



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

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Vice President, Nuclear Licensing

October 7, 2011

10 CFR 50.90

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

Browns Ferry Nuclear (BFN) Plant, Unit 1  
Facility Operating License Nos. DPR-33  
NRC Docket No. 50-259

Subject: Response to NRC Request for Additional Information Regarding Amendment Request to Transition to AREVA Fuel (TAC NO. ME3775)

- References:
1. Letter from TVA to NRC, "Technical Specification Change TS-473, AREVA Fuel Transition," dated April 16, 2010
  2. NRC Letter to TVA, "Browns Ferry Nuclear Plant, Unit 1 - Request for Additional Information Regarding Amendment Request to Transition to AREVA Fuel (TAC NO. ME3775)," dated August 23, 2011

On April 16, 2010, the Tennessee Valley Authority (TVA) submitted "Technical Specification Change TS-473, AREVA Fuel Transition," (Reference 1) to the NRC requesting approval of a license amendment to support using AREVA Fuel in Unit 1 at Browns Ferry Nuclear (BFN). On August 23, 2011, TVA received a Request for Additional Information (RAI) letter from the NRC (Reference 2) containing 7 questions related to Technical Specification Change TS-473. The NRC requested the responses within 45 days, i.e., no later than October 7, 2011.

Enclosure 1 to this letter provides the TVA responses to the 7 NRC RAI questions. Incorporated by reference to Enclosure 2 are responses from AREVA NP to four of the questions.

ANP-3035(P), Revision 0, "AREVA Responses to August 2011 RAIs for Browns Ferry Unit 1 Fuel Transition – LOCA" is contained in Enclosure 2.

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ANP-3015(P), Revision 0, "Browns Ferry Units 1, 2, and 3, LOCA Break Spectrum Analysis" is contained in Enclosure 5.

Enclosures 2 and 5 to this letter contain information that AREVA NP Inc. considers to be proprietary in nature and subsequently, pursuant to 10 CFR 2.390, "Public inspections, exemptions, requests for withholding," paragraph (a)(4), it is requested that such information be withheld from public disclosure.

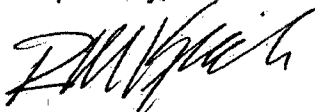
Enclosures 3 and 6 contain the redacted versions of Enclosures 2 and 5, respectively, with the proprietary material removed, suitable for public disclosure.

Enclosures 4 and 7 provide the affidavits, supporting these requests.

This letter does not include any new regulatory commitments. Please direct any questions concerning this matter to Tom Hess at (423) 751-3487.

I declare under penalty of perjury that the foregoing is true and correct.  
Executed on the 7th day of October, 2011.

Respectfully,



R. M. Krich

Enclosures:

1. TVA Response to Request for Additional Information
2. ANP-3035(P), Revision 0, "AREVA Responses to August 2011 RAIs for Browns Ferry Unit 1 Fuel Transition – LOCA", Proprietary
3. ANP-3035(NP), Revision 0, "AREVA Responses to August 2011 RAIs for Browns Ferry Unit 1 Fuel Transition – LOCA", Non-Proprietary
4. Affidavit for ANP-3035(P), Revision 0, "AREVA Responses to August 2011 RAIs for Browns Ferry Unit 1 Fuel Transition – LOCA", Proprietary
5. ANP-3015(P), Revision 0, " Browns Ferry Units 1, 2, and 3, LOCA Break Spectrum Analysis", Proprietary
6. ANP-3015(NP), Revision 0, " Browns Ferry Units 1, 2, and 3, LOCA Break Spectrum Analysis", Non-Proprietary
7. Affidavit for ANP-3015(P), Revision 0, " Browns Ferry Units 1, 2, and 3, LOCA Break Spectrum Analysis", Proprietary

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cc (Enclosures):

