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

February 18, 2016

Mr. Joseph W. Shea
Vice President, Nuclear Licensing
Tennessee Valley Authority
1101 Market Street, LP 3R-C
Chattanooga, TN 37402-2801

SUBJECT: BROWNS FERRY NUCLEAR PLANT, UNITS 1, 2, AND 3 - REQUEST FOR ADDITIONAL INFORMATION RELATED TO LICENSE AMENDMENT REQUEST REGARDING EXTENDED POWER UPRATE (CAC NOS. MF6741, MF6742, AND MF6743)

Dear Mr. Shea:

By letter dated September 21, 2015 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML15282A152), as supplemented by letters dated November 13, December 15, and December 18, 2015 (ADAMS Accession Nos. ML15317A361, ML15351A113, and ML15355A413, respectively), Tennessee Valley Authority (TVA, the licensee) submitted a license amendment request (LAR) for Browns Ferry Nuclear Plant (BFN), Units 1, 2, and 3. The proposed amendment would increase the authorized maximum steady-state reactor core power level for each unit from 3,458 megawatt thermal (MWt) to 3,952 MWt. This LAR represents an increase of approximately 20 percent above the original licensed thermal power level of 3,293 MWt, and an increase of approximately 14.3 percent above the current licensed thermal power level of 3,458 MWt.

The U.S. Nuclear Regulatory Commission (NRC) staff reviewed the licensee's submittals and determined that additional information is needed. On January 20, 2016, the NRC staff forwarded, by electronic mail, a draft request for additional information (RAI) to TVA. On January 29, 2016, the NRC staff held a conference call to provide the licensee with an opportunity to clarify any portion of the draft RAI and discuss the timeframe for which TVA may provide the requested information. The RAI is enclosed. As agreed by the NRC and TVA staff during the conference call, TVA will respond to this RAI by March 14, 2016.

If you have any questions, please contact me at 301-415-1447 or Farideh.Saba@nrc.gov.

Sincerely,

Farideh E. Saba

Farideh E. Saba, Senior Project Manager
Plant Licensing Branch II-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket Nos. 50-259, 50-260, and 50-296

Enclosure:
Request for Additional Information

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REQUEST FOR ADDITIONAL INFORMATION (RAI)

LICENSE AMENDMENT REQUEST REGARDING EXTENDED POWER UPRATE

TENNESSEE VALLEY AUTHORITY

BROWNS FERRY NUCLEAR PLANT, UNITS 1, 2, AND 3

DOCKET NOS. 50-259, 50-260, AND 50-296

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The U.S. Nuclear Regulatory Commission (NRC) staff from the Containment and Ventilation Branch (SCVB) in the Division of Safety Systems, Office of Nuclear Reactor Regulation, reviewed the information the licensee provided and determined that the following additional information is required in order to complete the evaluation.

SCVB-RAI 1

During the review of Attachment X of the LAR regarding National Fire Protection Association (NFPA) 805 Transition Report (Reference 1), the NRC staff requested in an RAI (SCVB-RAI-5) that TVA describe the revised BFN, Units 1, 2, and 3, residual heat removal (RHR) heat exchanger performance monitoring program, which will assure that its fouling factor and tube plugging would not exceed their worst values assumed in calculating a K-value of 284.5 British thermal unit (BTU)/sec-degrees Fahrenheit (°F). In response to this RAI (Reference 2), TVA stated, "The revised performance monitoring program has not been developed at this time...", and made a commitment to revise the program that monitors the RHR heat exchanger performance.

In the approval of the NPFA 805 LAR, the NRC imposed the following license condition, which was accepted by TVA as implementation Item No. 49 in Reference 3:

> Revise the program that monitors BFN Residual Heat Removal (RHR) heat exchanger performance for consistency with the assumptions of the NFPA 805 Net Positive Suction Head (NPSH) analysis. The monitoring program shall include verification that the tested worst fouling resistance, with measurement uncertainty added, of all BFN Units 1, 2, and 3 RHR heat exchangers is less than the design value of 0.001517 hr-ft^2-°F/BTU and the worst tube plugging is less than 4.57 percent.

