



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

CNL-16-193

December 21, 2016

10 CFR 50.4  
10 CFR 50.54(f)

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: **Spent Fuel Pool Evaluation Supplemental Report for Browns Ferry Nuclear Plant, Units 1, 2, and 3 - Response to NRC Request for Information Pursuant to Title 10 of the Code of Federal Regulations 50.54(f) Regarding Recommendation 2.1 of the Near-Term Task Force Review of Insights from the Fukushima Dai-ichi Accident**

- References:
1. NRC Letter, "Request for Information Pursuant to Title 10 of the Code of Federal Regulations 50.54(f) Regarding Recommendations 2.1, 2.3, and 9.3, of the Near-Term Task Force Review of Insights from the Fukushima Dai-ichi Accident," dated March 12, 2012 (ML12053A340)
  2. NRC Letter, "Final Determination of Licensee Seismic Probabilistic Risk Assessments Under the Request for Information Pursuant to Title 10 of the Code of Federal Regulations 50.54(f) Regarding Recommendation 2.1 "Seismic" of the Near-Term Task Force Review of Insights from the Fukushima Dai-ichi Accident," dated October 27, 2015 (ML15194A015)
  3. NEI letter to NRC, "Request for Endorsement of Seismic Evaluation Guidance: Spent Fuel Pool Integrity Evaluation (EPRI 3002007148)," dated February 23, 2016 (ML16055A017)
  4. EPRI 3002007148, "Seismic Evaluation Guidance, Spent Fuel Pool Integrity Evaluation," dated February 2016 (ML16055A021)

5. NRC letter to NEI, "Endorsement of Electrical Power Research Institute Report 3002007148, Seismic Evaluation Guidance: Spent Fuel Pool Integrity Evaluation," dated March 18, 2016 (ML15350A158)
6. TVA letter to NRC, "Tennessee Valley Authority's Seismic Hazard and Screening Report (CEUS Sites), Response to NRC Request for Information Pursuant to 10 CFR 50.54(f) Regarding Recommendation 2.1 of the Near-Term Task Force Review of Insights from the Fukushima Dai-ichi Accident," dated March 31, 2014 (ML14098A478)
7. NRC letter to TVA, "Browns Ferry Nuclear Plant, Units 1, 2 and 3 - Staff Assessment of Information provided Pursuant to Title 10 of the Code of Federal Regulations Part 50, Section 50.54(f), Seismic Hazard Reevaluations Relating to Recommendation 2.1 of the Near-Term Task Force Review of Insights from the Fukushima DAI-ICHI Accident (TAC Nos. MF3764, MF3765 and MF3766)," dated April 21, 2015 (ML15090A745)
8. EPRI 1025287, "Seismic Evaluation Guidance, Screening, Prioritization and Implementation Details [SPID] for the Resolution of Fukushima Near-Term Task Force Recommendation 2.1: Seismic," dated February 2013 (ML12333A170)

On March 12, 2012, the Nuclear Regulatory Commission (NRC) issued a Request for Information pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50.54(f) (Reference 1) to all power reactor licensees. Enclosure 1, Item (9) of the 50.54(f) letter requested addressees to provide limited scope spent fuel pool (SFP) evaluations. By letter dated October 27, 2015 (Reference 2), the NRC transmitted final seismic information request tables which identified that Browns Ferry Nuclear Plant is to conduct a limited scope SFP Evaluation. Each unit at Browns Ferry Nuclear Plant has a SFP. In Reference 3, the Nuclear Energy Institute (NEI) submitted the Electric Power Research Institute (EPRI) report, "Seismic Evaluation Guidance Spent Fuel Pool Integrity Evaluation (EPRI 3002007148)," (Reference 4) for NRC review and endorsement. NRC endorsement of EPRI 3002007148 was provided by Reference 5.

