



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

July 10, 2018

Ms. Cheryl A. Gayheart
Regulatory Affairs Director
Southern Nuclear Operating Co., Inc.
3535 Colonnade Parkway
Birmingham, AL 35243

SUBJECT: VOGTLE ELECTRIC GENERATING PLANT, UNITS 1 AND 2 – SEISMIC
HAZARD MITIGATION STRATEGIES ASSESSMENT (CAC NOS. MF7888 AND
MF7889; EPID L-2016-JLD-0006)

Dear Ms. Gayheart:

By letter dated March 12, 2012 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML12053A340), the U.S. Nuclear Regulatory Commission (NRC) issued a request for information to all power reactor licensees and holders of construction permits in active or deferred status, pursuant to Title 10 of the *Code of Federal Regulations*, Section 50.54(f), "Conditions of Licenses" (hereafter referred to as the "50.54(f) letter"). The request was issued in connection with implementing lessons learned from the 2011 accident at the Fukushima Dai-ichi nuclear power plant, as documented in the NRC's Near-Term Task Force report (ADAMS Accession No. ML111861807).

Enclosure 1 to the 50.54(f) letter requested that licensees reevaluate seismic hazards for their site(s) using present-day methods and regulatory guidance used by the NRC staff when reviewing applications for early site permits and combined licenses. Concurrent with the reevaluation of seismic hazards, licensees were required to develop and implement mitigating strategies in accordance with 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 implementation of Order EA-12-049, licensees used the current licensing basis seismic hazard or the most recent seismic hazard information, which may not have been based on present-day methodologies and guidance, in the development of their mitigating strategies.

By letter dated December 5, 2017 (ADAMS Accession No. ML17339A367), Southern Nuclear Operating Company, Inc. (SNC, the licensee), submitted its seismic mitigation strategies assessment (MSA) for the Vogtle Electric Generating Plant, Units 1 and 2 (Vogtle). The MSA is intended to confirm that licensees have adequately addressed the reevaluated seismic hazards within their mitigating strategies for beyond-design-basis external events. The purpose of this letter is to provide the NRC's assessment of the Vogtle MSA.

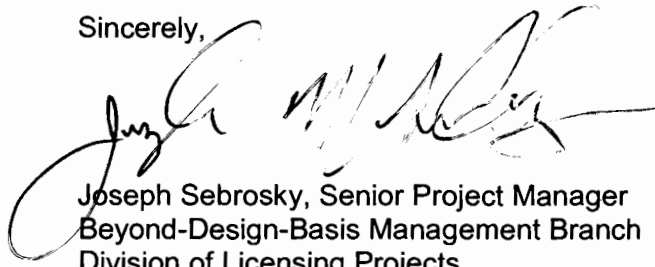
The NRC staff has concluded that the Vogtle MSA was performed consistent with the guidance described in Appendix H of Nuclear Energy Institute (NEI) guidance document NEI 12-06, Revision 4. The guidance in NEI 12-06, Revision 4, and Appendix H in particular, supports the proposed Mitigation of Beyond-Design-Basis Events rulemaking. In a letter to the NEI dated

February 8, 2017 (ADAMS Accession No. ML17034A286), the NRC staff stated that Japan Lessons-Learned Division (JLD) Interim Staff Guidance (ISG) JLD-ISG-2012-01, Revision 2 (ADAMS Package Accession No. ML17005A182) had been issued and had been made publicly available. This ISG revision endorsed NEI 12-06, Revision 4, with exceptions, clarifications and additions.

In addition, the licensee has demonstrated that the alternate mitigation strategies, if appropriately implemented, are reasonably protected from reevaluated seismic hazard conditions for beyond-design-basis external events. This closes out the NRC's efforts associated with CAC Nos. MF7888 and MF7889.

If you have any questions, please contact me at 301-415-1132 or via e-mail at Joseph.Sebrosky@nrc.gov.

Sincerely,

A handwritten signature in black ink, appearing to read "Joseph Sebrosky", written over a white background.

Joseph Sebrosky, Senior Project Manager
Beyond-Design-Basis Management Branch
Division of Licensing Projects
Office of Nuclear Reactor Regulation

Docket Nos. 50-424 and 50-425

Enclosure:
Staff Assessment Related to the
Mitigating Strategies for Vogtle

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STAFF ASSESSMENT BY THE OFFICE OF NUCLEAR REACTOR REGULATION
RELATED TO MITIGATION STRATEGIES FOR
VOGTLE ELECTRIC GENERATING PLANT, UNITS 1 AND 2
AS A RESULT OF THE REEVALUATED SEISMIC HAZARD
NEAR-TERM TASK FORCE RECOMMENDATION 2.1 – SEISMIC
(CAC NOS. MF7888 AND MF7889)

1.0 INTRODUCTION

By letter dated March 12, 2012 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML12053A340), the U.S. Nuclear Regulatory Commission (NRC) issued a request for information to all power reactor licensees and holders of construction permits in active or deferred status, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR), Section 50.54(f), "Conditions of Licenses" (hereafter referred to as the "50.54(f) letter"). The request was issued in connection with implementing lessons learned from the 2011 accident at the Fukushima Dai-ichi nuclear power plant as documented in the NRC's Near-Term Task Force (NTTF) report (ADAMS Accession No. ML111861807).

