



1101 Market Street, Chattanooga, Tennessee 37402

CNL-15-054

March 26, 2015

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 Regarding the License Amendment Request to Adopt NFPA 805 Performance-Based Standard for Fire Protection for Light Water Reactor Electric Generating Plants for the Browns Ferry Nuclear Plant, Units 1, 2, and 3 (TAC Nos. MF1185, MF1186, and MF1187) - Containment and Ventilation Branch Follow-up**

- References:
1. Letter from TVA to NRC, "License Amendment Request to Adopt NFPA 805 Performance-Based Standard for Fire Protection for Light Water Reactor Electric Generating Plants (2001 Edition) (Technical Specification Change TS-480)," dated March 27, 2013 (ADAMS Accession No. ML13092A393)
 2. Letter from TVA to NRC, "Response to NRC Request to Supplement License Amendment Request to Adopt NFPA 805 Performance-Based Standard for Fire Protection for Light Water Reactor Electric Generating Plants for the Browns Ferry Nuclear Plant, Units 1, 2, and 3 (TAC Nos. MF1185, MF1186, and MF1187)," dated May 16, 2013 (ADAMS Accession No. ML13141A291)
 3. Electronic Mail from F. Saba (NRC) to G. Williams (TVA), "Follow up RAI regarding Attachment X of NFPA 805 LAR," dated February 21, 2015 (ADAMS Accession No. ML15055A181)
 4. Letter from TVA to NRC, "Response to NRC Request for Additional Information Regarding the License Amendment Request to Adopt NFPA 805 Performance-Based Standard for Fire Protection for Light Water Reactor Electric Generating Plants for the Browns Ferry Nuclear Plant, Units 1, 2, and 3 (TAC Nos. MF1185, MF1186, and MF1187) - Probabilistic Risk Assessment Follow Up (162-Day Responses)," dated December 17, 2014 (ADAMS Accession No. ML14363A056)

By letter dated March 27, 2013 (Reference 1), Tennessee Valley Authority (TVA) submitted a license amendment request (LAR) for Browns Ferry Nuclear Plant (BFN), Units 1, 2, and 3, to transition to National Fire Protection Association Standard (NFPA) 805. In addition, by letter dated May 16, 2013 (Reference 2), TVA provided information to supplement the Reference 1 letter.

By electronic mail dated February 21, 2015 (Reference 3), the NRC staff requested additional information related to the TVA Request for Additional Information (RAI) response letter dated December 17, 2014 (Reference 4), to support the NRC review of the LAR.

Enclosure 1 provides the TVA response to the RAI identified in the Reference 3 electronic mail. As stated in Reference 3, this response is due by March 27, 2015.

In addition, this letter provides editorial-type corrections in Enclosures 2 and 3 to the information provided in TVA letter dated December 17, 2014 (Reference 4). Enclosure 2 provides a minor correction to the TVA response to Fire Protection Engineering (FPE) RAI 10, previously updated in the TVA letter dated December 17, 2014 (Reference 4). Changes to the response are denoted by deleted text struck through and a revision bar in the right margin.

Enclosure 3 provides a replacement markup page for LAR, Attachment S, "Modifications and Implementation Items," Table S-2, "Plant Modifications Committed," provided in TVA letter dated December 17, 2014, Enclosure 7, "Markups of License Amendment Pages - Security-Related" (Reference 4). The markup page provided in Enclosure 3 contains security-related information and should be withheld from public disclosure under 10 CFR 2.390.

During a conference call on March 9, 2015, TVA informed the NRC of changes to LAR, Attachment S, Table S-2, Modification Items 52b and 52c. TVA stated that justification for the proposed changes would be included in a TVA letter dated March 27, 2015. TVA has subsequently decided not to revise Modification Items 52b and 52c at this time. Therefore, this letter does not provide discussion of the proposed changes to Modification Items 52b and 52c.

