



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

July 6, 2017

Ms. Mary J. Fisher
Senior Director Fort Calhoun Station
Decommissioning
Omaha Public Power District
Fort Calhoun Station
Mail Stop FC-2-4
9610 Power Lane
Blair, NE 68008

SUBJECT: FORT CALHOUN STATION, UNIT 1 – NRC RESPONSE TO OMAHA PUBLIC POWER DISTRICT'S FINAL RESPONSE TO THE MARCH 12, 2012, REQUEST FOR INFORMATION LETTER REGARDING NEAR-TERM TASK FORCE RECOMMENDATIONS 2.1, 2.3, AND 9.3

Dear Ms. Fisher:

This letter provides the U.S. Nuclear Regulatory Commission's (NRC's) response to the letter received from Omaha Public Power District (OPPD, the licensee) on November 18, 2016 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML16323A206), related to post-Fukushima hazard reevaluations. In its letter, OPPD reaffirmed that Fort Calhoun Station, Unit 1 (Fort Calhoun) is no longer an operating plant, but is a permanently shut down and defueled reactor. Therefore, the licensee indicated that it considers the NRC's March 12, 2012, request for information under Title 10 of the *Code of Federal Regulations*, Section 50.54(f) (hereafter referred to as the 50.54(f) letter) to no longer be applicable to Fort Calhoun, and that it is not proceeding further with implementation of the requests in the 50.54(f) letter.

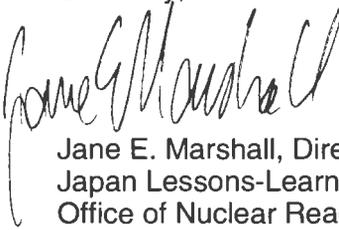
The staff disagrees that the 50.54(f) letter is not applicable because Fort Calhoun is no longer an operating plant. The 50.54(f) letter was issued to the licensee while Fort Calhoun was an operating plant and the staff's position is that once this letter was issued, the licensee is obligated to provide a response to all aspects of this letter. However, the staff evaluated information provided in response to the 50.54(f) letter to date, including reevaluated hazard information, to determine if any additional regulatory actions are necessary for Fort Calhoun as a facility in the decommissioning process. Based on this evaluation the staff has concluded that no further regulatory actions are necessary or likely to be developed by additional responses to the 50.54(f) letter. The staff's assessment is provided in the enclosure to this letter.

M. Fisher

- 2 -

If you have any questions regarding this letter, please contact Ms. Tekia Govan at 301-415-6197 or Tekia.Govan@nrc.gov.

Sincerely,

A handwritten signature in black ink, appearing to read "Jane E. Marshall". The signature is written in a cursive style with a large initial "J".

Jane E. Marshall, Director
Japan Lessons-Learned Division
Office of Nuclear Reactor Regulation

Enclosure:
Staff Assessment

Docket No. 50-285

cc: Distribution via Listserv

STAFF ASSESSMENT OF THE TERMINATION OF REMAINING 10 CFR 50.54(f)

HAZARD REEVALUATION ACTIVITIES FOR

FORT CALHOUN STATION, UNIT 1

SUMMARY

On November 18, 2016, Omaha Public Power District (OPPD, the licensee) submitted a letter (Agencywide Documents Access and Management System (ADAMS) Accession No. ML16323A206) asserting that since Fort Calhoun Station, Unit 1 (Fort Calhoun) is no longer an operating plant, it considers the Nuclear Regulatory Commission's (NRC's) March 12, 2012, request for information under Title 10 of the *Code of Federal Regulations*, Section 50.54(f) (hereafter referred to as the 50.54(f) letter) to no longer be applicable to Fort Calhoun, and that it is not proceeding further with implementation of the requests in the 50.54(f) letter.

The staff disagrees that the 50.54(f) letter is not applicable because Fort Calhoun is no longer an operating plant. The 50.54(f) letter was issued to the licensee while Fort Calhoun was an operating plant and the staff's position is that once this letter was issued, the licensee is obligated to provide a response to all aspects of this letter. However, the staff evaluated information provided in response to the 50.54(f) letter to date, including reevaluated hazard information, to determine if any additional regulatory actions are necessary for Fort Calhoun as a facility in the decommissioning process. The staff's evaluation considered whether any additional information that would be developed by completing the responses to the 50.54(f) letter would likely alter the staff's regulatory actions. The staff concluded that no further regulatory actions are necessary or likely to be developed by additional responses to the 50.54(f) letter. The basis for this conclusion is provided below.

