



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

June 20, 2014

Karen D. Fili
Site Vice President
Northern States Power Company - Minnesota
Monticello Nuclear Generating Plant
2807 West County Road 75
Monticello, MN 55362

SUBJECT: MONTICELLO NUCLEAR GENERATING STATION – 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 NO. MF0248)

Dear Mrs. Fili:

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 tsunamis. 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.

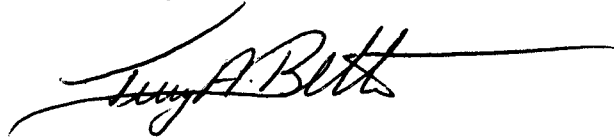
By letter dated November 27, 2012, Northern States Power Company, a Minnesota corporation (NSPM), doing business as Xcel Energy, submitted its Flooding Walkdown Report as requested in Enclosure 4 of the 50.54(f) letter for the Monticello Nuclear Generating Plant. NSPM supplemented its November 27, 2012, letter in a letter dated July 31, 2013.

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 4 of the 50.54(f) letter.

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If you have any questions, please contact me at 301-415-3049 or by e-mail at Terry.Beltz@nrc.gov.

Sincerely,

A handwritten signature in black ink, appearing to read "Terry A. Beltz", with a long horizontal flourish extending to the right.

Terry A. Beltz, Senior Project Manager
Plant Licensing Branch III-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-263

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
NORTHERN STATES POWER COMPANY
MONTICELLO NUCLEAR GENERATING STATION
DOCKET NO. 50-263

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*, (10 CFR) 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 provide the following:

- a. Describe the design basis flood hazard level(s) for all flood-causing mechanism, 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. 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 Agencywide Documents Access and Management System (ADAMS) Accession No. ML12053A340

² ADAMS Accession No. ML12056A050

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 process. 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 Northern States Power Company, a Minnesota corporation (NSPM, the licensee), doing business as Xcel Energy, provided a response to Enclosure 4 of the 50.54(f) letter Required Response Item 2, for the Monticello Nuclear Generating Plant (Monticello). The licensee supplemented this response in a letter dated July 31, 2013⁶. In a letter dated December 23, 2013⁷, the NRC staff requested additional information regarding the licensee's available physical margin (APM). The licensee responded to the NRC staff request by letter dated January 31, 2014⁸.

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 SSCs important to safety in operating nuclear power plants are designed either in accordance with, or meet the intent of Criterion 2, "Design bases for protection against natural phenomena," of Appendix A to 10 CFR Part 50; and Appendix A, "Seismic and Geologic Siting Criteria for Nuclear Power Plants," to 10 CFR Part 100. Criterion 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 of a facility must perform, and the specific values or ranges of values chosen for controlling parameters as reference bounds for the design.

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

The current licensing basis (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 that are in effect.

³ ADAMS Package Accession No. ML121440522

⁴ ADAMS Accession No. ML12144A142

⁵ ADAMS Accession No. ML12333A348

⁶ ADAMS Accession No. ML13212A349

⁷ ADAMS Accession No. ML13325A891

⁸ ADAMS Accession No. ML14031A325

3.0 TECHNICAL EVALUATION

3.1 Design Basis Flooding Hazard for the Monticello Nuclear Generating Plant (Monticello)

The licensee reported that the design basis flood (DBF) hazard for Monticello is a probable maximum flood (PMF) on the Mississippi River occurring in the spring. The licensee stated that the most critical sequence of meteorological events that leads to a major flood consists of (1) an unusually heavy spring snowfall, (2) a period of low temperatures following a warm period that would result in the formation of an ice sheet creating an impervious ground surface, (3) a period of extremely high temperatures resulting in rapid snowmelt, and (4) a major storm. These four events combine to create a maximum water-surface elevation of 939.2 feet mean sea level (MSL), not including wind wave activity. The PMF peak water-surface elevation for the Monticello site would occur approximately 12 days after the occurrence of critical spring meteorological (storm) conditions and would remain higher than 930 feet MSL for approximately 11 days.

The licensee considered a late spring snowmelt and runoff from a summer probable maximum storm for evaluating the PMF in the Mississippi River near the Monticello site. It also considered flooding from backwater effects created by ice jams. The result of these scenarios produced a flooding event less than that of the PMF described above.

