



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

July 11, 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 – SUMMARY REPORT FOR THE MAY 3 - MAY 5, 2016 AUDIT IN SUPPORT OF CONTAINMENT ACCIDENT PRESSURE ASSOCIATED WITH EXTENDED POWER UPRATE LICENSE AMENDMENT REQUEST (CAC NOS. MF6741, MF6742, AND MF6743)

Dear Mr. Shea:

By letter dated September 21, 2015, as supplemented by letters dated November 13, December 15 (2 letters), and December 18, 2015, 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.

In addition, by letter dated February 18, 2016, the U.S. Nuclear Regulatory Commission (NRC) issued a request for additional information (RAI). The licensee, by letter dated March 28, 2016, responded to the requested information.

On March 25 and March 28, 2016, the NRC staff forwarded, by electronic mails (emails), draft requests for additional information (RAIs) to TVA. On April 8, 2016, the NRC staff held a conference call to provide the licensee with an opportunity to clarify any portion of the draft RAIs and discuss the timeframe for which TVA may provide the requested information. Subsequently, the NRC staff determined an audit would be the most effective approach to enable the NRC staff to develop focused RAIs in order for the licensee to provide quality and timely responses.

The audit was held at the EXCEL Services Corporation facility in Rockville, Maryland, from May 3 to May 5, 2016. The audit plan dated April 21, 2016, is available in the NRC's Agencywide Documents Access and Management System under Accession No. ML16105A297. A list of audit attendees is provided in Enclosure 1.

During the audit, the licensee provided the NRC staff with a documentation package that included the draft RAIs that were emailed to TVA on March 28, 2016, TVA's draft responses, and the supplemental information that would support completion of the NRC staff's review. The NRC staff reviewed the information provided in the package and discussed it with the TVA and the General Electric Hitachi (TVA contractor) staffs.

J. Shea

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As the result of this audit, the NRC staff was able to finalize the draft RAIs. The NRC's letter dated June 13, 2016, documents the finalized RAIs associated with the containment accident pressure and the agreed upon RAI response dates. The licensee was able to identify draft responses that would be revised to provide additional clarifications. Enclosure 2 to this letter provides the audit summary report.

If you have any questions, please contact me at (301) 415-1447 or [Farideh.Saba@nrc.gov](mailto:Farideh.Saba@nrc.gov).

Sincerely,



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

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

Enclosures:

1. List of Attendees
2. Summary Report for Audit

cc w/encls: Distribution via Listserv

LIST OF ATTENDEES  
MAY 3 - 5, 2016, AUDIT OF TENNESSEE VALLEY AUTHORITY  
BROWNS FERRY NUCLEAR PLANT, UNITS 1, 2, AND 3  
CONTAINMENT ACCIDENT PRESSURE REVIEW  
ASSOCIATED WITH EXTENDED POWER UPRATE  
LICENSE AMENDMENT REQUEST

<b>Name</b>	<b>Affiliation</b>	<b>Entrance 05/03</b>	<b>05/03</b>	<b>05/04</b>	<b>05/05</b>	<b>Exit 05/05</b>
Ben Beasley	NRC					X
Ahsan Sallman	NRC	X	X	X	X	X
Yuri Orechwa	NRC	X	In AM		X	X
Eric Oesterle	NRC	X	In AM			X
Farideh Saba	NRC	X	X	X	X	X
Gerard Doyle	TVA	X	X	X	X	X
Dan Green	TVA	X	X	X	X	X
Pete Donahue	TVA	X	X	X	X	X
David Melear	TVA	X	X	X	X	X
Ben Hammargren	TVA		In PM	X	X	X
Michael Dick	TVA	X	X	X	X	X
Larry King	GEH	X	X	X	X	X
Guangjun Li	GEH		In PM			
Antonio Barrett	GEH		In PM			
Jason Cody	Zachry Nuclear Engineering		by phone			

SUMMARY REPORT FOR MAY 3 - 5, 2016, AUDIT  
AT EXCEL FACILITY IN ROCKVILLE, MARYLAND  
REVIEW OF EXTENDED POWER UPRATE  
LICENSE AMENDMENT REQUEST  
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 (2 letters), and December 18, 2015 (ADAMS Accession Nos. ML15317A361, ML15351A097, 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 (Browns Ferry). The proposed amendment would increase the authorized maximum steady-state reactor core power level for each unit from current licensed thermal power (CLTP) of 3,458 megawatt thermal (MWt) to extended power update (EPU) level of 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 CLTP.

