



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

June 17, 2014

Mr. Anthony J. Vitale  
Site Vice President  
Entergy Nuclear Operations, Inc  
Palisades Nuclear Plant  
27780 Blue Star Memorial Highway  
Covert, MI 49043-9530

SUBJECT: PALISADES NUCLEAR 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. MF0257)

Dear Mr. Vitale:

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 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, Entergy Nuclear Operations, Inc. submitted a Flooding Walkdown Report as requested in Enclosure 4 of the 50.54(f) letter for the Palisades Nuclear Plant (PNP) site. By letter dated January 30, 2014, Entergy Nuclear Operations, Inc. provided a response to the NRC request for additional information for the staff to complete its assessments.

By letter dated November 27, 2012, the licensee provided an acceptable schedule to complete the delayed walkdown items no later than June 1, 2014. The NRC staff reviewed the information provided and, as documented in the enclosed staff assessment, determined sufficient information was provided to be responsive to Enclosure 4 of the 50.54(f) letter.

A.Vitale

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If you have any questions, please contact me at (301) 415-8371 or by e-mail at Mahesh.Chawla@nrc.gov.

Sincerely,

A handwritten signature in black ink, appearing to read "Chawla".

Mahesh L Chawla, Project Manager  
Plant Licensing Branch III-1  
Division of Operating Reactor Licensing  
Office of Nuclear Reactor Regulation

Docket No. 50-255

Enclosures:  
Staff Assessment of Flooding Walkdown Report

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STAFF ASSESSMENT OF SEISMIC WALKDOWN REPORT  
NEAR-TERM TASK FORCE RECOMMENDATION 2.3 RELATED TO  
THE FUKUSHIMA DAI-ICHI NUCLEAR POWER PLANT ACCIDENT  
ENTERGY NUCLEAR OPERATIONS, INC. PALISADES NUCLEAR PLANT  
DOCKET NO. 50-255

1.0 INTRODUCTION

On March 12, 2012,<sup>1</sup> 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,"<sup>2</sup> 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 systems, structures 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.

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<sup>1</sup> Agencywide Documents Access and Management System (ADAMS) Accession No. ML12053A340

<sup>2</sup> 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<sup>3</sup>, 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, 2012<sup>4</sup>, the NRC staff endorsed the walkdown guidance.

By letter dated November 27, 2012,<sup>5</sup> Entergy Nuclear Operations Inc. (ENO, the licensee), provided a response to Enclosure 4 of the 50.54(f) letter Required Response Item 2, for the Palisades Nuclear Plant (PNP). The NRC staff issued a request for additional information (RAI) to the licensee regarding the available physical margin (APM) dated December 23, 2013<sup>6</sup>. The licensee responded by letter dated January 30, 2014<sup>7</sup>.

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 (GDC) 2: "Design Bases for Protection Against Natural Phenomena;" and Appendix A "Seismic and Geological Criteria for Nuclear Plants," to 10 CFR Part 100. Criteria 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.

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3 ADAMS Package Accession No. ML121440522

4 ADAMS Accession No. ML12144A142

5 ADAMS Accession No. ML12332A377

6 ADAMS Accession No. ML13325A891

7 ADAMS Accession No. ML14034A168

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 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 Palisades Nuclear Plant

The licensee reported that the design basis flood hazard for the site is the probable seiche flooding from Lake Michigan, with a maximum flood level of 594.1 ft mean sea level (MSL). The duration of this storm is not specified in the current licensing basis, but is stated to be "measured in minutes rather than hours." The probable maximum precipitation (PMP) of 25.5 inches within 6 hours at the site is an additional design basis flood, with a stated flooding level of less than 6 inches above grade (590.0 ft MSL) at all safety related structures.

Other flooding mechanisms included in the CLB and discussed in Section 2.1 of the Flooding Walkdown Report are wind wave activity and maximum water table. Both of these mechanisms are stated to produce flood elevations lower than the seiche flooding elevation.

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 is consistent with the walkdown guidance.

#### 3.2 Flood Protection and Mitigation

##### 3.2.1 Flood Protection and Mitigation Description

The licensee stated that the CLB flood protection is to an elevation of 594.4 ft. The safety related buildings are designed to withstand flooding by the PMP event to a water depth of 6 inches throughout the site and to a depth of five feet on the east side of the Service Building (non-safety related structure). There are incorporated or exterior passive features that prevent flooding and an "Acts of Nature" procedure that provides actions to be taken in the event of external flooding caused by natural phenomena. The facilities, systems, and equipment were designed to be protected against the seiche flood level of 594.1 ft and the six hour PMP. Safety-related SSCs are protected by being housed in Category 1 structures, designed to withstand the design flood or located above the maximum design basis flooding level. Site storm sewers and drainage ditches surrounding SSCs are designed to carry the majority of the PMP runoff.

### 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. These barriers include: walls and floors for the Auxiliary Building, Turbine Building, and the Screen House; and the concrete cement top of the Fuel Oil Tank T-10A, and tank penetration caps.

### 3.2.3 Temporary Barriers and Other Manual Actions

The licensee stated that the site has no temporary barriers nor manual actions that require operator action. The watertight doors in the Turbine Building and Auxiliary Building are considered incorporated active barriers, however are normally closed therefore do not require manual actions.

### 3.2.4 Reasonable Simulation and Results

The licensee did not perform reasonable simulation, because procedures are not credited in the CLB and temporary flood barriers are not necessary.

