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NORTHEAST NUCLEAR ENERGY COMPANY

General Offices • Selden Street, Berlin, Connecticut

P.O. BOX 270
HARTFORD, CONNECTICUT 06141-0270
(203) 665-5000

January 4, 1991

Docket No. 50-336
A09150

Re: Boraflex Degradation

U.S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, DC 20555

Gentlemen:

Millstone Nuclear Power Station, Unit No. 2
Request for Additional Information
Boraflex Degradation in Spent Fuel Pool Storage Racks (TAC No. 77726)

In a letter dated October 1, 1990,(1) Northeast Nuclear Energy Company (NNECO) submitted information to the NRC Staff regarding Millstone Unit No. 2's Boraflex degradation in the spent fuel pool storage racks. In reviewing this information, the Staff requested additional information in a letter dated November 15, 1990.(2) The following are responses to the questions raised by the Staff.

NRC Question #1

Preliminary results from the blackness tests indicate that 45 panels had a gap in the Boraflex material with the largest single measured gap approximately 1.8 inches wide. What was the total accumulated gamma radiation to these panels at the time of the blackness tests? What additional gamma dose will be accumulated by the Boraflex panels before the next blackness testing and what additional shrinkage (gap size) could this cause?

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(1) E. J. Mroczka letter to U.S. Nuclear Regulatory Commission, "Millstone Unit No. 2, Spent Fuel Racks Boraflex Degradation," dated October 1, 1990.

(2) G. S. Vissing letter to E. J. Mroczka, "Request for Additional Information concerning Boraflex Degradation in Millstone 2 Spent Fuel Pool Storage Racks (TAC No. 77726)," dated November 15, 1990.

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NNECO Response

The total accumulated gamma radiation to the panels containing gaps was between 5.9 x 10^9 and 2.3 x 10^{10} rads gamma, depending on the service of the rack cell with the gaps.

The spent fuel racks have recently experienced the discharge associated with end of Cycle 10 spent fuel. A conservative method of estimating the additional exposure is the average value at 1.1 x 10^7 rads/day for 1 year storage. NNECO is still evaluating the frequency criterion associated with the follow-up blackness testing program.

NNECO contends that little or no further increase in gap sizes to the tested cell locations are expected. This is due to the fact that Boraflex shrinkage significantly reduces and/or ceases to occur at gamma saturation levels beyond 5 x 10^9 rads gamma. All of the cells tested, wherein gaps were observed, have seen this exposure level and beyond; therefore, they are at or approaching the saturation level.

NRC Question #2

It is reported that the results of the CE criticality analysis confirms that the K-eff of the spent fuel pool is less than 0.95 for 2.7-inch gaps located at the same axial elevation throughout Region 1 for the fuel assemblies enriched to 4.5 weight percent U_{235}. Since the present fuel assemblies stored in Region 1 are arranged in a two-out-of-four storage pattern (checkerboard), was this the configuration assumed in the CE criticality analysis? How much margin existed between the calculated K-eff and 0.95? As a result of previous Question 1 above, could gaps larger than the 2.7 inches assumed in the criticality analysis occur with further irradiation?

NNECO Response

The CE criticality analysis assumed 4.5 w/o U_{235} fuel arranged in a 4-out-of-4 storage configuration as originally reviewed and licensed by the NRC. The only difference in the analysis was the incorporation of the axial gaps.

The 2.7-inch gap criteria resulted in a K-eff = .95.

It is possible that larger than 2.7-inch gaps could occur in the untested locations with further irradiation. However, of the 420 panels inspected, only 45 panels contained gaps; 37 of which had gaps less than 1 inch, 7 had gaps between 1 inch - 1½ inches, and 1 panel contained a 1.8-inch gap. All of the gaps encountered were randomly distributed axially throughout the panels.

Additionally, the average gap size experienced by other nuclear utilities utilizing Boraflex has been less than 1 inch, consistent with our results.

The follow-up future blackness testing program will provide the confirmation of gap formation and size in the untested cells. However, should additional reanalysis be required, a redevelopment of the criticality model to account for the different gap sizes, axial locations and panels containing the gaps would eliminate the very conservative nature of the current analysis and thereby permit incorporation of gaps larger than 2.7 inches should they occur.

Please contact us if you have any additional questions.

Very truly yours,

NORTHEAST NUCLEAR ENERGY COMPANY

E. J. Mroczka
Senior Vice President

cc: T. T. Martin, Region I Administrator
G. S. Vissing, NRC Project Manager, Millstone Unit No. 2
P. Habighorst, Resident Inspector, Millstone Unit No. 2
W. J. Raymond, Senior Resident Inspector, Millstone Unit Nos. 1, 2, and 3