



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

March 20, 2014

Vice President, Operations
Entergy Nuclear Operations, Inc.
Vermont Yankee Nuclear Power Station
P.O. Box 250
Governor Hunt Road
Vernon, VT 05354

SUBJECT: VERMONT YANKEE NUCLEAR POWER STATION - STAFF ASSESSMENT OF
RESPONSE TO 10 CFR 50.54(f) INFORMATION REQUEST – FLOODING
WALKDOWNS (TAC NO. MF0293)

Dear Sir or Madam:

By letter dated March 12, 2012, the Nuclear Regulatory Commission (NRC) issued a request for information pursuant to Title 10 of the *Code of Federal Regulations*, Section 50.54(f) (hence referred to as the 50.54(f) letter). The request was issued as a part of implementing lessons-learned from the accident at the Fukushima Dai-ichi nuclear power plant. The request addressed the methods and procedures for plants 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 21, 2012, Entergy Nuclear Operations, Inc. submitted a Flooding Walkdown Report as requested per Enclosure 4, "Recommendation 2.3: Flooding," of the 50.54(f) letter for the Vermont Yankee Nuclear Power Station.

The NRC staff has reviewed the information provided and, as documented in the enclosed staff analysis, determined that you have provided sufficient information to be responsive to the 50.54(f) letter. This closes out the NRC's efforts associated with TAC No. MF0293. If you have any questions, please contact me at (301) 415-1364.

Sincerely,

A handwritten signature in black ink that reads "Douglas V. Pickett".

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

Docket No. 50-271

Enclosure:
Staff Analysis of Flooding Walkdown

cc w/encl: Distribution via Listserv



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STAFF ANALYSIS BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO FLOODING WALKDOWN REPORT

VERMONT YANKEE NUCLEAR POWER STATION

DOCKET NOS. 50-271

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*, Subpart 50.54(f) (50.54(f) letter) to all power reactor licensees and holders of construction permits in active or deferred status. The request was part of the implementation of lessons learned from the accident at the Fukushima Dai-ichi nuclear power plant. Enclosure 4, "Recommendation 2.3: Flooding," 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 requests licensees to include the following:

- a. Perform flood protection walkdowns using an NRC-endorsed walkdown methodology,
- b. Identify and address plant-specific degraded, nonconforming, or unanalyzed conditions, as well as, cliff-edge effects through the corrective action program, and consider these findings in the Recommendation 2.1 hazard evaluations, as appropriate,
- c. Identify any other actions taken or planned to further enhance the site flood protection,
- d. Verify the adequacy of programs, monitoring and maintenance for protection features, and,
- e. Report to the NRC the results of the walkdowns and corrective actions taken or planned.

In accordance with the 50.54(f) letter, Enclosure 4 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML12056A050), 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, the Nuclear Energy Institute (NEI) staff submitted NEI 12-07, Revision 0-A, "Guidelines for Performing Verification Walkdowns of Plant Flood Protection Features" to the NRC staff to consider for endorsement². 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 of the 50.54(f) letter. By letter dated

¹ ADAMS Accession No. ML12053A340.

² ADAMS Accession No. ML12173A215.

May 31, 2012³, the NRC staff found that the performance and reporting of flooding protection walkdowns in accordance with the guidance would be responsive to the 50.54(f) letter.

By letter dated November 21, 2012,⁴ Entergy Nuclear Operations, Inc. provided for a response for Vermont Yankee Nuclear Power Station (VYNPS). This response was supplemented by letter dated February 25, 2014.⁵

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 structures, systems, and components (SSCs) important to safety in operating nuclear power plants are designed either in accordance with, or meet the intent of Appendix A to 10 CFR Part 50, General Design Criteria (GDC) 2: "Design Bases for Protection Against Natural Phenomena;" and Appendix A to 10 CFR Part 100, "Reactor Site Criteria." GDC 2 states that SSCs important to safety at nuclear power plants shall be designed to withstand the effects of natural phenomena such as earthquakes, tornadoes, hurricanes, floods, tsunamis, and seiches without loss of capability to perform their safety functions.

