



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

April 14, 2014

Mr. Michael J. Pacilio  
President and Chief Nuclear Officer  
Exelon Nuclear  
4300 Winfield Road  
Warrenville, IL 60555

SUBJECT: LIMERICK GENERATING STATION , UNIT 1 - 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. MF0138)

Dear Mr. Pacilio:

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 19, 2012, Exelon Generation Company, LLC (EGC) submitted its Seismic Walkdown Report as requested in Enclosure 3 of the 50.54(f) letter for the Limerick Generating Station (Limerick), Unit 1. By letter dated November 27, 2013, EGC provided a response to the NRC request for additional information for the staff to complete its assessments. The NRC staff acknowledges that additional walkdown activities will be conducted during the next refueling outage scheduled for the second quarter of 2014 to address the remaining inaccessible items as stated in the regulatory commitment contained in Enclosure 3 to EGC's letter dated November 19, 2012. An Issue Report has been created by EGC to schedule the seismic walkdowns and area walk-bys for these items.

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.

M. Pacilio

- 2 -

If you have any questions, please contact me at 301-415-1420 or by e-mail at [Rick.Ennis@nrc.gov](mailto:Rick.Ennis@nrc.gov).

Sincerely,

A handwritten signature in black ink, appearing to read 'RBE' followed by a stylized flourish.

Richard B. Ennis, Senior Project Manager  
Plant Licensing Branch I-2  
Division of Operating Reactor Licensing  
Office of Nuclear Reactor Regulation

Docket No. 50-352

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  
EXELON GENERATION COMPANY, LLC  
LIMERICK GENERATING STATION, UNIT 1  
DOCKET NO. 50-352

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*, 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.

Enclosure 3 of 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 IPEEE [Individual Plant Examination of External Events] 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 condition ...
- 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 walkdown process. By letter dated May 29, 2012,<sup>3</sup> the Nuclear Energy Institute (NEI) staff

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<sup>1</sup> Agencywide Documents Access and Management System (ADAMS) Accession No. ML12053A340.

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

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

submitted Electric Power Research Institute (EPRI) 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 19, 2012,<sup>5</sup> Exelon Generation Company, LLC (the licensee) provided a response to Enclosure 3 of the 50.54(f) letter Required Response Item 2, for Limerick Generating Station (Limerick), Unit 1. The NRC staff reviewed the walkdown report and determined that additional information would assist the staff in completing its review. In a letter dated November 1, 2013,<sup>6</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 November 27, 2013.<sup>7</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 Criteria for Nuclear Power Plants," Criterion 2: "Design bases for protection against natural phenomena;" and Appendix A to 10 CFR Part 100, "Reactor Site Criteria." Criterion 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 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.

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

<sup>5</sup> ADAMS Package Accession No. ML123420141.

<sup>6</sup> ADAMS Accession No. ML13304B418.

<sup>7</sup> ADAMS Accession No. ML13331B501.

### 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 Limerick, Unit 1 in Section 2 of the seismic walkdown report. Consistent with the walkdown guidance, the NRC staff noted that the report includes a summary of the Safe Shutdown Earthquake (SSE) and refers to the Updated Final Safety Analysis Report (UFSAR) for 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 seismic walkdown report, focusing on the summary of the SSE and the design codes used in the design of Limerick, Unit 1.

Based on the its review, the NRC staff concludes that the licensee has 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 (EPRI Document 1025286) provide information to licensees regarding the implementation of an appropriate seismic walkdown methodology. By letter dated July 10, 2012,<sup>8</sup> the licensee confirmed that it would utilize the walkdown guidance in the performance of the seismic walkdowns at Limerick, Unit 1.

The walkdown report dated November 19, 2012, 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

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<sup>8</sup> ADAMS Accession No. ML12193A081.