BACKGROUND

The NRC issues the 50.54(f) letter to all nuclear power reactor licensees and construction permit holders in response to lessons learned from the March 2011 accident at Japan's Fukushima Dai-ichi nuclear power plant (ADAMS Accession No. ML12053A340). The 50.54(f) letter requests licensees perform seismic and flooding walkdowns, hazard reevaluations, and perform emergency preparedness communication and staffing evaluations for prolonged loss of power events affecting multiple units on site.

By letter dated June 24, 2016 (ADAMS Accession No. ML16176A213), OPPD certified permanent cessation of power operations of Fort Calhoun, per 10 CFR 50.82(a)(1)(i). By letter dated November 13, 2016 (ADAMS Accession No. ML16319A254), OPPD certified that the fuel has been permanently removed from the Fort Calhoun reactor vessel and placed in the spent fuel pool (SFP), per 10 CFR 50.82(a)(1)(ii). The licensee acknowledged that once these certifications are docketed, the Fort Calhoun license will no longer authorize operation of the reactor or placement or retention of fuel in the reactor vessel.

EVALUATION

The NRC staff verified that the Fort Calhoun certifications are docketed and that the license no longer authorizes operation of the reactor or placement or retention of fuel in the reactor vessel. Because retention of fuel in the reactor vessel is no longer authorized, any potential fuel-related accident scenarios are limited to those associated with the SFP.

Enclosure

To assess the need for additional actions for Fort Calhoun as a permanently shut down reactor, the following evaluation documents the staff's review of the actions related to the 50.54(f) taken to date and considers the risk from the remaining fuel in the SFP considering its heat load, inherent design margins, existing mitigation strategies, initiating event frequencies, and the site's ability to cope with the reevaluated hazards.

Seismic and Flooding Walkdowns

The seismic and flooding walkdowns were completed prior to the decision to cease operation of the reactor. The NRC staff determined that sufficient information was provided to be responsive to Enclosures 3 and 4 of the 50.54(f) letter as documented in the seismic and flooding walkdown report staff assessments dated April 22, 2014 (ADAMS Accession No. ML14105A373), and June 24, 2014 (ADAMS Accession No. ML14157A079), respectively.

Seismic Hazard Reevaluation

Fort Calhoun transitioned from an operating reactor to a permanently defueled reactor prior to the completion of all seismic reevaluation activities requested by the 50.54(f) letter. However, since the reactor is permanently defueled, the only remaining seismic area of interest relates to the safety of the SFP. The safety of fuel located in the SFP is assured for an extended period through maintenance of the SFP's structural integrity, which preserves coolant inventory and maintains margin to prevent criticality. A plant-specific seismic evaluation of the Fort Calhoun SFP was performed by OPPD as part of the 50.54(f) letter response and was submitted to the NRC by letter dated May 25, 2016 (ADAMS Accession No. ML16146A545). The NRC staff completed its review of the submittal and responded by letter dated August 4, 2016 (ADAMS Accession No. ML16182A361). The NRC staff's review concluded that: (1) the licensee had demonstrated that the SFP structure is sufficiently robust to withstand the reevaluated ground motions at the site; and (2) the licensee had acceptably demonstrated that non-structural components, whose failure could lead to potential drain-down of the SFP due to a seismic event, are sufficiently robust to withstand the reevaluated ground motions at the site. The staff concludes that since the SFP is sufficiently robust to withstand the reevaluated ground motions at the site, additional regulatory actions associated with the reevaluated seismic hazard are not warranted.

Flooding Hazard Reevaluation

Fort Calhoun transitioned from an operating reactor to a permanently defueled reactor prior to the completion of all flooding reevaluation activities requested by the 50.54(f) letter. In light of the Fort Calhoun shutdown, the staff assessed the need for any additional regulatory actions associated with the SFP in relation to the reevaluated flood hazard. To perform this assessment, staff followed similar criteria that guided the staff's conclusions in its previous study documented in Enclosure 1 of SECY-15-0081, "Staff Evaluation of Applicability of Lessons Learned from the Fukushima Dai-ichi Accident to Facilities other than Operating Power Reactors," dated June 9, 2015 (ADAMS Accession No. ML15050A066). These criteria included an assessment of heat load, the site's ability to cope with and mitigate an accident, and consideration of initiating event frequencies. The key points of the staff's assessment for Fort Calhoun are provided below.

