



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

February 1, 2018

Mr. Joel P. Gebbie  
Senior Vice President and Chief  
Nuclear Officer  
Indiana Michigan Power Company  
Nuclear Generation Group  
Donald C. Cook Nuclear Plant  
One Cook Place  
Bridgman, MI 49106

SUBJECT: DONALD C. COOK NUCLEAR PLANT, UNITS 1 AND 2 – RESPONSE TO  
REQUEST FOR EXTENSION OF SEISMIC PROBABILISTIC RISK  
ASSESSMENT SUBMITTAL

Dear Mr. Gebbie:

The purpose of this letter is to provide the U.S. Nuclear Regulatory Commission (NRC) staff's response to the letter received from Indiana Michigan Power Company (the licensee), on November 15, 2017 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML17321A083), related to post-Fukushima seismic hazard reevaluations. The letter requests an extension of the submittal date of the seismic probabilistic risk assessment (SPRA) associated with the seismic hazard reevaluation for Donald C. Cook Nuclear Plant, Units 1 and 2 (D.C. Cook) to November 6, 2019. The request was made in order to fully complete separate SPRA modeling for both units in order to ensure realistic SPRA results for D.C. Cook. The NRC staff has determined that extending the submittal date of the SPRA is acceptable.

**BACKGROUND**

By letter dated March 12, 2012, 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 (ADAMS Accession No. ML12053A340). 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, D.C. Cook is expected to complete an SPRA, which will also assess high frequency ground motion effects, and a limited-scope evaluation for the spent fuel pool (SFP).

The limited-scope evaluation for the SFP at D.C. Cook was completed, and the NRC issued a corresponding staff assessment by letter dated November 9, 2016 (ADAMS Accession No. ML16308A086). The SPRA was expected to be submitted to the NRC by June 30, 2018.

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). The seismic MSA was also due at the time of the SPRA submittal.

By letter dated November 15, 2017, the licensee requested an extension of the submittal date for the SPRA and corresponding MSA until November 6, 2019.

### 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 D.C. Cook 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. ML12056A044); (3) the magnitude of the reevaluated seismic hazard at D.C. Cook versus the design-basis earthquake; (4) the seismic design margin currently existing in nuclear power plants; and (5) the documented ability of D.C. Cook, specifically, to cope with earthquakes larger than the design-basis earthquake.

As shown in the NRC's October 27, 2015, letter, 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 licensees were requested to perform SPRAs. D.C. Cook was one of the sites requested to perform an SPRA. 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. That is to say, the plants are not graded within this submittal date range in order of increasing or decreasing seismic risk. The D.C. Cook 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 stated in a May 9, 2014 (ADAMS Accession No. ML14111A147), letter, 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 D.C. Cook's compliance with Orders EA-12-049 and EA-12-051. The NRC staff issued D.C. Cook's safety evaluation regarding implementation of these mitigating strategies and reliable spent fuel pool instrumentation on November 9, 2015 (ADAMS Accession No. ML15264A851). The NRC

inspectors verified implementation at D.C. Cook in May 2016 (ADAMS Accession No. ML16154A450). The completion of this work results in a safety benefit and an enhanced ability to mitigate beyond-design-basis events, including seismic events, at D.C. Cook during the period of extension.

Another consideration of the NRC staff was the relationship between the existing design-basis earthquake and the reevaluated seismic hazard at the D.C. Cook site.

As documented in the licensee's December 18, 2014 (ADAMS Accession No. ML14357A053), Expedited Seismic Evaluation Process (ESEP) report, the maximum ratio of the reevaluated Ground Motion Response Spectrum (GMRS) when compared to the site's design-basis Safe Shutdown Earthquake (SSE) at the time of that evaluation was 1.93. As described in the following paragraphs, there is inherent seismic margin in the design of nuclear power plants, and D.C. Cook has performed analyses demonstrating that safe shutdown equipment at the plant can cope with an earthquake at least 1.93 times the SSE.

Information regarding the seismic design margin inherent in nuclear plants, including NRC and industry studies summarized in the NRC's May 9, 2014, letter, outlines a number of reasons for 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 D.C. Cook, specifically, to cope with earthquakes larger than the design-basis earthquake is documented in the December 18, 2014 (ADAMS Accession No. ML14357A053), ESEP report. The staff's assessment can be found in a letter dated August 25, 2015 (ADAMS Accession No. ML15232A411). The staff's 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 1.93 times the SSE for D.C. Cook. The licensee stated in the November 15, 2017, SPRA extension request letter that all actions necessary to meet the ESEP beyond-design-basis seismic criteria for the credited plant equipment have been completed. This statement is in reference to the actions listed in Section 8.4 of the ESEP submittal (ADAMS Accession No. ML14357A053). Additional details regarding the closure of these actions were submitted by the licensee by letter dated September 9, 2016 (ADAMS Accession No. ML16256A773).

As indicated in the licensee's November 15, 2017, SPRA extension request letter, the staff recognizes that, with the adjustment of the shear wave velocities to account for a layer of beach sand<sup>1</sup>, the GMRS-to-SSE ratio has increased from 1.93 to approximately 2.47. This increase corresponds to a peak spectral acceleration value of approximately 0.596g as documented in the licensee's SFP evaluation submittal dated October 12, 2016 (ADAMS Accession No. ML16288A843). The industry guidance document for performing the ESEP evaluations is Electric Power Research Institute (EPRI) Report 3002000704, "Seismic Evaluation Guidance: Augmented Approach for the Resolution of Fukushima Near-Term Task Force Recommendation 2.1: Seismic" (ADAMS Accession No. ML13102A142), as endorsed by NRC letter dated May 7, 2013 (ADAMS Accession No. ML13106A331). The EPRI guidance report

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<sup>1</sup> Details of the inclusion of the beach sand layer in the calculation of the seismic hazard can be found in the NRC staff's assessment of D.C. Cook's reevaluated seismic hazard (ADAMS Accession No. ML15097A196).

states that the review level ground motion (RLGM) for the ESEP is not to exceed two times the SSE of the site. Therefore, even in light of the increase of the peak spectral acceleration due to the inclusion of the beach sand layer in the GMRS, the ESEP evaluation would still have been limited to a GMRS-to-SSE ratio of 2.0. The difference in the ratios (1.93 versus 2.0) is relatively small. Therefore, the staff finds that the results of the ESEP evaluation at a ratio of 1.93 are still acceptable and continue to provide useful insights into the seismic margin inherent in the D.C. Cook plant design.

In summary, D.C. Cook'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 D.C. Cook during the period of extension. The combination of the seismic capacity inherent in the design of nuclear power plants and the D.C. Cook-specific evaluation of the seismic capacity of safe-shutdown equipment as documented by the ESEP provides additional assurance that D.C. Cook 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 to support unit-specific SPRA modeling refinements and analyses, in order to more realistically quantify the seismic risk at D.C. Cook, is acceptable.

### CONCLUSION

Based on the staff's evaluation, and after consultation with the Acting 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 and the extension of the corresponding seismic MSA are acceptable. Accordingly, the required response date for the SPRA submittal and MSA submittal is extended until November 6, 2019.

If you have any questions, please contact Brett Titus, Senior Project Manager, at (301) 415-3075 or via e-mail at [Brett.Titus@nrc.gov](mailto:Brett.Titus@nrc.gov).

Sincerely,

A handwritten signature in cursive script, appearing to read "Louise Lund".

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

Docket Nos. 50-315 and 50-316

cc: Distribution via Listserv

DONALD C. COOK NUCLEAR PLANT, UNITS 1 AND 2 – RESPONSE TO REQUEST FOR  
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February 1, 2018

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