

NORTHEAST UTILITIES

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NORTHEAST UTILITIES SERVICE COMPANY
NORTHEAST NUCLEAR ENERGY COMPANY

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April 30, 1993

Docket No. 50-423
B14308

Re: Spent Fuel Pool Boraflex

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

Gentlemen:

Millstone Nuclear Power Station, Unit No. 3
Spent Fuel Pool Boraflex Blackness Testing

Boraflex has been widely used as a neutron absorbing poison within the spent fuel pool storage racks of many commercial nuclear power plants. Industry experience in the use of this material has shown that Boraflex is mechanically susceptible to gamma radiation induced effects associated with spent fuel rack storage service. These effects may result in either perimeter shrinkage of the panels if the Boraflex is mechanically unrestrained, or separation (gap formation) if the Boraflex is mechanically restrained. At times, a combination of both types of effects may occur. By letter dated February 11, 1992,⁽¹⁾ Northeast Nuclear Energy Company (NNECO) provided an assessment of these phenomena for the Millstone Unit No. 3's spent fuel pool storage racks. NNECO stated that blackness testing would be performed to determine the extent of gap formation within the storage racks.

The purpose of this letter is to provide the NRC Staff with a summary of the results of the blackness testing conducted at Millstone Unit No. 3 in May 1992.

The Millstone Unit No. 3 spent fuel pool contains 756 fuel storage locations. The target population, considered most susceptible to gap function and shrinkage, were the 300 cells that have seen recently discharged fuel. The blackness testing was performed on 62 cells containing 232 panels of Boraflex. (By design some cells have 2, 3, or 4 poisoned panels.)

The test results indicated a maximum gap size of 3.5 inches. The average was approximately 1.5 inches. Additionally, the test results depict a shrinkage of 4 inches at the bottom of some of the Boraflex panels. However, no gaps were encountered in the panels that had shrinkage.

(1) J. F. Opeka letter to U.S. Nuclear Regulatory Commission, "Millstone Nuclear Power Station, Unit No. 3--Spent Fuel Pool Boraflex Surveillance Coupons," dated February 11, 1992.

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It is important to note that the criticality evaluations performed with 3.3 percent shrinkage (4.66 inches) are conservative and bound the test results for both gaps and shrinkage.

NNECO contracted vendor services to reanalyze the criticality analysis utilized in the licensing qualification of the spent fuel pool. The analysis remodeled the spent fuel rack, utilizing the test results as the basis for the modeling of the gaps/shrinkage in the Boraflex panels. It was conservatively assumed that all (100 percent) of the Boraflex panels exhibited gaps or shrinkage with a more conservative 4 percent shrinkage rate in every panel. Three distributions of gaps/shrinkage were analyzed: one, assumed that the gaps were randomly distributed axially in each panel; two, assumed that 50 percent of the panels experienced random gaps, while the remaining 50 percent of the panels experienced uniform shrinkage from the bottom-end; and three, assumed that all of the panels experienced uniform shrinkage, with half of the panels having experienced top-end shrinkage and half of the panels having experienced bottom-end shrinkage. All of the cases analyzed satisfied the 0.95 Keff criticality acceptance criterion. Therefore, the results of the reanalysis confirm that the safety of the spent fuel pool remains assured, and that no license amendment for Millstone Unit No. 3 is warranted.

NNECO will continue to validate the analytic assumptions incorporated into the criticality rack model with ongoing surveillance of the Boraflex panels at Millstone Unit No. 3. Additional blackness testing is planned to occur during Cycle 5 at Millstone Unit No. 3.

We trust you will find this information satisfactory and we remain available to answer any questions you may have.

Very truly yours,

NORTHEAST NUCLEAR ENERGY COMPANY

FOR: J. F. Opeka
Executive Vice President

BY: E. A. DeBarba
E. A. DeBarba
Vice President

cc: T. T. Martin, Region I Administrator
V. L. Rooney, NRC Project Manager, Millstone Unit No. 3
P. D. Swetland, Senior Resident Inspector, Millstone Unit Nos. 1, 2,
and 3