



1101 Market Street, Chattanooga, Tennessee 37402

CNL-16-066

April 15, 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: Response to NRC Request for Additional Information Related to License Amendment Request for Adding New Specifications to Technical Specification 3.3.8.3 (BFN-TS-486) (CAC Nos. MF6738, MF6739, and MF6740) - Letter 1

- References:
1. Letter from TVA to NRC, CNL-15-073, "Application to Modify the Browns Ferry Nuclear Plant, Units 1, and 2 Technical Specifications by Adding New Specification TS 3.3.8.3, 'Emergency Core Cooling System Preferred Pump Logic, Common Accident Signal (CAS) Logic, and Unit Priority Re-Trip Logic,' and Unit 3 TS by adding New Specification TS 3.3.8.3, 'Common Accident Signal (CAS) Logic, and Unit Priority Re-Trip Logic,' (BFN-TS-486)," dated September 16, 2015 (ML15260B125)
 2. Letter from NRC to TVA, "Browns Ferry Nuclear Plant, Units 1, 2, and 3 - Request for Additional Information Related to License Amendment Request for Adding New Specifications to Technical Specification 3.3.8.3 (CAC Nos. MF6738, MF6739, and MF6740)," dated March 21, 2016 (ML16074A126)

By letter dated September 16, 2015 (Reference 1), Tennessee Valley Authority (TVA) submitted a license amendment request (LAR) for Browns Ferry Nuclear Plant (BFN), Units 1, 2, and 3, to revise the BFN, Units 1 and 2, Technical Specifications (TS) by adding a new specification governing the safety functions for the Emergency Core Cooling System (ECCS) Preferred Pump Logic, Common Accident Signal Logic, and the Unit Priority Re-Trip Logic. In addition, the LAR relocated the BFN, Unit 3 requirements for Common Accident Signal Logic and Unit Priority Re-trip Logic to a new specification governing the safety functions for the Common Accident Signal Logic, and the Unit Priority Re-Trip Logic for consistency with the changes to the BFN, Units 1 and 2 TS.

By letter dated March 21, 2016 (Reference 2), the Nuclear Regulatory Commission (NRC) requested additional information to support the review of the LAR. The required dates for responding to the requests for additional information varied from April 15, 2016, to May 25, 2016.

Enclosure 1 provides the first set of TVA responses to some of the requests for additional information (RAIs) identified in the Reference 2 letter. As stated in the Reference 2 letter, these responses are due by April 15, 2016. As discussed with the NRR Project Manager (PM) for BFN, TVA is unable to provide some of the RAI responses by the requested due dates. Consequently, as agreed-upon with the NRR PM, Enclosure 2 provides a listing of the RAIs contained in the Reference 2 letter and the revised date of the TVA response to each of the RAIs.

Consistent with the standards set forth in Title 10 of the *Code of Federal Regulations* (10 CFR), Part 50.92(c), TVA has determined that the additional information, as provided in this letter, does not affect the no significant hazards consideration associated with the proposed application previously provided in Reference 1.

There are no new regulatory commitments associated with this submittal. Please address any questions regarding this request to Edward D. Schrull at (423) 751-3850.

I declare under penalty of perjury that the foregoing is true and correct. Executed on this 15th day of April 2015.

Respectfully,



J. W. Shea
Vice President, Nuclear Licensing

- Enclosures: 1. TVA Responses to NRC Request for Additional Information: Set 1
2. Summary of BFN Request for Additional Information Response Dates

Enclosure
cc (Enclosure):

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

ENCLOSURE 1

TENNESSEE VALLEY AUTHORITY

BROWNS FERRY NUCLEAR PLANT UNITS 1, 2, AND 3

TVA Responses to NRC Request for Additional Information: Set 1

Probabilistic Risk Assessment (PRA) Licensing Branch (APLA) RAI 1

The LAR does not appear to clearly indicate the proposed risk-informed TS changes. Please summarize which TS Limiting Conditions of Operation (LCOs) and Conditions or Surveillance Requirements, are being proposed as risk-informed TS changes and have been evaluated using PRA for this LAR.