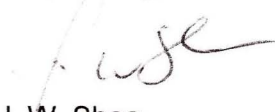
Consistent with the standards set forth in Title 10 of the *Code of Federal Regulations* (10 CFR), Part 50.92(c), TVA has determined that the additional information, as provided in this letter, does not affect the no significant hazards consideration associated with the proposed application previously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

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

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I declare under penalty of perjury that the foregoing is true and correct. Executed on this 26th day of March 2015.

Respectfully,



J. W. Shea
Vice President, Nuclear Licensing

Enclosures:

1. TVA Response to NRC Request for Additional Information: SCVB Follow-Up RAI
2. Corrected TVA Response to FPE RAI 10
3. NFPA 805 License Amendment Request, Table S-2 Replacement Markup Page

cc (Enclosures):

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

ENCLOSURE 1

**Tennessee Valley Authority
Browns Ferry Nuclear Plant, Units 1, 2, and 3
TVA Response to NRC Request for Additional Information: SCVB Follow-Up RAI**

Containment and Ventilation Branch (SCVB) Request for Additional Information (RAI) 13

SCVB-RAI-13

Refer to response to SCVB-RAI-12(c) in Reference 1 that states:

“The TVA Model is a mass and energy balance model that includes mass and energy inputs to the Reactor Pressure Vessel (RPV) from injection sources and decay heat and transfer of energy from the RPV to the suppression pool via the Safety Relief Valves (SRVs). The computer code solves the mass and energy balance for the Suppression Pool and RPV. The developed code allows for various operating parameters to be entered. The code takes these inputs and performs an integration of several mass, temperature, and pressure differential equations. The output is the results of these differential equations.”

Please provide response to item (A)1 through (A)7 below OR item (B).

- (A) The following information is requested regarding the TVA Model in order for the NRC staff to review its specific application for determining the NFPA 805 Case 3 long term suppression pool temperature response.
1. Confirm that the TVA Model is qualified to the requirements of 10 CFR Part 50 Appendix B, “Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants” with error reporting in accordance with 10 CFR Part 21, “Reporting of Defects and Noncompliance”
 2. Provide technical justification for using TVA Model instead of SHEX model for determining the NFPA 805 Case 3 suppression pool temperature response
 3. Sources of mass and sources of energy input for NFPA Case 3 in the TVA Model
 4. Decay heat model used in the TVA Model
 5. Assumptions used for NFPA 805 Case 3 in the TVA Model and comparison with the assumptions in SHEX long term suppression pool temperature response analysis for analyzing NFPA 805 Cases 1 and 2
 6. Inputs used for NFPA 805 Case 3 in the TVA Model and comparison with the inputs in SHEX long term suppression pool temperature response analysis for analyzing NFPA 805 Cases 1 and 2
 7. Explain how the Adder 5.9°F, given in response to SCVB-RAI-12(b), for the change in suppression pool temperature was calculated

- (B) *Perform the NFPA 805 Case 3 analysis using General Electric-Hitachi Super Hex (SHEX) code using the same inputs and assumptions as in Case 1 and Case 2, Residual Heat Removal (RHR) heat exchanger k-factor of 270 BTU/sec-°F, and RHR Service Water (RHRSW) initiation time 2 hours. Provide results of peak suppression pool temperature, minimum Net Positive Suction Head (NPSH) available (NPSHa), and the margin between the NPSHa and NPSH required (NPSHr).*

REFERENCE

1. *Letter from TVA to NRC dated December 17, 2014, "Response to NRC Request for Additional Information Regarding the License Amendment Request to Adopt NFPA 805 Performance-Based Standard for Fire Protection for Light Water Reactor Electric Generating Plants for the Browns Ferry Nuclear Plant, Units 1, 2, and 3 (TAC Nos. MF1185, MF1186, and MF1187) - Probabilistic Risk Assessment Follow Up (162-Day Responses)", (ADAMS Accession No. ML14363A056).*

TVA RESPONSE

TVA provides the following response to SCVB RAI 13, item (B), in lieu of responding to SCVB RAI 13 items (A)1 through (A)7.

