



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

March 18, 2014

Mr. Joseph W. Shea  
Vice President Nuclear Licensing  
Tennessee Valley Authority  
1101 Market Street, LP 3D-C  
Chattanooga, TN 37402-2801

SUBJECT: BROWNS FERRY NUCLEAR PLANT, UNIT 2 - STAFF ASSESSMENT OF THE SEISMIC WALKDOWN REPORT SUPPORTING IMPLEMENTATION OF NEAR-TERM TASK FORCE RECOMMENDATION 2.3 RELATED TO THE FUKUSHIMA DAI-ICHI NUCLEAR POWER PLANT ACCIDENT (TAC NO. MF0097)

Dear Mr. Shea:

On March 12, 2012, the U.S. Nuclear Regulatory Commission (NRC) issued a request for information letter per Title 10 of the *Code of Federal Regulations*, Subpart 50.54(f) (50.54(f) letter). The 50.54(f) letter was issued to power reactor licensees and holders of construction permits requesting addressees to provide further information to support the NRC staff's evaluation of regulatory actions to be taken in response to lessons learned from Japan's March 11, 2011, Great Tōhoku Earthquake and subsequent tsunami. The request addressed the methods and procedures for nuclear power plant licensees to conduct seismic and flooding hazard walkdowns to identify and address degraded, nonconforming, or unanalyzed conditions through the corrective action program, and to verify the adequacy of the monitoring and maintenance procedures.

By letter dated November 27, 2012, as supplemented by letter dated June 28, 2013, the Tennessee Valley Authority (TVA) submitted its Seismic Walkdown Report as requested in Enclosure 3 of the 50.54(f) letter for the Browns Ferry Nuclear Plant, Unit 2. By letter dated December 2, 2013, TVA provided a response to the NRC request for additional information for the staff to complete its assessments.

The NRC staff reviewed the information provided and, as documented in the enclosed staff assessment, determined that sufficient information was provided to be responsive to Enclosure 3 of the 50.54(f) letter.

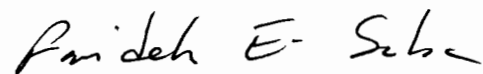
This concludes the NRC's efforts associated with TAC No. MF0097.

J. Shea

- 2 -

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

Sincerely,

A handwritten signature in black ink that reads "Farideh E. Saba". The signature is written in a cursive style with a horizontal line at the end.

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

Docket No. 50-260

Enclosure:  
Staff Assessment of Seismic Walkdown Report

cc w/encl: Distribution via Listserv

STAFF ASSESSMENT OF SEISMIC WALKDOWN REPORT  
NEAR-TERM TASK FORCE RECOMMENDATION 2.3 RELATED TO  
THE FUKUSHIMA DAI-ICHI NUCLEAR POWER PLANT ACCIDENT  
TENNESSEE VALLEY AUTHORITY  
BROWNS FERRY NUCLEAR PLANT, UNIT 2  
DOCKET NO. 50-260

1.0 INTRODUCTION

On March 12, 2012,<sup>1</sup> the U.S. Nuclear Regulatory Commission (NRC) issued a request for information per Title 10 of the *Code of Federal Regulations* (10 CFR), Subpart 50.54(f) (50.54(f) letter) to all power reactor licensees and holders of construction permits in active or deferred status. The request was part of the implementation of lessons learned from the accident at the Fukushima Dai-ichi nuclear power plant. Enclosure 3, "Recommendation 2.3: Seismic,"<sup>2</sup> to the 50.54(f) letter requested licensees to conduct seismic walkdowns to identify and address degraded, nonconforming, or unanalyzed conditions using the corrective action program (CAP), verify the adequacy of monitoring and maintenance procedures, and report the results to the NRC.

The 50.54(f) letter requested licensees to provide the following:

- a. Information concerning the plant-specific hazard licensing bases and a description of the protection and mitigation features considered in the licensing basis evaluation.
- b. Information related to the implementation of the walkdown process.
- c. A list of plant-specific vulnerabilities identified by the Individual Plant Examination of External Events (IPEEE) program and a description of the actions taken to eliminate or reduce them.
- d. Results of the walkdown including key findings and identified degraded, nonconforming, or unanalyzed conditions.
- e. Any planned or newly installed protection and mitigation features.
- f. Results and any subsequent actions taken in response to the peer review.

