



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

March 25, 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 the Browns Ferry Nuclear Plant, 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 megawatts 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 February 4, 2016, the NRC staff forwarded, by electronic mail, a draft request for additional information (RAI) to TVA. On February 18, 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. As agreed by NRC and TVA staff during the conference call, TVA will respond to the RAI (Enclosure 1) by April 4, 2016.

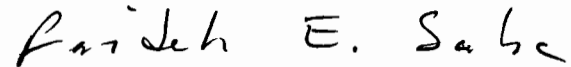
In addition, by letter dated March, 15, 2016 (ADAMS Accession No. ML16062A072), the NRC issued RAIs from the Reactor System Branch (SRXB). Subsequently, TVA notified the NRC staff of an editorial error in the issued RAI. Specifically, in SRXB-RAI 13, the word "quantitative" should be "qualitative." The corrected page is provided in Enclosure 2.

J. Shea

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

Sincerely,

A handwritten signature in black ink that reads "Farideh E. Saba". The script is cursive and fluid, with the first name being the most prominent.

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

Enclosures:

1. Request for Additional Information
2. Correction to SRXB-RAI 13 dated March 15, 2016

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REQUEST FOR ADDITIONAL INFORMATION
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

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 the 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 megawatts 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 from the Instrumentation and Controls Branch (EICB), Division of Engineering, 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.

EICB-Request for Additional Information (RAI) 1

In Section 2.4.1.3.3, "APRM [Average Power Range Monitors] Flow Biased Simulated Thermal Power – High Scram," of Attachment 6,¹ "NEDC-33860P, Safety Analysis Report for Browns Ferry Nuclear Plant Units 1, 2, and 3 Extended Power Uprate" (aka PUSAR), to the LAR, the licensee stated that the analytical limits (ALs) and allowable values (AVs) for this function were recalculated based on the revised rated thermal power (RTP) level.

In the PUSAR, Table 2.4-1, "Technical Specification Setpoint Information," the licensee proposed to revise the ALs for flow biased simulated thermal power high for two-loop operation from $\leq 0.66W^2 + 68.0$ percent RTP to $\leq 0.55W + 67.5$ percent RTP. The proposed change also revises the AL for one-loop operation from $0.66 (W - \Delta W) + 68.0$ percent RTP to $0.55 (W - \Delta W) W + 67.5$ percent RTP.

¹ Attachment 7, "NED0-33860, Safety Analysis Report for Browns Ferry Nuclear Plant Units 1, 2, and 3 Extended Power Uprate," contains a non-proprietary version of Attachment 6.

² W is the recirculation drive flow in percent of rated flow. ΔW is the difference between the dual-loop operation and single-loop operation drive flow at the same core flow. The current value of ΔW is 10 percent and is not changed.

In Section 3.1.9.f of the enclosure to the LAR, the licensee proposed to revise the AVs for flow biased simulated thermal power high for two-loop operation from $\leq 0.66W + 66.0$ percent RTP to $\leq 0.55W + 65.5$ percent RTP. The proposed change also revises footnote (c) for one-loop operation from $0.66 (W - \Delta W) + 66.0$ percent RTP to $0.55 (W - \Delta W) + 65.5$ percent RTP.

Provide a summary of the calculation used to calculate the AVs from the revised ALs.

CORRECTION TO SRXB-RAI 13 DATED MARCH 15, 2016

SRXB-RAI 12

ANP-3404P, Table 1.1, "EOD and EOOS Operating Conditions," lists "Extended Operating Domain (EOD) Conditions" and "Equipment Out-Of-Service (EOOS) Operating Conditions." Section 5.3 describes EOOS scenarios. Section 5.3 describes operation scenarios with turbine bypass valve OOS, feed water heater OOS, power load unbalance OOS, and different combinations of these scenarios.

- a. Clarify whether TVA is planning to take credit for these analyses when the above specified equipment becomes inoperable. ANP-3404P representative analyses are only for Unit 3, Cycle 19, and hence, may not accurately reflect the actual Unit 1 and Unit 2 plant configuration in future operations.
- b. Specify the number of turbine bypass valves, feed water heater OOS assumed to be inoperable.
- c. How many power load unbalance devices are in the plant? Are they located in the control room or outside the control room?
- d. Minimum critical power ratio limits are given in Tables 8.1 and 8.2 for EOOS. Describe the nominal scram speed and technical specifications scram speed tests performed during the EOOS operation, if they are different from the tests done at normal operation.
- e. Note below that Table 1.1 states, "SLO [single-loop operation] may be combined with all of the other EOOS conditions." The NRC staff does not agree with this statement. SLO operation is susceptible to thermal-hydraulic stability, and feedwater heater OOS may increase the susceptibility. Verify that analyses have been performed to confirm the TVA statement.
- f. Note below that Table 1.1 mentions two traversing in-core probe (TIP) machines OOS. How many TIP machines are in BFN units?

SRXB-RAI 13

PCT for anticipated transient without scram (ATWS) is not provided in the LAR. Provide a qualitative assessment to justify the TVA position that the PCT calculation is not needed for the ATWS scenario.

SRXB-RAI 14

ANP 3403P, Revision 3, "Fuel Uprate Safety Analysis Report for Browns Ferry Units 1, 2, and 3 (Proprietary)," Enclosure 1¹ to the letter dated December 15, 2015, in Section 2.8.5.4.2, "Uncontrolled Control Rod Assembly Withdrawal at Power," Technical Evaluation, TVA stated, "The event was analyzed at EPU conditions and resulted in an unblocked delta CPR of 0.27." What is meant by "unblocked"?

¹ Enclosure 2 contains a non-proprietary version of Enclosure 1.

J. Shea

- 2 -

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
Office of Nuclear Reactor Regulation

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

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*by e-mail

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DATE	3/25/2016	3/25/2016	3/24/2016	3/25/2016	3/25/2016

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