



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

June 16, 2014

Mr. Dean Curtland, Site Vice President
c/o Mr. Michael Ossing
NextEra Energy Seabrook, LLC
P.O. Box 300
Seabrook, NH 03874

SUBJECT: SEABROOK STATION, UNIT 1 - STAFF ASSESSMENT OF THE FLOODING WALKDOWN REPORT SUPPORTING IMPLEMENTATION OF NEAR-TERM TASK FORCE RECOMMENDATION 2.3 RELATED TO THE FUKUSHIMA DAI-ICHI NUCLEAR POWER PLANT ACCIDENT (TAC NO. MF0280)

Dear Mr. Curtland:

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*, Section 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 that may be taken in response to lessons learned from Japan's March 11, 2011, Great Tōhoku Earthquake, resultant tsunami, and subsequent accident at the Fukushima Dai-ichi nuclear power plant. The request addressed the methods and procedures for nuclear power plant licensees to conduct seismic and flooding hazard walkdowns to identify and address degraded, nonconforming, or unanalyzed conditions through the corrective action program, and to verify the adequacy of the monitoring and maintenance procedures.

By letter dated November 27, 2012, as supplemented by letter dated January 30, 2014, NextEra Energy Seabrook, LLC (NextEra) submitted a Flooding Walkdown Report as requested in Enclosure 4 of the 50.54(f) letter for the Seabrook Station, Unit 1.

The NRC staff reviewed the information provided and, as documented in the enclosed staff assessment, determined sufficient information has been provided to be responsive to Enclosure 4 of the 50.54(f) letter. This closes the NRC's efforts associated with TAC No. MF0280.

D. Curtland

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If you have any questions, please contact me at (301) 415-3100 or by e-mail at John.Lamb@nrc.gov.

Sincerely,

A handwritten signature in black ink, appearing to read "John Lamb", written in a cursive style.

John Lamb, Senior Project Manager
Plant Licensing Branch I-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-443

Enclosure:
Staff Assessment of Flooding Walkdown
Report

cc w/encl: Distribution via Listserv

STAFF ASSESSMENT OF FLOODING WALKDOWN REPORT
NEAR-TERM TASK FORCE RECOMMENDATION 2.3 RELATED TO
THE FUKUSHIMA DAI-ICHI NUCLEAR POWER PLANT ACCIDENT
NEXTERA ENERGY SEABROOK, LLC
SEABROOK STATION, UNIT 1
DOCKET NO. 50-443

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*, Section 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 4, "Recommendation 2.3: Flooding,"² to the 50.54(f) letter requested licensees to conduct flooding 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 4 of the 50.54(f) letter requested licensees to respond with the following information:

- a. Describe the design basis flood hazard level(s) for all flood-causing mechanisms, including groundwater ingress.
- b. Describe protection and migration features that are considered in the licensing basis evaluation to protect against external ingress of water into SSCs [systems, structures, and components] important to safety.
- c. Describe any warning systems to detect the presence of water in rooms important to safety.
- d. Discuss the effectiveness of flood protection systems and exterior, incorporated, and temporary flood barriers. Discuss how these systems and barriers were evaluated using the acceptance criteria developed as part of Requested Information item 1.h.
- e. Present information related to the implementation of the walkdown process (e.g., details of selection of the walkdown team and procedures) using the documentation template discussed in Requested Information item 1.j, including actions taken in response to the peer review.

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

² ADAMS Accession No. ML12056A050.

- f. Results of the walkdown including key findings and identified degraded, nonconforming, or unanalyzed conditions. Include a detailed description of the actions taken or planned to address these conditions using guidance in Regulatory Issues Summary 2005-20, Revision 1, Revision to the NRC Inspection Manual Part 9900 Technical Guidance, "Operability Conditions Adverse to Quality or Safety," including entering the condition in the corrective action program.
- g. Document any cliff-edge effects identified and the associated basis. Indicate those that were entered into the corrective action program. Also include a detailed description of the actions taken or planned to address these effects.
- h. Describe any other planned or newly installed flood protection systems or flood mitigation measures including flood barriers that further enhance the flood protection. Identify results and any subsequent actions taken in response to the peer review.

