



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

February 19, 2014

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

SUBJECT: VERMONT YANKEE NUCLEAR POWER STATION - AUDIT REPORT  
REGARDING FLOODING WALKDOWNS TO SUPPORT IMPLEMENTATION  
OF NEAR-TERM TASK FORCE RECOMMENDATION 2.3 RELATED TO THE  
FUKUSHIMA DAI-ICHI NUCLEAR POWER PLANT ACCIDENT  
(TAC NO. MF0246)

Dear Sir or Madam:

On March 12, 2012, the U.S. Nuclear Regulatory Commission staff (NRC or the staff) 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 to 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 plants to conduct seismic and flooding hazard walkdowns which were conducted 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. (Entergy) submitted a Flooding Walkdown Report as requested per Enclosure 4 of the 50.54(f) letter for the Vermont Yankee Nuclear Power Station. On July 19, 2013, an NRC audit team completed the on-site audit to gain a better understanding of the methods and procedures used by Entergy to conduct the flooding walkdowns. The information gained during the audit will facilitate the NRC staff review of the walkdown report and allow for more concise requests for information. The NRC staff appreciates your support of the audit. The final audit report has been included as an enclosure to this letter.

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If you have any questions, please contact me at 301-415-1364 or by e-mail at [Douglas.Pickett@nrc.gov](mailto: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 initial 'D' and a checkmark-like flourish above the 'V'.

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:  
Audit Report

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REPORT OF REGULATORY AUDIT ON JULY 17 TO JULY 19, 2013

FLOODING WALKDOWNS

ENTERGY NUCLEAR OPERATIONS, INC.

VERMONT YANKEE NUCLEAR POWER STATION

DOCKET NO. 50-271

**1. Introduction**

This document provides a summary of the United States Nuclear Regulatory Commission (NRC) audit of the flooding walkdowns performed at Vermont Yankee Nuclear Power Station. The walkdowns were performed in response to NRC's request for information contained in its March 12, 2012, 50.54(f) letter, Enclosure 4.

**1.1 Background**

By letter dated March 12, 2012, the NRC issued a request for information to all power reactor licensees and holders of construction permits in active or deferred status, pursuant to Title 10 of the *Code of Federal Regulations*, Section 50.54(f)<sup>1</sup> (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, Japan, nuclear power plant. Enclosure 4 of the 50.54(f) letter requested that licensees plan and perform flooding walkdowns to identify degraded, nonconforming, or unanalyzed conditions related to the licensing bases of structures, systems, and components (SSCs) important to safety and to verify the adequacy of monitoring and maintenance procedures.

By letter dated November 21, 2012, Entergy Nuclear Operations, Inc. (Entergy) submitted a report<sup>2</sup> documenting the flooding walkdowns as requested per Enclosure 4 of the 50.54(f) letter for Vermont Yankee Nuclear Power Station.

**1.2 Regulatory Audit Basis**

The NRC staff conducted a regulatory audit to gain a better understanding of the methods and associated procedures used by Entergy to conduct the flooding walkdowns at Vermont Yankee Nuclear Power Station and to facilitate NRC staff assessment of the report documenting the site walkdowns.

The Nuclear Energy Institute (NEI) developed guidance for performing the flooding walkdowns with extensive review and input from NRC staff in numerous public meetings, webinars, and public conference calls. The NEI submitted NEI 12-07, "Guidelines for Performing Verification

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<sup>1</sup> The 50.54(f) letter is available in the Agencywide Documents Access and Management System (ADAMS) under Accession No. ML12053A340.

<sup>2</sup> The licensee's walkdown report is available in ADAMS under Accession No. ML12333A013.

Walkdowns of Plant Flood Protection Features<sup>3</sup> for endorsement. NRC staff subsequently endorsed the walkdown guidance by letter dated May 31, 2012.<sup>4</sup> By letter dated June 11, 2012, Entergy indicated that they would follow the NRC endorsed guidance for the flooding walkdowns at Vermont Yankee Nuclear Power Station.<sup>5</sup>

### 1.3 Audit Logistics

An audit plan was issued to Entergy on May 21, 2013.<sup>6</sup> The audit plan included a proposed audit schedule and a list of information that NRC requested that the licensee make available for review during the audit. The audit plan also requested the personnel (licensee staff and contractors) who performed the walkdowns be available for interviews.

