



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

June 24, 2014

Mr. Oscar A. Limpias  
Vice President-Nuclear and CNO  
Nebraska Public Power District  
72676 648A Avenue  
Brownville, NE 68321

SUBJECT: COOPER NUCLEAR 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. MF0216)

Dear Mr. Limpias:

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, as supplemented by letter dated November 21, 2013, Nebraska Public Power District (NPPD, the licensee) submitted a Flooding Walkdown Report as requested in Enclosure 4 of the 50.54(f) letter for the Cooper Nuclear Station (CNS). By letter dated January 31, 2014, NPPD provided a response to the NRC staff's request for additional information dated December 23, 2013, for the staff to complete its assessments.

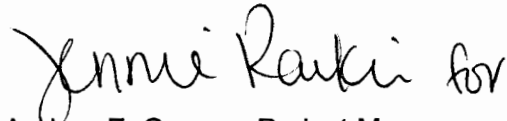
The NRC staff acknowledges that the licensee is to have the delayed walkdown items completed prior to startup from refueling outage 28, currently scheduled to begin in October 2014, consistent with the regulatory commitment provided in its letter dated November 27, 2012. The NRC staff reviewed the information 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.

O. Limpias

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If you have any questions, please contact me at (301) 415-1081 or by e-mail at [Andrea.George@nrc.gov](mailto:Andrea.George@nrc.gov).

Sincerely,



Andrea E. George, Project Manager  
Plant Licensing Branch IV-1  
Division of Operating Reactor Licensing  
Office of Nuclear Reactor Regulation

Docket No. 50-298

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  
NEBRASKA PUBLIC POWER DISTRICT  
COOPER NUCLEAR STATION  
DOCKET NO. 50-298

## 1.0 INTRODUCTION

On March 12, 2012,<sup>1</sup> 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,"<sup>2</sup> 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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<sup>1</sup> Agencywide Documents Access and Management System (ADAMS) Accession No. ML12053A340.

<sup>2</sup> 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,<sup>3</sup> 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,<sup>4</sup> the NRC staff endorsed the walkdown guidance.

By letter dated November 27, 2012,<sup>5</sup> Nebraska Public Power District, hereafter referred to as the licensee, provided a response to Enclosure 4 of the 50.54(f) letter Required Response Item 2, for the Cooper Nuclear Station (CNS). The licensee submitted a supplement dated November 21, 2013.<sup>6</sup> The NRC staff issued a request for additional information (RAI) to the licensee regarding the available physical margin (APM) dated December 23, 2013.<sup>7</sup> The licensee responded by letter dated January 31, 2014.<sup>8</sup>

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

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<sup>3</sup> ADAMS Package Accession No. ML121440522.

<sup>4</sup> ADAMS Accession No. ML12144A142.

<sup>5</sup> ADAMS Accession No. ML12333A319.

<sup>6</sup> ADAMS Accession No. ML13330B276.

<sup>7</sup> ADAMS Accession No. ML13325A891.

<sup>8</sup> ADAMS Accession No. ML14035A220.

phenomena,” and Appendix A “Seismic and Geological Criteria for Nuclear 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, 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.

### 3.0 TECHNICAL EVALUATION

#### 3.1 Design Basis Flooding Hazard at for CNS

The licensee reported that the design basis flood hazard for the site is a probable maximum flood (PMF) on the Missouri River considering the probable maximum precipitation over the watershed, resulting in a stillwater elevation of 903 feet (ft) mean sea level (MSL) at the CNS site. The licensee stated that the finished floor elevation of all Class I Structures is 903.5 ft MSL as stated by the licensee. The licensee stated that the licensee has committed to flood protection to 906 ft MSL, while the CLB is 903 ft MSL. The licensee considers the PMF in combination with wave runoff to reach an elevation of 909.7 ft MSL at the Intake Structure. Wave action at the Main Plant Complex is considered to have no impact on the flood mitigation. The licensee stated that there is no specifically stated time(s) associated with the PMF event provided in the CNS CLB; however, a flood hydrograph cited in the Updated Safety Analysis Report (USAR) for the river at the CNS site indicates that an approximate duration of 5.5 days of flood conditions may be expected (i.e., an initial river flow of 200,000 cubic feet per second (cfs) to 600,000 cfs (the PMF) and then back down to 200,000 cfs).

