



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

May 16., 2014

Kelvin Henderson
Site Vice President
Catawba Nuclear Station
Duke Energy Carolinas, LLC
4800 Concord Rd.
York, SC 29745

SUBJECT: CATAWBA NUCLEAR STATION (CNS), UNIT 2 - STAFF ASSESSMENT OF THE SEISMIC WALKDOWN REPORT SUPPORTING IMPLEMENTATION OF NEAR-TERM TASK FORCE RECOMMENDATION 2.3 RELATED TO THE FUKUSHIMA DAI-ICHI NUCLEAR POWER PLANT ACCIDENT (TAC NO. MF0107)

Dear Mr. Henderson:

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*, Subpart 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 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, as supplemented by letter dated January 14, 2014, Duke Energy Carolina, LLC (Duke Energy) submitted its Seismic Walkdown Report as requested in Enclosure 3 of the 50.54(f) letter for Catawba Nuclear Station, Unit 2 (CNS-2). By letters dated December 2, 2013, and May 5, 2014, Duke Energy provided a response to NRC requests for additional information for the staff to complete its assessments.

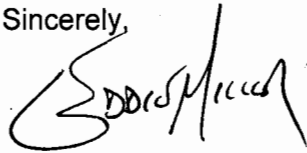
The NRC staff reviewed the information provided and, as documented in the enclosed staff assessment, determined that sufficient information was provided to be responsive to Enclosure 3 of the 50.54(f) letter.

K. Henderson

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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 "G. Edward Miller". The signature is stylized with a large initial "G" and a long, sweeping underline.

G. Edward Miller, Project Manager
Plant Licensing Branch 2-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-414

Enclosure:
Staff Assessment of Seismic Walkdown Report

cc w/encl: Distribution via Listserv

STAFF ASSESSMENT OF SEISMIC WALKDOWN REPORT
NEAR-TERM TASK FORCE RECOMMENDATION 2.3 RELATED TO
THE FUKUSHIMA DAI-ICHI NUCLEAR POWER PLANT ACCIDENT
DUKE ENERGY CAROLINA, LLC
CATAWBA NUCLEAR STATION, UNIT 2
DOCKET NO. 50-414

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 3, "Recommendation 2.3: Seismic,"² to the 50.54(f) letter requested licensees to conduct seismic 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.

Enclosure 3 of the 50.54(f) letter requested licensees to provide the following:

- a. Information concerning the plant-specific hazard licensing bases and a description of the protection and mitigation features considered in the licensing basis evaluation.
- b. Information related to the implementation of the walkdown process.
- c. A list of plant-specific vulnerabilities identified by the Individual Plant Examination of External Events (IPEEE) program and a description of the actions taken to eliminate or reduce them.
- d. Results of the walkdown including key findings and identified degraded, nonconforming, or unanalyzed conditions.
- e. Any planned or newly installed protection and mitigation features.
- f. Results and any subsequent actions taken in response to the peer review.

¹ ADAMS Accession No. ML12053A340

² ADAMS Accession No. ML12056A049

In accordance with the 50.54(f) letter, Enclosure 3, Required Response Item 2, licensees were required to submit a response within 180 days of the NRC's endorsement of the seismic walkdown process. By letter dated May 29, 2012,³ the Nuclear Energy Institute (NEI) staff submitted Electric Power Research Institute (EPRI) document 1025286, "Seismic Walkdown Guidance for Resolution of Fukushima Near-Term Task Force Recommendation 2.3: Seismic," (walkdown guidance) 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 Carolina, LLC (the licensee) provided a response to Enclosure 3 of the 50.54(f) letter Required Response Item 2, for Catawba Nuclear Station Unit 2 (CNS-2). In addition to the aforementioned letter, the licensee, by letter dated January 14, 2014⁶, provided a supplement to the CNS-2 seismic walkdown report. The supplemental report provides the results for the supplemental seismic walkdowns of components which were inaccessible during the initial walkdowns. The NRC staff reviewed the initial walkdown report and determined that additional supplemental information would assist the NRC staff in completing its review. On November 1, 2013⁷ and April 14, 2014⁸, the NRC staff requested additional information to gain a better understanding of the processes and procedures used by the licensee in conducting the walkdowns and walk-bys. The licensee responded to the NRC staff request by letters dated December 2, 2013⁹ and May 5, 2014¹⁰.