Heat Load

The study in SECY-15-0081 contains the staff's evaluation for decommissioned power reactors and it concluded that additional regulatory actions are not warranted because existing regulatory

processes provide for adequate protection of public health and safety. The evaluation in the SECY paper included recently decommissioned operating power plants. As documented in the SECY paper, the staff assessed the risk of external events (including flooding) for the decommissioned power reactors that have fuel stored in their SFPs (including those that had recently permanently ceased operation). The staff's evaluation noted that previous studies and analyses have shown that the SFP structure is extremely robust and capable of withstanding the severe external events addressed by that paper. The studies cited in the SECY paper included:

- NUREG-1738, "Technical Study of Spent Fuel Pool Accident Risk at Decommissioning Nuclear Power Plants" (ADAMS Accession No. ML010430066); and
- NUREG-2161, "Consequence Study of a Beyond-Design-Basis Earthquake Affecting the Spent Fuel Pool for a U.S. Mark I Boiling Water Reactor" (ADAMS Accession No. ML14255A365).

SECY-15-0081 also concluded that based on the decay heat levels of the five recently permanently shutdown reactors and the time available to take mitigating actions, there were no identified safety concerns that needed further analysis.

With respect to Fort Calhoun, an NRC letter dated June 14, 2017 (ADAMS Accession No. ML17124A114) withdrew Order EA-12-049, "Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events." The staff noted in its evaluation of the order withdrawal that based on the calculated decay heat level as of August 31, 2017, the time to boil in the SFP will be approximately 32 hours and the time to reduce SFP water inventory to a point 10 feet above the top of the spent fuel rack will be an additional 153.5 hours. Thus, the licensee would have a total of approximately 185 hours, or 7.7 days, to respond to an extended loss of power to the normal SFP cooling system, such as what could occur following a beyond-design-basis external event (BDBEE), prior to water level reaching a point where a person standing on the SFP operating deck would no longer maintain substantial shielding. The 7.7 day timeframe provides sufficient time for the licensee to obtain off-site resources on an ad hoc basis to sustain the SFP cooling function indefinitely.

Coping and Mitigation Strategies

The licensee's October 31, 2016, submittal (ADAMS Accession No. ML16307A209) described a plan to mitigate beyond-design-basis events for the fuel permanently removed from the reactor vessel to the SFP. In its letter, the licensee provided an assessment of the reevaluated flooding hazards applicable to Fort Calhoun with all fuel in the SFP and a plan that included the capability to mitigate these reevaluated flooding hazards. The sequence of events were provided in OPPD's letter for two limiting flooding scenarios, in addition to the extended loss of alternating current power. The SFP temperature and boil off calculations conservatively used a decay heat level corresponding to 60 days after shutdown for fuel removed from the reactor pressure vessel to the SFP. The reevaluated flood hazards used in the October 31, 2016, analysis are consistent with the hazards that are identified in an NRC letter to the licensee dated December 22, 2015 (ADAMS Accession No. ML15355A087).

The licensee voluntarily submitted the October 31, 2016 letter which provided details regarding onsite portable equipment that will be available to mitigate a postulated BDBEE for the SFP including those associated with the reevaluated flood hazards. This includes pumps, valves, portable diesel generators (DGs), and piping stored in a robust structure that is protected from BDBEEs. Further, the licensee has equipment available, pursuant to the requirements of 10 CFR 50.54(hh)(2), and this equipment is also stored in a robust structure. In addition, the

low decay heat and long boil off period of the SFP provides sufficient time for the licensee to obtain off-site resources on an ad hoc basis to sustain the SFP cooling function indefinitely.

The strategy to maintain SFP cooling is to replenish water in the SFP that is lost due to boil-off. Water to maintain the level in the SFP is supplied from the safety injection and refueling water tank via one of two submersible pumps. Electrical power is supplied via one of two portable diesel generators (DG). The DGs are located such that this strategy can be implemented for the worst case sunny day dam failure and adequate time is available to deploy equipment before flood waters arrive at the site. If conditions exist where a beyond-design-basis flood due to a hydrologic failure could submerge the DG in their normal storage location, one DG is relocated to a higher elevation above the predicted level of a flood. Provided the additional equipment onsite and the response strategy outlined by the licensee, the staff concludes that the site has additional capabilities to cope with the BDB flooding events.

