UNITED STATES
NUCLEAR REGULATORY COMMISSION
OFFICE OF NUCLEAR REACTOR REGULATION
OFFICE OF NEW REACTORS
OFFICE OF FEDERAL AND STATE MATERIALS
AND ENVIRONMENTAL MANAGEMENT PROGRAMS
WASHINGTON, DC 20555-0001

August 10, 2012

NRC INFORMATION NOTICE 2012-13: BORAFLEX DEGRADATION SURVEILLANCE PROGRAMS AND CORRECTIVE ACTIONS IN THE SPENT FUEL POOL

ADDRESSEES

All holders of an operating license or construction permit for a nuclear power reactor under Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, "Domestic Licensing of Production and Utilization Facilities," including those that have permanently ceased operations and have spent fuel stored in the spent fuel pool.

All holders of or applicants for a combined license issued under 10 CFR Part 52, "Licenses, Certifications, and Approvals for Nuclear Power Plants."

PURPOSE

The U.S. Nuclear Regulatory Commission (NRC) is issuing this information notice (IN) to inform addressees on the continuing issue of degradation of the neutron absorbing material Boraflex in spent fuel storage racks. The NRC expects that recipients will review the information for applicability to their facilities and consider actions, as appropriate, to avoid similar problems. Suggestions contained in this IN are not NRC requirements; therefore, no specific action or written response is required.

DESCRIPTION OF CIRCUMSTANCES

Turkey Point Nuclear Plant, Unit 3

In 2001, a condition prohibited by Turkey Point Nuclear Plant (TPNP), Unit 3 technical specifications (TS) occurred when the areal density of boron in portions of a Boraflex panel in the Unit 3 spent fuel pool (SFP) was measured to be less than the value used in the licensing basis analysis. The areal density of the Boraflex panels was a critical design feature of the spent fuel storage racks. Since 2001, Florida Power & Light Company (FPL) had found degradation of Boraflex panels greater than assumed in safety reviews for the SFP and incrementally took steps to assure the subcritical storage of fuel.

As part of a review in 2010, the NRC staff identified that FPL incorrectly used the combined areal density of the panels in a single cell to determine compliance with the effective neutron multiplication factor (k_{eff}) requirements in its TS. When the areal density of a single panel

degraded below the value assumed in the licensing basis analysis described in the updated final safety analysis report, the licensee was not in compliance with its TS.

In addition, it was identified that the licensee failed to implement effective corrective actions as required by 10 CFR Part 50, Appendix B, Criterion XVI, "Corrective Action." Despite SFP management controls which prohibited the placement of fuel assemblies into SFP cells with greater than 50 percent Boraflex degradation, two cells were found to have stored fuel assemblies in them. Although the licensee had a neutron absorber monitoring program, the program was ineffective at identifying and mitigating degradation of the Boraflex panels in the SFP. This unidentified and unmitigated degradation posed a potential safety concern because it reduced the margin to criticality.

The licensee implemented compensatory measures to provide reasonable assurance that the SFP remained subcritical until the licensee could implement an approved license amendment to eliminate the reliance on Boraflex as a neutron absorber. The NRC issued a confirmatory action letter (CAL), dated February 19, 2010, containing the licensee's compensatory measures. In a follow-up inspection report, the NRC staff confirmed that the licensee had implemented the CAL commitments to address the degraded neutron absorbers in the spent fuel storage racks. The NRC staff subsequently concluded that the licensee had reestablished compliance with the license requirements for the spent fuel storage racks.

Additional information is available in the following documents:

(1) Licensee Event Report 05000250/2010-001-02, "Spent Fuel Storage Design Feature Assumption are Exceeded," dated June 7, 2011, (Agencywide Documents Access and Management System (ADAMS) Accession No. ML11174A040).
(2) "Turkey Point Nuclear Plant – NRC Integrated Inspection Report 05000250/2010008," dated March 11, 2010 (ADAMS Accession No. ML100700661).
(3) "Turkey Point Nuclear Plant Unit 3 - NRC Inspection procedures 95001 Supplemental and 92702 Follow up – Inspection Report 05000250/2010-010," dated January 6, 2011 (ADAMS Accession No. ML110060770).
(4) "License Amendment Request – Spent Fuel Pool Boraflex Remedy," dated January 27, 2006 (ADAMS Accession No. ML060900250).