TVA Response

The Completion Time of proposed Browns Ferry Nuclear Plant (BFN), Units 1 and 2 Technical Specification (TS) 3.3.8.3, Condition A for one or more inoperable divisions of Emergency Core Cooling System (ECCS) Preferred Pump Logic (PPL) is the only change being proposed as a risk-informed change. The following information is provided to clarify the proposed changes contained in Enclosure, Section 4.3 Technical Analysis of the TVA License Amendment Request (LAR) dated September 16, 2015.

Browns Ferry Nuclear Plant, Units 1 and 2 ECCS PPL

The ECCS PPL receives input signals from TS Table 3.3.5.1-1, Core Spray (CS) Functions 1a, 1b, and 1c and Low Pressure Coolant Injection (LPCI) Functions 2a, 2b, and 2c.

In the event one or more required channels specified in TS Table 3.3.5.1-1 is found to be inoperable, current TS 3.3.5.1, Condition A requires immediately entering the Condition referenced in Table 3.3.5.1-1 for the affected channel(s). The two Conditions specified by TS Table 3.3.5.1-1 associated with CS Functions 1a, 1b, and 1c and LPCI Functions 2a, 2b, and 2c are Conditions B and C.

TS Table 3.3.5.1-1 references Condition B for CS Functions 1.a and 1.b, and LPCI Functions 2.a and 2.b during operation in Modes 1, 2, and 3, and CS Functions 1.a and 1.c and LPCI Functions 2.a and 2.c during operation in Modes 4 and 5 when the associated subsystem(s) are required to be operable. TS Table 3.3.5.1-1 references Condition C for CS Function 1.c and LPCI Function 2.c during operation in Modes 1, 2, and 3.

TS 3.3.5.1, Condition B requires placing the channel in trip within 24 hours in Modes 4 and 5, when the associated subsystem(s) are required to be operable. In addition, TS 3.3.5.1, Condition B requires declaring the supported ECCS feature(s) inoperable when the redundant feature ECCS initiation capability is inoperable within one hour from discovery of loss of initiation capability for features in both divisions.

TS 3.3.5.1, Condition C requires restoring the channel to operable status within 24 hours. In addition, TS 3.3.5.1, Condition C requires declaring the supported ECCS feature(s) inoperable when the redundant feature ECCS initiation capability is inoperable within one hour from discovery of loss of initiation capability for features in both divisions.

In the event the Required Action and associated Completion Time of TS 3.3.5.1, Conditions B and C are not met, TS 3.3.5.1, Condition H requires immediately declaring the associated support ECCS feature(s) inoperable. Therefore, Required Action of TS 3.3.5.1, Condition H requires entry into the appropriate Conditions of TS 3.5.1, during operation in Modes 1, 2, and 3, or TS 3.5.2, during operation in Modes 4 and 5.

With one low pressure ECCS injection/spray subsystem inoperable during operation in Modes 1, 2, and 3, TS 3.5.1, Condition A requires restoring the affected ECCS injection/spray subsystem to operable status within seven days. With two or more low pressure ECCS injection/spray subsystem inoperable during operation in Modes 1, 2, and 3, TS 3.5.1, Condition H requires immediate entry into Limiting Condition for Operation (LCO) 3.0.3.

With one required low pressure ECCS injection/spray subsystem inoperable during operation in Modes 4 and 5, except with the spent fuel storage pool gates removed and water level ≥ 22 feet over the top of the reactor pressure vessel flange, TS 3.5.2, Condition A requires restoring the required ECCS injection/spray subsystem to operable status within four hours.

