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

August 31, 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 TO ADD NEW TECHNICAL SPECIFICATION 3.3.8.3 (CAC NOS. MF6738, MF6739, AND MF6740)

Dear Mr. Shea:

By letter dated September 16, 2015 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML15260B125), Tennessee Valley Authority, (TVA, the licensee) submitted a license amendment request (LAR) for Renewed Facility Operating License Nos. DPR-33, DPR-52, and DPR-68, for the Browns Ferry Nuclear Plant (BFN) Units 1, 2 and 3, respectively. The proposed changes revise BFN, Units 1 and 2, Technical Specifications (TSs) by adding a new specification governing the safety functions for the emergency core cooling system preferred pump logic, common accident signal (CAS) logic, and the unit priority re-trip logic (UPRTL). The changes proposed for BFN, Unit 3 (i.e., relocating the requirements for CAS logic and UPRTL) are made for consistency with the changes to BFN, Units 1 and 2 TSs.

In addition, by letter dated March 21, 2016 (ADAMS Accession No. ML16074A126), the U.S. Nuclear Regulatory Commission (NRC) issued a request for additional information (RAI). The licensee, by letters dated April 15, April 29, May 11, May 25, and June 16, 2016 (ADAMS Accession Nos. ML16106A323, ML16123A071, ML16133A566, ML16146A725, and ML16169A179, respectively), responded to the RAIs.

The NRC staff reviewed the information provided in the LAR and the RAI responses submitted by the licensee, and determined that additional information is needed. On August 3, 2016, the NRC staff forwarded to TVA by e-mail followup questions from the Probabilistic Risk Assessment Licensing Branch, Division of Risk Assessment, Office of Nuclear Reactor Regulation. On August 11 and August 18, 2016, NRC and TVA staff held conference calls for the licensee to clarify any staff questions, and discuss the timeframe in which TVA may provide the requested information. The enclosure to this letter contains the finalized followup RAIs. During the conference call, NRC and TVA staff agreed that TVA would respond to the staff RAIs by September 16, 2016.

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

Sincerely,

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

Enclosure:
Request for Additional Information

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REQUEST FOR ADDITIONAL INFORMATION

LICENSE AMENDMENT REQUEST

TO ADD NEW TECHNICAL SPECIFICATION 3.3.8.3

TENNESSEE VALLEY AUTHORITY

BROWNS FERRY NUCLEAR PLANT, UNITS 1, 2, AND 3

DOCKET NOS. 50-259, 50-260, AND 50-296

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The NRC staff from the Probabilistic Risk Assessment (PRA) Licensing Branch (APLA), Division of Risk Assessment, Office of Nuclear Reactor Regulation, has reviewed the information provided in the LAR dated September 16, 2015, and TVA's responses to the staff's RAIs. NRC staff determined that the following additional information is needed to complete its review.

APLA-RAI-17[1] **Defense-in-Depth**

In response to APLA-RAI-2, 3, 4 and 6b, in TVA letters dated April 15 and May 11, 2016, the licensee summarized the effects on the plant's ability to support the ECCS loads with a combination of real and spurious accident signals in Units 1 and 2 when one division of ECCS PPL is out of service or one division of UPRTL is out of service. The assessment provided in response to APLA-RAI-6b, concluded that for some scenarios when one ECCS PPL division or one UPRT division is out of service, the low pressure safety injection pumps would not be available in the accident unit, due to overloading the diesel generators and the shutdown boards. Further, the response to APLA-RAI-3 states that if ECCS PPL is unavailable and a combination of real and spurious signals occurs in Units 1 and 2, all residual heat removal

[1] The NRC letter dated March 21, 2016, contains APLA RAIs 1 through 16.