In accordance with the 50.54(f) letter, Enclosure 3, Required Response Item 2, licensees were required to submit a response within 180 days of the NRC's endorsement of the seismic

---

<sup>1</sup> ADAMS Accession No. ML12053A340.

<sup>2</sup> ADAMS Accession No. ML12056A049.

walkdown process. By letter dated May 29, 2012,<sup>3</sup> the Nuclear Energy Institute submitted Electric Power Research Institute document 1025286, "Seismic Walkdown Guidance for Resolution of Fukushima Near-Term Task Force Recommendation 2.3: Seismic," (walkdown guidance) to the NRC staff to consider for endorsement. By letter dated May 31, 2012,<sup>4</sup> the NRC staff endorsed the walkdown guidance.

By letter dated November 27, 2012,<sup>5</sup> the Tennessee Valley Authority (the licensee) provided a response to Enclosure 3 of the 50.54(f) letter Required Response Item 2, for Browns Ferry Unit 2. In addition to the aforementioned letter, the licensee, by letter dated June 28, 2013,<sup>6</sup> provided a supplement to the initial seismic walkdown report. The purpose of the latter submittal was to provide walkdown results for those items that were inaccessible and not included in the first submittal.

The NRC staff reviewed the walkdown reports and determined that additional supplemental information would assist the staff in completing its review. In letter dated November 1, 2013,<sup>7</sup> the NRC staff requested additional information to gain a better understanding of the processes and procedures used by the licensee in conducting the walkdowns and walk-bys. The licensee responded to the NRC staff request by letter dated December 2, 2013.<sup>8</sup>

The NRC staff evaluated the licensee's submittals to determine if the information provided in the walkdown report met the intent of the walkdown guidance and if the licensee responded appropriately to Enclosure 3 of the 50.54(f) letter.

## 2.0 REGULATORY EVALUATION

The structures, systems, and components (SSCs) important to safety in operating nuclear power plants are designed either in accordance with, or meet the intent of Appendix A to 10 CFR Part 50, General Design Criterion (GDC) 2, "Design Bases for Protection Against Natural Phenomena," and Appendix A to 10 CFR Part 100, "Seismic and Geologic Siting Criteria for Nuclear Power Plants." GDC 2 states that SSCs important to safety at nuclear power plants shall be designed to withstand the effects of natural phenomena such as earthquakes, tornadoes, hurricanes, floods, tsunamis, and seiches without loss of capability to perform their safety functions.

For initial licensing, each licensee was required to develop and maintain design bases that, as defined by 10 CFR 50.2, identify the specific functions that an SSC of a facility must perform, and the specific values or ranges of values chosen for controlling parameters as reference bounds for the design.

The design bases for the SSCs reflect appropriate consideration of the most severe natural phenomena that have been historically reported for the site and surrounding area. The design

---

<sup>3</sup> ADAMS Package Accession No. ML121640872.

<sup>4</sup> ADAMS Accession No. ML12145A529.

<sup>5</sup> ADAMS Package Accession No. ML13002A487.

<sup>6</sup> ADAMS Accession No. ML1318A058.

<sup>7</sup> ADAMS Accession No. ML13304B418.

<sup>8</sup> ADAMS Accession No. ML13339A333.

bases also reflect sufficient margin to account for the limited accuracy, quantity, and period of time in which the historical data have been accumulated.

The current licensing basis is the set of NRC requirements applicable to a specific plant, including the licensee's docketed commitments for ensuring compliance with, and operation within, applicable NRC requirements and the plant-specific design basis, including all modifications and additions to such commitments over the life of the facility operating license.