In addition, by letter dated February 18, 2016, the U.S. Nuclear Regulatory Commission (NRC) staff issued a request for additional information (RAI) (ADAMS Accession No. ML 16041A307<sup>1</sup>). The licensee, on March 28, 2016 (ADAMS Accession No. ML16089A054), responded to the NRC staff's requested information.

On March 25 and March 28, 2016, the NRC staff forwarded, by electronic mails (emails), draft RAIs to TVA. On April 8, 2016, the NRC staff held a conference call to provide the licensee with an opportunity to clarify any portion of the draft RAIs and discuss the timeframe for which TVA may provide the requested information. Subsequently, the NRC staff determined an audit would be the most effective approach to enable the NRC staff to develop focused RAIs in order for the licensee to provide quality and timely responses.

The audit was held at the EXCEL Services Corporation facility in Rockville, Maryland, from May 3 to May 5, 2016. The audit plan dated April 21, 2016, is available in ADAMS under Accession No. ML16105A297. A list of attendees in the entrance meeting, audit days, and exit meeting was shown in Enclosure 1. The following NRC staff participated in the audit discussions: Ahsan Sallman, lead technical reviewer, Yuri Orechwa, supporting uncertainty analysis reviews, and Farideh Saba, project manager.

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<sup>1</sup> This document contains SCVB [Containment and Ventilation Branch]-RAI 01.

The audit team held an entrance meeting on May 3, 2016. At this meeting, following the introduction, TVA and its contractor, General Electric Hitachi (GEH), provided a short background about NRC approval of the elimination of the use of containment accident pressure (CAP) in the net positive suction head (NPSH) analysis for the residual heat removal (RHR) system pumps during a postulated National Fire Protection Association (NFPA) 805 fire event safe shutdown at the CLTP at Browns Ferry. In the proposed EPU application, the licensee has similarly not credited CAP in the NFPA 805 fire safe shutdown NPSH analysis as well as for the design basis loss-of-coolant accident, station blackout, stuck open relief valve, anticipated transient without scram, loss of shutdown cooling events, and safe shutdown of the non-accident unit NPSH analyses. The basis for not crediting CAP and having a positive NPSH margin is the tested value of the RHR heat exchanger fouling resistance. The purpose of this audit was to review the key items that form the basis for not crediting CAP in the NPSH analyses.

During the audit, the licensee presented to the NRC staff, a package that included the NRC staff's 35 draft RAIs that were emailed to TVA on March 25 and March 28, 2016; TVA draft responses to all draft RAIs, except SCVB-RAI 14, which a draft response was not available, and SCVB-RAI 30, which was deleted during the conference call; and the supplemental information that would support the NRC staff's review. The documents in the documentation package presented by TVA are listed below:

1. Letter from NRC to TVA, "Browns Ferry Nuclear Plant, Units 1, 2, and 3 – Regulatory Audit Plan for May 3 - 5, 2016, Audit at EXCEL Facility in Rockville, Maryland, in Support of Extended Power Uprate License Amendment Request (CAC Nos. MF6741, MF6742, and MF6743)," dated April 21, 2016 (ML16105A297).
2. Draft NRC SCVB RAIs, "MF6741-3 BFN EPU LAR Draft RAI SCVB," dated March 25, 2016 (Transmitted RAIs SCVB-RAI 2 through SCVB-RAI 35).
3. Browns Ferry EPU - draft follow-up RAIs in Response to SCVB-RAI 1 (transmitted revised RAIs SCVB-RAI 24 and provided SCVB-RAI 36 through SCVB-RAI 38<sup>2</sup>).
4. Draft responses SCVB-RAI 2 through SCVB-RAI-38.
5. Markup of Browns Ferry Nuclear Plant LAR Attachment 6 - Safety Analysis Report for Browns Ferry Plant.
6. Markup of Browns Ferry Nuclear Plant LAR Attachment 39 - RHR Heat Exchanger K-Values.
7. Markup of Browns Ferry Nuclear Plant LAR Attachment 47 - List and Status of Plant Modifications.