In accordance with the 50.54(f) letter, Enclosure 4, Required Response Item 2, licensees were required to submit a response within 180 days of the NRC's endorsement of the flooding walkdown guidance. By letter dated May 21, 2012,³ the Nuclear Energy Institute (NEI) staff submitted NEI 12-07, Revision 0, "Guidelines for Performing Verification Walkdowns of Plant Flood Protection Features," to the NRC staff to consider for endorsement. NEI 12-07 describes a methodology for performing walkdowns in a manner that will address requested information items 1.a through 1.j of Enclosure 4 to the 50.54(f) letter. By letter dated May 31, 2012,⁴ the NRC staff endorsed the walkdown guidance.

By letter dated November 27, 2012,⁵ NextEra Energy Seabrook, LLC (NextEra, the licensee), provided a response to Enclosure 4 of the 50.54(f) letter Required Response Item 2, for the Seabrook Station, Unit 1 (Seabrook). The NRC staff issued a request for additional information (RAI) to the licensee regarding the available physical margin (APM) dated December 23, 2013.⁶ The licensee responded by letter dated January 30, 2014.⁷

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 4 of the 50.54(f) letter.

2.0 REGULATORY EVALUATION

The 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, "Seismic and Geological Siting Criteria for Nuclear Plants." Criterion 2 states that SSCs important to safety at nuclear power plants shall

3 ADAMS Package Accession No. ML121440522.

4 ADAMS Accession No. ML12144A142.

5 ADAMS Accession Nos. ML12342A008 and ML12342A009.

6 ADAMS Accession No. ML13325A891.

7 ADAMS Accession No. ML14035A216

be designed to withstand the effects of natural phenomena such as earthquakes, tornadoes, hurricanes, floods, tsunami, 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 to be performed by SSC, 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 (CLB), as defined in 10 CFR 54.3(a), is the set of NRC requirements applicable to a specific plant, and a licensee's written commitments for ensuring compliance with, and operation within, applicable NRC requirements and the plant-specific design basis that are in effect.

3.0 TECHNICAL EVALUATION

3.1 Design Basis Flooding Hazard for Seabrook

The licensee stated that the design basis flood hazard for the site is a combined Standard Project Storm (SPS) and Probable Maximum Hurricane (PMH) including coincident wave runup during the SPS/PMH storm. The licensee reported that Seabrook's safety-related structures are located at a finished grade of 20 ft above mean sea level (MSL) and shielded above this elevation by flood protection features. The anticipated elevation of ponded floodwater during the SPS/PMH storm is 20.6 ft MSL according to the licensee. The licensee reported that wave runup that can accompany the combined SPS/PMH is estimated to reach 21.8 ft MSL against the eastern and southern (ocean) facing walls of specific site buildings.

The licensee stated that the duration of the SPS/PMH event is expected to be between 1 and 2 hours, occurring at the time of peak water levels and maximum wave attack. Notification of the declaration of "Hurricane Warning," "Hurricane Watch," "High Winds," or "Winter Storm," will lead the Seabrook Operations Department to begin its "Severe Weather Conditions" procedure, which identifies the steps to be taken when severe weather conditions are possible.

Based on the NRC staff's review, the licensee appears to have described the design basis flood hazard level requested in the 50.54(f) letter and consistent with the walkdown guidance.

3.2 Flood Protection and Mitigation

3.2.1 Flood Protection and Mitigation Description

The licensee stated that the current licensing basis flood protection is 20.6 ft MSL with wave runup that can accompany the SPS/PMH storm estimated to reach an elevation of 21.8 ft MSL. The licensee reported that safety-related structures are located at a finished grade of 20 ft MSL

with safety-related equipment installed at elevations that are either above the expected maximum flood water level or that are isolated from potential external flood water leakage paths.

