



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

May 29, 2014

Mr. Michael J. Pacilio
Senior Vice President
Exelon Generation Company, LLC
President and Chief Nuclear Officer (CNO)
Exelon Nuclear
4300 Winfield Road
Warrenville, IL 60555

SUBJECT: QUAD CITIES NUCLEAR POWER STATION, UNITS 1 AND 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 NOS. MF0165 AND MF0166)

Dear Mr. Pacilio:

On March 12, 2012,¹ the U.S. Nuclear Regulatory Commission (NRC) issued a letter requesting information per Title 10 of the *Code of Federal Regulations*, Paragraph 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, 2012², as supplemented by letters dated June 27³ and November 27, 2013⁴, Exelon Generation Company, LLC (Exelon) submitted seismic walkdown reports for Quad Cities Nuclear Power Station, Units 1 and 2, as requested in Enclosure 3, "Recommendation 2.3: Seismic," of the 50.54(f) letter. By letter dated September 16, 2013⁵, Exelon provided additional information on the completion of inaccessible items and the substitutions made to the list of inaccessible items in order to complete all walkdowns and submit the final reports by July 30, 2014.

The NRC staff reviewed the information provided and, as documented in the enclosed staff assessments, determined that sufficient information was provided to be responsive to Enclosure 3 of the 50.54(f) letter. The staff acknowledges that a supplemental letter will be provided by July 30, 2014, addressing the remaining inaccessible items consistent with the regulatory commitment.

¹ Agencywide Document Access and Management System (ADAMS) Accession No. ML12053A340

² ADAMS Package Accession No. ML123620010

³ ADAMS Accession No. ML13182A610, only for Unit 1

⁴ ADAMS Accession No. ML13331B501

⁵ ADAMS Accession No. ML13260A083

M. Pacilio

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If you have any questions, please contact Blake Purnell at 301-415-1380 or by e-mail at Blake.Purnell@nrc.gov.

Sincerely,

A handwritten signature in black ink, appearing to read "Brenda Mozafari". The signature is fluid and cursive, with the first name "Brenda" and last name "Mozafari" clearly distinguishable.

Brenda Mozafari, Senior Project Manager
Plant Licensing Branch III-2 and
Planning and Analysis Branch
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket Nos. 50-254 and 50-265

Enclosures:

1. Staff Assessment of Seismic Walkdown Report for Unit 1
2. Staff Assessment of Seismic Walkdown Report for Unit 2

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
QUAD CITIES NUCLEAR POWER STATION, UNIT 1
DOCKET NO. 50-254

1.0 INTRODUCTION

On March 12, 2012,¹ the U.S. Nuclear Regulatory Commission (NRC) issued a request for information per Title 10 of the *Code of Federal Regulations* (10 CFR), Paragraph 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," 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 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 walkdown process. By letter dated May 29, 2012,² the Nuclear Energy Institute submitted

¹ Agencywide Document Access and Management System (ADAMS) Accession No. ML12053A340

² ADAMS Package Accession No. ML121640872

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, 2012,³ the NRC staff endorsed the walkdown guidance.

By letter dated November 27, 2012⁴, as updated by letter dated June 27, 2013⁵, Exelon Generation Company, LLC (the licensee or EGC) provided a seismic walkdown report in response to Enclosure 3 of the 50.54(f) letter Required Response Item 2, for Quad Cities Nuclear Power Station, Unit 1 (QCNPS-1). By letter dated September 16, 2013⁶, the licensee updated its commitment for completing and reporting the delayed inspections of remaining inaccessible items by July 30, 2014. The NRC staff reviewed the walkdown report and determined that additional supplemental information would assist the staff in completing its review. By letter dated November 1, 2013⁷, 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, 2013.⁸

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 (GDC) 2, "Design Bases for Protection Against Natural Phenomena," and Appendix A to 10 CFR Part 100, "Reactor Site Criteria." 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, "Definitions," 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,

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⁵ ADAMS Accession No. ML13182A610

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⁸ ADAMS Accession No. ML13331B501

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 QCNPS-1 in Section 2.0 of the walkdown report. Consistent with the walkdown guidance, the NRC staff noted that the report includes a summary of the safe-shutdown earthquake (SSE) and 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 staff reviewed Section 2 of the walkdown report, focusing on the summary of the SSE and the design codes used in the design.