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 3 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, 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 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.

³ ADAMS Package Accession No. ML121640872

⁴ ADAMS Accession No. ML12145A529

⁵ ADAMS Accession Package No. ML13177A318

⁶ ADAMS Accession No. ML14041A294

⁷ ADAMS Accession No. ML13304B418

⁸ ADAMS Accession No. ML14106A669

⁹ ADAMS Accession No. ML13338A280

¹⁰ ADAMS Accession No. ML14127A441

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 Seismic Licensing Basis Information

The licensee provided information on the plant-specific licensing basis for the Seismic Category I SSCs for CNS-2 in Section 1.0 of the walkdown report. Consistent with the walkdown guidance, the NRC staff noted that the report includes a summary of the Safe Shutdown Earthquake (SSE) and a list of the codes, standards, and methods that were used in the design of the Seismic Category I SSCs for meeting the plant-specific seismic licensing basis requirements. The licensee referred to its updated final safety analysis report for a complete description of its SSC seismic design. The NRC staff reviewed Section 1.0 of the walkdown report, focusing on the summary of the SSE and the design codes used in the design.

Based on its review, the NRC staff concludes that the licensee has provided information on the plant-specific seismic licensing basis and a description of the protection and mitigation features considered in the licensing bases evaluation consistent with Section 8, Submittal Report, of the walkdown guidance.

3.2 Seismic Walkdown Methodology Implementation

Section 2, Personnel Qualifications; Section 3, Selection of SSCs; Section 4, Seismic Walkdowns and Area Walk-Bys; and Section 5, Seismic Licensing Basis Evaluations, of the walkdown guidance provide information to licensees regarding the implementation of an appropriate seismic walkdown methodology. By letter dated July 9, 2012,¹¹ the licensee confirmed that it would utilize the walkdown guidance in the performance of the seismic walkdowns at CNS-2.

The walkdown report dated November 27, 2012, and supplemented on January 14, 2014, did not identify deviations from the walkdown guidance.

The NRC staff reviewed the following areas of the walkdown methodology implementation provided in the walkdown report:

- Personnel Qualifications
- Development of the Seismic Walkdown Equipment Lists (SWELs)
- Implementation of the Walkdown Process

¹¹ ADAMS Accession No. ML12194A028

- Licensing Basis Evaluations and Results

3.2.1 Personnel Qualifications

Section 2, Personnel Qualifications, of the walkdown guidance provides licensees with qualification information for personnel involved in the conduct of the seismic walkdowns and area walk-bys.

The NRC staff reviewed the information provided in Section 2, Table 2-1 and Attachment 6A of the walkdown report, which includes information on the walkdown personnel and their qualifications. Specifically, the NRC staff reviewed the summary of the background, experience, and level of involvement for the following personnel involved in the seismic walkdown activities: equipment selection personnel, seismic walkdown engineers (SWEs), licensing basis reviewers, IPEEE reviewers, peer review team, and operations staff.

Based on the review of the licensee's submittals, the NRC staff concludes that those involved in the seismic walkdown activities have the appropriate seismic background, knowledge and experience, as specified in Section 2 of the walkdown guidance.

3.2.2 Development of the SWELs

Section 3, Selection of SSCs, of the walkdown guidance provides information to licensees for selecting the SSCs that should be placed on the SWELs, so that they can be walked down by qualified personnel.

The NRC staff reviewed the overall process used by the licensee to develop the CNS-2 base list, SWEL 1 (sample list of designated safety functions equipment), and SWEL 2 (sample list of spent fuel pool related equipment).

The overall equipment selection process followed the screening process shown in Figures 1-1 and 1-2 of the walkdown guidance. Based on Attachments 2B and 4B of the walkdown report, CNS-2 SWEL 1 and 2 meet the inclusion requirements of the walkdown guidance. Specifically, the following attributes were considered in the sample selection:

- A variety of systems, equipment and environments
- IPEEE equipment
- Major new or replacement equipment
- Risk considerations

Due to individual plant configurations and the walkdown guidance screening process followed to select the final SWEL equipment, it is possible that some classes of equipment will not be represented on the SWEL. The walkdown guidance recognizes this is due to the equipment not being present in the plant (e.g., some plants generate DC power using inverters and therefore do not have motor generators) or the equipment being screened out during the screening process (the screening process is described in Section 3 of the walkdown guidance). Based on the information provided, the NRC staff noted that a detailed explanation was provided justifying

cases where specific classes of equipment were not included as part of the SWEL, and concludes that these exclusions are acceptable.