(RHR) and core spray pumps would not be available, and the high pressure injection systems would be lost due to depressurization, and therefore these scenarios proceed directly to core damage. Based on the RAI responses, one inoperable PPL division appears to be equivalent to both PPL divisions inoperable in that there is no mitigation for the design-basis scenario of a dual unit loss-of- coolant accident signals. That is, such accident scenarios that result in a PPL demand appear to result in core damage as a result of the initiating event. Regulatory Guide (RG) 1.174, Section 2.1.1 and RG 1.177, Section 2.2.1 describes defense in depth attributes which should be maintained for a proposed TS change.

Demonstrate mitigation for such initiating events in order to justify defense in depth, as described in RG 1.174 and RG 1.177, for the proposed TS amendment or remove the proposed TS amendment.

APLA-RAI-18 Single Unit Risk Contribution

The response to APLA-RAI-4 states that "the ECCS PPL function is performed by Core Spray and RHR-LPCI [low-pressure coolant injection] system relays and components. Most of these components only provide an ECCS PPL function and do not have to operate for a normal RHR and Core Spray initiation with only one accident signal and no RHR or Core Spray pumps running on the non-accident unit." It further states that the "inoperable Core Spray relay 14A-K11A(B) would also make the affected division of Core Spray inoperable," and that "inoperable RHR relay 10A-K36A(B) would also make the affected division of RHR inoperable."

As described in the LAR and updated in response to APLA-RAI-2, 5, 6.d, and 14, it appears that the change in Core Damage Frequency reported in response to APLA-RAI-14 addresses the risk increase from inoperable ECCS PPL logic with coincident accident signals in Units 1 and 2. However, some PPL components may be shared with another signal such as CAS. In such instances PPL-related risks also incur CAS-related risks. In other words, single unit initiators would also be expected to contribute to the change in risk when a shared PPL component is inoperable (i.e., even if a PPL signal is not received). The response to APLA-RAI-5 states:

"The CS [core spray] relays that initiate Common Accident Signal (CAS) (relays 14A-K11A/B) are considered in the logic developed for ECCS PPL. The internal events PRA model used in this evaluation does not include logic for CAS, Pre-Accident Signal (PAS), or Unit Priority Re-Trip Logic (UPRTL)."

Based on this response, single unit risk incurred by shared PPL/CAS signals (or other signals that may share a PPL component) may not be included in the risk results. The NRC staff requests the licensee to address all risks associated with inoperable PPL components or clarify how this has been done for the reported risk analysis results.

APLA-RAI-19 **Fire Risk Contribution**

The response dated May 25, 2016, to APLA-RAI-12, TVA stated: "Any Fire PRA quantification results in subsequent RAIs (i.e., APLA-RAI-14 to be submitted in a subsequent TVA letter) without the non-completed modifications would be considered as information only and not a valid risk insight." Also, in responses to APLA-RAI-13 dated May 25 and June 16, 2016, the licensee provided a bounding estimate due to fire for extending the completion time for the ECCS PPL.

Justify how this bounding estimate is credible for the current plant configuration, given that the fire PRA used in the analysis credits a number of plant modifications that have not yet been completed, and these modifications appear to have a significant impact on risk as provided in response to APLA-RAI-12, and that removal of these modifications for Fire PRA quantification results would be considered as not a valid risk insight according to the response to APLA-RAI-12.

APLA-RAI-20 **Tier 2**

RG 1.177 for Tier 2, "Avoidance of Risk-Significant Plant Configuration," requires that the licensee identify "potentially high-risk configurations that could exist if equipment, in addition to that associated with the change, were to be taken out of service simultaneously or other risk-significant operational factors, such as concurrent system or equipment testing, were also involved." The licensee, in response to APLA-RAI-15 dated May 25, 2016, stated that the risk of taking the ECCS PPL out of service combined with other equipment out of service was not analyzed and that "any potential work-significant configurations would be identified by the work control process evaluations performed several weeks prior to taking the ECCS PPL component out of service."

TVA response to APLA-RAI-15 does not address the information requested in RG 1.177 for Tier 2. Provide the Tier 2 required information as discussed in RG 1.177 Section 2.3 and Section 4, "Documentation and Submittal."

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

Sincerely,

/RA AHon for/

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

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