Initiating Event Frequency

The staff also considered the likelihood of beyond-design-basis flooding scenarios that might challenge the integrity and long-term cooling capability of the SFP. The only scenarios that would result in significant flooding at the site are related to upstream dam failures.

Because of the complexity of the Missouri River, the system dam failure analysis for Fort Calhoun was performed by the U.S. Army Corps of Engineers (USACE). The six large dams on the Missouri River operated by the USACE upstream of Fort Calhoun were modeled by the USACE and the analysis was included in the Fort Calhoun flooding hazard reevaluation report dated February 4, 2015 (ADAMS Accession No. ML15042A162).

The NRC staff is able to conclude that the failure probability of the upper three Missouri River dams is sufficiently low, such that additional regulatory actions, beyond those voluntary actions described in OPPD's October 31, 2016, letter, are not warranted for potential failure of these dams. The frequency of the dam failures are such that these scenarios would not meet the NRC's backfit criteria, which are found in NUREG/BR-0058, Revision 4, "Regulatory Analysis Guidelines of the U.S. Nuclear Regulatory Commission" (available at: <http://www.nrc.gov/reading-rm/doccollections/nuregs/brochures/br0058/br0058r4.pdf>).

In addition to the upper three dams, the NRC staff considered flooding scenarios associated with the failure of the lower three Missouri River dams, examining the associated flood levels and their impact on the SFP. These dam failure scenarios could produce flood levels in excess of the current design basis flood for the site. However, based on the anticipated flood levels, the NRC staff concluded that the design of the SFP and the surrounding building have sufficient margin to maintain its structural integrity under the anticipated flood levels associated with the failure of these three Missouri River dams. With the structural integrity maintained, the staff concludes that the plans described in OPPD's October 31, 2016, letter provide a reasonable approach to address the postulated flooding conditions associated with the failure scenarios of the lower three Missouri River dams. Therefore, additional regulatory actions are not warranted to protect or mitigate against those scenarios.

Flooding Conclusion

Based on the evaluation above, the staff finds that the conclusions in SECY-15-0081 for decommissioned reactors remain valid; therefore, no additional regulatory actions are warranted. In addition, the mitigation strategies developed for the SFP described in OPPD's October 31, 2016, submittal are prudent, and if appropriately implemented, will further enhance

the site's ability to cope with BDBEE. Further, the staff concludes that further response to the 50.54(f) letter in the flooding area is no longer required.

Staff and Communication Assessments

The licensee submitted the requested information pursuant to the 50.54(f) letter related to enhanced communication in a letter dated October 31, 2012 (ADAMS Accession No. ML12307A118), as supplemented by a letter dated February 22, 2013 (ADAMS Accession No. ML13057A115). The licensee submitted the requested information pursuant to the 50.54(f) letter related to staffing in a letter dated May 27, 2016 (ADAMS Accession No. ML16148A072). No further responses on staffing and communications were expected from the licensee.

As a result of the very low decay heat levels present in the SFP within a few months following permanent shutdown of the reactor, recovery and mitigation actions could be completed over a long period of time due to the slow progression of any accident. Thus, SFP beyond-design-basis accident scenarios at decommissioning reactor sites do not require the enhanced communication and staffing that may be necessary for the reactor-centered events the 50.54(f) letter addresses. Based on the above, the staff finds that no additional actions are necessary in relation to staffing and communications in response to the 50.54(f) letter.

CONCLUSION

The staff disagrees that the 50.54(f) letter is not applicable because Fort Calhoun is no longer operating. Based on the staff's evaluation of OPPD actions to date, the staff has concluded that no further regulatory actions are necessary or likely to be developed by additional responses to the 50.54(f) letter.

SUBJECT: FORT CALHOUN STATION, UNIT 1 – NRC RESPONSE TO OMAHA PUBLIC POWER DISTRICT'S FINAL RESPONSE TO THE MARCH 12, 2012, REQUEST FOR INFORMATION LETTER REGARDING NEAR-TERM TASK FORCE RECOMMENDATIONS 2.1, 2.3, AND 9.3 DATED JULY 6, 2017

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