



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

June 17, 2014

Vice President, Operations
Entergy Nuclear Operations, Inc.
James A. FitzPatrick Nuclear Power Plant
P. O. Box 110
Lycoming, NY 13093

SUBJECT: JAMES A. FITZPATRICK NUCLEAR POWER PLANT – 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. MF0229)

Dear Sir or Madam:

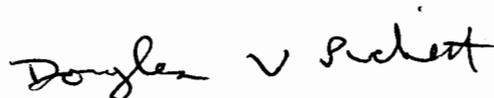
On March 12, 2012, the U.S. Nuclear Regulatory Commission (NRC) issued a request for information letter per Title 10 of the *Code of Federal Regulations*, Section 50.54(f) (50.54(f) letter). The 50.54(f) letter was issued to power reactor licensees and holders of construction permits requesting addressees 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 and subsequent tsunami. The request addressed the methods and procedures for nuclear power plant licensees to conduct 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, Entergy Nuclear Operations, Inc (Entergy) submitted a Flooding Walkdown Report as requested in Enclosure 4 of the 50.54(f) letter for the James A. Fitzpatrick Nuclear Power Plant (JAF) site. By letter dated January 30, 2014, Entergy provided a response to the NRC request for additional information for the staff to complete its assessments.

The NRC staff acknowledges that the licensee will complete the delayed walkdowns items no later than November 1, 2014, consistent with its regulatory commitment. The staff reviewed the information provided and, as documented in the enclosed staff assessment, determined that sufficient information has been provided to be responsive to Enclosure 4 of the 50.54(f) letter.

If you have any questions, please contact me at (301) 415-1364 or by e-mail at Douglas.Pickett@nrc.gov.

Sincerely,

A handwritten signature in black ink that reads "Douglas V Pickett". The signature is written in a cursive style with a large, stylized 'D' and 'P'.

Douglas V. Pickett, Senior Project Manager
Plant Licensing Branch I-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-333

Enclosure:
Staff Assessment of Flooding Walkdown Report

cc w/encl: Distribution via Listserv



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
JAMES A. FITZPATRICK NUCLEAR POWER PLANT
DOCKET NO. 50-333

1 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.

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.
- 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,

¹ ADAMS Accession No. ML12053A340.

² ADAMS Accession No. ML12056A050.

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) 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, 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 James A. Fitzpatrick Nuclear Power Plant (JAF). The NRC staff issued a request for additional information (RAI) to the licensee regarding the available physical margin (APM) dated December 23, 2013⁶. The licensee responded by letter dated January 30, 2014⁷.

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 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 [GDC] for Nuclear Power Plants," Criterion 2, "Design bases for protection against natural phenomena," and Appendix A, "Seismic and Geological Criteria for Nuclear Plants," to 10 CFR Part 100 . 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.

3 ADAMS Package Accession No. ML121440522.

4 ADAMS Accession No. ML12144A142.

5 ADAMS Accession No. ML12332A379.

6 ADAMS Accession No. ML13325A891.

7 ADAMS Accession No. ML14031A432.

The current licensing basis (CLB) 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.

3 TECHNICAL EVALUATION

3.1 Design Basis Flooding Hazard for the James A. FitzPatrick Nuclear Power Plant

The licensee stated that the design basis flood hazard for the JAF plant is flooding from Lake Ontario. The licensee reported that high lake levels are of concern at the Screenwell Building and at the shoreline. The license reported that the design basis flood level at the Screenwell Building is 255 ft based on the effects of a ten thousand year storm.

The licensee stated that the maximum probable flood level elevation is calculated as 262 ft, based on a maximum still water level elevation of 250 ft, maximum wave runup of 7.5 ft, maximum probable short-term rise in lake level (wind setup) of 4.1 ft, and maximum probable rainfall of 0.35 ft (which total 261.95 ft). According to the JAF Final Safety Analysis Report (FSAR), sustained winds are a key contributor to lake level changes and wave formation. Flood duration of winds speeds 50 mph (on average) or greater is 23 hr.