NFPA 805 License Amendment Request (LAR), Attachment X, "Elimination of Containment Accident Pressure Credit," Table 4, "Summary of NFPA 805 Analysis Inputs," Case 3 "NFPA 805 - Condensate System Available," was performed using GE SHEX with the same inputs previously given for NFPA 805 LAR, Attachment X, Table 4, Case 3 using a Residual Heat Removal (RHR) Heat Exchanger k-factor of 270 British Thermal Units per second - degree Fahrenheit (BTU/sec-°F) and an RHR Service Water (RHRSW) initiation time of two hours. The NFPA 805 LAR, Attachment X, Table 4, Case 1, "NFPA 805 - Early Reactor Depressurization with ASDC," and Case 2, "NFPA 805 - High Pressure Systems Available and Delayed Reactor Depressurization," also used RHR Heat Exchanger k-factor of 270 BTU/sec-°F and an RHRSW initiation time of two hours. RHR pump flow was changed in the NFPA 805 LAR, Attachment X, Table 4, Case 3 inputs from 8000 gpm to 7500 gpm to correspond to a k-factor of 270 BTU/sec-°F. The SHEX analysis yields the following results:

Peak suppression pool temperature	205.7°F
Required minimum Net Positive Suction Head (NPSHr)	16 feet
Available NPSH (NPSHa)	16.65 feet
Margin between the NPSHa and NPSHr	0.65 feet

ENCLOSURE 2

Tennessee Valley Authority Browns Ferry Nuclear Plant, Units 1, 2, and 3

Corrected TVA Response to FPE RAI 10

Fire Protection Engineering (FPE) RAI 10

TVA initially responded to FPE RAI 10 by letter dated March 14, 2014 (ADAMS Accession No. ML14079A159). By letter dated December 17, 2014 (ADAMS Accession No. ML14363A056), TVA revised the response to FPE RAI 10 to state that the area wide very early warning fire detection system (VEWFDS) and the automatic gaseous suppression system in the Cable Spreading Rooms (CSRs) would not be installed, and updated the response to state that the incipient fire detection systems proposed in NFPA 805 License Amendment Request (LAR) Attachment S, Table S-2, "Committed Modifications," Item 3, had been installed. As part of the revision, TVA included a sentence stating "The installed area wide very early warning fire detection systems have been designed in accordance with and meet the requirements in these codes." This sentence was intended to apply only to the very early warning fire detections systems installed in the Auxiliary Instrument Room cabinets, not to the area wide very early warning fire detections systems. The correction provided below deletes "area wide" from the subject sentence.

No changes to the NFPA 805 LAR are required by this correction.

The below corrected response supersedes the previous response for FPE RAI 10 in its entirety. The changes from the previous response provided in TVA letter dated December 17, 2014, are shown with deleted text struck through and a revision bar in the right margin.

REVISED RESPONSE

LAR Attachment S, Table S-2 identifies three modifications associated with incipient detection systems (i.e., very early warning fire detection systems). These three modifications are Items 3, 77, and 78.

LAR Attachment S, Table S-2, Item 77 proposes modifications to install area wide incipient detection (i.e., a very early warning fire detection system) in the auxiliary instrument rooms (Fire Compartments 16-K, 16-M, and 16-O). TVA has decided not to install the area wide very early warning fire detection system in the auxiliary instrument rooms. This decision was made because the risk increase of removing the credit for prompt detection is less than 1% total plant Core Damage Frequency (CDF) and Large Early Release Frequency (LERF). Therefore, the effect on the Fire PRA is negligible. LAR Table S-2 is revised to delete Item 77. In addition, LAR Section V.2.4 is revised to remove discussions of credit for area wide very early warning fire detection in the auxiliary instrument room (see Enclosure 1, Attachment 1 of TVA letter dated March 14, 2014). The TVA response to FPE RAI 12, Part c provides further information on the effect of removing the area wide very early warning fire detection system from the Fire Probabilistic Risk Assessment (PRA). In-cabinet protection is provided as discussed below.