With two required ECCS injection/spray subsystems inoperable during operation in Modes 4 and 5, except with the spent fuel storage pool gates removed and water level ≥ 22 feet over the top of the reactor pressure vessel flange, TS 3.5.2, Condition C requires that action be initiated immediately to suspend operations that could result in draining the reactor vessel and restoring one ECCS injection/spray subsystem to operable status within four hours.

The proposed TS 3.3.8.3, Condition A allows one or more required ECCS PPL divisions to be inoperable for seven days before restoration to operable status. This is a less restrictive requirement than currently specified by TS 3.3.5.3, Conditions B and C. Therefore, the proposed TS 3.3.8.3, Condition A Completion Time is considered risk-informed.

During operation in Modes 1, 2, and 3, proposed TS 3.3.8.3, Condition D requires placing the unit in Mode 3 within 12 hours and in Mode 4 within 36 hours, if the Required Action and associated Completion Time of TS 3.3.8.3, Condition A are not met. This is a more restrictive requirement than currently required by TS 3.3.5.3, Condition H. Therefore this change is not risk-informed.

During operation in Modes 4 and 5 with the opposite unit in Modes 1, 2, or 3, proposed TS 3.3.8.3, Condition E requires immediately declaring the associated ECCS components inoperable, if the Required Action and associated Completion Time of TS 3.3.8.3, Condition A are not met. TVA letter dated September 16, 2015, Enclosure, Section 4.3 provides the justification for why the requirement for the opposite unit to be in Modes 1, 2, or 3 is added to the Condition. This change is not risk-informed.

The proposed SR 3.3.8.3.1 is consistent with the existing Logic System Functional Test required currently specified by SR 3.3.5.1.6. The six-hour allowance in the proposed SR 3.3.8.3.1, Note 1 is also consistent with the current Note 2 allowance of the TS 3.3.5.1 Surveillance Requirements table. The allowance to not require actuation of breakers in the opposite unit provided in the proposed SR 3.3.8.3.1, Note 2 is necessary to preclude unnecessary challenges to an operating unit. Actuation of the associated breakers on the opposite unit will be performed by the opposite unit's Logic System Functional Test. Therefore, the changes incorporating SR 3.3.8.3.1, the six-hour allowance, and the allowance to not require actuation of breakers in the opposite unit are not risk-informed changes.

BFN Units 1, 2, and 3 Common Accident Signal (CAS) and Unit Priority Re-Trip Logics

The proposed changes relocating the requirements for CAS from the current Units 1, 2, and 3, TS 3.8.1 to the proposed Units 1, 2, and 3, TS 3.3.8.3 are administrative in that no technical changes are made to the LCO, Mode of Applicability, Conditions, Required Actions and Completion Times. Therefore, the relocation of the CAS requirements is not a risk-informed change.

The proposed changes providing explicit requirements for the Unit Priority Re-Trip Logic are not risk informed. The proposed changes are administrative in that the Unit Priority Re-Trip Logic is currently described in the TS 3.8.1 Bases Background discussion in the discussion of the CAS Signal Logic. The proposed change proposes the same Conditions, Required Actions, and Completion Times for the Unit Priority Re-Trip Logic as those currently specified in TS 3.8.1 for the CAS Logic.

The proposed SR 3.3.8.3.1 is consistent with the existing Logic System Functional Test required currently specified by SR 3.3.5.1.6. The six-hour allowance in the proposed SR 3.3.8.3.1 is also consistent with the current Note 2 allowance of the TS 3.3.5.1 Surveillance Requirements table. Therefore, the change incorporating SR 3.3.8.3.1 and the six-hour allowance is not a risk-informed change.

In summary, the only change that is considered to be risk-informed is the Completion Time of proposed BFN, Units 1 and 2 Technical Specification (TS) 3.3.8.3, Condition A for one or more inoperable divisions of ECCS PPL. This proposed Completion Time has been evaluated using PRA for this LAR.

APLA RAI 2

Explain the equipment impact of the PPL unavailabilities allowed by the proposed TS change and how it is modeled in the internal events PRA. Include an explanation of same unit and opposite unit equipment impacts. Indicate whether the PRA evaluates single and multiple unit risk for the PPL unavailabilities and is included in the PRA results.