The licensee report that the probable maximum precipitation (PMP) was reevaluated in the JAF Individual Plant Examination for External Events (IPEEE) using criteria that exceed the original design basis values⁸:

- 4.6 in./hr for a 6-hr duration;
- 16 in./hr for a 1-hr duration;
- 24.3 in./hr for a 30-min duration;
- 34.2 in./hr for a 15-min duration;
- 65.3 in./hr for a 5-min duration.

The IPEEE calculated that under these PMPs, the 50 lb/ft² load capacity of the Reactor Building roof could be exceeded if two of three drains on one side of the roof were blocked and, as a result, the depth of water of the roof exceeded 9.6 in. The licensee stated that the capacity of the roof drainage system is limited by the flow of water at the lower levels and higher roof water levels have increased drainage capacity. The licensee reported that although the IPEEE is not part of the FSAR design basis, it concluded that the plant is not particularly susceptible to internal flooding and this flooding scenario would not pose a significant hazard.

Based on the NRC staff's review the licensee appears to have described the design basis flood hazard level(s) as 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 to an elevation of 255 ft. The licensee reported that the flood protection and mitigation features were designed using the following assumptions and inputs:

8 ADAMS Accession No. ML073550636.

The JAF plant is located on a topographic high and the terrain naturally slopes toward Lake Ontario. The site grade is 272 ft, well above the probable coincident maximum flood level of 262 ft, with a freeboard of 10 ft. The elevation difference between the site grade and the lake flood level acts as a natural barrier to flooding. The licensee stated in its walkdown report, and as discussed in FSAR Section 2.4.3.2, that the maximum probable flood level at the screenwell is elevation 255 ft. This flood level coincides with the top of the floor slab. This barrier is available and functional with no operator actions required. There are no other existing plant equipment, structures, or procedures that could mitigate the effects of an external flood at the screenwell house. Existing procedures focus on loss of level at the intake or high differential level across the screens. No procedures related to high level conditions in the screenwell were found to exist.

The licensee reported that precipitation falling on the site is discharged to Lake Ontario through intermittent streams. The licensee stated that roof drains are routed to the lake via the stormwater drainage system.

3.2.2 Incorporated and Exterior Barriers

The licensee reported that the site has incorporated and/or exterior barriers that are permanently in-place, requiring no operator manual actions. The licensee stated that these flood protection barriers include roof drains, conduit seals, sump pumps, perimeter drain pumps, and site grade. The licensee stated that sump pumps and perimeter drain pumps are passive features and do not require manual operation. The licensee report that shoreline headwalls are located along the JAF plant's north perimeter and act as a barrier to protect the site from lake flood level.

3.2.3 Temporary Barriers and Other Manual Actions

The licensee reported that the site does not have temporary barriers and other manual actions requiring operator action.

3.2.4 Reasonable Simulation and Results

The licensee reported that the site does not have temporary barriers and other manual actions requiring operator action, therefore no reasonable simulations were required.

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 reported that groundwater collecting in a circumferential drain at the base of the Reactor Building is discharged to the storm drainage system by two perimeter drain pumps (a primary and a standby). The licensee stated that failure of the primary pump results in operation of the standby pump; failure of both pumps results in high water levels that trigger a control room alarm. The licensee stated that pump failures result in manual actions involving troubleshooting and restoring pumps to operability. The licensee reported that there are no automatic actions associated with the control room alarm. The licensee stated that pump

performance is monitored on a weekly basis by the JAF plant's Chemistry Department as part of its tritium detection program.

