



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

June 10, 2014

Steve D. Capps
Vice President
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McGuire Nuclear Station
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SUBJECT: MCGUIRE NUCLEAR STATION, UNITS 1 AND 2 – 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 NOS. MF0244 AND MF0245)

Dear Mr. Capps:

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 26, 2012, Duke Energy Carolinas, LLC (Duke Energy), submitted a Flooding Walkdown Report as requested in Enclosure 4 of the 50.54(f) letter for the McGuire Nuclear Station (MNS), Units 1 and 2. By letter dated January 30, 2014, Duke Energy provided a response to the NRC request for additional information for the staff to complete its assessments.

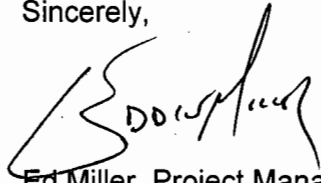
The NRC staff reviewed the information provided and, as documented in the enclosed staff assessment, determined sufficient information was provided to be responsive to Enclosure 4 of the 50.54(f) letter.

S. Capps

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If you have any questions, please contact me at (301) 415-2481 or by e-mail at Ed.Miller@nrc.gov.

Sincerely,

A handwritten signature in black ink, appearing to read "Ed Miller", written over a faint, larger signature.

Ed Miller, Project Manager
Plant Licensing Branch II-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket Nos. 50-369 and 50-370

Enclosure:

1. Staff Assessment of Flooding Walkdown Report

cc w/encl: Distribution via Listserv

STAFF ASSESSMENT OF FLOODING WALKDOWN REPORT
NEAR-TERM TASK FORCE RECOMMENDATION 2.3 RELATED TO
THE FUKUSHIMA DAI-ICHI NUCLEAR POWER PLANT ACCIDENT
DUKE ENERGY CAROLINAS, LLC MCGUIRE NUCLEAR STATION UNITS 1 AND 2
DOCKET NO. 50-369 AND 50-370

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, 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.

¹ ADAMS Accession No. ML12053A340.

² ADAMS Accession No. ML12056A050.

- 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, 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 26, 2012⁵, Duke Energy Carolinas, LLC (Duke Energy), provided a response to Enclosure 4 of the 50.54(f) letter Required Response Item 2, for the McGuire Nuclear Station (MNS), Units 1 and 2. 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 "Seismic and Geological Criteria for Nuclear Plants," to 10 CFR Part 50, General Design Criteria (GDC) 2 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 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. ML12361A006.

6 ADAMS Accession No. ML13325A891.

7 ADAMS Accession No. ML14037A213.

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 McGuire Nuclear Station (MNS), Units 1 and 2

The licensee reported that the design basis flood hazard for the MNS plant is flooding from Lake Norman. The licensee stated that the Probable Maximum Flood (PMF) is determined by calculating the probable Maximum Precipitation (PMP) over each of the reservoir drainage areas upstream of Lake Norman. The PMF level elevation is calculated as 773.9 ft. mean sea level (MSL) at Lake Norman on the embankment at Cowans Ford, based on a maximum still water level elevation of 767.9 ft. MSL and a maximum wave height of 6.0 ft. The licensee considered various design basis flood hazard levels at the site and provided the following flood events as well as the elevation results of the flood analysis.

1. Considered for all of the flood events, the earthen dike protects the plant site with a top elevation at El. 780.0 ft. MSL, and Lake Norman is regarded at a full pond elevation of 760.0 ft. MSL.
2. The flood level for a Probable Maximum Flood (PMF) at Lake Norman is at elevation 767.9 ft. MSL.
3. The flood level for a Probable Maximum Flood (PMF) at Lake Norman with waves is at 773.9 ft. MSL.
4. The flood level for an upstream dam failure is at 762.6 ft. MSL.
5. The flood level for an upstream dam failure with waves is at 767.71 ft. MSL.
6. The flood level for a Probable Maximum Hurricane (PMH) with a wind of 96 mph and with Lake Norman at full pond is at 774.75 ft. MSL for maximum waves and at 772.24 ft. MSL for significant waves.

Based on its review, the NRC staff concludes that the licensee has described the design basis flood hazard level(s) as indicated in Requested Information item 2.a of the 50.54(f) letter, consistent with Appendix D, Walkdown Report, of 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 773.9 ft. The licensee listed the flood protection and mitigation features that are credited in the licensing basis to protect safety related SSCs against external sources of flooding and against external ingress of water.