The Monticello flooding walkdown report did not include a description of groundwater ingress. The Monticello Updated Safety Analysis Report (USAR) indicates that the groundwater table at the site has an approximate elevation of 908 feet MSL and flows toward the river, which has a normal water table elevation of 905 feet MSL. However, groundwater may not flow toward the river during flooding events.

Based on the NRC staff's review, the licensee appears to have described the design basis flood hazard level as requested in the 50.54(f) letter and is consistent with walkdown guidance.

3.2 Flood Protection and Mitigation

3.2.1 Flood Protection and Mitigation Description

The licensee stated that the CLB calls for flood protection and mitigation to an elevation of 939.2 feet MSL. The flood protection and mitigation features were designed using the following assumptions and inputs:

- Monticello site grade is at elevation 930 feet MSL, and the maximum recorded high water level at the site is 916 feet MSL.
- The 1000-year projected high water level is at elevation 921 feet MSL, and Class I and Class II SSCs have been designed for a high water level elevation of 930 feet MSL.
- Structural safety of plant buildings for resulting hydrostatic loading.
- Modifications to plant buildings required to withstand hydrostatic loadings and/or methods for closing openings below 939.2 feet MSL.

- The PMF peak water-surface elevation for the Monticello site would occur approximately 12 days after the critical spring meteorological (storm) conditions and the flood water-surface elevation would remain higher than 930 feet MSL for approximately 11 days.
- When the water-surface elevation in the Mississippi River is predicted to reach or exceed 918 feet MSL, an unusual event is declared and external flooding procedures are implemented.
- When the river water-surface elevation reaches 921 feet MSL, the plant is shut down and placed in a cold standby condition.

The DBF event applies to all modes of operation including startup, power production, hot and cold shutdowns, and refueling. No adverse weather conditions are assumed concurrent with flood protection features and associated actions.

3.2.2 Incorporated and Exterior Barriers

The licensee reported that site has incorporated and exterior barriers that are permanently in-place, requiring no operator manual actions. The Monticello site grade is at an elevation of 930 feet MSL, which is 14 feet higher than the maximum recorded high water level at the site and 9 feet higher than the 1,000-yr projected high water level. Buildings housing SSCs located on the Monticello site are designed to resist a hydrostatic load from a flooding elevation of 930 feet MSL, and a one-third increase in allowable stress was permitted for a PMF of 939.2 feet MSL.

3.2.3 Temporary Barriers and Manual Actions

The licensee stated that the site has temporary barriers and manual actions requiring operator involvement, including installation of steel plates; construction of levees; deployment of sandbags; construction of berms; maintaining diesel oil storage levels; and weighting of floors to resist buoyant forces.

When the water-surface elevation in the river is predicted to exceed 930 feet MSL, a levee is constructed to protect the Class I structures, Class II structures that contain Class I equipment, and the radwaste building. The offgas stack, also a Class I structure, is outside the levee perimeter and would be protected using sandbags. The offgas storage building is a Class II structure containing Class I equipment; however all of the Class I equipment and components inside the building are located above the peak DBF water-surface elevation. The licensee stated that other temporary flood protection features such as steel plates, grouts, or sandbags may be used to provide additional defense in depth when the river water-surface elevation is expected to exceed 930 feet MSL.

Protection for the diesel generator building is provided by either constructing a flood barrier around the building or by preventing the buckling of the floor slab of the building. Buckling prevention is provided up to a flood water-surface elevation of 933 feet MSL by exposing the entire floor area to a loading of 200 pounds per square foot. If the flood water-surface elevation is expected to exceed 933 feet MSL, a flood barrier would be constructed around the diesel generator building.

The licensee stated that the emergency diesel oil storage tank is designed for a flood water-surface elevation of 932 feet MSL, with a minimum of 2 feet of fuel oil maintained in the tank. For flood water-surface elevation exceeding 932 feet MSL, the tank would be protected by a flood barrier or by a berm constructed around the tank.

3.2.4 Reasonable Simulation and Results

The licensee performed reasonable simulations to support walkthroughs of flood protection procedures. These simulations included (1) drills or exercises for activities not performed previously, (2) records or desktop evaluations for standard operating procedures including a review of past performance records to verify timely completion, (3) desktop evaluations of standard operating procedures including possible effects of flooding conditions on the execution of the procedures and availability of sufficient time for executing the procedure, and (4) detailed walkthroughs of activities to evaluate available time, resources, and staff for execution of the activities. The licensee listed 129 reasonable simulations related to Monticello flood protection procedures in its supplement to the walkdown report.