Located approximately 1.75 miles from the Atlantic Ocean, Seabrook is in an area where hurricanes, high winds and winter storms are not uncommon. From west to east, Seabrook is separated from the ocean by an expanse of marshland, a wide open water tidal area, and a peninsular residential beachhead. The marshland and tidal area are open to the ocean through the Hampton Harbor Inlet separating the peninsular beachhead. The flood duration of the SPS/PMH storm is anticipated to be between 1 and 2 hours. Tsunami flooding was considered extremely unlikely for the site location and the absence of any dams of appreciable size precluded dam failure consideration. The licensee identified no temporary active or temporary passive flood mitigation features within the Severe Weather Condition Procedure.

The flood protection features include four designs along the site perimeter which are exposed to ocean wave action. To the south and southeast, wave protection is provided by a stone revetment with a seawall protecting a portion of the southeast perimeter. On the east and northeast, sloped compacted structural fill covered with 8-inch stone provides protection with a sheet pile retaining wall protecting a portion of the north side. The revetment and seawall have a top elevation of 20 ft MSL, which is also site grade. The resulting ponding of water on the site is estimated to reach a depth of 0.6 ft and includes consideration of the available yard drainage capacity.

Wave runup that can accompany the combined SPS/PMH is estimated to reach 21.8 ft MSL against the eastern and southern (ocean) facing walls of specific site buildings. Accordingly, these walls have doors and other penetrations that are either sealed or installed at an elevation above the anticipated wave runup height. Safety-related structures have sump pumps to remove any infiltrating groundwater. These pumps are covered under a Preventative Maintenance Program.

3.2.2 Incorporated and Exterior Barriers

The licensee reported that the site has incorporated exterior barriers that are permanently in place requiring no operator manual actions. These barriers include structural walls of buildings containing safety-related equipment with sealed penetrations and door seals in those walls, stone revetments along the south and southeast sides, a vertical seawall along the southeast side, compacted fill covered with 8-inch diameter stone on the east and northeast sides, and a sheet pile retaining wall along portions of the north side.

3.2.3 Temporary Barriers and Other Manual Actions

The licensee stated that the site has neither temporary barriers nor manual actions requiring operator action.

3.2.4 Reasonable Simulation and Results

No reasonable simulations were performed by the licensee. Seabrook has no temporary passive or temporary active flood protection features required for flood protection.

3.2.5 Conclusion

Based on the NRC staff's review, the licensee appears to have described protection and mitigation features as requested in the 50.54(f) letter and consistent with the walkdown guidance.

3.3 Warning Systems

The licensee stated that the notification of the declaration of "Hurricane Warning," "Hurricane Watch," "High Winds," or "Winter Storm," will lead the Seabrook Operations Department to begin its "Severe Weather Conditions" procedure. The licensee did not provide details on the how Seabrook obtains a severe weather declaration or any information on off-site entities providing the declaration. The licensee also noted that there are systems in the safety-related buildings to detect leakage. Although these were intended to detect leakage from internal flooding sources, they would also provide warning of flooding from external sources entering the buildings.

Based on the NRC staff's review, the licensee appears to have provided information to describe any warning systems as requested in the 50.54(f) letter and consistent with the walkdown guidance.

3.4 Effectiveness of Flood Protection Features

The licensee stated that the walkdown report concluded that the Seabrook SSCs are adequately protected from external flooding and capable of performing their design function as credited in the current licensing basis. The licensee reported that these conclusions were based on the flood features being configured in accordance with as-built drawings, inspection records and vendor documents, visual inspections, preventative maintenance activities or periodic inspections in place, and no topography changes including security barrier installations that would adversely affect the site drainage plan.

Based on the NRC staff's review, the licensee appears to have discussed the effectiveness of flood protection features as requested in the 50.54(f) letter and consistent with the walkdown guidance.

