



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

June 26, 2014

Mr. John A. Dent, Jr.
Site Vice President
Entergy Nuclear Operations, Inc.
Pilgrim Nuclear Power Station
600 Rocky Hill Road
Plymouth, MA 02360-5508

SUBJECT: PILGRIM NUCLEAR POWER STATION – 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. MF0264)

Dear Mr. Dent:

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 November 26, 2013, Entergy Nuclear Operations, Inc. (Entergy) submitted a Flooding Walkdown Report for Pilgrim Nuclear Power Station, as requested in Enclosure 4 of the 50.54(f) letter. By letter dated January 31, 2014, Entergy provided a response to the NRC request for additional information for the staff to complete its assessments.

The NRC staff reviewed the information provided and determined that the information was responsive to Enclosure 4 of the 50.54(f) letter, as documented in the enclosed NRC staff assessment.

J. Dent

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If you have any questions, please contact me at 301-415-1016 or by e-mail at Nadiyah.Morgan@nrc.gov

Sincerely,

A handwritten signature in black ink, appearing to be 'Nadiyah S. Morgan', written in a cursive style.

Nadiyah S. Morgan, Project Manager
Plant Licensing Branch I-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-293

Enclosure:
As stated

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UNITED STATES
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STAFF ASSESSMENT OF FLOODING WALKDOWN REPORT
NEAR-TERM TASK FORCE RECOMMENDATION 2.3 RELATED TO
THE FUKUSHIMA DAI-ICHI NUCLEAR POWER PLANT ACCIDENT
ENTERGY NUCLEAR OPERATIONS, INC
PILGRIM NUCLEAR POWER STATION
DOCKET NO. 50-293

1.0 INTRODUCTION

On March 12, 2012¹, the U.S. Nuclear Regulatory Commission (NRC) issued a request for information per Title 10 of the *Code of Federal Regulations* (10 CFR), 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.

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

- 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 structures, systems, and components (SSCs) 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.

1. Agencywide Documents Access and Management System (ADAMS) Accession No. ML12053A340
2. ADAMS Accession No. ML12056A050

- 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.
- 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 CAP.
- g. Document any cliff-edge effects identified and the associated basis. Indicate those that were entered into the CAP. 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, 2012³, 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. By letter dated May 31, 2012⁴, the NRC staff endorsed the walkdown guidance.

By letter dated November 27, 2012⁵, as supplemented by letter dated November 26, 2013⁶, Entergy Nuclear Operations, Inc. (Entergy, the licensee), provided a response to Enclosure 4 of the 50.54(f) letter Required Response Item 2, for the Pilgrim Nuclear Power Station (Pilgrim). The NRC staff issued a request for additional information (RAI) to the licensee regarding the available physical margin (APM) dated December 23, 2013⁷. The licensee responded by letter dated January 31, 2014⁸.

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.

3. ADAMS Accession No. ML121440522
4. ADAMS Accession No. ML12144A142
5. ADAMS Accession No. ML12333A321
6. ADAMS Accession No. ML13346A013
7. ADAMS Accession No. ML13325A891
8. ADAMS Accession No. ML14037A207

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 Criteria for Nuclear Plants." Criterion 2 states that SSCs important to safety at nuclear power plants shall be designed to withstand the effects of natural phenomena such as earthquakes, tornadoes, hurricanes, floods, tsunamis, and seiches without loss of capability to perform their safety functions.

For initial licensing, each licensee was required to develop and maintain design bases that, as defined by 10 CFR 50.2, identify the specific functions to be performed by an 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) is the set of NRC requirements applicable to a specific plant, and the 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 Pilgrim

The licensee reported that the design basis flooding hazard for Pilgrim is the maximum northeaster or hurricane produced storm surge. The design basis storm surge flood tide level is 13.5 feet (ft) mean sea level (MSL). The licensee stated that this type of event is the only CLB flood hazard event at Pilgrim. The duration of the maximum storm tide is not defined. For comparison, the elevation in the vicinity of the power block is 22 ft MSL and the building floor elevation at grade level is 23 ft MSL. The licensee's flood walkdown report (FWR), as supplemented, evaluates the design storm and flood protection for the CLB and for a probable maximum precipitation (PMP) event evaluated as part of the Pilgrim Individual Plant Examination for External Events, which is not a part of the design basis.