Based on the NRC staff's review, the 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 provide information to licensees regarding the implementation of an appropriate seismic walkdown methodology. By letter dated July 10, 2012,⁹ the licensee confirmed that it would use the walkdown guidance to perform the seismic walkdowns at QCNPS-1.

The walkdown reports dated November 27, 2012, and June 27, 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

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.

⁹ ADAMS Accession No. ML12193A081

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.

The NRC staff noted that the walkdown report did not clearly describe the role of the operations staff beyond the selection of the SWEL items. In its response to a request for additional information (RAI) 1 (described below), the licensee clarified that operations personnel reviewed the final SWEL and were involved in the walkdowns when potential operability issues were noted by the SWEs.

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 QCNPS-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 provided the base list and SWEL 1 in Appendix B of the walkdown report, and discussed the SWEL development process in Section 4.2 of the report. 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 Appendix B of the walkdown report, QCNPS-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

It is possible that some classes of equipment will not be represented on the SWEL due to individual plant configurations and the walkdown guidance screening process followed to select the final SWEL equipment. 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, 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). Based on the information provided, the NRC staff noted that a detailed explanation was provided justifying cases where specific classes of equipment were not included as part of the SWEL, and concludes that these exclusions are acceptable.

As stated above, the licensee noted that no items were included as part of the SWEL 2. In Section 4.2.2 of the walkdown report, the licensee stated that, based on the review of the design and licensing basis documentation, no Seismic Category I equipment were identified for the QCNPS-1 SFP. The NRC staff reviewed the licensee's rationale that led to this conclusion, which included a detailed explanation on how the screening process was applied, and determined that it was consistent with the screening criteria (specifically, Screen #1) in Figure 1-2 of the walkdown guidance. 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 guidance. In Section 4.2.2 of the updated walkdown report, the licensee stated there are no components that could, upon failure, result in rapid drain-down of the SFP water level to below 3 meters (10 feet) above the top of the fuel. After reviewing the information provided in this section, the staff concludes that the licensee provided adequate justification for not including rapid drain-down items as part of the SWEL 2.

In its letter dated September 16, 2013, the licensee stated that it made one component substitution in order to complete the walkdowns of inaccessible items by the end of 2014. The licensee stated that the substituted item represents an equipment of comparable configuration, location, design, and environment. The NRC staff reviewed the licensee's proposed plans and the justification provided for the equipment substitution and agrees that the substituted item is comparable to the previous one and located in similar environmental conditions. In addition, the staff concludes that the substitution maintains the diversity of the equipment classes represented in the original SWEL.

After reviewing the SWEL and the substitution, 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 updated 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 updated 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 walk-by checklists (AWCs), the initial and delayed walkdown activities were conducted during the months of August 2012 and March 2013, respectively.

The updated walkdown report also states that the SWEs discussed their observations and judgments with each other during the walkdowns. Additionally, the SWEs agreed on the results of their seismic walkdowns and area walk-bys before reporting the results of their review.

The completed SWCs and AWCs, documenting the results for each item of equipment on the SWEL and each area containing SWEL equipment, were provided in Appendices C and D of the initial walkdown report and Appendices AC and AD of the updated walkdown report. 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 A5-2 and A5-3 of the updated walkdown report list the conditions, including PASCs, identified during both seismic walkdowns and area walk-bys. The tables describe how each condition was addressed (e.g., placement in the CAP), its resolution and current status.

By letter dated November 1, 2013, the NRC staff issued two questions in an RAI in order to obtain additional 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 in the QCNPS-1 CAP. The licensee referred to Tables A5-2 and A5-3 of the updated walkdown reports, which include all the PASCs identified during the walkdowns and area walk-bys for QCNPS-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. Furthermore, the licensee confirmed, based on its review of the QCNPS-1 walkdown process and the information submitted in the walkdown reports, that no new conditions were identified that would require an additional supplement or additional CAP entries.