### 3.0 TECHNICAL EVALUATION

#### 3.1 Seismic Licensing Basis Information

The licensee provided information on the plant-specific licensing basis for the Seismic Category I SSCs for Browns Ferry Unit 2 in Section 2 of the walkdown report. Consistent with the walkdown guidance, the staff noted that the report includes a summary of the Safe Shutdown Earthquake (SSE) as well as a description of the codes, standards, and methods that were used in the design of the Seismic Category I SSCs for meeting the plant-specific seismic licensing basis requirements. The NRC staff reviewed Section 2 of the walkdown report, focusing on the summary of the SSE and the design codes used in the design of Browns Ferry Unit 2.

Based on the NRC staff's review, the staff concludes that the licensee provided information on the plant-specific seismic licensing basis and a description of the protection and mitigation features considered in the licensing bases evaluation consistent with Section 8, Submittal Report, of the walkdown guidance.

#### 3.2 Seismic Walkdown Methodology Implementation

Section 2, Personnel Qualifications; Section 3, Selection of SSCs; Section 4, Seismic Walkdowns and Area Walk-Bys; and Section 5, Seismic Licensing Basis Evaluations, of the walkdown guidance provide information to licensees regarding the implementation of an appropriate seismic walkdown methodology. By letter dated July 10, 2012,<sup>9</sup> the licensee confirmed that it would use the walkdown guidance in the performance of the seismic walkdowns at Browns Ferry Unit 2.

The walkdown report dated November 27, 2012, as supplemented on June 28, 2013, did not identify deviations from the walkdown guidance.

The NRC staff reviewed the following sections of the walkdown methodology implementation provided in the walkdown report:

- Personnel Qualifications
- Development of the Seismic Walkdown Equipment Lists (SWELs)
- Implementation of the Walkdown Process
- Licensing Basis Evaluations and Results

---

<sup>9</sup> ADAMS Accession No. ML12193A509.

### 3.2.1 Personnel Qualifications

Section 2, Personnel Qualifications, of the walkdown guidance provides licensees with qualification information for personnel involved in the conduct of the seismic walkdowns and area walk-bys.

The NRC staff reviewed the information provided in Section 3, and Appendix A of the walkdown report, which includes information on the walkdown personnel and their qualifications. Specifically, the staff reviewed the summary of the background, experience, and level of involvement for the following personnel involved in the seismic walkdown activities: equipment selection personnel, seismic walkdown engineers (SWEs), licensing basis reviewers, IPEEE reviewers, peer review team, and operations staff.

Based on the review of the licensee's submittals, the NRC staff concludes that those involved in the seismic walkdown activities have the appropriate seismic background, knowledge and experience, as specified in Section 2 of the walkdown guidance.

### 3.2.2 Development of the SWELs

Section 3, Selection of SSCs, of the walkdown guidance provides information to licensees for selecting the SSCs that should be placed on the SWELs, so that they can be walked down by qualified personnel.

The NRC staff reviewed the overall process used by the licensee to develop the Browns Ferry Unit 2 base list, SWEL 1 (sample list of designated safety functions equipment), and SWEL 2 (sample list of spent fuel pool related equipment).

The overall equipment selection process followed the screening process shown in Figures 1-1 and 1-2 of the walkdown guidance. Based on Appendix D and the description provided in Section 4 of the walkdown report, Browns Ferry Unit 2 SWEL 1 and 2 meet the inclusion requirements of the walkdown guidance. Specifically, the following attributes were considered in the sample selection:

- A variety of systems, equipment and environments
- IPEEE equipment
- Major new or replacement equipment
- Risk considerations

The staff noted that no rapid drain-down items were added to SWEL 2, as described in Section 3 of the guidance. In Section 4.1 of the walkdown report, the licensee stated that there is no path for a rapid drain-down to occur. After reviewing the information provided in this section, the staff concludes that the licensee provided adequate justification for not including a rapid drain-down list as part of SWEL 2.

Due to individual plant configurations and the walkdown guidance screening process followed to select the final SWEL equipment, it is possible that some classes of equipment will not be represented on the SWEL. The walkdown guidance recognizes this is due to the equipment not being present in the plant (e.g., some plants generate DC power using inverters and therefore do

not have motor generators) or the equipment being screened out during the screening process (the screening process is described in Section 3 of the walkdown guidance).