LAR Attachment S, Table S-2, Item 78 proposes area wide incipient fire detection systems for the Units 1, 2, and 3 Cable Spreading Rooms (CSRs). TVA has decided not to install the area wide very early warning fire detections systems in the CSRs.

LAR Attachment S, Table S-2, Item 3 addresses incipient detection that has been installed in the electrical panels in the Units 1, 2, and 3 Auxiliary Instrument Rooms. These detection systems have been designed and the modifications have been implemented. These detection systems are addressed in the remainder of this RAI response.

NFPA 72-2010, "National Fire Alarm and Signaling Code," applies to these detection systems along with meeting the requirements of NFPA 76-2012, "Standard for the Fire Protection of Telecommunications Facilities," for response transport times and sensitivity settings. The installed ~~area-wide~~ very early warning fire detections systems have been designed in accordance with and meet the requirements in these codes.

The design of the detection systems includes one detector installed in each Auxiliary Instrument Room, with each detector monitoring four zones. Each of the four zones monitors the electrical panels in one of the four rows of panels. The detection system would send an alarm to the main control room (MCR) fire alarm annunciator and Fire Operation's annunciator. This would alert personnel to respond to a potential fire so it could be extinguished manually during the incipient stage. The system indicates which of the four zones are in alarm to permit personnel to investigate the row of panels from which the alarm is originating.

Testing and commissioning of each incipient detector have been completed in accordance with the vendor's acceptance test and associated sensitivity testing. The vendor commissioning of the detector demonstrates compliance with criteria established by applicable standards, which includes testing the sensitivity and transport time. In accordance with NFPA 76, this type of system is required to have a transport time of no greater than 60 seconds from any one sampling point. The sensitivity and setpoints are controlled by surveillance procedure(s). Routine inspection, testing and maintenance will be conducted in accordance with vendor recommendations, including sensitivity and transport time tests.

Procedures and training will be developed as part of NFPA 805 implementation covering responses to an alarm. Personnel will respond to alarm conditions to locate the source and extinguish any fire that may occur. To ensure that procedures are developed and training is provided, a new implementation item, Item 48, is added to LAR Table S-3. The LAR table requires that certain items be completed prior to implementation of the NFPA 805 fire protection program. The new implementation item reads: "Develop and deliver training to Fire Operations on incipient detection systems alarm response procedures."

Design and installation are in compliance with each of the elements, limitations and criteria of NUREG/CR-6850, Supplement 1, "Fire Probabilistic Risk Assessment Methods Enhancements," Chapter 13, and FAQ 08-0046 including the closeout memo (ADAMS Accession No. ML093220426).

ENCLOSURE 3

Tennessee Valley Authority Browns Ferry Nuclear Plant, Units 1, 2, and 3

NFPA 805 License Amendment Request, Table S-2 Replacement Markup Page

TVA letter dated December 17, 2014, "Response to NRC Request for Additional Information Regarding the License Amendment Request to Adopt NFPA 805 Performance-Based Standard for Fire Protection for Light Water Reactor Electric Generating Plants for the Browns Ferry Nuclear Plant, Units 1, 2, and 3 (TAC Nos. MF1185, MF1186, and MF1187) - Probabilistic Risk Assessment Follow Up (162-Day Responses)" (ADAMS Accession No. ML14363A056), Enclosure 4 described a revision to LAR, Attachment S, "Modifications and Implementation Items," Table S-2, "Plant Modifications Committed," Modification Item 93. However, the changes to LAR, Attachment S, Table S-2, Modification Item 93 were not reflected on the marked-up pages provided in TVA letter dated December 17, 2014, Enclosure 7. Therefore, a replacement markup page showing the change to Modification 93 is provided in this enclosure.

The markup contains text boxes with arrows indicating where the text is to be inserted. References to the TVA submittal describing the changes on the page are provided in text boxes located in the right margin of the page.

Page 2 provided in this enclosure contains security-related information and should be withheld from public disclosure under 10 CFR 2.390.