TVA Response

A single event is used to model unavailability of PPL and this basic event is used for both BFN Units 1 and 2. The ECCS PPL unavailability basic event is included under the PPL logic for Low Pressure Injection (LPI), i.e., Unit 1 Residual Heat Removal (RHR) pumps 1A and 1C, and Unit 1 CS pumps 1A and 1C, or Unit 2 RHR pumps 1B and 1D, and Unit 2 CS pumps 2B and 2D. Similarly, a single event is used for ECCS PPL failure on demand (i.e., the conservative approach taken did not include divisional ECCS PPL relays, or unavailability events). In addition, a spurious ECCS PPL event is included in the model. The logic is set up such that the pumps assigned divisionally for ECCS PPL (i.e., Unit 1

RHR pumps 1A and 1C and Unit 1 CS pumps 1A and 1C, or Unit 2 RHR pumps 2B and 2D and Unit 2 CS pumps 2B and 2D) are assumed to be failed if ECCS PPL is unavailable and simultaneous loss of coolant accident (LOCA) signals occur in both units. The remaining RHR or CS pumps in a unit (not ECCS PPL) are assumed to fail if simultaneous signals occur. The logic is applicable in fast acting scenarios (e.g., Large LOCA, Medium LOCA, Small LOCA without high pressure injection (HPI), Break Outside Containment). The PRA Model does not include "bus separation" given ECCS PPL failure. However, in the remaining scenarios, the board and loads can be realigned because core damage would take over 36 minutes (i.e., without any injection), or many hours if steam driven HPI systems are available. The impact of single and multiple unit initiators is evaluated for Unit 1 and Unit 2. The following table lists the pumps of interest in the PRA ECCS PPL logic, and impact of ECCS PPL logic on Unit 1 and Unit 2.

Pump	Shutdown Board (SDBD)	Unit 1	Unit 2	Notes
RHR 1A	4kV SDBD A	PPL		
RHR 1C	4kV SDBD B	PPL		
RHR 1B	4kV SDBD C	Not PPL		PRA assumes failure of this pump if simultaneous LOCA signals occur
RHR 1D	4kV SDBD D	Not PPL		PRA assumes failure of this pump if simultaneous LOCA signals occur
CS 1A	4kV SDBD A	PPL		
CS 1C	4kV SDBD B	PPL		
CS 1B	4kV SDBD C	Not PPL		PRA assumes failure of this pump if simultaneous LOCA signals occur
CS 1D	4kV SDBD D	Not PPL		PRA assumes failure of this pump if simultaneous LOCA signals occur
RHR 2A	4kV SDBD A		Not PPL	PRA assumes failure of this pump if simultaneous LOCA signals occur
RHR 2C	4kV SDBD B		Not PPL	PRA assumes failure of this pump if simultaneous LOCA signals occur
RHR 2B	4kV SDBD C		PPL	
RHR 2D	4kV SDBD D		PPL	
CS 2A	4kV SDBD A		Not PPL	PRA assumes failure of this pump if simultaneous LOCA signals occur
CS 2C	4kV SDBD B		Not PPL	PRA assumes failure of this pump if simultaneous LOCA signals occur
CS 2B	4kV SDBD C		PPL	
CS 2D	4kV SDBD D		PPL	

APLA RAI 3

Explain whether PPL unavailabilities could result in no low pressure injection (as well as no high pressure injection) following a LOCA (to include feedwater and steamline break). If so, explain the plant's defense-in-depth for the LOCA scenario.