Peach Bottom Atomic Power Station, Unit 2

In 2010, Peach Bottom Atomic Power Station (PBAPS) performed an operability determination (OD) that concluded that sufficient margin to criticality in its SFP would be maintained until 2014. However, the NRC's review of the OD concluded that the licensee had not accurately projected the rate of Boraflex degradation and had used several nonconservative assumptions in the analysis. The licensee performed a reanalysis and determined that several Boraflex panels had degraded below the TS requirements as early as the fourth quarter of 2008. As a result, contrary to 10 CFR Part 50, Appendix B, Criterion XVI, "Corrective Actions," the licensee had not implemented corrective actions to prevent the Boraflex panels from degrading below the TS requirements. Although the licensee had a neutron absorber monitoring program, the program did not adequately monitor and manage degradation of the Boraflex panels in the SFP to ensure sufficient margin to criticality was maintained. This unidentified and unmitigated degradation posed a potential safety concern because it reduced the margin to criticality.

In June 2011, the licensee relocated 201 fuel assemblies from the storage cells with the highest Boraflex degradation. Additionally, the licensee put administrative controls in place to restrict the usage of rack locations containing degraded Boraflex.

Additional information is available in the following documents:

(1) Licensee Event Report 05000277/2011-002-00, “Condition Prohibited by Technical Specifications due to Degraded Spent Fuel Pool Racks Boraflex® Panels” dated July 29, 2011 (ADAMS Accession No. ML11213A262).
(2) “License Amendment Request - Use of Neutron Absorbing Inserts in Units 2 and 3 Spent Fuel Pool Storage Racks,” dated November 3, 2011 (ADAMS under Accession No. ML113081441).

BACKGROUND

Generic Letter 96-04, “Boraflex Degradation in Spent Fuel Pool Storage Racks,” highlights industry operational experience with the degradation of Boraflex that had been previously addressed by the NRC IN 87-43, "Gaps in Neutron-Absorbing Material in High-Density Spent Fuel Storage Racks," September 8, 1987; IN 93-70, "Degradation of Boraflex Neutron Absorber Coupons," September 10, 1993; and IN 95-38, "Degradation of Boraflex Neutron Absorber in Spent Fuel Storage Racks," September 8, 1995. Additionally, Generic Letter 96-04 requested each licensee crediting Boraflex to provide the NRC with its plan to manage the degradation.

Since the issuance of Generic Letter 96-04, there has been additional operating experience with neutron absorbing materials (other than Boraflex) degrading while in the spent fuel storage racks. IN 09-26, “Degradation of Neutron-Absorbing Materials in the Spent Fuel Pool,” October 28, 2009, addresses the degradation of the materials Boral and Carborundum. IN 09-26 emphasizes that to prevent noncompliance with SFP criticality requirements, it is important to know the condition of the neutron absorbing material in the SFP and monitor the SFP for any indications that the material may be degrading.

DISCUSSION

Fuel stored in the spent fuel storage racks must be maintained subcritical in accordance with the requirements in 10 CFR 50.68(b)(4). This IN is to inform licensees about the importance of effective surveillance programs and corrective actions when dealing with Boraflex degradation in the SFP. The occurences at TPNP and PBAPS are recent examples where the surveillance programs and corrective actions were not effective in dealing with Boraflex degradation.

The recent operating experience with neutron absorber degradation, like that of Boraflex, demonstrates the need for effective material surveillance programs. These instances highlight that ineffectual monitoring and corrective actions can lead to unidentified and unmitigated degradation that may challenge the subcritical margin for the SFP. An effective surveillance and monitoring program for neutron absorber materials degradation is essential to manage the degradation before it results in a potential safety concern.

CONTACT

This IN requires no specific action or written response. Please direct any questions about this matter to the technical contacts listed below or the appropriate NRC project manager.

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Note: NRC generic communications may be found on the NRC public Web site, http://www.nrc.gov, under NRC Library.

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