After reviewing SWEL 1 and 2, the NRC staff concludes that the sample of SSCs represents a diversity of component types and assures inclusion of components from critical systems and functions, thereby meeting the intent of the walkdown guidance. In addition, the NRC staff notes that the equipment selection personnel were appropriately supported by plant operations staff as described in the walkdown guidance.

### 3.2.3 Implementation of the Walkdown Process

Section 4, Seismic Walkdowns and Area Walk-Bys, of the walkdown guidance provides information to licensees regarding the conduct of the seismic walkdowns and area walk-bys for each site.

The NRC staff reviewed Section 5 of the walkdown report, which summarizes the results of the seismic walkdowns and area walk-bys, including an overview of the number of items walked down and the number of areas walked-by. The walkdown report states that teams, consisting of two qualified SWEs, conducted the seismic walkdowns and area walk-bys between July 9, 2012, and November 2, 2012. In addition, a subsequent set of walkdowns were performed on March 25, 2013, as stated in the June 28, 2013, letter from the licensee. The purpose of the last activity was to complete a number of items that were inaccessible during the initial walkdowns.

The walkdown report also states that the SWEs discussed their observations and judgments with each other during the walkdowns. The SWEs were also assisted by plant operations personnel while conducting seismic walkdown activities. Additionally, the SWEs agreed on the results of their seismic walkdowns and area walk-bys before reporting the results of their review on the seismic walkdown checklists (SWCs) and area walk-by checklists (AWCs). Appendices E and F of the initial and supplemental walkdown reports provide the completed SWCs and AWCs, documenting the results for each item of equipment on the SWEL (SWEL 1 and 2) and each area containing SWEL equipment. The licensee used the checklists provided in Appendix C of the walkdown guidance without modification.

The licensee documented cases of potentially adverse seismic conditions (PASCs) in the checklists for further evaluation. Section 6.2 of the initial walkdown report lists the PASCs identified during the seismic walkdowns and the area walk-bys. According to the licensee, there were no degraded, nonconforming or unanalyzed conditions that required either immediate or followup actions identified as part of the subsequent walkdowns.

Based on the review of the checklists, the staff was unable to confirm that all the PASCs identified during the walkdowns were included in this section. As such, by letter dated November 1, 2013, the staff issued two questions in a request for additional information (RAI) in order to obtain clarification regarding the process followed by the licensee when evaluating conditions identified in the field during the walkdowns and walk-bys. Specifically, in RAI 1 the staff requested the licensee to provide further explanation regarding how a field observation was determined to be PASC, and to ensure that the basis for determination was addressed using normal plant processes and documented in the walkdown report. In response to RAI 1, the licensee confirmed that observations which could not be readily judged to be acceptable were compared to

the design basis documentation, or in some cases, engineering judgment was used to determine if the observation was a PASC. Observations that could not be confirmed through documentation or sound engineering judgment to meet the current licensing basis were identified as PASCs and were entered into the Browns Ferry Unit 2 CAP. The licensee stated that judgments were then validated by the peer review team and documented in the Peer Review Report. The licensee provided Table 2 of the RAI response, which includes all the PASCs identified during the walkdowns and area walk-bys for Browns Ferry Unit 2, a description of how each condition was addressed (e.g., placement in the CAP), its resolution, and current status. Table 2 of the RAI response identified the PASCs described in Section 6.2 of the walkdown report.

After evaluating the licensee's response and reviewing Table 2 of the RAI response, the NRC staff concludes that the licensee responded appropriately to RAI 1, PASCs were properly identified and documented, and Table 2 is considered complete.

In addition to the information provided above, the NRC staff notes that anchorage configurations were verified to be consistent with existing plant documentation for at least 50 percent of the SWEL items, in accordance with Section 4 of the walkdown guidance.

Section 5.1 of the walkdown report states that cabinets were opened to ensure that visibly accessible internal component mountings are adequate. Based on a detailed review of SWCs and AWCs, the staff confirmed that cabinets were opened by the seismic walkdown team.