The licensee stated that the MNS plant safety related structures are protected from possible flooding from Lake Norman by an earthen dam and the dike extension of Cowans Ford Dam. At the plant site, the embankment crest rises to elevation 780 ft. MSL. Other design features include flexible water seals for piping for the fire protection system that penetrates the exterior wall of the Auxiliary Building and other electrical penetrations and trenches that are sealed to prevent the inflow of water into the buildings. These penetrations and trenches include the Refueling Water Storage Tank (RWST) Trench penetrations, Diesel Generator Room penetrations, Security Trench penetrations, and the Low Level Intake and Intake Structure

Trench. In addition, 6 inch door thresholds are used to prevent water inflow into the buildings and the precipitation falling on the site is discharged to Catawba River downstream of the Cowans Ford Dam through paved spillway ditches. Roof drains are routed to the lake via the stormwater drainage system.

3.2.2 Incorporated and Exterior Barriers

The licensee stated that the site has incorporated and exterior barriers that are permanently in-place, requiring no operator manual actions. These flood protection barriers include an earthen dam, roof drains and conduit seals.

3.2.3 Temporary Barriers and Other Manual Actions

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

3.2.4 Reasonable Simulation and Results

The licensee stated that no reasonable simulations were performed since there were no manual actions 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 Appendix D, Walkdown Report, of the walkdown guidance.

3.3 Warning Systems

The licensee stated in the walkdown report that there are no credited flood protection warning systems to detect the presence of water in the rooms that are important to safety for an external flood source.

Based the NRC staff's review, the licensee appears to have described 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 provided a review of the effectiveness of the flood protection features (mentioned in Section 3.2.1) and how they were assessed to meet this acceptance criterion. After a detailed visual inspection for degradation, no deficiencies were identified during the inspections and the licensee concluded that the analyzed flood protection features were considered to be adequate and acceptable.

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, 2012,⁸ 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."⁹ The licensee's walkdown submittal dated November 26, 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 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 all the flood protection features that are credited in the current licensing basis. The licensee stated that no observations were identified as deficiencies as determined by the corrective action program.

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 MNS plant's flood protection features. The licensee stated that "the results of the walkdowns performed for the flood protection features that are credited in the CLB did not identify any degraded, non-conforming, or unanalyzed conditions". The licensee also stated that there were no deficiencies determined by the CAP, and there were no observations that were dispositioned as deficiencies.

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."

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 MNS.

3.6.4 Planned or newly installed features

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

⁸ ADAMS Accession No. ML12164A399.

⁹ ADAMS Accession No. ML12173A215.

3.6.5 Deficiencies Noted and Actions Taken or Planned to Address

The licensee stated that there were no deficiencies determined by the CAP, and there were no observations that were dispositioned as deficiencies.

3.6.6 Staff Analysis of Walkdowns

The NRC staff reviewed the licensee walkdown report dated November 26, 2012, the NRC staff reviewed this additional information in conjunction with the submitted walkdown report. The licensee performed visual inspections of all flood protection features in the CLB. The licensee did not note any deficiencies. The licensee did not perform reasonable simulations since no manual operator actions are required as part of the CLB flood protection.

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

The NRC staff issued a request for additional information (RAI) to the licensee regarding the APM dated December 23, 2013¹⁰. The licensee responded with a letter dated January 30, 2014¹¹. The licensee has reviewed their APM determination process, and determined there were no conditions identified that would require entry into the CAP process for further evaluation. The NRC 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."¹² In accordance with the TI, NRC inspectors independently verified that the 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 January 25, 2013¹³ and April 24, 2013¹⁴, documents the results of this inspection. No findings of significance were identified.

10 ADAMS Accession No. ML13325A891.

11 ADAMS Accession No. ML14037A213.

12 ADAMS Accession No. ML12129A108.

13 ADAMS Accession No. ML13028A143.

14 ADAMS Accession NO. ML13115A200

4 SSCS NOT WALKED DOWN

The license did not identify restricted access or 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 NRC 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 NRC staff notes that no immediate safety concerns were identified. 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.

S. Capps

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If you have any questions, please contact me at (301) 415-2481 or by e-mail at Ed.Miller@nrc.gov.

Sincerely,

/RA/

Ed Miller, Project Manager
Plant Licensing Branch II-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket Nos. 50-369 and 50-370

Enclosure:

- 1. Staff Assessment of Flooding Walkdown Report

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* concurrence by e-mail

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