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

June 30, 2014

Mr. Scott L. Batson
Vice President
Oconee Nuclear Station
Duke Energy Carolinas, LLC
7800 Rochester Hwy.
Seneca, SC 29672

SUBJECT: OCONEE NUCLEAR STATION, UNITS 1, 2, AND 3 – 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. MF0253, MF0254, AND MF0255)

Dear Mr. Batson:

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, Duke Energy submitted a Flooding Walkdown Report as requested in Enclosure 4 of the 50.54(f) letter for the Oconee Nuclear Station. By letter dated January 30, 2014, Duke Energy provided a response to the NRC request for additional information for the NRC 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.

If you have any questions, please contact me at (301) 415-4032 or by e-mail at Randy.Hall@nrc.gov.

Sincerely,

James R. Hall

James R. Hall, Project Manager
Plant Licensing Branch II-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-269, 50-270, and 50-287

Enclosure:
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

OCONEE, UNITS 1, 2 AND 3

DOCKET NOS. 50-269, 50-270 AND 50-287

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 respond with the following information:

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

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1 ADAMS Accession No. ML12053A340.
2 ADAMS Accession No. ML12056A050.

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,[3] 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,[4] the NRC staff endorsed the walkdown guidance.

By letter dated November 27, 2012,[5] Duke Energy (Duke, the licensee), provided a response to Enclosure 4 of the 50.54(f) letter Required Response Item 2, for the Oconee Nuclear Station, Units 1, 2 and 3 (ONS). The NRC staff issued a request for additional information (RAI) to the licensee regarding the available physical margin (APM) dated December 23, 2013.[6] The licensee responded by letter dated January 30, 2014.[7]

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

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3 ADAMS Package Accession No. ML121440522.
4 ADAMS Accession No. ML12144A142.
5 ADAMS Accession No. ML123380111.
6 ADAMS Accession No. ML13325A891.
7 ADAMS Accession No. ML14034A105.

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.

3 TECHNICAL EVALUATION

3.1 Design Basis Flooding Hazard for Oconee Nuclear Station

The licensee reported that the design basis flood hazard for the ONS site is based on two hazards. The first is a probable maximum precipitation (PMP) flood event of 26.6 inches of rain falling within a 48-hour period resulting in a flood elevation of 796.0 feet relative to mean sea level (MSL). The second flood hazard is a sunny day failure of Jocassee Dam resulting in a flood elevation of 815.0 ft MSL in the Oconee Yard. This flooding event would last approximately 8 hours before flood waters begin to receed. The NRC staff noted that this second flood hazard originates from the June 22, 2010, Confirmatory Action Letter[8] to address external flooding concerns.

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 reported that the current licensing basis provides flood protection to an elevation of 796.5 ft MSL. The flood protection features for the PMP include a 6 inch water "sill" around the Auxillary, Turbine, and Services Buildings intended to protect against flood waters. The yard drainage system is intended to capture and remove any flood waters. Subsurface walls and seals in safety-related buildings are meant to limit water leakage through any equipment related pass-throughs. Trench covers and seals from the Radwaste Facility to the Turbine and Auxiliary Building in addition to other various trench and manhole covers provide flood protection. Sandbag barriers and Gryffolyn are also used at the 6 inch sills as compensatory measures developed during an earlier 2012 flood protection walkdown.

For the Jocassee Dam failure, the flood is expected to affect the ONS site yard to a flood level of 4.71 ft. The licensee built walls approximately 5 ft in height to protect the Standby Shutdown facility (SSF), but the walls are not part of the design basis.

3.2.2 Incorporated and Exterior Barriers

The licensee stated that the site has incorporated exterior barriers that are permanently in-place, requiring no operator manual actions. These barriers include the six-inch water sill,

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8 ADAMS Accession No. ML12363A086.

subsurface walls and building seals, and the yard drainage system. A corrective action was entered into the problem identification program (PIP), the ONS equivalent of the Corrective Action Program (CAP), to address the yard drainage system with respect to passive design. It is assumed that the trench and manhole covers are permanent items, though if not in place, may require operator action for proper placement.

3.2.3 Temporary Barriers and Other Manual Actions

The licensee reported that the site has temporary barriers and other manual actions that require operator action. Note that the previous walkdown in early 2012 was credited for certain manual actions including the sandbags.

3.2.4 Reasonable Simulation and Results

The licensee performed simulations for the Engineering Procedure (EM 5.3) and the Abnormal Procedure AP/0/A/1700/047. These procedures have been previously simulated during Emergency Drills, including simulation of operator manual actions, therefore tasks such as turning on equipment and making connections were not performed during the simulation. The licensee stated that any issues discovered during the simulation and reported in the PIP did not discount its effectiveness.

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 there are no warning systems for detection of water inside the buildings credited for external flooding at ONS. However, at the Jocassee Dam there are forebay and tailrace alarms as well as video monitoring of the dam.

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 walkdown report states that the effectiveness of the features is adequate to protect against the CLB rainfall events. The licensee identified potential deficiencies during the walkdown which were entered into the PIP. None of the potential deficiencies would prevent the flood protection systems from performing their functions; most were minor issues such as procedure manuals being wet, obstructions to fire hose layout paths, cosmetic degradation at construction joints. The walkdown identified a potential deficiency in the inoperative voltmeters for the Keowee spillway gate.

