



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

September 17, 2018

Mr. Bryan C. Hanson  
Senior Vice President  
Exelon Generation Company, LLC  
President and Chief Nuclear Officer (CNO)  
Exelon Nuclear  
4300 Winfield Road  
Warrenville, IL 60555

SUBJECT: DRESDEN NUCLEAR POWER STATION, UNITS 2 AND 3 – RESPONSE TO  
REQUEST FOR EXTENSION OF SEISMIC PROBABILISTIC RISK  
ASSESSMENT SUBMITTAL

Dear Mr. Hanson:

The purpose of this letter is to provide the U.S. Nuclear Regulatory Commission (NRC) staff's response to the letter received from Exelon Generation Company, LLC (the licensee), dated May 14, 2018 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML18134A224), 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 Dresden Nuclear Power Station, Units 2 and 3 (Dresden) to December 31, 2019. The request was made in order to expand the scope of the Dresden SPRA to include additional structural modeling and analysis in order to ensure realistic SPRA results for Dresden, and to allow the necessary time to complete the SPRA peer review and resolution of any resulting findings and observations. The NRC staff has determined that extending the submittal date of the SPRA is acceptable.

#### BACKGROUND

By letter dated March 12, 2012, the NRC staff 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 as directed by 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, Dresden 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 licensee completed Dresden's limited-scope evaluation for the SFP and submitted its site-specific data to the NRC by letter dated August 31, 2016 (ADAMS Accession No. ML16244A801). The NRC issued a corresponding staff assessment by letter dated November 8, 2016 (ADAMS Accession No. ML16291A021). The SPRA was expected to be submitted to the NRC by June 30, 2019.

In its May 14, 2018, letter, the licensee requested an extension of the submittal date for the SPRA until December 31, 2019.

### EVALUATION

The staff's evaluation of the licensee's request for extension of the due date for the SPRA considered several factors including: (1) the schedule of the Dresden 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 Dresden versus the design-basis earthquake; (4) the seismic design margin currently existing in nuclear power plants; and (5) the documented ability of Dresden, 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. Dresden 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 Dresden 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, letter (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 Dresden's compliance with Orders EA-12-049 and EA-12-051. The NRC staff issued Dresden's safety evaluation regarding implementation of these mitigating strategies and reliable spent fuel pool instrumentation on February 16, 2017 (ADAMS Accession No. ML17037C929). The NRC

inspectors verified implementation at Dresden and issued an inspection report in January 2018 (ADAMS Accession No. ML18002A344). The completion of this work results in a safety benefit and an enhanced ability to mitigate beyond-design-basis events, including seismic events, at Dresden 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 Dresden site.

As documented in the licensee's December 2014, Expedited Seismic Evaluation Process (ESEP) report (ADAMS Accession No. ML14360A123), 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 1.78. As described in the following paragraphs, there is inherent seismic margin in the design of nuclear power plants, and Dresden has performed analyses demonstrating that certain key installed equipment relied upon to implement mitigating strategies can cope with an earthquake at least 1.78 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 safety margins in the designs such that plants can withstand potential earthquakes exceeding the original design-basis and that the impact on fleet-wide seismic core damage risk as a result of the reevaluated hazard does not pose a concern regarding adequate protection.

The ability of Dresden to cope with earthquakes larger than the design-basis earthquake was initially documented, as an interim evaluation, in Dresden's ESEP report. The NRC staff issued its assessment of the ESEP report in a letter dated June 30, 2015 (ADAMS Accession No. ML15173A244). 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 1.78 times the SSE for Dresden. The licensee stated in its May 14, 2018, 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. No modifications were identified or required as a result of the Dresden ESEP.

Dresden also submitted its SFP seismic evaluation by letter dated August 31, 2016 (ADAMS Accession No. ML16244A801), confirming that the Dresden SFPs met the criteria of the applicable EPRI seismic evaluation guidance and are seismically adequate in accordance with NTF 2.1 seismic evaluation criteria. The NRC staff's November 2016 staff assessment concluded that the licensee's SFP seismic integrity evaluation met the criteria of the SFP Evaluation Guidance Report for Dresden.

Finally, by letter dated August 31, 2017 (ADAMS Accession No. ML17243A113), the licensee submitted its seismic hazard mitigating strategies assessment (MSA) report. The seismic MSA is an assessment of whether the mitigating 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. The licensee followed the NRC-endorsed MSA guidance and concluded that these mitigating strategies remain acceptable and no further modifications are necessary. The NRC staff issued its staff assessment of the Dresden seismic MSA on March 22, 2018 (ADAMS Accession No. ML18068A654), and concluded that the licensee appropriately implemented the MSA guidance and demonstrated that the licensee's plans for

the development and implementation of guidance and strategies under Order EA-12-049 appropriately address the reevaluated seismic hazard information.

In summary, Dresden'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 Dresden during the period of extension. The combination of the seismic capacity inherent in the design of nuclear power plants, the Dresden-specific evaluation of the seismic capacity of key installed equipment documented by the ESEP, Dresden's SFP seismic evaluation, and confirmation of the EA-12-049 mitigating strategies considering the reevaluated seismic hazard, as documented in the seismic MSA report, provides additional assurance that Dresden 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 Dresden, and to allow appropriate time for the necessary peer review activities, is acceptable.

### 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 request to extend the due date of the SPRA submittal 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 December 31, 2019.

If you have any questions, please contact Steve Philpott, Project Manager, at (301) 415-2365 or via e-mail at [Stephen.Philpott@nrc.gov](mailto:Stephen.Philpott@nrc.gov).

Sincerely,



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

Docket Nos. 50-237 and 50-249

cc: Distribution via Listserv

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**ADAMS Accession No. ML18236A262**

**\*Via e-mail**

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