



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

CNL-16-063

April 5, 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 10, 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. MF6741, MF6742, and MF6743)," dated March 25, 2016 (ML16084A320)

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 their technical review of the LAR, the Nuclear Regulatory Commission (NRC) identified the need for additional information. The Reference 2 letter provided an NRC Request for Additional Information (RAI) related to instrumentation and controls. The due date for the response to the NRC RAI provided by the Reference 2 letter is incorrectly stated as April 4, 2016. This due date was subsequently corrected by the NRC.

The corrected due date is April 8, 2016. The enclosure to this letter provides the response to the RAI included in the Reference 2 letter.

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 Edward D. Schrull at (423) 751-3850.

I declare under penalty of perjury that the foregoing is true and correct. Executed on the 5th day of April 2016.

Respectfully,

**J. W. Shea**

Digitally signed by J. W. Shea  
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J. W. Shea  
Vice President, Nuclear Licensing

Enclosure:     Response to NRC Request for Additional Information EICB-RAI 1

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  
EICB-RAI 1**

## EICB RAI 1

*In Section 2.4.1.3.3, "APRM [Average Power Range Monitors] Flow Biased Simulated Thermal Power - High Scram," of Attachment 6,<sup>1</sup> "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  $0.55(W - \Delta W) + 67.5$  percent RTP.*

*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.*

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<sup>1</sup> 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.

<sup>2</sup> *W is the recirculation drive flow in percent of rated flow.  $\Delta W$  is the difference between the dual-loop operation and single-loop operation drive flow at the same core flow. The current value of  $\Delta W$  is 10 percent and is not changed.*

## TVA Response

The following is a summary of the calculation used to determine the Average Power Range Monitor (APRM) Simulated Thermal Power - High Allowable Values (AVs) from the revised Analytical Limits (ALs). This information was previously provided to the NRC Staff in the Reference 1 response to NRC RAI Part (b) during the review of BFN license amendment request (LAR) TS-453 (Reference 2) concerning the BFN instrument setpoint program. The NRC approved the TS-453 LAR in Reference 3.

### Error Terms

APRM/Trip/Local Power Range

Monitor (LPRM) Accuracy	(A) = $\pm 1.48\%$ power flow biased
Channel Calibration Accuracy	(C) = $\pm 0.94\%$ power
Channel Instrument Drift	(D) = $\pm 0.86\%$ power flow biased
Primary Element Accuracy	(DPEA) = $0.82\%$ power bias (APEA) = $\pm 0.23\%$ power random
Process Measurement Accuracy	(PMA) = $\pm 1.15\%$ power flow biased

### APRM Flow Biased Simulated Thermal Power – High

$$AL = 0.55W + 67.5\% \text{ power}$$

Where W = recirculation pump drive flow, percent of rated

The Nominal Trip Setpoint (NTSP) is calculated as follows:

$$\begin{aligned} NTSP &= AL - [1.645/2] * [\text{SQRT}(A^2 + C^2 + PMA^2 + APEA^2 + D^2) + DPEA] \\ NTSP &= 0.55W + 67.5 - [1.645/2] * [\text{SQRT}(1.48^2 + 0.94^2 + 1.15^2 + 0.23^2 + 0.86^2) + 0.82] \\ &= 0.55W + 67.5 - 2.548 \\ &= 0.55W + 64.95 \\ &= 0.55W + 64.68 \text{ (for margin to chosen AV)} \end{aligned}$$

let NTSP (two loop operation) =  $0.55W + 64.5\%$  power

For single loop operation, the  $\Delta W$  term is applied to the above NTSP for two-loop operation. The  $\Delta W$  term does not change for EPU.

NTSP (single loop operation) =  $0.55(W - \Delta W) + 64.5\%$  power

The AV is calculated as follows:

$$\begin{aligned}AV &= AL - [1.645/2] * [\text{SQRT}(A^2 + C^2 + PMA^2 + APEA^2)] \\AV &= 0.55W + 67.5 - [1.645/2] * [\text{SQRT}(1.48^2 + 0.94^2 + 1.15^2 + 0.23^2)] \\&= 0.55W + 67.5 - 1.735 \\&= 0.55W + 65.77\end{aligned}$$

let  $AV = 0.55W + 65.5\%$  power

For single loop operation, the  $\Delta W$  term is applied to the above AV for two-loop operation. The  $\Delta W$  term does not change for EPU.

$AV$  (single loop operation) =  $0.55(W - \Delta W) + 65.5\%$  power

## References

1. Letter TVA to NRC, "Browns Ferry Nuclear Plant (BFN) – Units 1, 2, and 3 – Response to NRC Request for Additional Information (RAI) Related to Technical Specifications (TS) Change No. TS-453 - Instrument Setpoint Program (TAC Nos. MC9518, MC9519, and MC9520)," dated August 1, 2006. (ML062130245).
2. Letter TVA to NRC, "Browns Ferry Nuclear Plant (BFN) – Units 1, 2, and 3 – Technical Specifications (TS) Change No. TS-453 - Instrument Setpoint Program," dated January 10, 2006 (ML060180452).
3. Letter NRC to TVA, "Browns Ferry Nuclear Plant (BFN) – Units 1, 2, and 3 – Issuance of Amendments Regarding the Instrument Setpoint Program (TAC Nos. MC9518, MC9519, and MC9520) (TS-453)," dated September 14, 2006 (ML061680008).