analyses, in addition to those in WCAP-9157, to demonstrate acceptable environmental qualification of pressure transmitters to be used to measure containment pressure.

RESPONSE

3. Qualification of containment pressure transmitters: Westinghouse is conducting an investigatory test program with the objective of identifying the cause of the spurious positive pressure spike reported in WCAP 9157,

and eliminating the phenomenon. Assuming the source of the spurious signal is identified by these investigatory tests, a final demonstration test on 3 units, modified as necessary, will be completed by 2/8/80. We will provide you with the results as soon as they are available.

APPENDIX I

Radiation Dose Calculations for RTD's

The object of the following calculations is to estimate the plant specific in-service life, that when taken in conjunction with assuming the RTDs operate for 100 days in a post-LOCA environment, yields a total dose equal to 1×10^8 Rads as employed by Westinghouse for the testing reported in WCAP-9157.

External Environment

WCAP-8587, Figure 6-4, indicates a containment atmosphere dose of 1×10^7 Rads for 100 days post-LOCA. This value is based on a TID calculation for a 4100 MW reactor and a containment volume of 1.1×10^6 ft.^{3} corresponding to LOCA conditions with a release of 100% of the noble gases, 50% of the iodines; and 1% of the fission products in the core. The Westinghouse calculated dose can be approximately scaled for similar plant applications by the formula:

$$D = 1.0 \times 10^8 \frac{P}{4100} \quad \frac{1.1 \times 10^6}{V} \quad \text{Rads}$$

Inserting a value of 3500 MW (P) and 2.8×10^6 (V) as applicable to Diablo Canyon yields a post-LOCA 100 day integrated dose of 3.4×10^7 Rads for the RTD external connection.

The remaining dose available to cover in-service effects is the difference between the total dose employed in the Westinghouse test reported in WCAP-9157 (i.e., 1×10^8 Rads) and the above calculated post-LOCA dose (i.e., 3.4×10^7 Rads), which is 6.6×10^7 Rads. The dose rate during normal operation appropriate to the external connection is taken as 165 R/hr. (Table 6-2, WCAP-8587). Thus, assuming an 80 percent load factor, the time required to attain this remaining dose is:

$$\frac{6.6 \times 10^7}{165 \times 24 \times 365 \times 0.8} = 57 \text{ yrs.}$$

The Westinghouse calculated post-LOCA dose employed for this calculation is conservative with respect to those recommended by the Staff in Appendix D to NUREG-0588.

Internal Environment

WCAP-8587, Figure 6-8, indicates a RCS internal pipe dose of 1.8×10^7 Rads for 100 days post-LOCA. Without considering any reduction in this value by scaling for Diablo Canyon, the remaining dose available to cover in-service radiation effects on the RTD is 8.2×10^7 Rads. The dose rate during normal operation for wide range RTDs installed directly in the reactor coolant system is conservatively taken as 820 R/hr. as defined for the RCL pipe center in Table 6-2, WCAP-8587. For the bypass line, narrow range RTDs, the dose rate is conservatively taken as 165 R/hr. as defined for the RCL outside surface. Thus, assuming an 80 percent load factor, the time required for the internal part of the RTD to attain the remaining dose is:

Narrow Range $\quad \dfrac{8.2 \times 10^7}{165 \times 24 \times 365 \times 0.8} = 70.9$ years

Wide Range $\quad \dfrac{8.2 \times 10^7}{820 \times 24 \times 365 \times 0.8} = 14.3$ years

Summary

Using Westinghouse dose estimates from WCAP-8587 scaled for Diablo Canyon, the shortest demonstrated life for the wide range RTD is 14.3 years and greater than 40 years forthe narrow range RTD.