After evaluating the licensee's response and reviewing Tables A5-2 and A5-3, the NRC staff concludes that the licensee properly identified and documented the PASCs and that the PASC summary tables in the updated walkdown report are 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 AE-2 of the updated walkdown report confirms that the majority of the deferred inspections of inaccessible cabinets identified in Table E-2 of the initial walkdown report were internally inspected in March 2013. Accordingly, Table AE-2 confirms that only a small number of cabinet inspections remain and have not been completed. In order to complete all cabinet inspections, the licensee proposed in Table B of the September 16, 2013, letter, a revised list of all deferred cabinets, including one cabinet substitution, as specified previously. The walkdowns of the remaining cabinets will be completed by April 26, 2014.

Table AE-1 of the updated walkdown report confirms that all inaccessible SWEL items, not including the deferred inspections of cabinets previously discussed, identified in the initial walkdown report were completed in November 2012 and March 2013.

submit the final walkdown report to the NRC by July 30, 2014. The NRC staff concludes that the inaccessible equipment list was developed consistent with the walkdown guidance. The schedule for completion is consistent with the timing of the next scheduled refueling and system outages.

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 QCNPS-1 updated 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 initial report and Tables A5-2 and A5-3 of the updated walkdown report list the key licensee findings, and provide a complete list of the potentially degraded, nonconforming, or unanalyzed conditions. These tables also describe 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 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 7 of the QCNPS-1 updated 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, "Peer Review Report," of the initial walkdown report and Appendix AF, "Peer Review Report," of the updated walkdown report. In addition, the licensee stated that there were "no cases where any peer reviewer reviewed their own work for the EGC fleet."

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 of External Events for Severe Accident Vulnerabilities," licensees previously performed a systematic examination to identify any plant-specific vulnerabilities to severe accidents.

The licensee provided background information regarding its IPEEE program and referenced several submittals to the NRC. The licensee stated that there were no vulnerabilities, anomalies, or outliers noted during the IPEEE. However, the licensee lists plant improvements in Table G-1 of Appendix G identified in previous IPEEE reports. The licensee stated that all IPEEE improvement actions are complete.

Based on the NRC staff's review of Section 7 of the walkdown report, the staff concludes that the licensee's summary of the IPEEE is consistent with and 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, 2012,¹⁰ 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 October 25, 2012,¹¹ documents the results of this inspection. One licensee-identified finding of very low significance (green) related to the plant's seismic housekeeping procedure was reported. The licensee stated that the issue was entered into the CAP in a timely manner. No NRC-identified finding was reported.

4.0 INACCESSIBLE ITEMS

The status of limited number of remaining inaccessible items (only deferred cabinets) is listed in Attachment 9 of the September 16, 2013, letter. In that letter, the licensee committed to complete the walkdown of all of the remaining cabinets by April 26, 2014, and to provide a final walkdown report with the results of these walkdowns by July 30, 2014. The licensee's schedule for completion is acceptable since it is consistent with the timing of the next scheduled system and refueling outages.

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 the licensee, through the implementation of the walkdown guidance activities and, in accordance with plant processes and procedures, 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 staff acknowledges that a supplemental letter will be provided by July 30, 2014, addressing the remaining inaccessible items consistent with the regulatory commitment. 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.

¹⁰ ADAMS Accession No. ML12156A052

¹¹ ADAMS Accession No. ML12299A483

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
QUAD CITIES NUCLEAR POWER STATION, UNIT 2
DOCKET NO. 50-265

1.0 INTRODUCTION

On March 12, 2012,¹ the U.S. Nuclear Regulatory Commission (NRC) issued a request for information per Title 10 of the *Code of Federal Regulations* (10 CFR), Paragraph 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," 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.

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- 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.
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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, 2012,³ the NRC staff endorsed the walkdown guidance.

By letter dated November 27, 2012,⁴ Exelon Generation Company, LLC (the licensee or EGC) provided a seismic walkdown report in response to Enclosure 3 of the 50.54(f) letter Required Response Item 2, for Quad Cities Nuclear Power Station, Unit 2 (QCNPS-2). By letter dated September 16, 2013⁵, the licensee updated its commitment for completing and reporting the delayed inspections of remaining inaccessible items by July 30, 2014. The NRC staff reviewed the walkdown report and determined that additional supplemental information would assist the staff in completing its review. By letter dated November 1, 2013⁶, 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, 2013.⁷

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

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For initial licensing, each licensee was required to develop and maintain design bases that, as defined by 10 CFR 50.2, "Definitions," 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,

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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 QCNPS-2 in Section 2.0 of the walkdown report. Consistent with the walkdown guidance, the NRC staff noted that the report includes a summary of the safe-shutdown earthquake (SSE) and 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 staff reviewed Section 2.0 of the walkdown report, focusing on the summary of the SSE and the design codes used in the design.

