



Tennessee Valley Authority, 1101 Market Street, Chattanooga, Tennessee 37402

CNL-16-035

March 8, 2016

10 CFR 50.90

ATTN: Document Control Desk  
U.S. Nuclear Regulatory Commission  
Washington, D.C. 20555-0001

Browns Ferry Nuclear Plant, Units 1, 2, and 3  
Renewed Facility Operating License Nos. DPR-33, DPR-52, and DPR-68  
NRC Docket Nos. 50-259, 50-260, and 50-296

Subject: **Proposed Technical Specifications (TS) Change TS-505 - Request for License Amendments - Extended Power Uprate (EPU) - Supplement 5, Response to Request for Additional Information**

- References:
1. Letter from TVA to NRC, CNL-15-169, "Proposed Technical Specifications (TS) Change TS-505 - Request for License Amendments - Extended Power Uprate (EPU)," dated September 21, 2015 (ML15282A152)
  2. Letter from NRC to TVA, "Browns Ferry Nuclear Plant, Units 1, 2, and 3 - Request for Additional Information Related to License Amendment Request Regarding Extended Power Uprate (CAC Nos. MF4851, MF4582, and MF4853)," dated January 28, 2016 (ML16019A283)
  3. Letter from TVA to NRC, CNL-16-023, "Proposed Technical Specifications (TS) Change TS-505 - Request for License Amendments - Extended Power Uprate (EPU) - Supplement 4," dated February 16, 2016

By the Reference 1 letter, Tennessee Valley Authority (TVA) submitted a license amendment request (LAR) for the Extended Power Uprate (EPU) of Browns Ferry Nuclear Plant (BFN) Units 1, 2 and 3. The proposed LAR modifies the renewed operating licenses to increase the maximum authorized core thermal power level from the current licensed thermal power of 3458 megawatts to 3952 megawatts. During the technical review of the LAR, the NRC identified the need for additional information. The Reference 2 letter provided NRC Requests for Additional Information (RAIs) related to the Spent Fuel Pool

criticality safety analysis. The due date for the responses to these NRC RAIs was February 16, 2016. The Reference 3 letter provided the response to the Reference 2 letter RAIs with the exception of NRC RAI SFP-RAI 2. For the response to NRC RAI SFP-RAI 2, due to the time required to locate test records to support the development of the response and the subsequent review of documentation indicating that, in some cases, testing was inconclusive, the submittal date for this response was extended to March 11, 2016, per communications with the NRC Project Manager. The enclosure to this letter provides the response to the NRC RAI SFP-RAI 2.

TVA has reviewed the information supporting a finding of no significant hazards consideration and the environmental consideration provided to the NRC in the Reference 1 letter. The supplemental information provided in this submittal does not affect the bases for concluding that the proposed license amendment does not involve a significant hazards consideration. In addition, the supplemental information in this submittal does not affect the bases for concluding that neither an environmental impact statement nor an environmental assessment needs to be prepared in connection with the proposed license amendment. Additionally, in accordance with 10 CFR 50.91(b)(1), TVA is sending a copy of this letter to the Alabama State Department of Public Health.

There are no new regulatory commitments associated with this submittal. If there are any questions or if additional information is needed, please contact Mr. Edward D. Schrull at (423) 751-3850.

I declare under penalty of perjury that the foregoing is true and correct. Executed on the 8th day of March 2016.

Respectfully,

**J. W. Shea**

Digitally signed by J. W. Shea  
DN: cn=J. W. Shea, o=Tennessee Valley  
Authority, ou=Nuclear Licensing,  
email=jwshea@tva.gov, c=US  
Date: 2016.03.08 19:44:43 -05'00'

J. W. Shea  
Vice President, Nuclear Licensing

Enclosure: Response to NRC Request for Additional Information SFP-RAI 2

cc:

NRC Regional Administrator - Region II  
NRC Senior Resident Inspector - Browns Ferry Nuclear Plant  
State Health Officer, Alabama Department of Public Health