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 the walkdown guidance.

3.3 Warning Systems

The licensee reported that there are no warning systems credited to detect external flooding in rooms that house safety-related SSCs. The licensee listed the annunciators associated with level sensors and pump operation which could indicate room flooding that were included in the flooding walkdowns, but are not credited in the current licensing basis.

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 is consistent with the walkdown guidance.

3.4 Effectiveness of Flood Protection Features

The licensee stated that, in addition to visual inspection of flood protection features, it also reviewed preventive maintenance records to ensure continuing conformance of features credited in the CLB. The licensee developed acceptance criteria based on the NEI 12-07 guidance as noted in the walkdown record forms for the flood protection feature.

The licensee stated that in preparation for the planned NRC flooding audit, a self-assessment revealed that equipment may not be adequately protected from the effects of the DBF to maintain safe shutdown conditions. These issues were reported to the NRC in Event Notification 49085 and were entered into the CAP. The licensee stated that the issues are being evaluated but it did not state a timeline for completion.

The NRC staff identified one preliminary Yellow finding and one Green finding in its

June 11, 2013⁹, inspection report. The preliminary Yellow finding and the associated apparent violation of a technical specification are related to the licensee's failure to maintain flood protection procedures to implement activities within the 12-day timeframe credited in the CLB. The Green finding is related to the licensee's failure to perform walkthroughs of the flood protection procedures, which resulted in a failure to verify if necessary resources for levee construction and other activities were adequately pre-staged and available. In its response to the NRC's July 11, 2013¹⁰, inspection report, the licensee stated that the NRC determined these findings to not be a safety concern because the actions were completed by February 15, 2013. The licensee is implementing corrective actions to address the cause of these issues.

Based on its review, the NRC staff concludes that 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 11, 2012,¹¹ 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."¹² The licensee's walkdown submittal dated November 27, 2012, and supplement dated July 31, 2013, 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 its review, the NRC staff concludes that 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 several physical flood protection features that resulted in 99 walkdown record forms for physical flood features and 2 walkdown record forms for procedures. In addition, the licensee performed reasonable simulation of manual actions, including those related to Monticello flood protection procedures. As stated in Section 3.2.4, these simulations consisted of drills or exercises for activities not performed previously, records or desktop evaluations for standard operating procedures including review of past performance records to verify timely completion, desktop evaluations of standard operating procedures and detailed walkthroughs of activities to evaluate available time, resources, and staff for execution of the activities.

As stated above in Section 3.1, the DBF event applies to all modes of operation including startup, power production, hot and cold shutdowns, and refueling. However, the CLB does not describe adverse weather conditions. Monticello flood protection procedures state that rapid flow and

⁹ ADAMS Accession No. ML13162A776

¹⁰ ADAMS Accession No. ML13233A068

¹¹ ADAMS Accession No. ML12164A436

¹² ADAMS Accession No. ML12173A215

very cold water temperatures may occur during the DBF. The licensee stated that it considered the effects of adverse conditions from the DBF or from conditions that can occur concurrently with the DBF during its reasonable simulations.

The licensee developed acceptance criteria consistent with the intent of NEI 12-07. The licensee did not describe any additional site-specific acceptance criteria.

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. The licensee's evaluation of flood protection effectiveness is described in Section 3.4 above.

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 21 deficiencies because of the flood walkdowns, all of which were entered into the Monticello CAP. The supplemental submittal states that all entries into the CAP would be complete by December 1, 2013. Table 3.6.1 of the supplemental report lists all the deficiencies and actions taken to resolve the deficiency.

NEI 12-07 requires licensees to identify observations in the CAP that were not yet dispositioned at the time the walkdown report was submitted. The licensee identified observations awaiting disposition. Table 3.6.2 of the supplemental walkdown report lists the 38 observations, all of which were entered into the Monticello CAP. One observation was determined not to be a potential flood water leakage path, two are complete and the remaining 35 observations remain to be dispositioned.