Based on the NRC staff's review, the 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 provide information to licensees regarding the implementation of an appropriate seismic walkdown methodology. By letter dated July 10, 2012,⁸ the licensee confirmed that it would use the walkdown guidance to perform the seismic walkdowns at QCNPS-2.

The walkdown report dated November 27, 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

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.

⁸ ADAMS Accession No. ML12193A081

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.

The NRC staff noted that the walkdown report did not clearly describe the role of the operations staff beyond the selection of the SWEL items. In its response to a request for additional information (RAI) 1 (described below), the licensee clarified that operations personnel reviewed the final SWEL and were involved in the walkdowns when potential operability issues were noted by the SWEs.

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 QCNPS-2 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 provided the base list and SWEL 1 in Appendix B of the walkdown report, and discussed the SWEL development process in Section 4.2 of the report. 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 Appendix B of the walkdown report, QCNPS-2, 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

It is possible that some classes of equipment will not be represented on the SWEL due to individual plant configurations and the walkdown guidance screening process followed to select the final SWEL equipment. 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 (the screening process is described in Section 3 of the walkdown guidance). Based on the information provided, the NRC staff noted that a detailed explanation was provided justifying cases where specific classes of equipment were not included as part of the SWEL, and concludes that these exclusions are acceptable.

As stated above, the licensee noted that no items were included as part of the SWEL 2. In Section 4.2.2 of the walkdown report, the licensee stated that, based on the review of the design and licensing basis documentation, no Seismic Category I equipment were identified for the QCNPS-2 SFP. The NRC staff reviewed the licensee's rationale that led to this conclusion, which included a detailed explanation on how the screening process was applied, and determined that it was consistent with the screening criteria (specifically, Screen #1) in Figure 1-2 of the walkdown guidance. 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 guidance. In Section 4.2.2 of the walkdown report, the licensee stated there are no components that could, upon failure, result in rapid drain-down of the SFP water level to below 3 meters (10 feet) above the top of the fuel. After reviewing the information provided in this section, the staff concludes that the licensee provided adequate justification for not including rapid drain-down items as part of the SWEL 2.

In its letter dated September 16, 2013, the licensee stated that it made one component substitution in order to complete the walkdowns of inaccessible items by the end of 2014. The licensee stated that the substituted item represents an equipment of comparable configuration, location, design and environment. The NRC staff reviewed the licensee's proposed plans and the justification provided for the equipment substitution and agrees that the substituted item is comparable to the previous one and located in similar environmental conditions. In addition, the staff concludes that the substitution maintains the diversity of the equipment classes represented in the original SWEL.

After reviewing the SWEL and the substitution, 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, 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 walk-bys checklists (AWCs), these activities were conducted during the week of August 6, 2012.

The walkdown report also states that the SWEs discussed their observations and judgments with each other during the walkdowns. 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 report without modification.

The licensee documented cases of potentially adverse seismic conditions (PASCs) in the checklists for further evaluation. Tables 5-2 and 5-3 of the walkdown report list the conditions, including PASCs, identified during the seismic walkdowns and the area walk-bys. The tables describe how each condition was addressed (e.g., placement in the CAP), its resolution and current status.

By letter dated November 1, 2013, the NRC staff issued two questions in an RAI in order to obtain additional 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 a PASC, and to ensure that the basis for determination was addressed using normal plant processes and documented in the walkdown report. In its November 27, 2013, response, the licensee confirmed that all conditions identified during the walkdowns and walk-bys were documented as issue reports in the QCNPS-2 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 QCNPS-2, as well as, other potentially adverse conditions. The licensee stated that in addition to addressing the PASCs through the CAP, other nonseismic potentially adverse conditions, such as housekeeping and material conditions items, were identified by SWEs and addressed through the CAP. Furthermore, the licensee confirmed, based on its review of the QCNPS-2 walkdown process and the information submitted in the walkdown reports, that no new conditions were identified that would require an additional supplement or additional CAP entries.