Enclosure

In Attachment 6 (Reference 4) and Attachment 39 (Reference 5) to the extended power uprate (EPU) LAR, at the EPU design-basis accident (DBA) loss-of-coolant accident (LOCA) statepoint, the RHR heat exchanger K-value for one heat exchanger is reported to be 265 BTU/sec-°F for a design fouling resistance of 0.001521 hr-ft^2-°F/BTU, which supersedes the fouling factor of 0.001517 hr-ft^2-°F/BTU reported in the NFPA 805 LAR.

Section 2.1 of Reference 5 provides the following EPU RHR heat exchanger K-values used in the analyses:

- 265 BTU/sec-°F (DBA-LOCA, Small Break LOCA, Loss of Shutdown Cooling, Stuck Open Relief Valve and SBO [Station Blackout]), 302 BTU/sec-°F (Shutdown of Non-Accident Unit), and 287 BTU/sec-°F (fire event defense-in-depth demonstration case) are based on the EPU design fouling resistance, 0.001521 hr-ft^2-°F/BTU.

- 307 BTU/sec-°F (fire event licensing basis) is based on the EPU nominal fouling resistance, 0.001097 hr-ft^2-°F/BTU.

- 277 BTU/sec-°F for the ATWS-MSIVC-EOC event corresponds to a nominal fouling resistance of 0.001220 hr-ft^2-°F/BTU.

Describe the performance monitoring program to monitor the as-found worst RHR heat exchanger fouling factor and plugged tubes. As mentioned above, the description of this program was previously requested for the NFPA 805 LAR approval and is being again requested for the EPU LAR submittal. The monitoring program must verify the EPU design fouling resistance, 0.001521 hr-ft^2-°F/BTU and EPU nominal fouling resistance and 0.001097 hr-ft-°F/BTU, as given above.

The description of the program should include the following:

(a) Scope of monitoring
(b) Frequency of monitoring
(c) Acceptance criteria for the fouling factor should be less than nominal fouling resistance of 0.001097 hr-ft^2-°F/BTU (for fire event) with uncertainty included
(d) Acceptance criteria for plugged tubes - must be less than or equal to 4.57 percent tubes
(e) Accepted industry standards and guidelines used for heat exchanger performance testing
(f) Test setup
(g) Instrumentation with its accuracy
(h) Method of suppression pool heatup
(i) Data acquisition system
(j) Uncertainty analysis
(k) Data reduction method for calculation of the fouling factor
(l) Method of as-found heat-exchanger inspection for determining the number of plugged tubes and the effective heat transfer area

REFERENCES

1 Tennessee Valley Authority (TVA), Browns Ferry Nuclear Plant (BFN), Units 1, 2 and 3, "Transition to 10 CFR 50.48(c) - NFPA 805 Performance-Based Standard for Fire Protection for Light Water Reactor Electric Generating Plants, 2001 Edition, Transition Report," dated March 2013 (ADAMS Accession No. ML13092A392).

2 Letter from TVA to NRC, dated June 13, 2014, "Response to NRC Request for Additional Information Regarding the License Amendment Request to Adopt NFPA 805 Performance-Based Standard for Fire Protection for Light Water Reactor Electric Generating Plants for the Browns Ferry Nuclear Plant, Units 1, 2, and 3 (TAC Nos.°MF1185, MF1186, and MF1187) - Attachment X and Fire Modeling" (ADAMS Accession No. ML14167A175).

3 Letter from TVA to NRC, dated October 20, 2015, "Update to License Amendment Request to Adopt NFPA 805 Performance-Based Standard for Fire Protection for Light Water Reactor Electric Generating Plants for the Browns Ferry Nuclear Plant, Units 1, 2, and 3 (TAC Nos. MF1185, MF1186, and MF1187) - Revised Implementation Item 49" (ADAMS Accession No. ML15293A527).

4 Attachment 6 to EPU LAR, NEDC-33860P, Revision 0, "Safety Analysis Report for Browns Ferry Nuclear Plant, Units 1, 2, and 3, Extended Power Uprate (proprietary)" (ADAMS Accession No. ML15282A264 (non-public)).

5 Attachment 39 to BFN EPU LAR, "RHR Heat Exchanger K-values Utilized in EPU Containment Analyses" (ADAMS Accession No. ML15282A235).

If you have any questions, please contact me at 301-415-1447 or Farideh.Saba@nrc.gov.

Sincerely,

/RA/

Farideh E. Saba, Senior Project Manager
Plant Licensing Branch II-2
Division of Operating Reactor Licensing
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