3.6.3 Flood Protection and Mitigation Enhancements

The licensee has implemented or planned the following enhancements that improve the flood emergency procedure:

- Revise its flood protection procedures to address deficiencies. To address the deficiencies, some structural changes such as replacing windows or sealing gaps were made. The licensee described the revisions to flood protection procedures in the flooding walkdown report.
- Address 16 deficiencies with an expected completion date of December 1, 2013.
- Evaluate 35 observations entered into the CAP that will be dispositioned in the future.

3.6.4 Planned or Newly-Installed Features

The licensee determined that changes were necessary by the flood walkdowns. Section 3.6.3 above lists the implemented or planned changes to the Monticello flood emergency features and procedures. Apart from features that may be installed, repaired, or added as part of the revision to the Monticello flood protection procedures, the licensee identified the following enhancements:

- Potential flooding penetrations were sealed or identified to be sealed during the DBF. The licensee stated that sealing the penetrations before the flood event would reduce field work required during the DBF.
- Install permanent flood protection features on and around the intake structure. These enhancements would reduce field work during the DBF
- Expand the Monticello procedures which currently require inspections and inventory of available and stored material for flood protection to include equipment, materials, and consumables already acquired for flood protection. The licensee would add more equipment, materials, and consumables to the list as they are acquired.

3.6.5 Deficiencies Noted and Actions Taken or Planned to Address

The licensee identified deficiencies as stated above in Section 3.6.2. Section 3.6.3 above lists the implemented or planned changes to the Monticello flood emergency features and procedures to address the deficiencies.

3.6.6 Staff Analysis of Walkdowns

The NRC staff reviewed the licensee walkdown report dated November 27, 2012, and Section 2.4 of the Monticello USAR, Revision 22. The staff found that the walkdown report provided a description of the flood hazards and the flood mitigation strategy used at Monticello. The licensee provided a description of the manual actions needed to implement the Monticello flood protection procedures. The licensee performed 129 reasonable simulations, and identified deficiencies and observations that were entered into the CAP. The licensee stated that the deficiencies would be addressed by December 1, 2013, and observations would be dispositioned in the future. It also provided a description of the planned enhancements to the Monticello flood protection features. Based on the above assessment, staff concludes that the licensee performed these aspects of the walkdowns in accordance with the NEI 12-07 guidance.

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.

The NRC inspectors did identify the licensee's failure to conform with the guidelines of NEI 12-07, in that it did not perform adequate flooding procedure walk-throughs necessary to verify that flood protection actions were achievable, and could be completed within the credited timeline. The performance deficiency was documented in the NRC staff's June 11, 2013¹³, inspection report, and categorized as a Green finding of very low safety significance.

¹³ ADAMS Accession No. ML13162A776

3.6.7 Available Physical Margin

The NRC staff issued a request for additional information to the licensee regarding the APM dated December 23, 2013¹⁴. The licensee responded by letter dated January 31, 2014¹⁵. The licensee reviewed its APM determination process and entered any unknown APMs into the CAP. The NRC staff reviewed the response and concludes 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."¹⁶ In accordance with the TI, NRC inspectors independently verified that NSPM implemented its flooding walkdowns consistent with the intent of the walkdown guidance. Additionally, the inspectors independently conducted walkdowns of a sample of the flood protection features. The inspection report findings were documented in Section 3.4, above.

4.0 INACCESSIBLE AND RESTRICTED ACCESS FEATURES

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

5.0 CONCLUSION

The NRC staff concludes that the licensee's implementation of its flooding walkdown methodology meets the intent of the walkdown guidance. The staff also concludes, through the implementation of the walkdown guidance activities and in accordance with plant processes and procedures, that the licensee 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. The NRC staff notes that findings documented in the May 13, 2013, inspection report, will be processed in accordance with the NRC Enforcement Policy.

Overall, the NRC staff reviewed the information provided by the licensee and concludes that sufficient information was provided in its response to Enclosure 4 of the 50.54(f) letter.

¹⁴ ADAMS Accession No. ML13325A891

¹⁵ ADAMS Accession No. ML14031A325

¹⁶ ADAMS Accession No. ML12129A108

If you have any questions, please contact me at 301-415-3049 or by e-mail at Terry.Beltz@nrc.gov.

Sincerely,

/RA/

Terry A. Beltz, Senior Project Manager
Plant Licensing Branch III-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-263

Enclosure:
Staff Assessment of Flooding Walkdown Report

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