



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 Office (CNO)
Exelon Generation Company, LLC
4300 Winfield Road
Warrenville, IL 60555

SUBJECT: BYRON GENERATING STATION, UNIT NO. 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. MF0102)

Dear Mr. Pacilio:

On March 12, 2012 (Agencywide Document and Access Management System (ADAMS) Accession No. ML12053A340), 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 (ADAMS Accession No. ML12332A380), Exelon Generation Company, LLC (Exelon) submitted its seismic walkdown report as requested in Enclosure 3 of the 50.54(f) letter for the Byron Station, Unit No. 2. By letter dated November 27, 2013 (ADAMS Accession No. ML13331B501), Exelon provided a response to the NRC request for additional information for the staff to complete its assessments. By letter dated December 13, 2013 (ADAMS Accession No. ML13030A239), Exelon provided Annex A to the Byron, Unit No. 2, walkdown report documenting the results of additional seismic walkdowns performed for items that were inaccessible during the initial walkdowns.

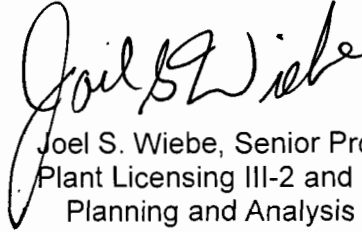
The NRC staff reviewed the information provided and, as documented in the enclosed staff assessment, determined that sufficient information was provided to be responsive to Enclosure 3 of the 50.54(f) letter.

M. Pacilio

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If you have any questions, please contact me at 301-415-6606 or by e-mail at Joel.Wiebe@nrc.gov.

Sincerely,

A handwritten signature in black ink that reads "Joel S. Wiebe". The signature is written in a cursive style with a large, looping initial "J".

Joel S. Wiebe, Senior Project Manager
Plant Licensing III-2 and
Planning and Analysis Branch
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-455

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
BYRON STATION, UNIT NO. 2
DOCKET NO. 50-455

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), 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,"² 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

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

² ADAMS Accession No. ML12056A049

walkdown process. By letter dated May 29, 2012,³ the Nuclear Energy Institute staff 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, 2012,⁴ the NRC staff endorsed the walkdown guidance.

By letter dated November 27, 2012,⁵ Exelon Generation Company, LLC (the licensee) provided a response to Enclosure 3 of the 50.54(f) letter Required Response Item 2, for Byron Station, Unit No. 2 (Byron 2). 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, 2013,⁶ 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 By letter dated December 13, 2013,⁸ the licensee provided Annex A to the walkdown report. The purpose of the Annex A was to provide the results of the completed internal inspection of cabinets that were not opened and inspected during the initial walkdowns.

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, 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.

³ ADAMS Accession No. ML121640872.

⁴ ADAMS Accession No. ML12145A529.

⁵ ADAMS Package Accession No. ML12341A160

⁶ ADAMS Accession No. ML13304B418

⁷ ADAMS Accession No. ML13331B501.

⁸ ADAMS Accession No. ML14030A243.

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 Byron 2 in Section 1.0 of the walkdown report. Consistent with the walkdown guidance, the 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 NRC staff reviewed Section 1.0 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 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 in the performance of the seismic walkdowns at Byron 2.

The walkdown report dated November 27, 2012, and supplemental walkdown report submitted on December 13, 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

⁹ 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 2 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 provide specific information about the involvement of the operations staff beyond the development of the SWELs and selection of items to be walked down. However, the licensee stated in its response to a request for additional information (RAI) 1 that operations staff were involved in the resolution of items placed into the CAP for resolution.

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 Byron 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 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, Byron 2 SWELs 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

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.

The NRC 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 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.

After reviewing the SWELs 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, 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), these activities were conducted during the weeks of August 6 and August 20, 2012. In addition, a subsequent set of walkdowns were performed during the third quarter of 2012, and the first and second quarter of 2013, as stated in the December 13, 2013, letter, from the licensee. The purpose of the last activity was to complete the internal inspection of cabinets that were not opened and inspected during the initial walkdowns. 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 for the initial walkdowns and walk-bys and documents the results for each item of equipment on the SWELs (SWELs 1 and 2) and each area containing the SWEL equipment. Appendices AC and AD of Annex A to the walkdown report provide the SWCs and AWCs for the subsequent walkdowns and walk-bys. 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 initial walkdown report list the PASCs identified during the initial seismic walkdowns and the area walk-bys. Table A5-2 of Annex A summarizes the conditions identified during the subsequent walkdowns and provides the updated conditions and status of the items in Table 5-2 of the initial walkdown report. Table A5-3 of Annex A provides the updated condition and status of the items in Table 5-3 of the initial walkdown report.

The licensee did not identify any conditions to enter into the CAP during the subsequent walk-bys. These tables describe how the condition was addressed (e.g., placement in the CAP), the resolution and the current status.

Based on the initial review of the checklists, the NRC staff was unable to confirm that all the PASCs identified during the walkdowns were included in this table. As such, by letter dated November 1, 2013, the NRC staff issued two questions in an 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 in the Byron 2 CAP. The licensee referred to Tables 5-2 and 5-3 of the walkdown report which includes all the PASCs identified during the walkdowns and area walk-bys for Byron 2. 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 Tables 5-2 and 5-3, the staff concludes that the licensee responded appropriately to RAI 1, PASCs were properly identified and documented, and summary Tables 5-2, 5-3, A5-2, and A5-3, 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.

Section A5.4 of Annex A provides the results of the walkdowns of the cabinets. Table A5-2 summarizes the conditions identified and their current status. No adverse conditions were identified.

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 Byron 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. Tables A5-2 and A5-3 of Annex A update this information with the most recent status of items in Tables 5-2 and 5-3. 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 8 and Appendix F of the Byron 2 walkdown report which describes the conduct of the peer review for the initial walkdowns. Section A8 and Appendix AF of Annex A describes the peer review of the subsequent walkdowns. 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 the full peer review report in Appendix F of the walkdown report. The licensee confirmed that there were no cases where any peer reviewer reviewed their own work for Byron 1.

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 GL 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 provided background information regarding their IPEEE program and referenced several submittals to the NRC in which the IPEEE outliers were identified along with their status at that time. The licensee stated that although it did not identify any vulnerabilities, additional improvements were made to enhance safety after the IPEEE was completed. These actions are summarized in Appendix G and Table G-1 of the walkdown report. Table G-1 also provides the IPEEE proposed resolution, the actual resolution and resolution date. The licensee stated that all IPEEE plant improvements and associated actions are complete

Based on the NRC staff's review of Section 7 and Appendix G 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, 2012,¹⁰ 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 Byron, Unit No 1, 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

¹⁰ ADAMS Accession No. ML12156A052.

report dated February 5, 2013,¹¹ 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 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.

¹¹ ADAMS Accession No. ML13036A035.

M. Pacilio

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If you have any questions, please contact me at 301-415-6606 or by e-mail at Joel.Wiebe@nrc.gov.

Sincerely,

/RA/

Joel S. Wiebe, Senior Project Manager
Plant Licensing III-2 and
Planning and Analysis Branch
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-455

Enclosure:
Staff Assessment of Seismic Walkdown Report

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