### 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 Limerick, Unit 1 base list, SWEL 1 (sample list of designated safety functions equipment), and SWEL 2 (sample list of spent fuel pool (SFP) related equipment). The licensee stated that no items were included as part of the SWEL 2. The overall equipment selection process followed the screening process shown in Figures 1-1 and 1-2 of the walkdown guidance. Based on Table B-1 of Appendix B of the walkdown report, Limerick, Unit 1 SWEL 1 meets 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

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 direct current power using inverters and therefore do not have motor generators) or the equipment being screened out during the screening process as described in Section 3 of the walkdown guidance.

As stated above, the NRC staff noted that no items were included as part of the SWEL 2. The licensee explained, in Section 4.3 of the walkdown report, that based on the review of the design and licensing basis documentation for the SFP no Seismic Category I equipment were identified for Limerick, Unit 1. The staff reviewed the rationale that led to this conclusion which included a detailed explanation on how the screening process was applied and agrees with the licensee in that no SFP equipment satisfied the Screen #1 criteria described in Figure 1-2 of the walkdown guidance. Further, the staff also noted that a rapid drain-down list was not included as part of the SWEL 2, as described in Section 3 of the walkdown guidance. In Section 4.3 of the walkdown report, the licensee stated that Limerick, Unit 1 does not have any SFP penetrations below 10 feet above the top of the fuel assemblies. After reviewing the information provided in this section, the staff concludes that the licensee provided sufficient information to justify that there are no items to be included as part of the SWEL 2 for Limerick, Unit 1.

After reviewing the SWEL, the NRC staff concludes that the sample of SSCs represents 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, which consisted of at least two qualified SWEs conducted the seismic walkdowns and area walk-bys. According to the signed seismic walkdown checklists (SWCs) and area walkdown checklists (AWCs), the initial walkdown activities were conducted during the weeks of July 29, and August 5, 2012. The walkdown report states that during these evaluations, the SWEs actively discussed their observations and judgments with each other. Additionally, the SWEs agreed on the results of their Seismic Walkdowns and Area Walk-Bys before reporting the results of their review. Appendices C and D of the walkdown report, provide the completed SWCs and AWCs, documenting the results for each item of equipment on the SWEL 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. Tables 5-2 and 5-3 list the PASCs identified during the seismic walkdowns and the area walk-bys. These tables describe how each condition was addressed (e.g., placement in the CAP) and its current status. Based on the review of the checklists, the NRC staff was unable to confirm that all the PASCs identified during the walkdowns were included in these tables. As such, by letter dated November 1, 2013, the NRC 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 all conditions identified during the walkdowns and walk-bys were documented as issue reports (IRs) in the Limerick, Unit 1 CAP. The licensee referred to Tables 5-2 and 5-3 of the walkdown report, which include all the PASCs identified during the walkdowns and area walk-bys for Limerick, Unit 1 as well as other potentially adverse conditions. The licensee stated that in addition to addressing the PASCs through the CAP, other non-seismic potentially adverse conditions, such as housekeeping and material conditions items, were identified by SWEs and addressed through the CAP.

After evaluating the licensee's response and reviewing Sections 5 of the walkdown report, the NRC staff concludes that the licensee responded appropriately to the RAI, PASCs were properly identified and documented, and summary Tables 5-2 and 5-3 in the walkdown report are 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.

Table E-2 of the walkdown report confirms that most of the accessible cabinets were opened to view the internal lateral anchorages to adjacent cabinets, internal floor anchorage, and physical condition of any internal equipment. Table E-2 also lists cabinets that were not opened during the initial walkdowns and provides completion dates for these internal inspections and tracking numbers. Since the licensee has committed to open accessible cabinets to verify their internal components and provided the schedules for performing these actions, the NRC staff concludes this is an acceptable approach.

