UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

July 5, 2012

Mr. Joseph W. Shea
Manager, Corp. Nuclear Licensing Programs
Tennessee Valley Authority
1101 Market Street, LP 4B-C
Chattanooga, TN 37402-2801

SUBJECT: BROWNS FERRY REVIEW OF COMMITMENT SUBMITTAL FOR LICENSE RENEWAL REGARDING THE UNIT 1 PERIODIC INSPECTION PROGRAM (TAC NO. ME7126)

By letter dated April 23, 2007, the Tennessee Valley Authority, the licensee for the Browns Ferry Nuclear Plant, submitted information to fulfill a commitment for license renewal regarding the Browns Ferry, Unit 1 Periodic Inspection Program. The licensee's commitment is specified in Commitment no. 49 in Appendix A of NUREG-1843, "Safety Evaluation Report Related to the License Renewal of the Browns Ferry Nuclear Plant, Units 1, 2, and 3," dated January 2006, and Supplement 1 to NUREG-1843, dated April 2006. Commitment no. 49 states that the licensee will "develop and submit implementing procedures, for [U.S. Nuclear Regulatory Commission (NRC)] review."

The NRC staff reviewed the information in the licensee's letter and in the response dated April 30, 2012, to the staff's request for additional information, and determined that the licensee has fulfilled Commitment no. 49 for license renewal and demonstrated that the implementing procedure for the Unit 1 Periodic Inspection Program, as revised by a new commitment, will adequately manage aging of applicable components during the period of extended operation.

Sincerely,

Heather M. Jones, Project Manager
Subsequent Renewal, Guidance, and Operations Branch
Division of License Renewal
Office of Nuclear Reactor Regulation

Docket No. 50-259

Enclosure:
As stated

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OFFICE OF NUCLEAR REACTOR REGULATION
REVIEW OF COMMITMENT FOR LICENSE RENEWAL
EVALUATION OF UNIT 1 PERIODIC INSPECTION PROGRAM
BROWNS FERRY NUCLEAR PLANT, UNIT 1
DOCKET NO. 50-259

By letter dated April 23, 2007, the Tennessee Valley Authority, the licensee for the Browns Ferry Nuclear Plant (BFN), submitted information to fulfill its commitment to submit, for U.S. Nuclear Regulatory Commission (NRC) review, the implementing procedures for the Browns Ferry, Unit 1 Periodic Inspection Program. The licensee developed this new, plant-specific aging management program to manage aging for Unit 1 piping and components that were subject to extended lay-up conditions.

Background

In accordance with Part 54, "Requirements for Renewal of Operating Licenses for Nuclear Power Plants," of Title 10 of the *Code* of *Federal Regulations* (10 CFR Part 54), the NRC issued Renewed Facility Operating License DPR-33 to BFN, Unit 1, on May 4, 2006. NUREG-1843, "Safety Evaluation Report Related to the License Renewal of the Browns Ferry Nuclear Plant, Units 1, 2, and 3," dated January 2006, and Supplement 1 to NUREG-1843, dated April 2006, document the NRC staff's technical review of the license renewal application (LRA). Components with a license renewal intended function are subject to an aging management review in order to ensure that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the current licensing basis for the period of extended operation as required by 10 CFR 54.21 (a)(3).

Appendix A of Supplement 1 to NUREG-1843, documents the commitments that were made to manage the effects of aging during the period of extended operation. The subject Commitment no. 49 is associated with the plant-specific aging management program (AMP), Unit 1 Periodic Inspection Program. This new program addressed staff concerns regarding potentially latent aging effects in components that were not in service during the extended BFN, Unit 1 shutdown from 1985 to 2007. Commitment no. 49 states that the program will be developed and implemented prior to the restart of Unit 1. The commitment also states that the associated implementing procedures will be developed and submitted, for NRC review, prior to the restart of Unit 1.

Summary of Information in Licensee's Letter Dated April 23, 2007

In its letter dated April 23, 2007, the licensee submitted implementing procedure 1-TI-521, "Unit 1 Periodic Inspection Program for License Renewal," Revision 0003. The procedure addresses carbon steel and stainless steel piping and fittings in systems that (a) were not in service and were exposed to air, treated water, or raw water during the extended Unit 1 shutdown and (b) will be exposed to treated water or raw water during normal operation.

The procedure states that periodic ultrasonic thickness (UT) measurements are performed on sample populations of piping. The sample populations are defined by common material and operating environments and focus on areas where degradation would be expected, as well as areas where degradation would not be expected. The inspection sample sizes for each of these populations are as follows:

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- Stainless steel/Treated water 9 locations
- Stainless steel/Raw water 0 locations
- Carbon steel/Treated water 59 locations
- Carbon steel/Closed cooling (treated) water 59 locations
- Carbon steel/Raw water 59 locations

The procedure states that the inspections of the stainless steel piping populations are limited due to extensive pipe replacement and the difficulty in performing UT measurements on pipe diameters of one inch or smaller.