For initial licensing, each licensee was required to develop and maintain design bases that, as defined by 10 CFR 50.2, identify the specific functions that an SSC of a facility must perform, and the specific values or ranges of values chosen for controlling parameters as reference bounds for the design.

The design bases for the SSCs reflect appropriate consideration of the most severe natural phenomena that have been historically reported for the site and surrounding area. The design bases also reflect sufficient margin to account for the limited accuracy, quantity, and period of time in which the historical data have been accumulated.

The current licensing basis is the set of NRC requirements applicable to a specific plant, including the licensee's docketed commitments for ensuring compliance with, and operation within, applicable NRC requirements and the plant-specific design basis, including all modifications and additions to such commitments over the life of the facility operating license.

3.0 TECHNICAL EVALUATION

3.1 Design Basis Flooding Hazard for the Vermont Yankee Nuclear Power Station

The safety-related facilities, systems, and equipment at VYNPS are capable of withstanding the worst flooding caused by a controlling flooding mechanism. The controlling source of flooding at the site during the licensing process was identified as a Probable Maximum Precipitation induced Probable Maximum Flood of 252.5 feet Mean Sea Level (MSL) stillwater and 254.0 feet MSL including wave effects on the Connecticut River and on shore near the plant per the 1971

3 ADAMS Accession No. ML12144A142.

4 ADAMS Accession No. ML12333A013.

5 ADAMS Accession No. ML14063A311.

Atomic Energy Commission Safety Evaluation. Upstream dam failures of the Moore, Townsend and Ball Mountain Dams were also considered and shown not to produce the controlling flood, however they were shown to impact the Intake Structure due to river elevation exceeding 237.0 feet MSL.

3.2 Flood Protection and Mitigation

3.2.1 Flood Protection and Mitigation Description

Flood protection and relevant flood mitigation features at the VYNPS site are described in the Updated Final Safety Analysis Report, Section 3.4.1.1. The critical safety related structures are the Reactor Building, Turbine Building, and Control Buildings, which are all built at elevation 252.5 feet MSL. Sandbags and plywood barricades are placed at entrances to protect against wave run up to 254.0 feet MSL. Penetration seals (within manholes and at building interfaces) minimize water intrusion through potential water avenues. Water levels in interior manholes at the Switchgear Room are monitored and portable sump pumps are employed to prevent flooding from impacting equipment in the room.

3.2.2 Incorporated and Exterior Barriers

The primary barrier to flooding is the elevation of the buildings. Additionally, penetration seals and entrance curbs provide barrier protection.

3.2.3 Temporary Barriers and Other Manual Actions

Temporary sump pumps and floor drain plugs are installed in the Switchgear Room. At the Reactor Building, Turbine Building, and Control Building, sandbags and plywood barricades are placed.

3.2.4 Reasonable Simulation and Results

Reasonable simulations of the sump pump operation, deployment of the floor drain plugs, sandbag and plywood barrier were performed. All reasonable simulations met the intent of the walkdown guidance.

3.3 Warning Systems

No interior water level warning systems are installed. Plant personnel perform 12 hour walkdowns of the Switchgear Room and Fuel Oil Pump Building to monitor water inleakage and take appropriate action.

3.4 Effectiveness of Flood Protection Features

All flood protection features were deemed effective. Three penetration seals required replacement or repair.

3.5 Walkdown Methodology

By letter dated June 11, 2012,⁶ 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 21, 2012, indicated that the licensee implemented the walkdowns in accordance with the guidance provided in NEI 12-07. The licensee did not identify any exceptions from NEI 12-07.

3.6 Walkdown Results

3.6.1 Walkdown Scope

The licensee prepared Walkdown Report Forms for 220 flood protection items, including those associated with the actions to be taken as part of the plant procedures as well as passive features.

The licensee used acceptance criteria in accordance with NEI 12-07, and in addition, the licensee used Entergy Nuclear Procedure EN-DC-170 that was developed to provide instructions for implementing 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 plant's flood protection features and concluded that the temporary barriers and passive barriers, such as penetrations/seals, were judged to be functional for their intended flood-protection features.

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 three deficiencies during the flood walkdowns which were entered into the CAP.