The equipment and areas that were inaccessible during the 180-day period are listed in Attachment E, Tables E-1, E-2 and E-3 of the walkdown report. The list of inaccessible items also includes the condition which caused the delay of the walkdown. A limited number of SWEL components (total of 13) were inaccessible at the time of the initial walkdowns. The licensee stated that the internally mounted items on three electrical cabinets were inaccessible due to the energized nature of the cabinets. However, the external anchorage conditions and the immediate area surrounding these components were included during the initial walkdown. The other 10 SWEL components located in the reactor's drywell were inaccessible at the time of the initial walkdowns and will be completed. The walkdowns for all of the remaining inaccessible items were committed to be completed by the end of the next scheduled refueling outage (spring 2014). The licensee created an IR in the CAP to schedule the seismic walkdowns for these items.

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 5 of the Limerick, Unit 1, 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 plant's CAP. Tables 5-2 and 5-3 of the walkdown report list the key licensee findings, and provide a complete list of the potentially degraded, nonconforming, or unanalyzed conditions. This table also describes 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 NRC 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 SWEL, 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 F of the 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 and Appendix F of the walkdown report. In addition, the licensee provided additional information on the level of involvement of the peer review team and its leader in order to further demonstrate the independence of the peer review process.

The NRC 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 for Severe Accident Vulnerabilities - 10 CFR 50.54(f)," dated November 23, 1988,<sup>9</sup> licensees previously had performed a systematic examination to identify any plant-specific vulnerabilities to severe accidents.

In Section 7 of the walkdown report the licensee provided background information regarding their IPEEE program and referenced several submittals to the NRC. The licensee stated that no seismic vulnerabilities were identified during the IPEEE program and therefore, no seismic related plant improvements were implemented or were committed to be implemented. The licensee further stated that although there were no equipment-related modifications, the IPEEE report did commit to improve the seismic housekeeping of the plant. A station housekeeping procedure and a guidance procedure for storage and housekeeping are both active to ensure good housekeeping practices at the site.

Based on the its review of Section 7 of the walkdown report, the NRC 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.

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<sup>9</sup> ADAMS Accession No. ML031150465.

### 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 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 5, 2013,<sup>11</sup> documents the results of this inspection and states that no findings were identified.

### 4.0 INACCESSIBLE ITEMS

The equipment and areas that were inaccessible during the 180-day period are listed in Table E-1 of Appendix E in the walkdown report. Cabinets that were not opened during the initial walkdown but will be opened and walked down were included in Tables E-2 and E-3. The walkdowns for these items are scheduled to be completed by the end of the next scheduled refueling outage (second quarter 2014). An IR has been issued to schedule the walkdowns for these items.

The NRC staff concludes that the development of inaccessible equipment list and conducting of follow-up walkdowns were consistent with the walkdown guidance. The schedule for completion of the remaining inaccessible items is acceptable.

### 5.0 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 procedures, the licensee verified the plant configuration with the current seismic licensing basis; addressed degraded, nonconforming, or unanalyzed seismic conditions, when applicable; 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 acknowledges that additional walkdown activities will be conducted during the next refueling outage scheduled for the second quarter of 2014 to address the remaining inaccessible items as stated in the regulatory commitment contained in Enclosure 3 to EGC's letter dated November 19, 2012. An IR has been issued to schedule the seismic walkdowns and area walk-bys for these items. The NRC staff reviewed the information provided and determined that sufficient information was provided to be responsive to Enclosure 3 of the 50.54(f) letter, dated March 12, 2012.

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

<sup>11</sup> ADAMS Accession No. ML13036A364.

M. Pacilio

- 2 -

If you have any questions, please contact me at 301-415-1420 or by e-mail at [Rick.Ennis@nrc.gov](mailto:Rick.Ennis@nrc.gov).

Sincerely,

**/RA/**

Richard B. Ennis, Senior Project Manager  
Plant Licensing Branch I-2  
Division of Operating Reactor Licensing  
Office of Nuclear Reactor Regulation

Docket No. 50-352

Enclosure:

Staff Assessment of Seismic Walkdown Report

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