The licensee discussed the approach to identifying all items that can lead to rapid drain-down in Section 3.0 of the walkdown report. The NRC staff reviewed Section 3.0, as well as the Base List 2, the Rapid Drain-Down list and the final SWEL 2. The NRC staff noted that several items, previously identified as rapid drain-down items, were not included as part of the final SWEL 2. Based on the discussion provided in Section 3.0 of the walkdown report, the NRC staff was unable to identify the reasons for exclusion of certain rapid drain-down items from the SWEL 2. Therefore, the NRC staff issued a request for additional information (RAI) dated April 14, 2014, for clarification on the licensee's identification and screening process to develop the SWEL 2 as it pertains to rapid drain down items. In its response, dated May 5, 2014, the licensee stated that the CNS-2 spent fuel pool (SFP) cooling system piping is arranged so any pipeline failure cannot drain the SFP to less than 10 feet above the top of the stored spent fuel assemblies. The licensee's response concludes that no items originally identified as rapid drain-down items and excluded from the final SWEL 2 were necessary to be included in the SWEL 2 for the CNS-2 SFP following the walkdown guidance. Additionally, the licensee provided an explanation that several items originally identified as rapid drain-down items were included in the walkdown even though they were outside of the scope of the walkdown guidance. After reviewing this information, the NRC staff concludes that the licensee provided adequate justification for the identification and assessment of rapid drain-down items for the CNS-2 SWEL 2.

After reviewing SWELs 1 and 2, the NRC staff concludes that the sample of SSCs represents a diversity of component types and assures inclusion of components from critical systems and functions, thereby meeting the intent of the walkdown guidance. In addition, the NRC staff notes that the equipment selection personnel were appropriately supported by plant operations staff as described in the walkdown guidance.

3.2.3 Implementation of the Walkdown Process

Section 4, Seismic Walkdowns and Area Walk-Bys, of the walkdown guidance provides information to licensees regarding the conduct of the seismic walkdowns and area walk-bys for each site.

The NRC staff reviewed Section 4 of the walkdown report, which summarizes the results of the seismic walkdowns and area walk-bys, including an overview of the number of items walked down and the number of areas walked-by. Attachment 5 of the initial walkdown report states that seismic review teams of at least two Seismic Walkdown Engineers (SWEs) conducted the seismic walkdowns and area walk-bys together during the weeks of September 17, 2012, through October 4, 2012. In addition, a subsequent set of walkdowns were performed from September 19, 2013, through October 24, 2013, to complete inspections on a number of components that were inaccessible during the initial walkdowns. In the letter dated January 14, 2014, the licensee submitted a supplemental walkdown report describing the results of these subsequent seismic walkdowns. The walkdown report also states that the SWEs discussed their observations and judgments with each other during the walkdowns. Additionally, the SWEs agreed on the results of their seismic walkdowns and area walk-bys before reporting the results of their review. Attachments 5B and 7B of the supplemental walkdown report provide the completed SWCs and AWCs, documenting the results for each item of equipment on SWELs 1 and 2 and

each area containing SWEL equipment. The licensee used the checklists provided in Appendix C of the walkdown guidance report without modification.

The licensee documented cases of potentially adverse seismic conditions (PASCs) in the checklists for further evaluation. Table 4-1 of the initial and supplemental walkdown report lists the PASCs identified during the seismic walkdowns and the area walk-bys. The table describes the identified PASCs, how the condition was addressed (e.g., placement in the CAP), their resolution and its current status.