The licensee summarized several other potential flood causing mechanisms and events, including postulated dam failure, which was evaluated but considered not credible. When upstream dam failure was considered in combination with the maximum natural flood, the licensee stated that an elevation of 905 ft MSL was estimated by the Atomic Energy Commission (AEC). The AEC estimated a maximum water level of 909.2 ft MSL for PMF plus wave effects at the Intake Structure and 905 ft MSL for PMF plus surge effects on other exposed safety-related structures. Roof drains and scuppers protect Class I and Class II buildings from the effects of the maximum precipitation. Flooding due to ice-dams was considered highly unlikely with ice-dams occurring only at water levels significantly lower than the PMF. River diversion due to dam failure hundreds of miles upstream was also evaluated. The licensee concluded that a 3-day warning time of dam failure and peak flood stage at the site

was sufficient, and any resulting river diversion and potential flooding would be available to facilitate a safe shutdown of the plant. Three days is the time necessary to achieve a cold shutdown at the CNS site.

Based on the NRC staff's, 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 stated that the CNS USAR provides for a value of 903 ft MSL for the PMF, with the first floor of all Class I buildings at 903.5 ft MSL. The licensee stated that grade level openings on exterior walls of the buildings (except for the Intake Structure) are protected from wave effects and water surface elevations up to 906 ft MSL per an NRC commitment, with temporary flood barriers erected per CNS Emergency Procedure 5.1 FLOOD and procedure 7.0.11 FLOOD CONTROL BARRIERS.

The licensee stated that surface water motors and controls in the Intake Structure are located above 908 ft MSL and protected from wave effects by 24-inch thick concrete walls extending to an elevation of 919 ft MSL. The Reactor Building, Emergency Diesel Generator Building, Radwaste Building, Control Building, and Turbine Building are protected by grade-level building walls and temporary flood barriers to 906 ft MSL. The Controlled Corridor is protected by grade-level Reactor and Turbine Building walls to 906 ft MSL.

The licensee stated that the Z Sump at 890 ft MSL contains equipment essential to the operation of the Standby Gas Treatment System and the sump must remain functional whenever Secondary Containment is required. The Z Sump will not be affected by flooding since the sump penetrations are sealed and the sump operation is monitored when flood levels reach 890 ft MSL. Diesel Fuel Storage tanks are buried and their appendages are protected by a substantial cover. The manholes providing access to the Diesel Oil Transfer Pumps, the capped fill connections and the tank vents are all above 906 ft MSL. The tank design and installation incorporates consideration to avoid flotation when empty in the event of the PMF.

The licensee stated that the Augmented Radwaste Building, Boiler Room, Fan Room, Water Treatment Plant, Tool Crib, Machine Shop, and Multi-Purpose Facility (MPF) Building are protected by grade-level building walls and by temporary flood barriers to 906 ft MSL. Other buildings and structures classified as not important to safe operation and shutdown of the plant are located at base elevations lower than the PMF elevation of 903 ft MSL and their protection is evaluated by plant management on an ad hoc basis.

The licensee stated that there is no specifically stated time(s) associated with the PMF event provided within the CNS CLB. The licensee cited a hydrograph in the USAR for the Platte Plus Missouri River(s) for deriving approximate expected flood conditions for 5.5 days (i.e., the period of time for river flow to rise/fall from 200,000 cfs to/from 600,000 cfs). The licensee stated that adverse weather is not an aspect of the CNS design basis; however, the licensee stated that the worst expected weather would be heavy rainfall which would not be a hindrance to stop log

(temporary) barrier construction. Licensee observational records indicated an implementation time range from 3.5 to 20 minutes for the total of 42 flood barriers deployed. Two barriers were unable to be deployed due to a refueling outage; however, these barriers were identical to similar barriers installed within 4 minutes.