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 that CLB provides flood protection to an elevation of 13.5 ft MSL. The licensee reported that the flood protection and mitigation features were developed with the

conservative approach that the storm tide level is 3 ft higher than what has ever been observed in the Boston Harbor area over the 244-year period of record.

The licensee reported that the exterior passive protection features include the main and east breakwaters, the east and west jetties at the end of the discharge canal, the east and west discharge canal revetments, and the shorefront revetment. There are no time dependent actions required for implementation of flood protection features that are credited in the Pilgrim CLB. Wave action model studies conducted by the licensee for severe storms indicated no flooding of safety significance for stillwater elevations of 13.5 ft and open ocean waves of 31 ft. Groundwater ingress is not specifically identified in the Pilgrim Final Safety Analysis Report (FSAR), however the Pilgrim FSAR describes the groundwater table and gradients with flow toward Cape Cod Bay. Pilgrim does not have any credited flood protection actions or procedures and therefore, no time dependent actions. Warnings for a storm surge or maximum precipitation event is based on monitoring weather services such as the National Weather Service for severe weather alerts.

3.2.2 Incorporated and Exterior Barriers

The licensee stated that Pilgrim has incorporated exterior barriers that are permanently in-place, requiring no operator manual actions. Storm surge external barriers include the main and east breakwaters, the east and west jetties at the end of the discharge canal, the east and west discharge canal revetments, and the shorefront revetment. The passive shorefront features are the only credited protection against a storm surge.

3.2.3 Temporary Barriers and Other Manual Actions

The licensee stated that Pilgrim has no temporary barriers and other manual actions that require operator action for the CLB storm surge event.

3.2.4 Reasonable Simulation and Results

There are no reasonable simulations for procedures associated with the CLB.

3.2.5 NRC Staff Findings

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 reported that there are no credited external flooding room level warning systems associated with the Pilgrim CLB storm surge event.

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 design basis flood for Pilgrim is based on a storm surge event. All storm surge protection features used to protect safety-related equipment are passive design features at Pilgrim. The licensee reported that the flood protection features that protect against the maximum storm tide are exterior passive features and include the main and east breakwaters, the east and west jetties at the end of the discharge canal, the east and west discharge canal revetments, and the shorefront revetment. The licensee indicated that the flood protection features at the shorefront are in adequate condition to function as flood protection features. Further, the effectiveness of the shorefront features is periodically assured because the features are included in a condition monitoring program under NRC 10 CFR 50.65 "Maintenance Rule," which requires a periodic visual inspection to ensure that there are no displaced rocks that would violate the design function of the feature. Visual inspections revealed no issues in the features that would diminish their effectiveness. All rocks and capstones on the breakwaters were in place and no significant gaps or crevices existed that would jeopardize the function of the breakwaters. Visual inspections are required yearly, or after a major storm when onshore winds exceed 50 miles per hour (mph) for two consecutive hours. Conduit seals are incorporated in the power block exterior walls. The licensee observed that these walls did not show any significant water stains indicating water ingress.

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 8, 2012⁹, 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." The licensee's walkdown submittal dated November 27, 2012, indicated that the licensee implemented the walkdowns consistent with the intent of the guidance provided in 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 for a total of 33 flood protection features including passive shorefront features, barrier walls, doors and seals. No reasonable simulations were performed by the licensee.

Adverse weather conditions assumed to exist during the CLB event are weather conditions typically associated with a hurricane, a northeaster, and intense precipitation. The licensee

9. ADAMS Accession No. ML12164A336

stated that there are no concerns for these weather conditions since there are no manual actions required. 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 performed an evaluation of the overall effectiveness of the Pilgrim flood protection features. The licensee indicated that the flood protection features at the shorefront are in adequate condition to function as flood protection features. Visual inspections revealed no issue in the features that would diminish their effectiveness. All rocks and capstones on the breakwaters were in place and no significant gaps or crevices existed that would jeopardize the function of the breakwaters.

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 walkdowns.

NEI 12-07 requires licensees to identify observations in the CAP that were not yet dispositioned at the time the walkdown report was submitted. In the supplemental walkdown, one observed condition did not meet the NEI 12-07 acceptance criteria and was entered into the CAP program, but was determined not to be a deficiency that causes the feature to be unable to perform its intended flood protection function as defined in NEI 12-07.