Based on the information provided in the licensee's submittals, the NRC staff concludes that the licensee's implementation of the walkdown process meets the intent of the walkdown guidance.

#### 3.2.4 Licensing Basis Evaluations and Results

Section 5, Seismic Licensing Basis Evaluations, of the walkdown guidance provides information to licensees regarding the conduct of licensing basis evaluations for items identified during the seismic walkdowns as degraded, nonconforming, or unanalyzed that might have potential seismic significance.

The NRC staff reviewed Section 6 of the Browns Ferry Unit 2 Walkdown Report, which discusses the process for conducting the seismic licensing basis evaluations of the PASCs identified during the seismic walkdowns and area walk-bys. The licensee stated that it performed licensing basis evaluations and resolved PASCs using the CAP. Section 6.2 of the walkdown report lists the key licensee findings, and provides a complete list of the potentially degraded, nonconforming, or unanalyzed conditions. Table 1 of the RAI response updates this information to include the actions taken or planned to address these conditions, including the current status of each of the items the licensee entered into the CAP. The licensee stated that no conditions outside the licensing basis were found during the course of the walkdown process.

The staff reviewed the CAP entries and the description of the actions taken or planned to address potential deficiencies. The staff concludes that the licensee appropriately identified degraded, nonconforming, or unanalyzed conditions and entered them into the CAP, which meets the intent of the walkdown guidance.



### 3.2.5 Conclusion

Based on the discussion above, the NRC staff concludes that the licensee's implementation of seismic walkdown methodology meets the intent of the walkdown guidance for personnel qualifications, development of SWELs, implementation of the walkdown process, and seismic licensing basis evaluations.

### 3.3 Peer Review

Section 6, Peer Review, of the walkdown guidance provides licensees with information regarding the conduct of peer reviews for the activities performed during the seismic walkdowns. Page 6-1 of the walkdown guidance identifies the following activities to be conducted during the peer review process:

- Review the selection of the SSCs included on the SWELs
- Review a sample of the checklists prepared for the seismic walkdowns and area walk-bys
- Review the licensing basis evaluations
- Review the decisions for entering the potentially adverse conditions into the CAP
- Review the walkdown report
- Summarize the results of the peer review process in the walkdown report

The NRC staff reviewed the information provided in Section 8 and Appendix G of the Browns Ferry Unit 2 Walkdown Report, which describes the conduct of the peer review. In addition, the staff reviewed the response to RAI 2. In RAI 2, the staff requested the licensee to provide additional information on the overall peer review process that was followed as part of the walkdown activities. Specifically, the staff requested the licensee to confirm that the activities identified on page 6-1 of the walkdown guidance were assessed and documented in the report. The licensee was also requested to confirm that any individual involved in performing any given walkdown activity was not a peer reviewer for that same activity. In response to RAI 2, the licensee confirmed that all the activities identified on page 6-1 of the walkdown guidance were included as part of the peer review process and referred to the summary of the peer review activities provided in Section 8 of the walkdown report and the full peer review report provided in Appendix G of the walkdown report. Table 3 of the RAI response provides a summary of the activities performed by the Peer Review Team.

The staff reviewed the licensee's summary of each of these activities, which included a discussion of the peer review team members' qualifications and level of involvement, the peer review findings, and resolution of peer review comments. After reviewing the licensee's submittals, the NRC staff concludes that the licensee sufficiently documented the results of the peer review activities and how these reviews affected the work described in the walkdown report.

Based on the discussion above, the NRC staff concludes that the licensee's results of the peer review and subsequent actions taken in response to the peer review meets the intent of Section 6 of the walkdown guidance.

### 3.4 IPEEE Information

Section 7, IPEEE Vulnerabilities, of the walkdown guidance provides information to licensees regarding the reporting of the evaluations conducted and actions taken in response to seismic vulnerabilities identified during the IPEEE program. Through the IPEEE program and Generic Letter 88-20, "Individual Plant Examination of External Events for Severe Accident Vulnerabilities," licensees previously had performed a systematic examination to identify any plant-specific vulnerabilities to severe accidents.