Based on the NRC staff's review, the licensee appears to have provided information to describe 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 reported that the key findings of the walkdown include:

- Manhole 1 Conduit Seals are routed below grade to the Reactor Building and are internally sealed at the manhole to prevent water intrusion into the Reactor Building. A sump pump prevents the water level from reaching the elevation of the conduit seals. In the event of sump pump failure, a temporary pump could be used to maintain the water level in the manhole below the level of the seals (though neither of the pumps are part of the flooding CLB).
- The grade of Yard Areas surrounding the Reactor building is at 271.5 ft, which provides natural flood protection (because it is 10 ft above the calculated flood level of 262 ft). Drainage from the areas is diverted to the stormwater drainage system that discharges into Lake Ontario. Catch basins located throughout the Yard Areas also divert rain water to the stormwater drainage system.
- Perimeter Drain Pumps (and Pump Pit) function to keep the backfill around the Reactor Building dry. The pumps operate automatically based on level switches. If the primary pump fails, a temporary pump could be used to maintain groundwater levels. Use of the temporary pump is not part of the CLB.
- The Screenwell Building design basis flood level is 255 ft (at the top of the concrete floor slab). There are no existing plant equipment, structures, or procedures to mitigate an external flood. Procedures are focused on loss of level at the intake structure or high differentials in levels across the screens.
- Shoreline Headwalls occur along Lake Ontario where water from the JAF site is discharged. There are no existing plant equipment, structures, or procedures to mitigate an external flood, nor are any required because the elevation difference (between the top of the headwalls at site grade and flood level) is sufficient to prevent flooding.

The licensee reported that roof drains on the Turbine and Reactor Buildings discharge rain water to the stormwater drainage system. The IPEEE evaluated the roof drains and concluded that PMP events would not pose a significant risk.

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

3.5 Walkdown Methodology

By letter dated June 8, 2012,⁹ the licensee responded to the 50.54(f) letter that they intended to utilize the NRC endorsed walkdown guidelines contained in NEI 12-07, Revision 0-A, "Guidelines for Performing Verification Walkdowns of Plant Flood Protection Features."¹⁰ The licensee's walkdown submittal dated November 27, 2012, indicated that the licensee

⁹ ADAMS Accession No. ML12164A240.

¹⁰ ADAMS Accession No. ML12173A215.

implemented the 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 28 flood protection features including manhole conduit seals, yard areas, perimeter drain pumps, the Screenwell Building, shoreline headwalls, and roof drains.

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 JAF plant's flood protection features. The licensee's evaluation of the effectiveness of flood protection features is summarized as follows:

- Manhole 1 Conduit Seals are available and functional, though their material condition requires further evaluation.
- Manhole 2 is a confined space and was not available for inspection during the walkdown period; a future walkdown is scheduled.
- Yard Areas are drained by streams which are available and functional. In addition, catch basins located throughout the plant yard area divert rain water to the stormwater drainage system.
- Perimeter Drain Pumps (and Pump Pit) are available and functional (inferred from the absence of an alarm for the drain pumps). The Perimeter Drain Pump Pit is a confined space and was not available for inspection during the walkdown period; a future walkdown is scheduled.
- The Screenwell Building design basis flood level is 255 ft (at the top of the concrete floor slab). The walkdown confirmed that the concrete floor slab has adequate structural integrity and safety related equipment was located above the floor level (to avoid impacts from a flood at 255 ft). The barrier is available and functional; no operator actions required.
- Shoreline Headwalls along Lake Ontario were available and functional; no operator actions are required.
- Roof Drains on the Turbine and Reactor Buildings were available and functional; no operator actions are required.

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 identified deficiencies because of the flood walkdowns. Deficiencies identified include:

- MG Set Room Roof Drains. Partially clogged and degraded roof drains were observed. No standing water present.

- Reactor Building Roof Drains. Degraded roof drains were observed.
- Turbine Building Roof Drains. Partially clogged and degraded roof drains were observed. Minor standing water was observed.
- Manhole 1 Material Condition. Uneven patchwork application of conduit sealing material was observed at the conduits leading to the Reactor Building. Significant corrosion of some of the armored cables entering the conduits was also observed. Water seepage observed at the location where an armored cable entered a circuit.