The NRC staff performed an audit of Vermont Yankee Nuclear Power Station on July 17-19, 2013. The audit was performed in accordance with the Office of Nuclear Reactor Regulation Office Instruction LIC-111, "Regulatory Audits."<sup>7</sup> The NRC staff participating in the audit are listed in Table 1. An entrance meeting was held on July 17, 2013 to convey to the licensee background information and the audit purpose. An exit meeting was held on July 19, 2013, to convey to the licensee observations from the audit, including: (1) observations related to whether the walkdowns were performed in accordance with NEI 12-07 and (2) observations forwarded to the resident inspectors for additional action, if appropriate.

Table 1: NRC audit team

Auditor	Affiliation	Audit Role
Stephen Campbell	NRC/NRR/DIRS/IRIB	Audit lead
Michelle Bensi	NRC/NRO/DSEA/RHMB	Technical lead
Sarah Rich	NRC/R-I/DRP/PB5/VYRO	Resident Inspector
Peter Chaput	NRC/NRO/DSEA/RHMB	Flooding Technical Support
George Wilson	NRC/NRR/JLD	Management Support
Ken Erwin	NRC/NRO/DSEA/RHMB/RMOT	Regulatory Support

## 2. Audit Scope

The audit provides support for the ongoing NRC staff assessment of the licensee submitted walkdown report. To support the staff assessment, the audit scope included review of information and documents available onsite, and interview of licensee staff and contractors to aid NRC staff understanding of:

1. How the licensee performed the flooding hazard walkdowns, and
2. Whether the walkdowns were performed in accordance with NEI 12-07.

The audit also helped to identify additional information that will require docketing to support the staff conclusions related to the staff assessment. Observations (if any) made by the audit team

<sup>3</sup> NEI 12-07 is available in ADAMS under Accession No. ML12144A401.

<sup>4</sup> The NRC endorsement of NEI 12-07 is available in ADAMS under Accession No. ML12144A142.

<sup>5</sup> The licensee's letter is available in ADAMS under Accession No. ML12171A278.

<sup>6</sup> The audit plan is available in ADAMS under Accession No. ML13127A461.

<sup>7</sup> LIC-111 is available in ADAMS under Accession No. ML082900195.

that were not within the scope of the audit were transferred to the resident inspector for additional action, if appropriate.

### 3. Audit Activities and Remarks

The audit team reviewed documents related to Entergy's performance of the flooding walkdowns, including:

- Walkdown record forms and supplemental documentation (e.g., photographs) generated by Entergy to document observations associated with the walkdowns
- The supplemental procedure used by the licensee, in addition to NEI 12-07, for the implementation of the flooding walkdown:
  - Fleet-specific procedure EN-DC-170, "Fukushima Near Term Task Force Recommendation 2.3 Flooding Walkdown Procedure"
- Flood-specific procedures that are part of flood protection and mitigation strategies or hazardous weather response that were reviewed or used by Entergy as part of the flood walkdowns:
  - OPOP-PHEN-3127, "Natural Phenomena," Revisions 10 and 12
- Documentation of training for personnel performing the walkdowns:
  - Attachment D of ENTCORP20-RPT-001
- A sample of entries into the corrective action program resulting from the performance of the flood walkdowns, including:
  - CR-VTY-2012-04898 associated with flood protection feature 12" CST-4
  - CR-VTY-2013-04444 related to Entergy's overall performance of the walkdowns
  - CR-VTY-2012-04912 related to minor leakage observed in the fuel oil pump house
- Site drawings showing manhole locations and interactions with buildings:
  - G-191384, sheet 1, "Yard Duct Runs and Grouting"
  - G-191384, sheet 3, "Electrical Handhole Details"
  - G-191384, sheets 5 and 6, "Electrical Manhole Details"
  - G-191373, sheet 2, "Outlying Area Conduit and Grounding"
  - G-191325, "Switchgear Room Conduit and Grounding"
  - G-191675, "Cntrl Bldg Plumb and Drain"
- Documents related to periodic surveillances, preventive maintenance (PM) procedures, or tests credited as part of the walkdowns:
  - PMID 50039105, Survey #7230, WO 52328580 01, "(OC) Manhole, Handhole Conduit Flood Seals Inspection"
  - Excerpt MM 97-030, Memo ESG 97-051 (dated 05/29/1997)
  - EM-WM-105, "Planning" Revision 11
  - OP-4019, "Surveillance of Plant Fire Barriers and Fire Rated Assemblies" Revision 31

Audit review responsibilities associated with review of documentation of walkdowns for flood protection features were divided among team members based on plant building or area: reactor building, switchgear room, emergency diesel generator and day tank rooms, emergency diesel generator fuel oil pump room, and control building manholes. The walkdown team reviewed a sample of walkdown record forms applicable to each area as well as associated photographs of

flood protection features (typically seals). In addition, one audit team member (supported by other team members) focused on review of reasonable simulations performed as part of the walkdowns.