### 3.2.2 Incorporated and Exterior Barriers

The licensee reported that the site has incorporated and/or exterior barriers that are permanently in-place, requiring no operator manual actions. Incorporated passive features include penetration seals and exterior walls and the site drainage system. Incorporated active features include the Z Sump which is required to function during a PMF. This sump contains equipment essential to the operation of the Standby Gas Treatment System, and therefore must remain functional whenever Secondary Containment is required.

### 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. The actions/barriers include temporary passive features. The licensee stated that these features include hardened flood barriers (aluminum stop logs, etc.) and secondary protection through the deployment of sand bags erected per CNS Procedure 7.0.11 to protect doorways, normal access openings within structures and other critical site assets from a PMF.

The licensee stated that temporary active features and methods of protection are specifically mentioned within the USAR in response to imminent flooding event at the CNS site with the material and equipment necessary to perform these protective measures available on site and inventoried on an annual basis. The licensee stated that the CNS USAR specifically addresses various actions that will be taken to protect safety-related SSCs located below the PMF plus wave effects level of 905 ft MSL.

### 3.2.4 Reasonable Simulation and Results

The licensee stated that CNS has two primary procedures for external flooding event response. The primary (high level) procedure for response, 5.1 FLOOD, is entered for a rising river level reaching 895 ft MSL, notification of upstream dam failure, and/or the river level is forecast to rise to or above 902 ft MSL within the next 36 hours. At this point, the 5.1 FLOOD emergency procedure is entered and the CNS reactor is placed in hot shutdown (to be completed within 12 hours) and then into cold shutdown (to be completed within 36 hours). This flood procedure invokes numerous other flood response measures, actions and activities in addition to the main response procedure, 7.0.11 FLOOD CONTROL BARRIERS.

As a reasonable simulation of the 5.1 FLOOD procedure, the licensee took credit for the performance of the flood procedures during CNS's response to the May 2011 flooding of the Missouri and Upper Mississippi River system. The licensee stated that review of the procedure during this period revealed several stated actions that require verification, including protocols to ensure notification of upstream dam failure is in place, and that protection of Main Transformer Yard features can be executed in a timely manner. To address these issues, the licensee

generated a condition report which was entered into the CNS CAP and assigned various, although unspecified, corrective actions.

The licensee stated that the CNS Maintenance Procedure 7.0.11 (FLOOD CONTROL BARRIERS) is a system for installing temporary flood control barriers at strategic locations in and around the Reactor Building, Turbine Building, Diesel Generator Building, Control Building, Radwaste Building, and the Multi-Purpose Facility (MPF). The licensee stated that these flood barriers were originally constructed of sandbags, plywood and plastic. Recent implementation of CNS change evaluation document (CED) 6033644 replaces the original barriers with engineered flood barriers that are easier to deploy, remove, and maintain; are more reliable; and safer to implement. The licensee conducted a simulated work plan which was considered a representative check of each type of flood door barrier and verified the time required for installation and deployment. Based on a comparison of observation records indicating an implementation time range of 3.5 to 20 minutes for barrier installation, the licensee concluded that reasonable simulation criteria were met. The licensee noted that information obtained from the deployment testing will be used by CNS to determine the personnel requirements necessary to deploy all barriers within the required procedural time/action periods. No further details were provided by the licensee concerning the evaluation of personnel required to meet the time requirements for CNS Maintenance Procedure 7.0.11.

### 3.2.5 Conclusion

Based on the 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 official plant internal warning systems at CNS dedicated to the detection of water infiltration related to an external flooding event in the current licensing basis. As previously discussed in this safety assessment, the licensee has identified specific flood levels and/or specific events as entry points into the licensee's external flooding procedures. However, the licensee provided no information on notification protocols for site personnel from either on-site or off-site entities of impending flood levels or events. The licensee mentions "a forecast issued by the official government agency" in the TRM BASES, but does not provide an agency name.

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 licensee stated that the CNS flood protection systems consist of various features, including building external structural walls, penetrations, doors, hatches, incorporated water stops, special rubber boots, and other related barriers. Temporary flood protection includes sand bagging, aluminum stop logs for specific areas, and openings as needed are also used for external



flooding mitigation, although the licensee stated that engineered barriers replaced the sandbag barriers through implementation of CED 6033644. The licensee cited CNS experience gained from the May 2011 flood of the Missouri and Upper Mississippi River system as providing significant evidence of the effectiveness of the current level of CNS flood protection, and as credit for reasonable simulations.