EPRI 3002007148 provides criteria for evaluating the seismic adequacy of a SFP to the reevaluated ground motion response spectrum (GMRS) hazard levels. This report supplements the guidance in the Seismic Evaluation Guidance, Screening, Prioritization and Implementation Details (SPID) (Reference 9), for plants where the GMRS peak spectral acceleration is less than or equal to 0.8g. Section 3.3 of EPRI 3002007148 lists the parameters to be verified to confirm that the results of the report are applicable to Browns Ferry Nuclear Plant, and that the Browns Ferry Nuclear Plant SFPs are seismically adequate in accordance with NTTF 2.1 Seismic evaluation criteria.

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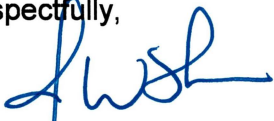
The Enclosure to this letter provides the data for Browns Ferry Nuclear Plant that confirms applicability of the EPRI 3002007148 criteria, confirms that the SFP is seismically adequate, and provides the requested information in response to Item (9) of the 50.54(f) letter associated with NTTF Recommendation 2.1 Seismic evaluation criteria.

This letter contains no new regulatory commitments.

If you have any questions regarding this submittal, please contact Russell Thompson at (423) 751-2567.

I declare under penalty of perjury that the foregoing is true and correct. Executed on the 21st day of December 2016.

Respectfully,



J. W. Shea  
Vice President, Nuclear Licensing

Enclosure:

Site-Specific Spent Fuel Pool Criteria, Browns Ferry Nuclear Plant, Units 1, 2, and 3

cc (Enclosure):

NRR Director - NRC Headquarters  
NRO Director - NRC Headquarters  
NRR JLD Director - NRC Headquarters  
NRC Regional Administrator - Region II  
NRC Project Manager - Browns Ferry Nuclear Plant  
NRC Senior Resident Inspector - Browns Ferry Nuclear Plant

**ENCLOSURE**

**Site-Specific Spent Fuel Pool Criteria  
Browns Ferry Nuclear Plant, Units 1, 2, and 3**

## Site-Specific Spent Fuel Pool Criteria Browns Ferry Nuclear Plant, Units 1, 2, and 3

The 50.54(f) letter requested that, in conjunction with the response to NTTF Recommendation 2.1, a seismic evaluation be made of the Spent Fuel Pools (SFPs). More specifically, plants were asked to consider "...all seismically induced failures that can lead to draining of the SFP." Such an evaluation would be needed for any plant in which the ground motion response spectrum (GMRS) exceeds the safe shutdown earthquake (SSE) in the 1 to 10 Hz frequency range. The staff confirmed through References 2 and 7 that the GMRS exceeds the SSE and concluded that a SFP evaluation is merited for Browns Ferry Nuclear Plant. By letter dated March 18, 2016 (Reference 5), the staff determined that EPRI 3002007148 was an acceptable approach for performing SFP evaluations for plants where the peak spectral acceleration is less than or equal to 0.8g.

The table below lists the criteria from Section 3.3 of EPRI 3002007148 along with data for Browns Ferry Nuclear Plant that confirms applicability of the EPRI 3002007148 criteria and confirms that the SFPs are seismically adequate and can retain adequate water inventory for 72 hours in accordance with NTTF 2.1 Seismic evaluation criteria.