After evaluating the licensee's response and reviewing Tables 5-2 and 5-3, the NRC staff concludes that the licensee properly identified and documented the PASCs and that summary Tables 5-2 and 5-3 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.

Tables E-1 and E-2 list equipment and areas that were inaccessible during the 180-day period. Table E-1 lists 10 SWEL components that were inaccessible at the time of the walkdowns due to a required outage, their respective completion date, and status. In addition, Table E-2 lists 18 deferred walkdowns of cabinets that were not internally inspected. Section 5.4 of the walkdown report states that although cabinets were not opened during the initial walkdowns, the cabinets will be opened during a later walkdown to ensure that visibly accessible internal component mountings are adequate. Attachment 10 to the September 16, 2013, letter, provides the status of delayed SWEL items, a revised list of deferred cabinets (including one cabinet substitution as specified previously), and the expected date of walkdown completion.

In its September 16, 2013, letter, the licensee committed to complete all walkdowns for the inaccessible SWEL items and deferred cabinets at QCNPS-2 by April 26, 2014, and submit the final walkdown report to the NRC by July 30, 2014. The NRC staff concludes that the inaccessible equipment list was developed consistent with the walkdown guidance. The licensee's schedule for completion is acceptable, since it is consistent with the timing of the next scheduled refueling and system outages.

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 QCNPS-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 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. These tables also describe 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 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 7 of the QCNPS-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 its November 27, 2013, letter, 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, "Peer Review Report," of the walkdown report. In addition, the licensee stated that there were "no cases where any peer reviewer reviewed their own work for the EGC fleet."

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 of External Events for Severe Accident Vulnerabilities," licensees previously performed a systematic examination to identify any plant-specific vulnerabilities to severe accidents.

The licensee provided background information regarding its IPEEE program and referenced several submittals to the NRC. The licensee stated that there were no vulnerabilities, anomalies, or outliers noted during the IPEEE. However, the licensee lists plant improvements in Table G-1 of Appendix G identified in previous IPEEE reports. The licensee stated that all IPEEE improvement actions are complete.

Based on the NRC staff's review of Section 7 of the walkdown report, the staff concludes that the licensee's summary of the IPEEE is consistent with and 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, 2012,⁹ 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 at QCNPS-2 in accordance with the walkdown guidance. Additionally, the inspectors independently performed walkdowns of a sample of seismic protection features. The inspection report dated October 25, 2012,¹⁰ documents the results of this inspection. One licensee-identified finding of very low significance (green) related to the plant's seismic housekeeping procedure was reported. The licensee stated that the issue was entered into the CAP in a timely manner. No NRC-identified findings were reported.

4.0 INACCESSIBLE ITEMS

The status of the limited number of inaccessible items and deferred cabinets is listed in Attachment 10 of the September 16, 2013, letter. In that letter, the licensee committed to complete the walkdowns for all of the remaining inaccessible items and cabinets by April 26, 2014, and to provide a final walkdown report with the results of these walkdown items by July 30, 2014. The licensee's schedule for completion is acceptable, since it is consistent with the timing of the next scheduled refueling and system outages.

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 the licensee, through the implementation of the walkdown guidance activities in accordance with plant processes and procedures, 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 staff acknowledges that a supplemental letter will be provided by July 30, 2014, addressing the remaining inaccessible items consistent with the regulatory commitment. 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.

⁹ ADAMS Accession No. ML12156A052

¹⁰ ADAMS Accession No. ML12299A483

M. Pacilio

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If you have any questions, please contact Blake Purnell at 301-415-1380 or by e-mail at Blake.Purnell@nrc.gov.

Sincerely,

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Plant Licensing Branch III-2 and
Planning and Analysis Branch
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket Nos. 50-254 and 50-265

Enclosures:

1. Staff Assessment of Seismic Walkdown Report for Unit 1
2. Staff Assessment of Seismic Walkdown Report for Unit 2

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