NEI 12-07 requires licensees to identify observations in the CAP that were not yet dispositioned at the time the walkdown report was submitted. The licensee did not identify any observations awaiting disposition.

3.6.3 Flood Protection and Mitigation Enhancements

Subsequent to the walkdown, the licensee has implemented one enhancement that improves or increases flood protection or mitigation. The "Flood Emergency Procedure" has recently been revised to change the 72-hour advanced warning time for prediction of elevated floodwaters at the site to a 96-hour lead time. The "Flood Emergency Procedure" would therefore require completion within 96 hours (instead of 72 hours previously).

⁶ ADAMS Accession No. ML12171A278.

3.6.4 Planned or Newly Installed Features

Other than the revision to the time needed to implement and complete the "Flood Emergency Procedure" as described in Section 3.6.3, the licensee did not determine that changes were necessitated by the flood walkdowns.

3.6.5 Deficiencies Noted and Actions Taken or Planned to Address

The licensee noted three deficiencies during the walkdowns and entered them into the CAP. Actions are being taken to address these deficiencies, and will be addressed at a future date. The licensee stated with reasonable assurance that the deficiencies would not prevent the associated flood protection features from performing their credited functions.

3.6.6 Walkdowns Not Performed for Flood Protection Features

3.6.6.1 Restricted Access

No flood protection features were deemed restricted.

3.6.6.2 Inaccessible Features

No flood protection features were deemed inaccessible.

3.6.7 Staff Analysis of Walkdowns

The NRC staff reviewed the licensee's walkdown report dated November 21, 2012, and conducted a site audit of the walkdown report at the VYNPS site in July 2013 (see Section 3.8). Based on the review of the walkdown report and the site audit, the NRC staff concludes that the licensee performed the walkdowns in accordance with NEI 12-07.

3.6.8 Available Physical Margin

During the site audit discussed in section 3.8, the NRC staff reviewed the processes used to calculate and address the available physical margin (APM) at flood protection features. The staff concluded that the licensee did not meet the intent of the APM process. The staff and licensee discussed the issue, and the licensee indicated that the APM at flood protection features would be reevaluated to conform to the process discussed in NEI 12-07. Per the revised walkdown report, dated February 25, 2014, the licensee has reevaluated the APMs in accordance with the NEI 12-07 guidance.

3.7 Independent Verification

On June 27, 2012, the NRC issued Temporary Instruction (TI) 2515/187.⁷ The TI directed NRC inspectors to independently verify that licensees were implementing the flooding walkdowns in accordance with the NRC endorsed walkdown methodology by accompanying licensee personnel on a sample of walkdowns. Additionally, the TI directed the inspectors to

⁷ TI 2515/187 can be found at ADAMS Accession No. ML12129A108.

independently perform walkdowns of a sample of flood protection features. In Inspection Report 050002711/2012005, dated January 30, 2013⁸, the results of this inspection were documented. No findings of significance were identified.

3.8 Staff Audit

The NRC staff performed an audit of VYNPS during the week of July 18, 2013. During the audit, the staff gained an increased understanding of the process used by the licensee to perform the walkdowns, including the available physical margin determinations. The staff identified and conveyed to the licensee the specific issues to be addressed. The staff also noted that the licensee discussed several self-identified issues. The audit report dated February 19, 2014,⁹ provides the results of this audit for VYNPS.

3.9 SSCs to be Walked Down at a Later Date

The licensee identified no restricted access features. Therefore, no SSCs are required to be walked down at a later date.

4.0 CONCLUSION

The NRC staff concludes that the licensee's implementation of flooding walkdown methodology meets the intent of the walkdown guidance. The NRC staff concludes that, through the implementation of the walkdown guidance activities and, in accordance with plant processes and procedures, VYNPS 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 NRC staff notes that no immediate safety concerns were identified. The NRC staff concludes that the licensee responded appropriately to Enclosure 4 of the 50.54(f) letter, dated March 12, 2012.

⁸ ADAMS Accession No. ML13030A147

⁹ ADAMS Accession No. ML14002A442.

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Sincerely,
/ra/

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

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Staff Analysis of Flooding Walkdown

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