The licensee stated that the flooding walkdowns and evaluations revealed various non-conforming penetration seals within the majority of the CNS essential plant structures which were identified as non-conforming or deficient overall in meeting their CLB function. Some examples of deficient penetration seals included open conduit penetrations, significantly degraded penetrations showing evidence of leakage, undocumented configuration changes, negative available physical margin by design, and open flood water pathways through piping systems into building and site areas unprotected from flood waters.

As part of the site drainage system walkdown, the licensee stated that site elevations and features have changed since the original flood analyses for the CNS site was performed. These observations were captured as condition reports in the licensee's CAP. The licensee's evaluation of the elevation and feature changes via the CAP was that the changes were found to have a low potential to cause storm water to enter buildings during a local intense precipitation event. The licensee stated that a re-analysis of the site drainage plan was being performed and was scheduled for completion by the end of 2012. Deficiencies including repairs and/or corrections are discussed in Section 3.6.2 below.

The licensee stated that the Z Sump was determined to not be affected by flooding since the sump penetrations were verified as sealed and the proper functioning of the sump was verified as being monitored by current preventative maintenance and surveillance procedures.

Based on the 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 November 27, 2012, 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." The licensee's walkdown submittal dated November 27, 2012, indicated that the licensee implemented the walkdowns consistent with the intent of the guidance provided in NEI 12-07. The licensee did not identify any exceptions from NEI 12-07.

Based on the NRC staff's review, the licensee appears to have presented information related to the implementation of the walkdown process as requested in the 50.54(f) letter and consistent with the walkdown guidance.

### 3.6 Walkdown Results

#### 3.6.1 Walkdown Scope

The licensee performed walkdowns of a total of 479 flood protection features, including two flooding-related procedures. Physical flood protection features included pipe penetrations, conduit penetrations, exterior walls within the subject Class I and II structures, and the Z sump. The primary (high level) emergency procedure, 5.1 FLOOD, was reviewed. The 5.1 FLOOD procedures invoke numerous flood response measures, actions, and activities in addition to the other main flooding response procedure reviewed, 7.0.11 FLOOD CONTROL BARRIERS. Credit for reasonable simulation for the 5.1 FLOOD procedures was taken for the response to May 2011 flooding on the Missouri and Upper Mississippi River system. The procedural review included several stated actions that required verification including notification of upstream dam failure protocols, and verification that protection of the Main Transformer Yard could be executed in a timely manner. A condition report within the CNS CAP was generated to address these procedural issues.

Within the 7.0.11 FLOOD CONTROL BARRIERS procedure, the licensee performed a representative check of flood door barrier installation and deployment times and determined that the reasonable procedural time/action period was met. When the 5.1 FLOOD procedure is implemented, the CNS reactor is placed into Hot Shutdown mode within 12 hours followed by Cold Shutdown mode within 36 hours. The 5.1 FLOOD procedure and other supporting procedures and documents do not specifically address the intensity of adverse weather conditions or the execution or deployment of external flood mitigation activities.

The licensee used/developed 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 licensee stated that the finished floor elevation of all Class I Structures is 903 ft MSL with finished floor elevation at 903.5 ft MSL. These structures were designed for a hydraulic load equivalent to groundwater elevation 903 ft MSL and reviewed for integrity for a river flood level elevation of 906 ft MSL. The licensee identified and documented various non-conforming penetration seals within the majority of the CNS essential plant structures. Where observations suggested that acceptance criteria were not met or required further evaluation, the potential issues were captured within the CNS CAP for disposition.

The licensee evaluated procedural steps for existing flood procedures and found through evaluation and reasonable simulation that corrective actions need to be applied to the flood mitigation initiating procedure. Additionally, the licensee identified the need for corrective action to determine the number of personnel required to deploy temporary flood barriers within the required procedural time/action period.