The audit team also interviewed site personnel and walkdown participants to inquire about how visual inspections were performed (e.g., criteria used to determine feature acceptability), the calculation of available physical margin (APM), and estimation of time required to perform manual actions. As necessary, the audit team observed areas of the site that are associated with plant flood response or were examined by Entergy as part of flooding walkdowns. In particular, the audit team performed a field visit to the emergency diesel generator (EDG) fuel oil tank rooms A and B. As part of the field visit, the audit team identified sealed penetrations that were not documented on the walkdown record forms. In addition the audit team performed field visits to the following locations: A and B EDG rooms, boiler room, switchgear room and manholes, external manholes, external switchgear building intake door, fuel oil storage tank (external), external roller door in the radiological controlled area (RCA), RCA B5b penetrations, independent spent fuel storage installation (ISFSI) tracked vehicle, ISFSI, and intake structure. The audit team also verified the presence of pre-staged sandbags and plywood isolation systems.

Section 4.1 of this audit summary describes observations made by the audit team, based on the information described above, regarding whether Entergy performed the walkdowns in accordance with NEI 12-07. The following provides additional details regarding the audit team's activities:

- The audit team reviewed the reasonable simulations performed for sandbagging activities. As part of the audit team's review of Entergy's walkdown of OPOP-PHEN-3127, the audit team asked about potentially imprecise or vague language in the procedure related to the locations where Entergy staff will place sandbags to protect critical plant equipment. Entergy staff indicated that a specified list of critical plant equipment is not contained in the procedure and that the intent is to barricade the most direct flow paths to equipment in the switchgear rooms and fuel oil storage tank and enclosure.
- The audit team reviewed the Entergy (fleet-wide) walkdown guidance in procedure EN-DC-170, which Entergy developed to provide instructions to plant personnel for implementation of NEI 12-07. The audit team noted that several examples and acceptance criteria in NEI 12-07 do not appear in EN-DC-170. For example, NEI 12-07, section A.1.3, includes acceptance criteria that flood seal material should have an absence of water stains below the penetration. This criterion does not appear in EN-DC-170. Entergy staff indicated that, though the criterion does not appear in EN-DC-170, if Entergy staff observed leakage, it was evaluated. Entergy staff referenced an example in which minor seal leakage was observed in the fuel oil transfer pump building and a corrective action report (CR-VTY-2012-4912) was initiated. Additional information about differences between EN-DC-170 and NEI 12-07 is described in conjunction with the observation contained in Section 4.3 of this audit summary.
- The audit team noted that the scope of the walkdowns did not include inspection of concrete walls credited for flood protection. Entergy staff indicated that they capture these features under Barrier Breach Procedure OPAP-BCP-0077 and periodically

inspect them under EN-DC-150, "Condition Monitoring of Maintenance Rule Structures," which was last completed during RFO30 (refueling outage) in April 2013.

- The audit team noted that the section of the walkdown record form related to visual inspection was left blank for a large number of penetration seals, which were not inspected as part of the walkdowns. Upon discussions with licensee personnel, the audit team learned that credited seals for cables and spare conduits are inspected under PMID 50039105 03, Survey #72030, WO 52328580, which is used to inspect manholes, handholes, and conduit flood seals. Other penetrations through walls are grouted or otherwise sealed to prevent groundwater intrusion and are inspected under ED-DC-150. Additional information associated with this observation related to incomplete documentation is contained in Section 4.1.
- Entergy staff stated that fires seals are credited as flood seals per the hydrostatic test performed as a result of event report 97-0197 and captured in memo group #97-051. The test was performed in association with VY MM 97-030 switchgear room conduit seal installation. The audit team reviewed the documentation for the tests of conduit seals and did not identify any issues with crediting the test results within the context of the walkdowns.
- The audit team noted that Entergy did not document the walkdowns of portable pumps on feature-specific walkdown forms consistent with Section 3.9, "Flood Protection Procedures," of NEI 12-07. While the audit team expected to see a form specifically for the portable pump, the audit team noted that all relevant information was contained on other forms.
- The audit team noted that APM for many features was recorded as "none" on the walkdown record forms. In addition, Entergy did not generically define a definition of "small margin" and typically did not complete question 27 of the walkdown record form contained in Appendix B of NEI 12-07. In response to inquiries from the audit team, Entergy staff indicated that the use of the term "none" means that a credited flood seal is in place to prevent water near or at the probable maximum flood from entering areas containing safety-related SSCs required for safe shutdown. Entergy generated an entry in its corrective action program (CR-VTY-2013-4444) to disposition inconsistent treatment and documentation of walkdown results. Based on an internal review, Entergy independently (i.e., separate from the observations of the audit team) identified that the treatment and documentation of APM was not consistent with fleet-procedure EN-DC-170. Entergy identified this as an administrative issue.