NEI 12-07 specifies that licensees identify observations in the CAP that were not yet dispositioned at the time the walkdown report was submitted. Entergy identified reported observations awaiting disposition. The licensee reported that all observations from the walkdowns were summarized in condition reports and a work order has been assigned to address the identified condition. The licensee confirmed the features remained functional considering the identified conditions.

3.6.3 Flood Protection and Mitigation Enhancements

The licensee has no plans to install flood protection or flood mitigation measures to enhance the flood protection at the JAF plant.

3.6.4 Planned or newly installed features

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

3.6.5 Deficiencies Noted and Actions Taken or Planned to Address

The licensee noted the following deficiencies and actions taken or planned to address the deficiencies:

- MG Set Room Roof Drains. Partially clogged and degraded roof drains were observed. No standing water present.
- Reactor Building Roof Drains. Degraded roof drains were observed.
- Turbine Building Roof Drains. Partially clogged and degraded roof drains were observed. Minor standing water was observed.
- Manhole 1 Material Condition. Uneven patchwork application of conduit sealing material was observed at the conduits leading to the Reactor Building. Significant corrosion of some of the armored cables entering the conduits was also observed. Water seepage observed at the location where an armored cable entered a circuit.

The licensee reported that all of the identified deficiencies were entered into the CAP and a site Work Order has been assigned to resolve the issues.

3.6.6 Staff Analysis of Walkdowns

The licensee has summarized all identified deficiencies in condition reports and a work order has been assigned to address each identified condition. Future walkdowns have been scheduled for two features: the Perimeter Drain Pump Pit and Manhole 2. The material conditions of conduit seals in Manhole 1 will also be further evaluated. Completion of these future walkdowns will be tracked within a condition report and will be completed by November 1, 2014.

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 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, 2013¹¹. The licensee responded with a letter dated January 30, 2014¹². The licensee 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 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."¹³ In accordance with the TI, NRC inspectors independently verified that the JAF 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 dated February 7, 2013¹⁴, documents the results of this inspection. No findings of significance were identified.

4 SSCS NOT WALKED DOWN

The license identified two restricted access features, but no inaccessible features.

4.1 Restricted Access

The licensee identified two restricted access features: the Perimeter Drain Pump Pit and Manhole 2. The licensee provided justification for the delay in walkdowns of restricted access features. For the Perimeter Drain Pump Pit, the pit is accessed through a vertical 30 in. diameter pipe that is over 40 ft long and entry into the pit requires special rigging to allow the worker to be lowered in a harness by a hoist. The licensee stated that the Perimeter Drain Pump Pit is a confined space and, therefore, considered a restricted access area. However, in the absence of a control alarm for the perimeter drain pumps, the feature was considered functional. The license reported that pump performance is monitored on a weekly basis as part of the tritium detection program. A video inspection done by the licensee in 2010 confirmed integrity of drain pipes associated with the drain pump system. The licensee committed to walkdown this feature by November 1, 2014.

11 ADAMS Accession No. ML13325A891.

12 ADAMS Accession No. ML14031A432.

13 ADAMS Accession No. ML12129A108

14 ADAMS Accession No. ML13038A174.

The licensee reported that Manhole 2 requires confined space entry and is thus considered restricted access. The licensee reported that site support was not available during the team walkdown activities because of a refueling outage. The licensee committed to walkdown this feature by November 1, 2014.

4.2 Inaccessible Features

The licensee did not identify any inaccessible features.

5 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 acknowledges that the licensee will complete the delayed walkdowns items no later than November 1, 2014, consistent with its regulatory commitment. The staff reviewed the information provided and determined that sufficient information was provided to be responsive to Enclosure 4 of the 50.54(f) letter.

If you have any questions, please contact me at (301) 415-1364 or by e-mail at Douglas.Pickett@nrc.gov.

Sincerely,

/RA/

Douglas V. Pickett, Senior Project Manager
Plant Licensing Branch I-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-333

Enclosure:
Staff Assessment of Flooding Walkdown Report

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ADAMS Accession Number: ML14127A023

* concurrence by e-mail

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