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

**ENCLOSURE 1**

**Browns Ferry Nuclear Plant Unit 1  
Technical Specifications Change TS - 473 - AREVA Fuel Transition**

**TVA Response to Request for Additional Information**

## ENCLOSURE 1

### Browns Ferry Nuclear Plant (BFN) Unit 1

#### Technical Specifications (TS) Change TS - 473 - AREVA Fuel Transition

#### TVA Response to Request for Additional Information

##### **NRC Question 1**

*Please provide a revised Emergency Core Cooling System (ECCS) Evaluation Summary that provides a detailed description of the most severe loss-of-coolant accident (LOCA) analysis, along with a description of other break sizes, locations and other properties that were evaluated to support the determination that the most severe postulated LOCA has been calculated.*

##### **TVA Response:**

The new break spectrum report, ANP-3015(P), Browns Ferry Units 1, 2, and 3, LOCA Break Spectrum Analysis, provides the requested summary (Enclosure 5).

##### **NRC Question 2**

*Please provide a detailed description of the model changes made to address the staff's concern with the evaluation model's application.*

##### **TVA Response:**

The description of the model change to address the staff's concerns is provided in Section 4.4 of ANP-3015(P) (Enclosure 5).

##### **NRC Question 3**

*Please provide the results of a sensitivity study demonstrating the effect of the EXEM-BWR 2000 pressure control assumptions on the break spectrum. Please include results for the limiting break size as determined using the modified EXEM-BWR 2000 analyses (0.21 ft<sup>2</sup>) and for a smaller break size that would result in a delayed pressurization following a level-driven main streamline isolation.*

##### **TVA Response:**

AREVA NP Inc. has provided this response in section 2.3 of ANP-3035(P), AREVA Responses to August 2011 RAIs for Browns Ferry Unit 1 Fuel Transition – LOCA, (Enclosure 2).

##### **NRC Question 4**

*Please provide a summary of the break spectrum results that include sufficient detail to compare the break spectra for each combination of power shape, core flow state point, single failure, and break geometry.*

**TVA Response:**

Appendices B, C, and D were added to ANP-3015(P) (Enclosure 5) to provide sufficient detail to compare spectra.

**NRC Question 5**

*Please explain why the break spectrum results exhibit slightly discontinuous behavior in the intermediate range of break sizes. Identify the significant model aspects that are causing the behavior and provide an estimate or description of the impact on the evaluation.*

**TVA Response:**

AREVA NP Inc. has provided this response in section 2.5 of ANP-3035(P) (Enclosure 2).

**NRC Question 6**

*Please determine the cause of the intermediate temperature transient observable in the plots of peak cladding temperature vs. time for the intermediate break size cases and provide a summary explanation. Justify the validity of the results, given the temperature trends depicted.*

**TVA Response:**

AREVA NP Inc. has provided this response in section 2.6 of ANP-3035(P) (Enclosure 2).

**NRC Question 7**

*Title 10 of the Code of Federal Regulations, Section 50.46, requires ECCS cooling performance to be calculated for a number of postulated LOCAs of different sizes, locations, and other properties sufficient to provide assurance that the most severe postulated LOCAs are calculated. At the time EXEM-BWR 2000 was approved, ECCS research suggested that the large-break LOCA was generally limiting for boiling-water reactors, and there appears to be little consideration of post-power uprate plant operation. Since the ECCS research was compiled and documented in NUREG-1230, "Compendium of ECCS Research for Realistic LOCA Analysis," operating experience has shown that the small break scenario can in fact result in a more limiting event. Because the small-break accident is limiting, AREVA Topical Report ANP-2908(P) includes a number of explicitly analyzed ancillary line breaks, since these breaks are smaller in size. The general trend is a liquid blow down at high pressure until the break uncovers, followed by a depressurization of the reactor coolant system caused by steam exiting the break. The analysis results indicate that, absent any emergency core cooling, the steam flow pressure reduction is a dominant mechanism in the event.*

*Please provide an analysis of the rupture of the bottom head drain line (which would not include the pressure reduction associated with break uncover) to demonstrate that the initial heatup would not contribute to the limiting peak cladding temperature. This analysis should consider the most limiting of the Battery Board B failure and the high-pressure coolant injection failure.*

**TVA Response:**

AREVA NP Inc. has provided this response in section 2.7 of ANP-3035(P) (Enclosure 2).