



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

January 10, 2019

Mr. Fadi Diya  
Senior Vice President and  
Chief Nuclear Officer  
Ameren Missouri  
Callaway Energy Center  
8315 County Road 459  
Steedman, MO 65077

SUBJECT: CALLAWAY PLANT, UNIT NO. 1 – RESPONSE TO REQUEST FOR  
EXTENSION OF SEISMIC PROBABILISTIC RISK ASSESSMENT SUBMITTAL  
(EPID NO. L-2018-JLD-0153)

Dear Mr. Diya:

The purpose of this letter is to provide the U.S. Nuclear Regulatory Commission (NRC) staff's response to the letter dated November 14, 2018 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML18318A059), submitted by Union Electric Company (Ameren Missouri, the licensee), related to post-Fukushima seismic hazard reevaluations at Callaway Plant, Unit No. 1 (Callaway). The letter submitted by the licensee requests an extension of the submittal date of the seismic probabilistic risk assessment (SPRA), associated with the seismic hazard reevaluation for Callaway, to September 30, 2019. According to the licensee, the request was made to allow additional time to fully complete SPRA refinement and analysis that realistically quantifies the seismic risk at Callaway. Specifically, the licensee's letter states that a peer review was performed in June of 2018, and the peer review team noted that a number of the modeling approaches in the fragility analysis and plant response analysis for the SPRA are overly conservative and have resulted in a seismic core damage frequency result that appears unrealistic for the Callaway plant design and operation. The licensee's letter indicates that more time is necessary to address the necessary modeling refinements and to complete the peer review closeout process. The NRC staff has determined that extending the submittal date of the SPRA is acceptable.

#### BACKGROUND

By letter dated March 12, 2012 (ADAMS Accession No. ML12053A340), the NRC issued a 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 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. Enclosure 1 of the 50.54(f) letter requested that licensees perform seismic hazard reevaluations using present-day methodologies and guidance, and then assess the impact of the reevaluated hazard on the plant (e.g., through an SPRA). The NRC staff would review the completed responses to these assessments to determine if there is a need for any additional regulatory actions, such as a plant-specific backfit.

Concurrent with the reevaluation of seismic hazards, licensees were required to develop and implement mitigating strategies under NRC Order EA-12-049, "Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events" (ADAMS Accession No. ML12054A735). In order to proceed with the implementation of Order EA-12-049, licensees used the current design basis seismic hazard or the most recent seismic hazard information, which may not be based on present-day methodologies and guidance, in developing their mitigation strategies.

By letter dated October 27, 2015 (ADAMS Accession No. ML15194A015), the NRC determined which licensees (1) should perform an SPRA; (2) should perform limited scope evaluations; or (3) had no further actions to perform based on a comparison of the reevaluated seismic hazard and the site's design-basis earthquake. As documented in that letter, the licensee is expected to complete an SPRA for Callaway which will also assess high frequency ground motion effects. The Callaway SPRA was expected to be submitted by December 31, 2018, a date that had been previously extended from December 31, 2017 (ADAMS Accession No. ML17200D113). The SPRA results may also be used to develop an assessment of whether the mitigation strategies of NRC Order EA-12-049 (or an alternate mitigation strategy) are acceptable as designed or need to be revised given the potential effects of the reevaluated seismic hazard. This assessment is called the seismic Mitigation Strategies Assessment (MSA).

In its letter dated November 14, 2018, the licensee requested that the submittal date for the SPRA be moved to September 30, 2019. The licensee's letter also requested that the submittal date for the corresponding MSA be moved to December 31, 2019.

In addition to the SPRA, a limited-scope evaluation for the spent fuel pool (SFP) at Callaway was expected to be performed. This evaluation was completed by the licensee and the NRC issued a corresponding staff assessment by letter dated January 23, 2018 (ADAMS Accession No. ML18003B419).

## EVALUATION

The staff's evaluation of the licensee's request for extension of the seismic reevaluations considered several factors including: (1) the schedule of the Callaway submittal, including the extension, as it relates to the NRC's overall SPRA submittal schedule; (2) the additional defense-in-depth capabilities achieved through Order EA-12-049 and Order EA-12-051, "Reliable Spent Fuel Pool Instrumentation" (ADAMS Accession No. ML12054A679); (3) the seismic design margin currently existing in nuclear power plants; and (4) the documented ability of Callaway, specifically, to cope with earthquakes larger than the design-basis earthquake.