TVA Response

HPI systems are not affected by ECCS PPL, but may not be available if the reactor pressure vessel depressurizes quickly because the HPI systems use steam driven pumps. Initiator impact is modeled under the HPI system logic that would automatically fail HPI. The PRA ECCS PPL logic model is included under RHR or CS logic as described in the TVA response to APLA-RAI-2. ECCS PPL unavailability could result in failure of Low Pressure Injection (CS and RHR) during a fast acting LOCA scenario if a coincident spurious or actual accident signal occurs in the other unit. For instance, if ECCS PPL is unavailable and a

LOCA occurs in a unit combined with a simultaneous LOCA signal (real or spurious) in the opposite unit, then the PRA models assume all RHR and CS pumps are not available to mitigate core damage in these fast acting scenarios. These scenarios are assumed to result in core damage because no additional systems are credited (e.g., sequence LLOCA-005).

APLA RAI 8

Prior to the proposed TS change, there was no explicit LCO for UPRTL [Unit Priority Re-Trip Logic]. The LAR states that the LCO for UPRTL is implicitly required by the TS 3.8.1 Condition D, which applied to the CAS. In the proposed TS change for Unit 1 and Unit 2, LCO 3.3.8.3, Condition B applies to CAS and LCO 3.3.8.3, Condition C applies to UPRTL. For Unit 3, LCO 3.3.8.3, Condition A applies to CAS and LCO 3.3.8.3, Condition B applies to UPRTL. These TS LCO Conditions for the UPRTL have a 7 day completion time and are new proposed changes. If these UPRTL TS LCOs are proposed as risk-informed changes, then include the associated risk for Units 1, 2, and 3 in the results reported in the LAR as part of APLA-RAI-14.

TVA Response

The proposed changes providing explicit requirements for the Unit Priority Re-Trip Logic are not risk informed. The proposed changes are considered administrative in that the Unit Priority Re-Trip Logic is currently described in the TS 3.8.1 Bases Background discussion in the discussion of the CAS Signal Logic. The proposed change proposes the same Conditions, Required Actions, and Completion Times for the Unit Priority Re-Trip Logic as those currently specified in TS 3.8.1 for the CAS Logic.

APLA RAI 9

Note 1 to the proposed SR 3.3.8.3.1 states that, "when a division is placed in an inoperable status solely for performance of a surveillance, entry into associated Conditions and Required Actions may be delayed for up to six hours provided the associated redundant division is OPERABLE." The proposed TS Bases state that the "PRA demonstrated that the 6 hour testing allowance does not significantly reduce the probability that the ECCS Preferred Pump, CAS and Unit Priority Re-trip Logics will initiate when necessary." If the LAR is justifying the 6 hour testing allowance time as a risk-informed TS change, then provide the PRA justification for the 6 hours testing allowance for the ECCS PPL, CAS, and UPRTL. Provide the LAR risk results impact as part of APLA-RAI-14.

TVA Response

The six-hour allowance in the proposed SR 3.3.8.3.1 is not a risk-informed change. As stated in the current TS 3.3.5.1 Bases, the allowance is based on the reliability analysis (i.e., NEDC-30936-P-A, "BWR Owners' Group Technical Specification Improvement Analyses for ECCS Actuation Instrumentation, Part 2," December 1988) assumption of the average time required to perform channel surveillance. That analysis demonstrated that the six-hour testing allowance does not significantly reduce the probability that the ECCS will initiate when necessary. The six-hour allowance was incorporated into the PRA when the ECCS PPL was first modeled. However, the six-hour allowance is not changed by the License Amendment Request. The Logic System Functional Test for ECCS PPL, CAS Logic and Unit Priority Re-Trip Logic is currently required by TS 3.3.5.1, SR 3.3.5.1.6. The current Surveillance Requirements Table of TS 3.3.5.1 is modified by Note 2, which states, "When a channel is placed in an inoperable status solely for performance of required Surveillances, entry into associated Conditions and Required Actions may be delayed as follows: (a) for up to six hours for Functions 3.c and 3.f; and (b) for up to six hours for

Functions other than 3.c and 3.f provided the associated Function or the redundant Function maintains ECCS initiation capability." ECCS PPL receives input signals from TS Table 3.3.5.1-1, CS Functions 1a, 1b, and 1c and LPCI Functions 2a, 2b, and 2c. CAS Logic receives input from TS Table 3.3.5.1-1, CS Functions 1a, 1b, and 1c. Unit Priority Re-Trip Logic receives input from TS Table 3.3.5.1-1, LPCI Functions 2a, 2b, and 2c. Therefore, the six-hour allowance currently applies to the ECCS PPL, CAS Logic and Unit Priority Re-Trip Logic and is not a change from the current requirements.

