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

May 16, 2014

Mr. Mark E. Reddemann
Chief Executive Officer
Energy Northwest
P.O. Box 968 (Mail Drop 1023)
Richland, WA 99352-0968

SUBJECT: COLUMBIA 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. MF0213)

Dear Mr. Reddemann:

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) (the 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 12, 2012, Energy Northwest (the licensee) submitted a Flooding Walkdown Report as requested in Enclosure 4 of the 50.54(f) letter for the Columbia Generating Station site. By letter dated January 29, 2014, the licensee provided a response to the NRC staff's request for additional information dated December 23, 2013, for the staff to complete its assessments.

The NRC staff has 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 regarding this matter, I may be reached at (301) 415-2296 or via e-mail at fred.lyon@nrc.gov.

Sincerely,

CFLyon

Carl F. Lyon, Project Manager
Plant Licensing Branch IV-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-397

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

ENERGY NORTHWEST

COLUMBIA GENERATING STATION

DOCKET NO. 50-397

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) (the 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.

Enclosure 4 of 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 SSCs [structures, systems and components] 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.

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[1] Agencywide Documents Access and Management System (ADAMS) Accession No. ML12053A340.
[2] ADAMS Accession No. ML12056A050.

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.

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-A, "Guidelines for Performing Verification Walkdowns of Plant Flood Protection Features,"[4] to the NRC staff to consider for endorsement. By letter dated May 31, 2012,[5] the NRC staff endorsed the walkdown guidance.

By letter dated November 12, 2012,[6] Energy Northwest (the licensee), provided a response to Enclosure 4 of the 50.54(f) letter Required Response Item 2, for the Columbia Generating Station (CGS). The NRC staff issued a request for additional information (RAI) to the licensee regarding the available physical margin (APM) dated December 23, 2013.[7] The licensee responded by letter dated January 29, 2014.[8]

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.

2.0 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 for Nuclear Power Plants," Criterion 2, "Design bases for protection against natural phenomena;" and Appendix A to 10 CFR Part 100, "Reactor Site Criteria." Criterion 2 states

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[3] ADAMS Accession No. ML121440522.
[4] ADAMS Accession No. ML12173A215.
[5] ADAMS Accession No. ML12144A142.
[6] ADAMS Accession No. ML12319A476.
[7] ADAMS Accession No. ML13325A891.
[8] ADAMS Accession No. ML14035A222.

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.

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), as defined in 10 CFR 54.3(a), 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 Design Basis Flooding Hazard for Columbia Generating Station

The design basis flood (DBF) hazard for the site is the probable maximum precipitation (PMP) event within the drainage basin containing CGS. The drainage runoff flows from the northwest of the plant down to a low area in the southeast of the plant. A wide channel forms the southerly drainage from the site. The PMP event totals 9.2 inches in a 6-hour period, which results in a flooding elevation of 431.1 feet (ft) mean sea level (MSL). An additional 2.2 ft of wind wave action is present. The DBF elevation for CGS is 433.3 ft MSL.

Other flooding mechanisms included in the CLB and discussed in Section 2 of the Flooding Walkdown Report are upstream dam failure, flooding from the Columbia River, ice jams and maximum water table. All of these mechanisms are stated to produce flood elevations lower than the design basis flooding elevation. The design basis groundwater level, produced from failure of the planned Ben Franklin dam, spray pond leakage, and pipe leakage onsite, is 420.0 ft MSL.

Based on its review, the NRC staff concludes that the licensee has described the DBF 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 CLB flood protection is achieved by site drainage, with all safety-related structures built such that the first floor elevations are 441 ft (above the 433.3 ft MSL DBF level), and the lowest

floor elevation at the top of the reactor building foundation mat is 422.25 ft MSL (above the 420.0 ft. MSL design basis groundwater level). Site drainage includes dry wells and catch basins are located throughout the site, specifically at flatter areas such as the parking lots. These wells and basins capture runoff and direct it away from the safety-related structures. In addition, roads are graded well below the first floor elevations of the buildings, and act as channels for runoff. The buildings' roofs are designed to withstand the local PMP rainfall, and include curbs and scuppers that drain the roofs.

The licensee stated that there are no flood protection features or flood mitigation procedures for protection and mitigation against external flooding events credited in the CGS CLB because CGS is considered a "dry site" as a result of its safety-related SSCs being built above the design basis flooding level. There are credited flood mitigation features below elevation 441 ft MSL. Although not credited for external flood mitigation and not evaluated in this NRC staff assessment, the Reactor Building is equipped with multiple sump pumps and storm catch basins are positioned to intercept localized precipitation. All below-grade Reactor Building penetrations are sealed to prevent inleakage from groundwater.

3.2.2 Incorporated and Exterior Barriers

The site has incorporated and/or exterior barriers that are permanently in-place, requiring no operator manual actions. These barriers include site drainage features and penetrations seals. All features were visually inspected, and maintain the overall natural drainage profiles in the CLB.

3.2.3 Temporary Barriers and Other Manual Actions

The site has no temporary barriers or manual actions required per the CLB.

3.2.4 Reasonable Simulation and Results

Since there are not manual actions required, the licensee did not perform any reasonable simulations.

3.2.5 Conclusion

Based on the NRC staff's review, the staff concludes that the licensee has described protection and mitigation features as indicated in Requested Information item 2.b of the 50.54(f) letter, consistent with Appendix D, Walkdown Report, of the walkdown guidance.

3.3 Warning Systems

The licensee stated that no localized flood level warning systems are needed for CGS, due to the high elevation of all safety-related systems, and since no interior water level warning systems or alarms are credited for flood protection function in the plant external flooding licensing basis.