**ENCLOSURE**

**Response to NRC Request for Additional Information SFP-RAI 2**

## ENCLOSURE

### SFP-RAI 2

*The NCS analyses submitted by the licensee are used to demonstrate the regulatory requirement of 10 CFR 50.68(b)(4), which states, in part, that, "the k-effective of the spent fuel storage racks loaded with fuel of the maximum fuel assembly reactivity must not exceed 0.95, at a 95 percent probability, 95 percent confidence level, if flooded with borated water, and the k-effective must remain below 1.0 (subcritical), at a 95 percent probability, 95 percent confidence level, if flooded with unborated water." This requirement is evaluated against both normal conditions and postulated accident conditions. In the NCS analysis, the limiting accident condition is one in which a single Boral plate is missing.*

*In the previous SFP LAR dated September 21, 1978 (ADAMS Accession No. ML020040269), which the NRC staff reviewed and approved in 1978, the licensee evaluated an accident condition where up to four Boral plates were missing. As part of this LAR, the licensee stated that, "the presence of the neutron absorber material in the fabricated fuel storage module will be verified at the reactor storage-pool site by use of a neutron source and neutron detectors." The licensee states there will be a permanent record of all test results and that, "a module will be accepted unless measurements indicate that five or more Boral sheets are not present." Section 10.3.6 of the BFN Updated Final Safety Analysis Report states that each rack was tested prior to installation to check for missing Boral plates. However, the information available to the NRC does not provide clear assurance that the testing results showed that no Boral plates were found to be missing. Given that the limiting accident condition assumes fewer missing Boral plates than allowed by the acceptance criteria associated with initial receipt of the rack modules, the possibility exists for an unanalyzed condition that challenges the calculated margin to the regulatory limit.*

*Provide information that demonstrates that the testing of the neutron attenuation of each tube in each rack prior to installation showed that no more than one Boral plate was missing from any of the prescribed locations in the fabricated fuel storage modules, even though the criteria for acceptance of each rack modules would have allowed for some missing plates.*

### **TVA Response:**

Neutron attenuation testing to verify the presence of the Boral plates in each tube of the high density spent fuel pool (SFP) storage modules was performed at the Browns Ferry Nuclear Plant (BFN) site by General Electric (GE) using a neutron source and four proportional counters. Documentation of the Boral verification testing include: 1) Strip chart records of the four proportional counters; 2) Product Quality Certifications (PQC) provided by GE for each storage module documenting the completion of Boral verification testing; and 3) Work plan documentation that include sign offs for the completion of Boral verification testing. Permanent records of all test results (i.e., strip charts) could not be found.

The available documentation reviewed consists of strip chart records, PQCs, and work plans. Based on the review of this documentation, Tennessee Valley Authority (TVA) is confident that all 57 SFP storage modules have been Boral verification tested. Additionally, no documentation has been identified that indicates the existence of missing Boral plates in any storage module.

## ENCLOSURE

For BFN Unit 1, PQC's or work plans for the SFP storage modules show that all testing was completed with no anomalies, with the exception of some cell locations on five storage modules. For these cell locations, it was identified that testing results were inconclusive due to their proximity to irradiated fuel in adjacent storage modules. A statistical analysis was performed that determined the confidence of missing no more than one Boral plate per module was greater than 99.9%. Based on the review of available documentation, there is reasonable expectation that the BFN Unit 1 SFP storage modules are missing no more than one Boral plate per module.

For BFN Unit 2, PQC's show that all testing was completed with no anomalies, and, therefore, there is reasonable expectation that the BFN Unit 2 SFP storage modules are missing no more than one Boral plate per module.

For BFN Unit 3, PQC's or work plans for the SFP storage modules show that all testing was completed with no anomalies, with the exception of some cell locations of one storage module. For these cell locations, it was identified that testing results were inconclusive due to the proximity of irradiated fuel in adjacent storage modules. A statistical analysis was performed that determined the confidence of missing no more than one Boral plate per module was greater than 99.9%. Therefore, there is reasonable expectation that the BFN Unit 3 SFP storage modules are missing no more than one Boral plate per module.

The failure to maintain complete permanent records of the Boral verification testing and the inconclusive testing of tubes in the storage modules has been entered into the TVA Corrective Action Program. Actions will be taken to resolve these issues associated with the SFP storage module Boral plate configuration in accordance with the Corrective Action Program.