#### **4. Audit Summary**

As described in Section 2, the goal of the audit was to support the development of the staff assessment of Entergy's walkdown report. Observations made by the audit team during the audit were compiled and conveyed to Entergy during the exit meeting. These observations are neither findings nor violations, however they will be used to inform the NRC staff assessment of Entergy's walkdown report.

#### **4.1 Observations related to NEI 12-07**

The audit team made observations during the audit directly related to the scope of the audit (see Section 2), particularly with regard to whether Entergy performed the walkdowns in accordance with NEI 12-07. These observations are described below.

Section 3.13 of NEI 12-07 defines the term available physical margin. The section also includes an example of calculating APM (e.g., describing calculation of APM for seals considering the hydraulic head for which the seals are designed). The audit team observed that many of the site's walkdown record forms did not include numerical values for APM. Instead values such as "n/a" or "none" were included or the field was left blank.

The walkdown record form contained in Appendix B of NEI 12-07 (which Entergy used to document walkdown records) includes a section to document instances of small APM and potentially significant safety consequences. In accordance with NEI 12-07, licensees should enter instances of small margin with potentially significant safety consequences into the corrective action program for further resolution. As previously described, in many cases, Entergy did not calculate APM as part of the walkdowns. As a result, Entergy did not evaluate whether the APM is small with potentially significant safety consequences.

The walkdown record form in NEI 12-07 includes a section to document visual inspections of flood protection features. However, the visual inspection section of the walkdown record form was blank for a large number of penetration seals. As part of the audit, the audit team learned that penetration seals are part of a PM program and, as a result, Entergy chose not to visually inspect these seals as part of the walkdowns. Based on the audit team's interpretation of NEI 12-07, Entergy should have completed the blank section of the walkdown record form to document that the material condition and critical characteristics of the seals (as determined by the PM program) are acceptable in accordance with NEI 12-07 and that all needed information is available from the PM program. For example, APM information is not collected under the PM program and it was not documented because the section containing the item was left blank.

#### **4.2 Observations communicated to resident inspectors**

The audit team did not make any observations related to the plant response to flooding hazards that were outside the scope of the audit and which were forwarded to the site resident inspectors for additional action.

#### **4.3 Additional observations**

The audit team made one observation related to the licensee's performance of the flooding walkdowns that was not directly related to the scope of the audit but was not considered appropriate for transfer to the resident inspectors. This observation was conveyed to the licensee during the exit meeting for their awareness only.

Entergy walkdown guidance EN-DC-170 was written to provide instructions to plant personnel for implementation of NEI 12-07. However several NEI 12-07 definition examples do not appear in EN-DC-170. For example, Section 3.2 of EN-DC-170, definition of Available Physical Margin does not include the examples of APM provided in NEI 12-07 Section 3.13, Available Physical Margin definition. The lack of examples from NEI 12-07 in EN-DC-170 may be a contributing



factor to some of the issues identified in Section 4.1. Similarly, Appendix A, Section A.1.3 of NEI 12-07 provides multiple examples of inspection considerations for penetration seals. EN-DC-170 includes two example acceptance criteria for penetration seals, which do not completely match the example criteria in NEI 12-07. Discussion with licensee staff indicated that the review of seals was based on the criteria in EN-DC-170 rather than the considerations described in NEI 12-07.

**5. Potential requests for additional information**

NRC staff does not plan to issue any requests for additional information at this time.

**6. Conclusions**

The audit provided NRC staff and contractors with information that is relevant to the staff assessment of the licensee's walkdown report. This audit summary will be used as an input to the staff assessment.

If you have any questions, please contact me at 301-415-1364 or by e-mail at [Douglas.Pickett@nrc.gov](mailto: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. 50-271

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Audit Report

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