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<sup>2</sup> The official RAIs to TVA were renumbered, since draft RAI 30 was deleted and draft SCVB-RAIs 32 through SCVB-RAI 34 were issued as SBPB [Balance of Plant Branch]-RAIs 1 through 3.

8. Work Order No. 117064509, Perform 0-TI-322 to measure RHR Heat Exchangers 1B and 1D efficiency.
9. Technical Instruction 0-TI-322, "RHR Heat Exchanger Performance Testing," Revision 0.
10. Zachry Engineering Evaluation 16-E04.
11. Zachry Engineering E-Mail dated 4/19/16.
12. NPG-SPP-09.14, "Generic Letter (GL) 89-13 Implementation," Revision 3.
13. Heat Exchanger Visual Inspection and Evaluation Forms (2A, 2C, 2D, 3A, 3C, 3D).

During the audit, the NRC staff reviewed the information provided in the package and discussed it with the TVA and GEH staffs. There was open communication throughout the audit and it was conducted in accordance with the audit plan with no known deviation. The NRC staff and TVA staff agreed to renumber the RAIs, since draft SCVB-RAI 30 was deleted as the result of the conference call held on April 8, 2016, and draft SCVB-RAIs 32, 33, and 34 were issued as SBPB [balance of plant branch]-RAIs (ADAMS Accession No. ML16145A158. No new RAI was added and no other RAI was deleted. From the 33 draft RAIs that were discussed during the audit, the NRC staff agreed to revise 2 RAIs to add clarification to the questions. The TVA staff determined that the additional clarification or performing additional work was necessary to provide appropriate responses to 13 of 33 draft RAIs. Specifically, TVA determined that it needs more time to provide a resolution to SCVB-RAI 32 (draft SCVB-RAI 36) associated with the uncertainty analysis.

At the conclusion of the audit, the NRC staff conducted an exit meeting on May 5, 2016. At this meeting, the staff provided a summary of the audit results in each subject area defined in the audit scope. The NRC staff and TVA staff both agreed that the audit helped the licensee to better focus on the scope of NRC's draft RAIs. The audit also provided the NRC staff with a better understanding of TVA's submittals and approach for responding to the NRC staff's RAIs. Additionally, NRC staff utilized results of the audit to finalize and issue the RAIs, which are documented in the NRC letter dated June 13, 2016 (ADAMS Accession No. ML16146A635).

Subsequent to the audit, TVA requested a conference call with the NRC staff to further discuss its response to SCVB-RAI 32 regarding the RHR heat exchangers thermal performance testing uncertainty. The NRC staff held a conference call on June 16, 2016. The licensee determined that additional clarification should be provided in the TVA response to this RAI. Currently, TVA is planning to submit its responses to the NRC staff RAIs as scheduled in the NRC letter June 13, 2016.

J. Shea

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As the result of this audit, the NRC staff was able to finalize the draft RAIs. The NRC's letter dated June 13, 2016, documents the finalized RAIs associated with the containment accident pressure and the agreed upon RAI response dates. The licensee was able to identify draft responses that would be revised to provide additional clarifications. Enclosure 2 to this letter provides the audit summary report.

If you have any questions, please contact me at (301) 415-1447 or [Farideh.Saba@nrc.gov](mailto:Farideh.Saba@nrc.gov).

Sincerely,

**/RA/**

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

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

Enclosures:

1. List of Attendees
2. Summary Report for Audit

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**ADAMS Accession No.: ML16176A316**

**\* By email**

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