Based on the initial review of the checklists, the NRC staff was unable to confirm that all the PASCs identified during the walkdowns were included in this table. As such, by letter dated November 1, 2013, the NRC staff issued two questions in an RAI in order to obtain clarification regarding the process followed by the licensee when evaluating conditions identified in the field during the walkdowns and walk-bys. Specifically, in RAI 1 the NRC staff requested the licensee to provide further explanation regarding how a field observation was determined to be PASC, and to ensure that the basis for determination was addressed using normal plant processes and documented in the walkdown report. In response to RAI 1, the licensee referenced Sections 4.0 and 5.0 of the supplemental walkdown report which provides a summary of the overall process used to evaluate observations identified in the field by the SWEs. Specifically, the licensee confirmed that all identified PASCs were entered into the CAP to allow further engineering evaluation. Further, the CAP engineering evaluation determined whether the potentially adverse seismic condition was degraded, unanalyzed, or non-conforming to the design and licensing bases. The licensee confirmed that there are no new PASCs to report because all PASC items were addressed and included in previous submittals and stated that all PASCs were entered into CNS CAP.

After evaluating the licensee's response and reviewing Sections 4.0 and 5.0 of the supplemental walkdown report, the NRC staff concludes that the licensee responded appropriately to RAI 1 and that PASCs were properly identified and documented.

In Section 3.0 of Attachment 5 of the initial walkdown report, the licensee stated that anchorage configurations were verified to be consistent with existing plant documentation for at least 50 percent of non-line mounted SWEL items, in accordance with Section 4 of the walkdown guidance.

Attachment 5 of the initial walkdown report states that, when possible, cabinets were opened to verify their internal components. The NRC staff reviewed the SWCs and was unable to confirm that cabinets were opened. However, Attachments 6B and 8B of the initial and supplemental walkdown reports, which documented the peer review process, confirms that cabinets and enclosures were opened for examination. Based on the information above, the NRC staff has reasonable assurance that cabinets were opened to verify their internal components.

Section 4.0 and Attachment 7B of the supplemental walkdown report confirm that additional walkdowns were conducted from September 19, 2013, through October 24, 2013, to perform inspections on inaccessible equipment and internal cabinets that were not completely inspected or were not opened during the initial walkdowns. In Section 4.0, Table 4-2 of the supplemental walkdown report, the licensee included a list of the supplemental inspections. The NRC staff reviewed the seismic walkdown checklists provided in the supplemental report and confirmed

that all supplemental inspections for inaccessible equipment were performed. PASCs identified as part of the subsequent walkdowns performed, were entered directly into the CAP to allow further engineering evaluation.

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.

3.2.4 Licensing Basis Evaluations and Results

Section 5, Seismic Licensing Basis Evaluations, of the walkdown guidance provides information to licensees regarding the conduct of licensing basis evaluations for items identified during the seismic walkdowns as degraded, nonconforming, or unanalyzed that might have potential seismic significance.

The NRC staff reviewed Section 5.0 of the CNS-2 walkdown report, which discusses the process for conducting the seismic licensing basis evaluations of the PASCs identified during the seismic walkdowns and area walk-bys. The licensee stated that it performed engineering evaluations and resolved PASCs using the plant's CAP. Table 4-1 of the walkdown report lists the licensee's findings, and provides a complete list of the potentially degraded, nonconforming, or unanalyzed conditions. This table also describes the actions taken or planned to address these conditions, including the current disposition of each of the items the licensee entered into the CAP. In Section 4.0 of the walkdown report, the licensee stated that engineering evaluation of each PASC concluded that the condition was in conformance with the current licensing bases.

The NRC staff reviewed the CAP entries and the description of the actions taken or planned to address potential deficiencies. The NRC staff concludes that the licensee appropriately identified degraded, nonconforming, or unanalyzed conditions and entered them into the CAP, which meets the intent of the walkdown guidance.

3.2.5 Conclusion

Based on the discussion above, the NRC staff concludes that the licensee's implementation of seismic walkdown methodology meets the intent of the walkdown guidance for personnel qualifications, development of SWELs, implementation of the walkdown process, and seismic licensing basis evaluations.