3.5 Walkdown Methodology

By letter dated June 7, 2012,⁸ the licensee responded to the 50.54(f) letter that they intended to utilize the NRC endorsed walkdown guidelines contained in NEI 12-07, "Guidelines for Performing Verification Walkdowns of Plant Flood Protection Features, Rev. 0-A."⁹ The licensee's walkdown submittal dated November 27, 2012, as supplemented by letter dated January 30, 2014, indicated that the licensee implemented walkdowns consistent with the intent of the guidance provided in NEI 12-07. The licensee did not identify any exceptions from NEI 12-07.

Based on the NRC staff's review, the licensee appears to have presented information related to the implementation of the walkdown process as requested in the 50.54(f) letter and consistent with the walkdown guidance.

3.6 Walkdown Results

3.6.1 Walkdown Scope

The licensee performed walkdowns of Seabrook's flood protection features including walls, the revetment and seawall and associated penetrations, roofs, site drainage features and manholes. The licensee compared these features to as-built drawings, as-built installation records, inspection records, and vendor documents. The walkdown team performed visual inspection to identify material degradation and confirmed that there were no significant changes to topography and that installation of security barriers did not affect the site drainage plan. The licensee stated that the Seabrook flooding protection CLB includes protection for the spent fuel pool and all plant configurations (e.g., full power operations, startup, shutdown, and refueling).

The licensee used acceptance criteria consistent with the intent of NEI 12-07.

3.6.2 Licensee Evaluation of Flood Protection Effectiveness, Key Findings, and Identified Deficiencies

The licensee's evaluation of the overall effectiveness of the plant's flood protection features included observations of concrete cracking and alkali-silica reactions on reinforced concrete structures that function as flooding mitigation features. However, the licensee has a program in place for monitoring and evaluating the effect of these issues on structural integrity. No degradation was observed that would impact the intended function of external flood protection features. The licensee determined that the revetment and seawall are structurally sound, and confirmed that safety-related structures have been built with ground floor door openings or protective curbs at or above 20.6 ft MSL.

The licensee noted that external eastern and southern walls of safety-related structures subject to wave runup have openings higher than 21.8 ft MSL, and that penetrations below this elevation are adequately sealed. External walls were found to be structurally sound with minor groundwater leakage for a small number of wall penetrations. The licensee stated that the plant dewatering system pumps have sufficient capacity to ensure significant groundwater intrusion

⁸ ADAMS Accession No. ML12165A263.

⁹ ADAMS Accession No. ML12173A215.

does not occur, and that sump pumps to remove any infiltrated groundwater in safety-related structures are covered under a preventative maintenance program. Leaking penetrations are captured in the station's CAP and monitoring program. Outdoor manholes were inspected to ensure there was no pathway for flood water leakage into safety-related buildings.

NEI 12-07 defines a deficiency as follows: "a deficiency exists when a flood protection feature is unable to perform its intended function when subject to a design basis flooding hazard." The licensee did not identify any deficiencies during the flood walkdown.

NEI 12-07 specifies that licensees identify observations in the CAP that were not yet dispositioned at the time the walkdown report was submitted. Exterior wall penetrations showing signs of groundwater leakage were captured in the CAP and Structural Monitoring Program. Other unspecified minor issues that did not rise to the level of a deficiency were entered into the CAP; however, no clarification was provided by the licensee as to the nature or disposition of these issues.

3.6.3 Flood Protection and Mitigation Enhancements

The licensee has not identified any enhancements to improve or increase flood protection or mitigation.

3.6.4 Planned or Newly Installed Features

The licensee determined that changes were not necessary by the flood walkdowns.

3.6.5 Deficiencies Noted and Actions Taken or Planned to Address

The walkdown team did not identify any flood protection feature that was unable to perform its function. Therefore, no deficiencies were identified.

3.6.6 NRC Staff Analysis of Walkdowns

The NRC staff reviewed the licensee walkdown report dated November 27, 2012, as supplemented by letter dated January 30, 2014. The walkdown revealed no deficiencies and licensee states that observations were entered into CAP. Exterior wall penetrations found to be leaking minor amounts of groundwater were entered into the CAP and are covered under the licensee's Structural Monitoring Program. Sump pumps in safety related structures to facilitate infiltrated groundwater removal are included in the licensee's Preventative Maintenance Program. The licensee stated that preventative maintenance programs and periodic inspections were considered for flood protection features; however, few details on the scope of these programs and inspections were provided in the licensee's walkdown report.