As shown in the NRC's letter dated October 27, 2015, licensees were requested to perform specific evaluations based on a number of criteria associated with the magnitude of their reevaluated seismic hazard and how it compared to their design basis seismic hazard. A subset of plants, which included Callaway, were requested to perform SPRAs. Within this subset, there is a range of dates by which licensees are to submit their SPRA reports. The range of dates begins in March 2017 and continues through December 2019. The ordering of licensee submittals within this range of dates was not based on safety or seismic risk concerns. Thus, the plants were not graded within this submittal date range in order of increasing or decreasing seismic risk. The Callaway extension request moves the SPRA submittal within the existing date range and not beyond the last date in the range. Therefore, the NRC staff's basis for continued safe operation, which is documented by letter dated May 9, 2014 (ADAMS Accession No. ML14111A147), is still applicable.

The staff also considered the additional defense-in-depth that has been achieved for coping with an extended loss of alternating current power and loss of normal access to the ultimate heat sink due to external events, including those caused by seismic events, as a result of Callaway's compliance with Orders EA-12-049 and EA-12-051. The NRC staff issued Callaway's safety evaluation regarding implementation of these mitigating strategies and reliable SFP instrumentation on February 2, 2017 (ADAMS Accession No. ML17010A332). The NRC inspection staff also verified the appropriate implementation of these two orders at Callaway and documented this inspection by letter dated August 28, 2017 (ADAMS Accession No. ML17277A053). The completion of this work results in a safety benefit and an enhanced ability to mitigate beyond-design-basis events, including seismic events, at Callaway during the period of extension.

Information regarding the seismic design margin inherent in nuclear plants, including NRC and industry studies summarized in the NRC's letter dated May 9, 2014, outlines a number of reasons that support continued operation while seismic reevaluations are continuing. These reasons include a safety margin in the design such that plants can withstand potential earthquakes exceeding the original design-basis and that the fleet-wide seismic core damage risk as a result of the reevaluated hazard did not pose a concern regarding adequate protection.

The ability of Callaway, specifically, to cope with earthquakes larger than the design-basis earthquake is documented in the Expedited Seismic Evaluation Process (ESEP) report. The staff's assessment of the Callaway ESEP report can be found in a letter dated October 14, 2015 (ADAMS Accession No. ML15282A044). The assessment concluded that the licensee demonstrated that a set of mitigation strategies equipment, which could be used to maintain or restore core cooling and containment function, has additional safety margin such that this equipment can cope with an earthquake at least two times the safe shutdown earthquake for Callaway.

Additionally, the limited-scope SFP seismic integrity evaluation performed by the licensee has confirmed that the pool is seismically adequate and can retain the necessary water inventory in accordance with the NRC-endorsed SFP Evaluation Guidance (ADAMS Accession No. ML17034A408). The SFP seismic evaluation was based on the reevaluated ground motion response spectrum peak spectral acceleration documented in the licensee's Seismic Hazard Evaluation (ADAMS Package Accession No. ML14090A446). The SFP seismic integrity evaluation provides assurance that the spent fuel will be adequately protected from the reevaluated seismic hazards during the requested extension period.

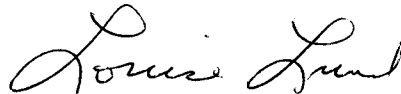
In summary, the licensee's extension request does not move the SPRA submittal outside the date range allotted to all plants who are to perform an SPRA. Compliance with NRC Orders EA-12-049 and EA-12-051 has provided a safety benefit and an enhanced ability to mitigate beyond-design-basis events at Callaway during the period of extension. The combination of the seismic capacity inherent in the design of nuclear power plants and the Callaway-specific evaluations of the seismic capacity of safe-shutdown equipment and the SFP, as documented by the ESEP and the SFP seismic integrity evaluations, respectively, provides additional assurance that the licensee can cope with an earthquake larger than the design-basis earthquake while the longer-term seismic risk evaluations are ongoing. For these reasons, the staff finds that extension of the due date of the SPRA submittal at Callaway, is acceptable. In addition, the NRC staff has no objection to the licensee's proposed MSA submittal date of December 31, 2019.

CONCLUSION

Based on the staff's evaluation, and after consultation with the Director of the NRC's Office of Nuclear Reactor Regulation, the NRC concludes that the licensee's proposal to extend the due date of the submittal of the SPRA related to the 50.54(f) letter request for information for seismic events is acceptable. Accordingly, the required response date for the SPRA submittal is extended until September 30, 2019.

If you have any questions, please contact Peter Bamford, Project Manager, at (301) 415-2833 or via e-mail at [Peter.Bamford@nrc.gov](mailto:Peter.Bamford@nrc.gov).

Sincerely,

A handwritten signature in black ink, appearing to read "Louise Lund". The signature is fluid and cursive, with the first name "Louise" written in a larger, more prominent script than the last name "Lund".

Louise Lund, Director  
Division of Licensing Projects  
Office of Nuclear Reactor Regulation

Docket No. 50-483

cc: Distribution via Listserv

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