3.3 Peer Review

Section 6, Peer Review, of the walkdown guidance provides licensees with information regarding the conduct of peer reviews for the activities performed during the seismic walkdowns. Page 6-1 of the walkdown guidance identifies the following activities to be conducted during the peer review process:

- Review the selection of the SSCs included on the SWELs
- Review a sample of the checklists prepared for the seismic walkdowns and area walk-bys
- Review the licensing basis evaluations
- Review the decisions for entering the potentially adverse conditions into the CAP

- Review the walkdown report
- Summarize the results of the peer review process in the walkdown report

The NRC staff reviewed the information provided in Section 7.0 of the CNS-2 walkdown report which describes the conduct of the peer review. In addition, the NRC staff reviewed Attachments 6B and 8B of the initial and supplemental walkdown reports, Peer Review Report, which contains the peer review checklists and all findings noted by the independent reviewers and the resolution. In RAI 2, the NRC staff requested the licensee to provide additional information on the overall peer review process that was followed as part of the walkdown activities. Specifically, the NRC staff requested the licensee to confirm that the activities identified on page 6-1 of the walkdown guidance were assessed and documented in the report. The licensee was also requested to confirm that any individual involved in performing any given walkdown activity was not a peer reviewer for that same activity. In response to RAI 2, the licensee confirmed that the peer review team was independent from the seismic walkdown related activities and that all the activities identified on page 6-1 of the walkdown guidance were included as part of the peer review process. The licensee referred to Attachments 6B and 8B of the CNS-2 initial and supplemental walkdown reports for a complete summary of the peer review activities. In addition, the licensee corrected a few minor inconsistencies and provided additional information on Section 7.0 and Table 2-1 of the walkdown report, which illustrates the names and assigned tasks of the peer review team.

The NRC staff reviewed the licensee's summary of each of these activities, which included a discussion of the peer review team members' qualifications and level of involvement, the peer review findings, and resolution of peer review comments. After reviewing the licensee's submittals, the NRC staff concludes that the licensee sufficiently documented the results of the peer review activities and how these reviews affected the work described in the walkdown report.

Based on the discussion above, the NRC staff concludes that the licensee's results of the peer review and subsequent actions taken in response to the peer review meets the intent of Section 6 of the walkdown guidance.

3.4 IPEEE Information

Section 7, IPEEE Vulnerabilities, of the walkdown guidance provides information to licensees regarding the reporting of the evaluations conducted and actions taken in response to seismic vulnerabilities identified during the IPEEE program. Through the IPEEE program and GL 88-20, "Individual Plant Examination of External Events for Severe Accident Vulnerabilities – 10 CFR 50.54(f)," dated November 23, 1988¹², licensees previously had performed a systematic examination to identify any plant-specific vulnerabilities to severe accidents.

In Section 6.0 of the walkdown report, the licensee stated that no plant-specific seismic vulnerabilities were identified at CNS-2 by the IPEEE program and that there were no identified plant changes that would significantly reduce the risk from seismic external events. The licensee identified several IPEEE enhancements in Table 6-1 of the walkdown report to resolve minor

¹² ADAMS Accession No. ML031150465

issues encountered during the IPEEE walkdowns. The licensee indicated that the enhancements were resolved.

Based on the NRC staff's review of Section 6.0 of the walkdown report, the NRC staff concludes that the licensee's identification of plant-specific vulnerabilities (including anomalies, outliers and other findings) identified by the IPEEE program, as well as actions taken to eliminate or reduce them, meets the intent of Section 7 of the walkdown guidance.

3.5 Planned Upgrades

The licensee did not identify any planned or newly installed protection and mitigation features in the walkdown report.

3.6 NRC Oversight

3.6.1 Independent Verification by Resident Inspectors

On July 6, 2012,¹³ the NRC issued Temporary Instruction (TI) 2515/188 "Inspection of Near-Term Task Force Recommendation 2.3 Seismic Walkdowns." In accordance with the TI, NRC inspectors independently verified that the CNS-2 licensee implemented the seismic walkdowns in accordance with the walkdown guidance. Additionally, the inspectors independently performed walkdowns of a sample of seismic protection features. The inspection report dated January 28, 2013,¹⁴ documents the results of this inspection and states that no findings were identified.

4.0 CONCLUSION

The NRC staff concludes that the licensee's implementation of seismic 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 seismic licensing basis; addressed degraded, nonconforming, or unanalyzed seismic 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 3 of the 50.54(f) letter.

¹³ ADAMS Accession No. ML12156A052

¹⁴ ADAMS Accession No. ML13029A680

K. Henderson

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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/

G. Edward Miller, Project Manager
Plant Licensing Branch 2-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-414

Enclosure:
Staff Assessment of Seismic Walkdown Report

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