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 deficiencies, as defined above, during the course of the flood walkdowns. The licensee determined that several flood protection features were deficient based on presenting an open pathway (absence of sealing device), and/or having a potential impact on an SSC required for safe shutdown from the effects of water infiltration/accumulation at the site. These features included sumps, floor drains, drain valves, manholes, and cabinet penetrations. All non-conforming flood features were entered into the CNS CAP by initiation of a condition report. The licensee provided disposition status of the flood protection feature deficiencies and provided anticipated completion dates for remaining open condition reports. The licensee also evaluated the site flood mitigation procedures and identified necessary corrective actions to procedural steps in procedure 5.1 FLOOD. The licensee has stated that all deficiencies identified for the procedural steps are complete. Remaining flood protection feature deficiencies are scheduled for completion prior to startup from refueling outage 28.

NEI 12-07 specifies that licensees identify observations/potential deficiencies in the CAP that were not yet dispositioned at the time the walkdown report was submitted. The licensee identified a partial, but not complete, list of reported observations awaiting disposition. The observations included evaluating a main flood maintenance procedure for person loading for placement of temporary barriers in the required time/action period. The disposition of this observation included in the reasonable simulation was not discussed. Dispositioned observations included evaluation of drainage system grates partially covered with overlain security and concrete barriers placed over catch basins, degraded seals and potential pathways through unsealed drains and penetrations. The licensee stated that a re-analysis of the site drainage system was to be completed by the end of 2012.

### 3.6.3 Flood Protection and Mitigation Enhancements

The licensee reported that they implemented or planned enhancements that improve or increase flood protection or mitigation as described in Section 3.6.4 of this staff assessment.

### 3.6.4 Planned or Newly Installed Features

The licensee determined that changes were necessary by the flood walkdowns. The licensee recently completed the design of a plant modification which replaces the original sand bagging and plywood barrier construction with a new system of removable pre-engineered aluminum stop log beams at various exterior doors located at ground level. The modification also includes constructing a reinforced concrete flood wall around an access hatch that has historically been protected by sandbags and plywood. The modification was scheduled for completion by year-end 2012. The licensee stated that new engineered barriers will be installed in the same locations as the previous sandbag and plywood barriers as well as at doors H1100 and H1114 of the Multi-Purpose Facility with installation initiated through the CNS Emergency Procedure 5.1 FLOOD.

In addition to the temporary barrier enhancement mentioned above, the licensee provided additional changes that are currently being implemented or analyzed:

- CNS Fire Pump House Building temporary external flood barrier system and other modifications including construction of a permanent Severe Accident Management Guideline Diesel Generator Building located above flood level.
- Modification of various existing leaking penetrations located within Class II and II building structures with new internal seals in accordance with work orders.
- Initiation of maintenance work orders to correct non-conformance associated with site manholes, conduit seals, and manhole lids and seals.
- Water level monitoring instrumentation in Manholes 6/6A to be completed during the next operation cycle.

### 3.6.5 Deficiencies Noted and Actions Taken or Planned to Address

The licensee noted the following deficiencies and actions taken or planned to address the deficiencies as noted in Table 7.7.1 of the CNS Flooding Walkdown Report:

- An open flood pathway through a drain line leading to the Turbine Building Sump TT (corrective action completed).
- A potentially open external flooding pathway from a Muti-Purpose Facility floor drain to the Augmented Radwate Building (ARW) Building (corrective action completed).
- A bathroom floor drain leading to Sump AA in the ARW Building with no isolation valve (corrective action completed).
- Sump drains by gravity from the Main Sump Water Treatment Facility to the sludge pond with no check valve to prevent flooding above 903.5 ft MSL (Change Evaluation Document was generated with completion scheduled for refueling outage 28).
- Degraded outfall vertical drain gate valve bypassing primary flood barriers (Work Order issued and scheduled for completion by October 14, 2013).
- Lack of waterproof conduit seals in existing conduit penetration seals for Diesel Fuel Tank 1A and 1B. (Change Evaluation Document to be prepared and implemented with completion scheduled for refueling outage 28).