Based on the NRC staff's review, the licensee appears to have provided results of the walkdown and described any other planned or newly installed flood protection systems or flood mitigation measures as requested in the 50.54(f) letter and consistent with the walkdown guidance. 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.

3.6.7 Available Physical Margin

The NRC staff issued a request for additional information (RAI) to the licensee regarding the available physical margin (APM) dated December 23, 2013.¹⁰ The licensee responded by letter dated January 30, 2014.¹¹ The licensee has reviewed their APM determination process, and entered any unknown APMs into the CAP. The NRC staff reviewed the response, and concluded that the licensee met the intent of the APM determination per NEI 12-07.

Based on the NRC staff's review, the licensee appears to have documented the information requested for any cliff-edge effects, as requested in the 50.54(f) letter and consistent with the walkdown guidance. Further, the NRC staff reviewed the response, and concludes that the licensee met the intent of the APM determination per NEI 12-07.

3.7 NRC Oversight

3.7 Independent Verification by Resident Inspectors

On June 27, 2012, the NRC issued Temporary Instruction (TI) 2515/187, "Inspection of Near-Term Task Force Recommendation 2.3 Flooding Walkdowns." In accordance with the TI, NRC inspectors independently verified that the licensee implemented the flooding walkdowns consistent with the intent of the walkdown guidance. Additionally, the inspectors independently performed walkdowns of a sample of flood protection features. The Inspection Report 05000443/2012005, dated February 11, 2013 (ADAMS Accession No. ML13042A058), documents the results of this inspection. No findings of significance were identified.

4.0 WALKDOWNS NOT PERFORMED FOR FLOOD PROTECTION FEATURES

4.1 Restricted Access

No areas were identified as restricted access during the walkdown.

4.2 Inaccessible/Features

The licensee provided a basis for reasonable assurance that the following inaccessible features are available and will perform credited functions. The East Roof of the Main Steam Feedwater pipe enclosure was inaccessible during the walkdown due to safety issues associated with an active work zone. This feature was considered acceptable on the basis of visual inspection of all other roofs that housed safety equipment. Several Mechanical Penetration Areas on the north and south walls were inaccessible due to high radiation areas. Adjacent areas were inspected prior to the start of a refueling outage and were determined to meet their intended flood protection functions. Also in high radiation areas, demineralizer vaults were inaccessible although the licensee stated that these areas are continually monitored for early detection of internal leakage. The rationale for the vault walls maintaining an acceptable condition for flood protection was the lack of significant structural concrete issues noted during the walkdown. In the Primary Auxiliary Building, a visual inspection of some interior walls was blocked by numerous pipe assemblies. The adequate condition of these walls for flood protection was

10 ADAMS Accession No. ML13325A891.

11 ADAMS Accession No. ML14035A216.

based on inspection of other walls in the same area, which were showing no sign of degradation.

5.0 CONCLUSION

The NRC staff concludes that the licensee's implementation of the flooding walkdown methodology meets the intent of the walkdown guidance. The NRC 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 flooding licensing basis; addressed degraded, nonconforming, or unanalyzed flooding conditions; and verified the adequacy of monitoring and maintenance programs for protective features. Furthermore, the licensee's walkdown results, which were verified by the NRC staff's inspection, identified no immediate safety concerns. The NRC staff reviewed the information provided and determined that sufficient information was provided by the licensee to be responsive to Enclosure 4 of the 50.54(f) letter, dated March 12, 2012.

D. Curtland

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If you have any questions, please contact me at (301) 415-3100 or by e-mail at John.Lamb@nrc.gov.

Sincerely,

/RA/

John Lamb, Senior Project Manager
Plant Licensing Branch I-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-443

Enclosure:
Staff Assessment of Flooding Walkdown
Report

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ADAMS Accession No.: ML14128A498 * concurrence by e-mail

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