### 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 the walkdown guidance.

### 3.3 Warning Systems

The licensee reported that the current licensing basis at PNP does not credit any flood warning systems for external flood protection.

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 determined that there were no deficiencies and that the flood protection features at PNP are designed to withstand design basis external flooding events.

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, 2012,<sup>8</sup> 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

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8 ADAMS Accession No. ML12163A533

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. The licensee did not identify any exceptions from NEI 12-07.

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.

### 3.6 Walkdown Results

#### 3.6.1 Walkdown Scope

The licensee performed walkdowns of 36 flood protection features including walls, floors, penetration seals, internal conduits, manhole covers, watertight doors, storm drains, and roof drains.

The licensee did not discuss if different modes of operation or concurrent environmental conditions were considered for the flooding walkdowns, however the CLB does not require consideration of different modes nor concurrent environmental conditions, therefore the intent of the walkdown guidance has been met.

The licensee did use acceptance criteria in accordance with NEI 12-07. The licensee also used ENO procedures associated with condition monitoring of maintenance rule structures per 10 CFR 50.65. In addition, the maintenance procedures for the inspection of penetration seals were used as a reference in determining the acceptance criteria.

#### 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 plant’s flood protection features. The main flood protection features were assessed to be capable of withstanding the design basis external flooding event. Barriers were, for the most part determined to be functional, with a junction boxes and electrical penetrations requiring flood seals to be installed.

In addition one inch holes were discovered in manhole covers throughout the site, for use as crowbar insertion points. The licensee determined that the holes would allow only a small amount of water ingress through the manhole covers. The inundation of the specific manholes does not result in flooding of safety related structures, systems, and components due to the low volume of water that enters through holes.

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 deficiencies because of the flood walkdowns.

NEI 12-07 specifies that licensees identify observations in the corrective action program (CAP) that were not yet dispositioned at the time the walkdown report was submitted. ENO did not identify observations awaiting disposition.

Potential deficiencies were described in Section 7.3 of the Walkdown Report. This section describes actions that are required for the plant to fully comply with plant design requirements, and the CAP process is being used to track these issues. There are 10 actions listed in this section.

### 3.6.3 Flood Protection and Mitigation Enhancements

The licensee determined that no enhancements were necessary.

### 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

Licensee noted the following deficiencies and actions have been taken or planned to address the deficiencies:

- One inch holes used to lift covers at all manholes. The licensee determined that the holes do not allow enough flooding to compromise safety.
- Several electrical junction boxes not protected against flooding or material degradation that reduced flood protection.
- Service Water Pump pressure switches not protected against flooding.
- Card reader conduits not sealed against flooding.
- Penetrations for instrument air lines not sealed.

The licensee entered all deficiencies into the corrective action program, and all were addressed prior to the completion of the walkdown. Operability was determined, and all features can perform their flood protection function.

### 3.6.6 Staff analysis of walkdowns

NRC staff reviewed the licensee walkdown report dated November 27, 2012. The staff also reviewed the additional information in conjunction with the submitted walkdown report.

As part of the walkdown effort, the licensee evaluated the capability of flood protection features by conducting a set of visual inspections. The features were confirmed to be in place and available and also to be capable of performing their intended flood protection or mitigation functions. No changes or enhancements to flood protection or mitigation features were identified as a result of the walkdowns.

During the walkdowns, the items listed in Subsection 3.6.5 above were identified as not immediately acceptable; however, corrective actions were identified and are being taken. The actions taken included operability determinations that demonstrated that features could still perform their intended function.

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

NRC staff issued a request for additional information RAI to the licensee regarding the APM dated December 23, 2013<sup>9</sup>. The licensee responded by letter dated January 30, 2014<sup>10</sup>. 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 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

### 3.7.1 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." In accordance with the TI, NRC inspectors independently verified that the Palisades 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 11, 2013, documents the results of this inspection. No findings of significance were identified.

## 4.0 SSCs NOT WALKED DOWN

The licensee identified restricted access features.

The licensee provided justification for the delay in walkdowns of restricted access features. Two restricted access features require boroscoping, and the third is in an energized junction box that can only be accessed during an outage.

### 4.1 Restricted Access

The licensee described two buried diesel floor drain check valves that were not inspected due to being classified as restricted access features. The licensee provided reasonable assurance that the valves will perform their flood protection functions, as they are a part of a periodic Preventative Maintenance activity. In addition, a conduit watertight seal was also classified as restricted access. The licensee provided reasonable assurance that the seal will perform the

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9 ADAMS Accession No. ML13325A891

10 ADAMS Accession No. ML14034A168

designed flood protection function. The licensee committed to inspecting all of these features by June 1, 2014.

#### 4.2 Inaccessible Features

The licensee did not identify any inaccessible features.

#### 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 staff notes that no immediate safety concerns were identified. By letter dated November 27, 2012, the licensee provided an acceptable schedule to will complete the delayed walkdown items no later than June 1, 2014. The NRC staff reviewed the information provided and determined that sufficient information was provided to be responsive to Enclosure 4 of the 50.54(f) letter.

A. Vitale

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If you have any questions, please contact me at (301) 415-8371 or by e-mail at Mahesh.Chawla@nrc.gov.

Sincerely,

*/RA/*

Mahesh L Chawla, Project Manager  
Plant Licensing Branch III-1  
Division of Operating Reactor Licensing  
Office of Nuclear Reactor Regulation

Docket No. 50-255

Enclosures:  
Staff Assessment of Flooding Walkdown Report

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