ENCLOSURE 2

Tennessee Valley Authority

Browns Ferry Nuclear Plant, Units 1, 2, and 3

Summary of BFN Request for Additional Information Response Dates

Request for Additional Information (RAI) Question Number	Due Date (NRC Letter dated March 21, 2016)	Revised Due Dates	Actual Date of Response
Electrical Engineering Branch (EEEB)			
EEEB RAI 1	April 15, 2016	May 11, 2016	Future Letter
EEEB RAI 2	April 15, 2016	May 11, 2016	Future Letter
EEEB RAI 3	April 15, 2016	May 11, 2016	Future Letter
EEEB RAI 4	April 15, 2016	May 11, 2016	Future Letter
Instrumentation and Controls Branch (EICB)			
EICB RAI 1	April 15, 2016	May 11, 2016	Future Letter
EICB RAI 2	April 15, 2016	May 11, 2016	Future Letter
EICB RAI 3	April 15, 2016	June 16, 2016	Future Letter
Probabilistic Risk Assessment Branch (PRA) Licensing Branch (APLA)			
APLA-RAI-1	April 15, 2016	No change	CNL-16-066, April 15, 2016
APLA-RAI-2	April 15, 2016	No change	CNL-16-066, April 15, 2016
APLA-RAI-3	April 15, 2016	No change	CNL-16-066, April 15, 2016
APLA-RAI-4	May 25, 2016	May 11, 2016	Future Letter
APLA-RAI-5	May 25, 2016	June 16, 2016	Future Letter
APLA-RAI-6i	April 15, 2016	May 11, 2016	Future Letter
APLA-RAI-6ii	April 15, 2016	May 11, 2016	Future Letter
APLA-RAI-6iii	April 15, 2016	May 11, 2016	Future Letter
APLA-RAI-6iv	May 25, 2016	June 16, 2016	Future Letter
APLA-RAI-7	April 15, 2016	May 11, 2016	Future Letter
APLA-RAI-8	April 15, 2016	No change	CNL-16-066, April 15, 2016

Request for Additional Information (RAI) Question Number	Due Date (NRC Letter dated March 21, 2016)	Revised Due Dates	Actual Date of Response
APLA-RAI-9	April 15, 2016	No change	CNL-16-066, April 15, 2016
APLA-RAI-10	April 29, 2016	No change	Future Letter
APLA-RAI-11	April 29, 2016	No change	Future Letter
APLA-RAI-12	May 25, 2016	No change	Future Letter
APLA-RAI-13a	May 25, 2016	June 16, 2016	Future Letter
APLA-RAI-13b	May 25, 2016	No change	Future Letter
APLA-RAI-13b	May 25, 2016	No change	Future Letter
APLA-RAI-14	May 25, 2016	June 16, 2016	Future Letter
APLA-RAI-15	May 25, 2016	No change	Future Letter
APLA-RAI-16	April 29, 2016	No change	Future Letter

Summary

April 15, 2016: APLA RAI 1, 2, 3, 8, 9

April 29, 2016: APLA RAI 10, 11, 16

May 11, 2016: APLA RAI 4, 6i, 6ii, 6iii, 7; EEEB RAI 1, 2, 3, 4; EICB RAI 1, 2

May 25, 2016: APLA RAI 12, 13b, 13c, 15

June 16, 2016: APLA RAI 5, 6iv, 13a, 14; EICB RAI 3