SFP Criteria from EPRI 3002007148	Site-Specific Data
<b>Site Parameters</b>	
1. The site-specific GMRS peak spectral acceleration at any frequency should be less than or equal to 0.8g.	The GMRS peak spectral acceleration submitted for Browns Ferry Nuclear Plant GMRS (Reference 6), and accepted by the NRC in the Staff Assessment letter (Reference 7) is 0.58g, which is $\leq 0.8g$ . Therefore, this criterion is met.
<b>Structural Parameters</b>	
2. The structure housing the SFP should be designed using an SSE with a peak ground acceleration (PGA) of at least 0.1g.	The SFPs are housed in the Reactor Building, which is seismically designed to the site SSE with a PGA of 0.20g. The Browns Ferry Nuclear Plant PGA is greater than 0.1g. Therefore, this criterion is met.
3. The structural load path to the SFP should consist of some combination of reinforced concrete shear wall elements, reinforced concrete frame elements, post-tensioned concrete elements and/or structural steel frame elements.	The structural load path from the foundation to the SFPs consists of reinforced concrete shear wall elements and reinforced concrete frame elements. Therefore, this criterion is met for Browns Ferry Nuclear Plant.
4. The SFP structure should be included in the Civil Inspection Program performed in accordance with Maintenance Rule.	The SFP structure is included in the Browns Ferry Nuclear Plant Civil Inspection Program in accordance with 10 CFR 50.65, which monitors the performance or condition of structures, systems, or components (SSCs) in a manner sufficient to provide reasonable assurance that these SSCs are capable of fulfilling their intended functions. Therefore, this criterion is met for Browns Ferry Nuclear Plant.

**Site-Specific Spent Fuel Pool Criteria  
Browns Ferry Nuclear Plant, Units 1, 2, and 3**

SFP Criteria from EPRI 3002007148	Site-Specific Data
<b>Non-Structural Parameters</b>	
<p>5. To confirm applicability of the piping evaluation in Section 3.2 of EPRI 3002007148, piping attached to the SFP up to the first valve should have been evaluated for the SSE.</p>	<p>Piping attached to the SFP is evaluated to the SSE as documented in site calculations and evaluations. Therefore, this criterion is met for Browns Ferry Nuclear Plant.</p>
<p>6. Anti-siphoning devices should be installed on any piping that could lead to siphoning water from the SFP. In addition, for any cases where active anti-siphoning devices are attached to 2-inch or smaller piping and have extremely large extended operators, the valves should be walked down to confirm adequate lateral support.</p>	<p>The fuel pool cleanup diffuser line check valves are provided with a siphon breaking vent in order to prevent siphoning of fuel pool water to no more than 6 inches below the normal water level.</p> <p>As described, anti-siphoning devices are installed on all SFP piping that could lead to siphoning. Therefore, this criterion is met for Browns Ferry Nuclear Plant.</p> <p>There are no anti-siphoning devices attached to 2-inch or smaller piping with extremely large extended operators. Therefore, this criterion is met for Browns Ferry Nuclear Plant.</p>
<p>7. To confirm applicability of the sloshing evaluation in Section 3.2 of EPRI 3002007148, the maximum SFP horizontal dimension (length or width) should be less than 125 ft, the SFP depth should be greater than 36 ft, and the GMRS peak Sa should be &lt;0.1g at frequencies equal to or less than 0.3 Hz.</p>	<p>The Browns Ferry Nuclear Plant SFP has a length of 40 ft a width of 35.33 ft and a depth of 38.75ft based on Updated Final Safety Analysis Report drawings. Therefore, this criterion is met.</p> <p>The Browns Ferry Nuclear Plant GMRS maximum spectral acceleration in the frequency range equal to or less than 0.3 Hz is 0.05 g from Browns Ferry Nuclear Plant GMRS submittal (Reference 6) which is less than 0.1g. Therefore, this criterion is met.</p>
<p>8. To confirm applicability of the evaporation loss evaluation in Section 3.2 of EPRI 3002007148, the SFP surface area should be greater than 500 ft<sup>2</sup> and the licensed reactor core thermal power should be less than 4,000 MWt per unit.</p>	<p>The surface area of the Browns Ferry Nuclear Plant SFP is approximately 1400 ft<sup>2</sup>, which is greater than 500 ft<sup>2</sup>; and licensed reactor thermal power for Browns Ferry Nuclear Plant is 3458 MWt per unit which is less than 4,000 MWt per unit. Therefore, these criteria are met.</p> <p>The thermal power criterion is also met for the pending Extended Power Uprate license amendment request (3952 MWt) for Browns Ferry Nuclear Plant.</p>