Based on its review, the NRC staff concludes that the licensee has provided information to describe any warning systems as indicated in Requested Information item 2.c of the 50.54(f) letter, consistent with Appendix D, Walkdown Report, of the walkdown guidance.

3.4 Effectiveness of Flood Protection Features

The licensee determined that there were no deficiencies, and that the flood protection features at CGS are designed to withstand design basis external flooding events. In addition, the licensee stated that because the PMP event does not create and adverse hydrological condition on safety-related SSCs, no advance preparations of emergency flood-related equipment are credited in the CLB.

Based on its review, the NRC staff concludes that the licensee has discussed the effectiveness of flood protection features as indicated in Requested Information item 2.d of the 50.54(f) letter, consistent with Appendix D, Walkdown Report, of the walkdown guidance.

3.5 Walkdown Methodology

By letter dated June 11, 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. The licensee's walkdown submittal dated November 12, 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.

3.6 Walkdown Results

3.6.1 Walkdown Scope

The licensee performed walkdowns of flood protection features via visual inspections including walls, floors, penetration seals, site storm drainage features (e.g., catch basins, dry wells), and roof drains. Two groups of walkdown teams performed the visual inspections, one for internal and building features and the other for exterior features.

The licensee discussed modes of operation that were considered in the CLB. Safe shutdown and cooldown of the reactors can still be accomplished if the site is flooded due to the elevation of the safety-related SSCs necessary for shutdown and cooldown.

The licensee did use 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 plant's flood protection features. The main flood protection features were assessed to be capable of withstanding the design basis external flooding event. All features were found to be in working conditions with no deficiencies.

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[9] ADAMS Accession No. ML12166A310.

Although not credited in the CGS CLB, and not evaluated in this staff assessment, the licensee visually inspected penetrations at below-grade exterior walls for the Reactor Building and the Standby Service Water Pumphouses. The licensee found that the below-grade walls, floors, and penetration seals that were visually inspected were found to be in good condition, with two exceptions. There were two conduits in one of the Standby Service Water Pumphouses that did not have a visible seal viewed from the building side; the other side was in a buried duct bank and was not accessible. The interiors of the conduits were clean and there was no dirt, corrosion, debris, or evidence of water or insect intrusion from the outside. The licensee found that these exceptions are not deficiencies as defined in NEI 12-07 because the conduit seals are not credited to perform an intended flood protection function and are located above the design-basis groundwater elevation.

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 did not identify deficiencies because of the flood walkdowns.

NEI 12-07 specifies that licensees identify observations in the CAP that were not yet dispositioned at the time the walkdown report was submitted. CGS did not identify observations awaiting disposition.

3.6.3 Flood Protection and Mitigation Enhancements

The licensee did not implement or plan enhancements to improve or increase flood protection or mitigation.

3.6.4 Planned or Newly Installed Features

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

3.6.5 Deficiencies Noted and Actions Taken or Planned to Address

The licensee did not note any deficiencies, as defined by NEI 12-07.

3.6.7 NRC Staff Analysis of Walkdowns

The NRC staff reviewed the licensee's walkdown report dated November 12, 2012. As part of the walkdown effort, the licensee evaluated the capability of flood protection features by conducting a set of visual inspections. The features were confirmed to be capable of performing their intended flood protection or mitigation functions. No changes or enhancements to flood protection or mitigation features were identified as a result of the walkdowns.

Based on its review, the NRC staff concludes that the licensee has provided results of the walkdown and described any other planned or newly installed flood protection systems or flood mitigation measures as indicated in Requested Information items 2.f and 2.h of the 50.54(f) letter, consistent with Appendix D, Walkdown Report, of 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.

3.6.8 Available Physical Margin

The NRC staff submitted a request for additional information (RAI) to the licensee regarding the APM dated December 23, 2013. The licensee responded with a letter dated January 29, 2014. The licensee has reviewed its APM determination process, and entered any unknown APMs into the CAP. The staff reviewed the response, and concluded that the licensee met the intent of the APM determination per NEI 12-07.

Based on its review, the NRC staff concludes that the licensee has documented the information requested for any cliff-edge effects, as indicated in Requested Information item 2.g of the 50.54(f) letter, consistent with Appendix D, Walkdown Report, of the walkdown guidance. Further, the 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

On June 27, 2012, the NRC issued Temporary Instruction (TI) 2515/187, "Inspection of Near-Term Task Force Recommendation 2.3 Flooding Walkdowns."[10] The TI directed NRC inspectors to independently verify that licensees were implementing the flooding walkdowns in accordance with the NRC-endorsed walkdown methodology by accompanying licensee personnel on a sample of walkdowns. Additionally, the TI directed the inspectors to independently perform walkdowns of a sample of flood protection features. The NRC Inspection Report dated February 8, 2013,[11] documents the results of this inspection. No findings were identified.

4.0 SSCs NOT WALKED DOWN

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

5.0 CONCLUSION

The NRC staff concludes that the licensee's implementation of flooding walkdown methodology meets the intent of the walkdown guidance. The 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 licensee's walkdown results, which were verified by the staff's inspection, identified no immediate safety concerns. 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.

[10] ADAMS Accession No. ML12129A108.
[11] ADAMS Accession No. ML13039A078.

If you have any questions regarding this matter, I may be reached at (301) 415-2296 or via e-mail at fred.lyon@nrc.gov.

Sincerely,

/RA/

Carl F. Lyon, Project Manager
Plant Licensing Branch IV-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-397

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Staff Assessment of Flooding
Walkdown Report

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