### 3.6.6 Staff Analysis of Walkdowns

The NRC staff reviewed the licensee walkdown report dated November 27, 2012, as supplemented by letter dated November 21, 2013. The licensee evaluated the flood protection

procedures during the May 2011 flooding on the Missouri and Upper Mississippi River system when the plant entered Emergency Procedure 5.1 FLOOD. This procedure invokes numerous flood response measures, actions, and activities in addition to the other main response procedure 7.0.11 FLOOD CONTROL BARRIERS, which contains procedures for temporary flood barrier deployment. Based on an evaluation of these procedures during the May 2011 event, which was credited as a reasonable simulation by the licensee, the licensee generated a condition report to address procedural issues within the CNS CAP and assigned various corrective actions. The licensee stated that a person loading evaluation was to be performed for deployment of temporary flood barrier systems within the required time/action period, although no details of the evaluation were provided.

Non-conforming observations of flood protection features were entered into the CAP by initiation of a condition report. As part of the condition report process, the feature was evaluated with regard to meeting the design basis function and subsequent impact on plant operability. Several features were determined to be deficient based on presenting an open pathway for flooding and/or having an impact on an SSC required for safe shutdown by the effects of the water infiltration/accumulation. These features were entered into the CAP and dispositioned.

As discussed above, there are procedures in place for flood mitigation actions during a flood emergency event at CNS; however, the details for obtaining flood warning notifications were not provided by the licensee.

The licensee stated that condition reports were generated for APMs for items/features identified with an indeterminate or negative APM. A significant number of plant features were found to be indeterminate with regard to a specific APM value based on the presence of current or past water leakage/seepage. The licensee stated that walkdowns were developed with APM determined from 906 ft MSL. APMs for these exterior building walls, piping penetration seals, and conduit penetration seals were evaluated based on their original design basis, consisting of documented engineering criteria, vendor documentation, and contract documents. As discussed in Section 3.6.7 below, the licensee reviewed its APM determination process and entered any unknown APMs into the CAP.

Based on the 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

NRC staff issued an RAI to the licensee regarding the APM dated December 23, 2013. The licensee responded by letter dated January 31, 2014. The licensee has reviewed its APM determination process and entered any unknown APMs into the CAP. The NRC staff reviewed the response and the evaluation presented in walkdown report as described above in Section 3.3.6, and concluded that the licensee met the intent of the APM determination per NEI 12-07.

Based on the 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 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."<sup>9</sup> In accordance with the TI, NRC inspectors independently verified that the licensee implemented flooding walkdowns consistent with the intent of the walkdown guidance. Additionally, the inspectors independently performed walkdowns of a sample of flood protection features. The inspection report dated February 14, 2013,<sup>10</sup> documents the results of this inspection. The inspectors determined that the licensee's flooding walkdown team had not complied with station requirements for initiating condition reports when adverse conditions were identified and issued a non-cited violation of very low safety significance. The licensee initiated Condition Report CR-CNS-2012-06753 to address recurrence.

### 4.0 SSCS NOT WALKED DOWN

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

#### 4.1 Restricted Access

The licensee did not identify any restricted access features.

#### 4.2 Inaccessible Features

The licensee identified floor penetrations in energized areas of Diesel Generator #1, Room N100, and Diesel Generator #2, Room N101, as inaccessible, and stated that the features were to be inspected during refueling outage 28. These features were identified as walkdown package DG-1 and DG-2 in Table 7.8.1 of the licensee's Flooding Walkdown Report.

### 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

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<sup>9</sup> ADAMS Accession No. ML12129A108.

<sup>10</sup> ADAMS Accession No. ML13045A297.

adequacy of monitoring and maintenance programs for protective features. The NRC staff acknowledges that the licensee is to have the delayed walkdown items completed prior to startup from refueling outage 28, currently scheduled to begin in October 2014, consistent with the regulatory commitment. Furthermore, the 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.

O. Limpias

- 2 -

If you have any questions, please contact me at (301) 415-1081 or by e-mail at [Andrea.George@nrc.gov](mailto:Andrea.George@nrc.gov).

Sincerely,

*/RA by JRankin for/*

Andrea E. George, Project Manager  
Plant Licensing Branch IV-1  
Division of Operating Reactor Licensing  
Office of Nuclear Reactor Regulation

Docket No. 50-298

Enclosure:  
Staff Assessment of Flooding  
Walkdown Report

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\*email dated May 19, 2014

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