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,[9] the licensee responded to the 50.54(f) letter that it intended to utilize the NRC endorsed walkdown guidelines contained in NEI 12-07, "Guidelines for Performing Verification Walkdowns of Plant Flood Protection Features."[10] The licensee's walkdown report dated November 27, 2012, indicates 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 to 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 35 flood protection features including documents, plans, and procedures as well as physical features. The physical features at the plant include sills around buildings, trench and manhole covers, building walls and seals and yard drainage system. The physical features at the dam facilities include the dikes, dams, intake, spillway, forebay and tailrace alarms, video monitoring, backup spillway equipment, and drill documentation. Reasonable simulations were performed for procedures with limited physical actions. The licensee also conducted a Jocassee Dam failure Table Top exercise after which it revised the plan to make the ONS Operations Shift Manager the first contact in the event of a dam failure. The licensee incorporated results from recent inspections and exercises related to flooding which minimized redundant walkdowns.

The licensee used acceptance criteria consistent with the intent of NEI 12-07. The licensee also performed a self-assessment to ensure the Interim Compensatory Measures are maintained.

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 determined that the flood protection is adequate, with the exception of possible flooding of a 6 inch sill surrounding the Auxillary, Services, and Turbine buildings. The revised analysis of the PMP suggests that this sill may be exceeded by the PMP flood waters.

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 a deficiency because of the flood walkdowns. The deficiency noted is the out-of-service voltmeters for the Keowee spillway gates intended to monitor the voltage use of the gate motors. This deficiency was entered into the PIP but does not affect the actual opening of the spillway gates. In addition, site personnel could still measure the voltage manually.

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9 ADAMS Accession No. ML12164A399.
10 ADAMS Accession No. ML12173A215.

NEI 12-07 specifies that licensees identify observations in the CAP that were not yet dispositioned at the time the walkdown report was submitted. The licensee did not identify observations awaiting disposition. The licensee stated that all observations reported in the CAP, which at ONS is referred to as the PIP, were dispositioned at the time of the report

3.6.3 Flood Protection and Mitigation Enhancements

The licensee has implemented or planned the following enhancements that improve or increase flood protection. The licensee developed two recommendations as corrective actions in the PIP for further assessment.

The licensee will determine if the Jocassee Emergency Communication Equipment should include a mobile satellite phone to address widespread loss of power concerns and secure equipment, if warrented. The licensee also planned to inform its Jocassee Dam contact of any new Jocassee monitoring equipment issues that may arise, and the dam contact should generate a tracking PIP to inform ONS management of the status and resolution.

The licensee described plans to evaluate the use of non-ethanol fuel or the addition of a fuel stabilized to the electric generator powering the back-up spillway equipment. The licensee also planned to evaluate the frequency of draining and replacing the fuel in the electric generator.

3.6.4 Planned or newly installed features

The licensee determined that changes were not necessary by the flood walkdowns.

3.6.5 Deficiencies Noted and Actions Taken or Planned to Address

The licensee noted a deficiency as described in Section 3.6.2 above. The walkdown report states that the voltmeter was scheduled to be repaired by the end of 2012. The licensee stated that the PIP entries identified in Section 3.6.3 were dispositioned at the time the walkdown report was submitted.

3.6.6 Staff Analysis of Walkdowns

The NRC staff reviewed the licensee walkdown report dated November 27, 2012. The walkdown indicated that the flood protection features are adequate. The walkdown identified issues related to the design control process and one related to the preventative maintenance (PM) program for subsurface protective features such as the yard drainage system and below ground penetrations. Both of these issues were added to the PIP.

The deficiency regarding the voltmeters was reported to have been fixed by the end of 2012 and does not affect the operability of the spillway gates. The walkdown also resulted in recommended enhancements as stated in Section 3.6.3 which were added to the PIP.

The licensee utilized some recently-completed FERC inspections as a substitute for some of the walkdowns.

The licensee's review of the PM program identified weakness in the suction pipes at the Hale pumps and also the need for improvements in the program for yard drainage systems and penetrations located below grade.

The licensee performed reasonable simulations for the Abnormal and Engineering Procedures and credited previous simulations for some aspects of the procedures. The systems were found to be functional and the personnel actions feasible. The licensee stated that the simulations are consistent with walkdown guidance.

The walkdown report states that the APMs were collected and recorded in the walkdown forms.

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 an RAI to the licensee regarding the APM dated December 23, 2013[11]. The licensee responded with a letter dated January 30, 2014[12]. The licensee reviewed their APM determination process, and entered any unknown APMs into their PIP. 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." 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 reports dated January 25, 2013,[13] and April 24, 2013[14], document the results of this inspection. No findings of significance were identified.

4 SSCS NOT WALKED DOWN

The licensee did not identify any restricted access or inaccessible features.

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11 ADAMS Accession No. ML13325A891.
12 ADAMS Accession No. ML14034A105.
13 ADAMS Accession No. ML13028A133
14 ADAMS Accession No. ML13115A063

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.

If you have any questions, please contact me at (301) 415-4032 or by e-mail at Randy.Hall@nrc.gov.

Sincerely,

/RA/

James R. Hall, Project Manager
Plant Licensing Branch II-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-269, 50-270, and 50-287

Enclosure:
Staff Assessment of Flooding Walkdown Report

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