Baseline inspections were to be performed prior to the restart of Unit 1 (May 2007). The first periodic inspection will occur after Unit 1 is returned to service but prior to the end of the original licensing period (December 2013), the second periodic inspection will be completed within the first 10 years of the period of extended operation, and subsequent periodic inspections will continue until the trend of the results provides a basis to discontinue the inspections. The acceptance criteria for the inspections are that the pipe wall must remain above the minimum design thickness until the next periodic inspection and that, if any location fails to meet this acceptance criterion, the unacceptable degradation must be evaluated and dispositioned using the Corrective Action Program.

NRC Staff Review

The staff reviewed the implementing procedure against LRA Section B.2.1.42, Unit 1 Periodic Inspection Program, as evaluated by NRC staff in Section 3.0.3.3.5 of NUREG-1843 and its supplement. The staff compared the procedure to program elements one through six of the licensee's AMP. For the "scope of program," "preventive actions," "detection of aging effects," "monitoring and trending," and "acceptance criteria" program elements, the staff finds that the procedure is consistent with the licensee's AMP. For the "parameters monitored or inspected" program element, the staff determined the need for additional information, which resulted in the issuance of a request for additional information (RAI), as discussed below.

The "parameters monitored or inspected" program element in LRA Section B.2.1.42 states that the inspection sample is based on the 95/95 assurance criterion (95 percent confidence level that 95 percent of a population is not experiencing degradation), which specifies a minimum of 59 inspection locations for each material and environment combination for a large or infinite lot size. However, the staff noted that the procedure states that the inspections of stainless steel piping were limited to a total of only nine locations because the piping was either small-diameter or had been replaced. The staff also noted that the limited number of inspections may not be sufficient to detect any latent aging effects for stainless steel piping that was not in service during the extended Unit 1 shutdown. By letter dated March 30, 2012, the staff issued an RAI requesting that the licensee provide an alternative aging management approach for small-diameter stainless steel piping as a result of challenges in the use of the UT inspection technique.

In its response dated April 30, 2012, the licensee stated that procedure 1-TI-521 will be revised to include inspections of small-diameter piping (1/2 to 1 inch) using the 95/95 assurance criterion to select the sample size. The licensee also stated that, because degradation of stainless steel is expected to be small for both the treated water and raw water environments, these environments will be considered a single inspection population for the small-diameter piping. The licensee further stated that at least 50 percent of the sample population will include

piping in the raw water environment, because of its greater potential for degradation, while at least 20 percent of the inspections will include piping in the treated water environment. The licensee stated that the schedule for the added inspections of small-diameter piping will be as follows: (a) 70 percent of baseline inspections will be performed prior to the period of extended operation, and the remainder will be performed within the first two years of the period of extended operation, (b) the first periodic inspection will occur with the first five years of the period of extended operation and, (c) the second periodic inspection will occur with the first 10 years of the period of extended operation. The licensee also made a new commitment to implement the above changes to the procedure by October 10, 2012.

The staff finds the licensee's response acceptable because the periodic inspections of small-diameter piping described above are capable of detecting any latent aging effects for stainless steel piping due to the extended Unit 1 shutdown. The staff noted that, although the licensee proposed to consider stainless steel piping exposed to both treated water and raw water as a single inspection population, the stated distribution of inspections between the two environments provides sufficient opportunity to detect latent aging effects. The staff also noted that these inspections are not the only activities that manage loss of material for the subject piping in the period of extended operation. The Unit 1 Periodic Inspection Program is not a stand-alone AMP, but supplements the LRA AMPs that are normally used to manage aging for piping that is exposed to treated water and raw water (e.g., Chemistry Control Program, One-Time Inspection Program, Open-Cycle Cooling Water System Program), which gives additional assurance that degradation will be detected. The staff further noted that the schedule for the small-diameter piping inspections, which had to be adjusted from the schedule in the AMP due to their recent addition, will be capable of identifying, monitoring, and trending potential degradation before there is a loss of intended function. The staff's concern described in the RAI is resolved.

Conclusion

Based on its review of procedure 1-TI-521 and the licensee's response to the RAI, the staff concludes that the licensee has fulfilled license renewal Commitment no. 49 and demonstrated that the implementing procedure for the Unit 1 Periodic Inspection Program, as revised by the new commitment, will adequately manage aging of applicable components during the period of extended operation.

Primary Contributor: John Wise, NRR/DLR

Date: June 19, 2012

July 5, 2012

Mr. Joseph W. Shea
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1101 Market Street, LP 4B-C
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/RA/
Heather M. Jones, Project Manager
Subsequent Renewal, Guidance, and Operations Branch
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Letter to Joseph Shea from Heather Jones dated July 5, 2012

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