3.6.3 Flood Protection and Mitigation Enhancements

There are no recently implemented or planned enhancements to the Pilgrim site identified by the licensee that are intended to improve or increase flood protection and/or mitigation.

3.6.4 Planned or Newly Installed Features

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

3.6.5 Deficiencies Noted and Actions Taken or Planned to Address

The licensee noted no deficiencies or actions to be taken or planned.

Entergy entered some items from the initial walkdown that did not meet NEI 12-07 acceptance criteria into the CAP. However, none of these observations were determined to be deficiencies, which is a condition that causes the feature to be unable to perform its intended flood protection function as defined in NEI 12-07. The functionality determinations for these conditions concluded that the feature could perform its intended flood protection function when subject to its design basis flooding hazard.

3.6.6 NRC Staff Analysis of Walkdowns

The NRC staff reviewed the licensee's walkdown report dated November 27, 2012, as supplemented on November 26, 2013. The licensee's FWR, as supplemented, evaluates the design storm and flood protection for the CLB and for a PMP event which is not a part of the design basis. The staff review of the walkdown report focuses on those items related to the

CLB. The licensee adequately evaluated the CLB flood protection features and the features are functional and in good condition. There are no procedures in regards to the CLB requiring one or more reasonable simulations.

The licensee issued work orders for repair of the conditions that did not meet the NEI 12-07 acceptance criteria; however, these features can still perform their intended function. All of the items that did not meet NEI 12-07 criteria have been entered into the licensee's CAP and no observation identified required corrective actions since the CAP evaluation encountered no deficiencies.

Within the CLB, the shorefront protection features are routinely inspected and evaluated for effectiveness in accordance with the Maintenance Rule. The features are routinely visually inspected once a year or after a major storm when 50 mph onshore winds are observed for two consecutive hours.

Based on the NRC staff's review, the licensee has 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 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 an RAI to the licensee regarding the APM by letter dated December 23, 2013¹⁰. The licensee responded with a letter dated January 31, 2014¹¹. The licensee has reviewed their APM determination process, and entered any unknown APMs into their CAP. The 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 staff reviewed the licensee's RAI response, and concludes that the licensee met the intent of the APM determination per NEI 12-07.

3.7 NRC Oversight

3.7.1 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."¹² In accordance with the TI, NRC inspectors independently verified that Entergy 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 dated

10. ADAMS Accession No. ML13325A891

11. ADAMS Accession No. ML14037A207

12. ADAMS Accession No. ML12129A108

January 31, 2013¹³, documents the results of this inspection which indicated that no findings were identified.

4.0 SSCs Not Walked Down

The licensee identified restricted access and inaccessible features.

4.1 Restricted Access

There are four items classified as restricted access due to industrial safety concerns and plant configuration and operating mode:

1. Ductbank in the NW corner of the B RBCCW room;
2. Conduits in the Condenser Bay, Turbine Building, Area 8, start-up Transformer (SUT E3) J122;
3. Ductbank located in the Monitor Tank Room; and
4. Shut-down Transformer (SDT E3) J653 Ductbank located in the Monitor Tank Room.

The licensee provided justification for the delay in walkdowns of restricted access features. The licensee indicated that these features could not be walked down due to industrial safety concerns and plant configuration and operating modes. The licensee completed walkdowns of restricted access features by September 30, 2013, and provided a supplemental response on November 26, 2013, documenting the results.

4.2 Inaccessible Features

The licensee reported that there are conduit seals located in areas that are considered inaccessible due to their configuration which would require destructive work to inspect. The licensee provided assurance that these as-designed and built seals can perform their intended function citing design documentation, specifications, and acceptable inspections of similar interior conduit seals.

13. ADAMS Accession No ML13031A253

5.0 CONCLUSION

The NRC staff concludes that the licensee's implementation of flooding 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 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 staff's inspection, identified no immediate safety concerns. The staff reviewed the information provided and determined that the provided information was sufficient information and responsive to Enclosure 4 of the 50.54(f) letter.

J. Dent

- 2 -

If you have any questions, please contact me at 301-415-1016 or by e-mail at Nadiyah.Morgan@nrc.gov

Sincerely,

/RA/

Nadiyah S. Morgan, Project Manager
Plant Licensing Branch I-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-293

Enclosure:
As stated

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ADAMS Accession Number: ML14171A200

* concurrence via e-mail

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