The licensee stated that the IPEEE Report for the Browns Ferry Nuclear Plant addressed multiple vulnerabilities that were identified during the original IPEEE walkdown process for Units 2 and 3 systems including common systems for all three units. In addition, the licensee stated that a full list of these vulnerabilities can be found in their report, "Seismic IPEEE Report for Browns Ferry Nuclear Plant." A list of the equipment identified during IPEEE along with actions taken was provided in Section 7.2 of the walkdown report. Additionally, in letter dated November 27, 2012, the licensee committed to replace two IPEEE vulnerabilities, which are transformers common to all three units, by September 30, 2014.

Based on the NRC staff's review of Section 7 of the walkdown report, the staff concludes that the licensee's identification of plant-specific vulnerabilities (including anomalies, outliers and other findings) identified by the IPEEE program, as well as actions taken to eliminate or reduce them, meets the intent of Section 7 of the walkdown guidance.

### 3.5 Planned Upgrades

The licensee did not identify any planned or newly installed protection and mitigation features in the walkdown report.

### 3.6 NRC Oversight

#### 3.6.1 Independent Verification by Resident Inspectors

On July 6, 2012,<sup>10</sup> the NRC issued Temporary Instruction (TI) 2515/188 "Inspection of Near-Term Task Force Recommendation 2.3 Seismic Walkdowns." In accordance with the TI, NRC inspectors independently verified that the Browns Ferry Unit 2 licensee implemented the seismic walkdowns in accordance with the walkdown guidance. Additionally, the inspectors independently performed walkdowns of a sample of seismic protection features. The inspection report dated February 08, 2013,<sup>11</sup> documents the results of this inspection and states that no findings were identified.

## 4.0 CONCLUSION

The NRC staff concludes that the licensee's implementation of seismic walkdown methodology meets the intent of the walkdown guidance. The staff concludes that, through the implementation of the walkdown guidance activities and, in accordance with plant processes and

---

<sup>10</sup> ADAMS Accession No. ML12156A052.

<sup>11</sup> ADAMS Accession No. ML13039A321.

procedures, the licensee verified the plant configuration with the current seismic licensing basis; addressed degraded, nonconforming, or unanalyzed seismic conditions; and verified the adequacy of monitoring and maintenance programs for protective features. Furthermore, the staff notes that no immediate safety concerns were identified. The NRC staff concludes that the licensee responded appropriately to Enclosure 3 of the 50.54(f) letter.

J. Shea

- 2 -

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

Sincerely,

*/RA/*

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

Docket No. 50-260

Enclosure:  
Staff Assessment of Seismic Walkdown Report

cc w/encl: Distribution via Listserv

**DISTRIBUTION:**

PUBLIC	RidsRgn2MailCenter Resource	NDiFrancesco, NRR/JLD
LPL2-2 R/F	RidsOpaMail Resource	EQuinones, EDO
RidsNroDsea	RidsNrrLABClayton Resource	RidsAcrcAcnw MailCTR Resource
RidsNrrDorl Resource	RidsNrrPMBrown Ferry Resource	RidsNrrDorlLpl2-2 Resource
LRegner, NRR	NChokshi, NRO	SFlanders, NRO
DJackson, NRO	RKaras, NRO	FVega, NRO
MJardaneh, NRO		

**ADAMS Accession No.: ML14066A301**

**\* concurrence by e-mail**

OFFICE	DORL/LPII-2/PM	JLD/PMB/PM	DORL/LPLII-2/LA	DSEA/RGS2/BC*
NAME	FSaba	NDiFrancesco	BClayton	DJackson
DATE	3/13/14	3/13/14	3/12/14	3/5/2014
OFFICE	OGC	DORL/LPL2-2/BC	DORL/LPL2-2/PM	
NAME	Not Required	JQuichocho	FSaba	
DATE	---	3/18/14	3/18/14	

**OFFICIAL RECORD COPY**