Enclosure 1 to the 50.54(f) letter requested that licensees reevaluate seismic hazards for their respective site(s) using present-day methods and regulatory guidance used by the NRC staff when reviewing applications for early site permits and combined licenses. Concurrent with the reevaluation of seismic hazards, licensees were required to develop and implement mitigating strategies in accordance with 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). That order requires holders of operating reactor licenses and construction permits issued under 10 CFR Part 50 to modify the plants to provide additional capabilities and defense-in-depth for responding to beyond-design-basis external events, and to submit to the NRC for review a final integrated plan that describes how compliance with the requirements of Attachment 2 of the order was achieved. In order to proceed with implementation of Order EA-12-049, licensees used the current licensing basis seismic hazard or the most recent seismic hazard information, which may not have been based on present-day methodologies and guidance, in the development of their mitigating strategies.

The NRC staff and industry recognized the difficulty in developing and implementing mitigating strategies before completing the reevaluation of external hazards. To address this issue, Nuclear Energy Institute (NEI) guidance document NEI 12-06, Revision 4, "Diverse and Flexible Coping Strategies (FLEX) Implementation Guide" (ADAMS Accession No. ML16354B421) was written as an appropriate methodology for licensees to perform assessments of the mitigating strategies against the reevaluated seismic hazards developed in response to the March 12, 2012, 50.54(f) letter. The guidance in NEI 12-06, Revision 4, and Appendix H in particular, supports the proposed Mitigation of Beyond-Design-Basis Events rulemaking. In a letter to the NEI dated February 8, 2017 (ADAMS Accession No. ML17034A286), the NRC staff stated that JLD-ISG-2012-01, Revision 2 (ADAMS Package Accession No. ML17005A182) had been issued and had been made publicly available. This interim staff guidance (ISG) revision endorsed NEI 12-06, Revision 4, with exceptions, clarifications and additions.

2.0 BACKGROUND

By letter dated March 31, 2014 (ADAMS Accession No. ML14092A019), Southern Nuclear Operating Company, Inc. (SNC, the licensee) submitted the reevaluated seismic hazard

information for Vogtle Electric Generating Plant, Units 1 and 2 (Vogtle). The NRC performed a staff assessment of the submittal and issued a response letter on April 20, 2015 (ADAMS Accession No. ML15054A296). The NRC's assessment concluded that the licensee conducted the hazard reevaluation using present-day methodologies and regulatory guidance, appropriately characterized the site, and met the intent of the guidance for determining the reevaluated seismic hazard.

By letter dated October 27, 2015 (ADAMS Accession No. ML15194A015), the NRC documented a determination of which licensees were to perform: (1) a seismic probabilistic risk assessment (SPRA); (2) limited scope evaluations; or (3) no further actions based on a comparison of the reevaluated seismic hazard and the site's design-basis earthquake. As documented in that letter, Vogtle was expected to complete an SPRA, which would also assess high frequency ground motion effects, and a limited-scope evaluation for the spent fuel pool (SFP). These seismic evaluations were expected to be submitted to the NRC by March 30, 2017, and December 31, 2017, respectively.

By letter dated March 27, 2017 (ADAMS Accession No. ML17088A130), SNC provided its SPRA report for Vogtle. The NRC staff assessed the licensee's submittal and concluded that the technical adequacy of the licensee's SPRA submittal was sufficient to support regulatory decisionmaking associated with Phase 2 of the 10 CFR 50.54(f) letter and that the risk and safety insights provided by Vogtle's SPRA report support the NRC's determination that no further response or regulatory action is required in response to the reevaluated seismic hazard. The NRC's staff assessment documenting this decision was issued on March 7, 2018 (ADAMS Accession No. ML17293A427).

By letter dated December 5, 2017 (ADAMS Accession No. ML17339A367), the licensee submitted its seismic mitigation strategies assessment (MSA) for Vogtle.

3.0 TECHNICAL EVALUATION

Section H.4.5.3 of NEI 12-06, Revision 4, describes a method that the staff finds acceptable to demonstrate that the alternate mitigation strategies (AMS) at Vogtle are reasonably protected against the reevaluated seismic hazard. As specified in NEI 12-06, Vogtle's SPRA was peer reviewed in accordance with the expectations described in the Electric Power Research Institute's (EPRI's) Seismic Evaluation Guidance Report 1025287, "Screening, Prioritization, and Implementation Details (SPID) for the Resolution of Fukushima Near-Term Task Force Recommendation 2.1: Seismic" (ADAMS Accession No. ML12333A170). The NRC staff reviewed the licensee's SPRA information submitted by letter dated March 27, 2017, and determined that its technical adequacy was sufficient to support regulatory decisionmaking associated with the reevaluated seismic hazard. The seismic core damage frequency (SCDF) and seismic large early release frequency (SLERF) values reported for Vogtle in the March 27, 2017, letter are less than the $5 \times 10^{-5}/\text{yr}$ (SCDF) and $5 \times 10^{-6}/\text{yr}$ (SLERF) screening values described in Section H.4.5.3 of NEI 12-06, Revision 4. These base SPRA results demonstrate a high likelihood that the AMS are reasonably protected against the reevaluated seismic hazard, and no further evaluation of the maintenance of core cooling or containment integrity is necessary.

Regarding maintenance of spent fuel pool (SFP) cooling, Section H.4.5.6 of NEI 12-06, Revision 4, states that licensees following Path 5 need to ensure the SFP cooling mitigating strategies are maintained. Specifically, licensees will ensure that SFP makeup capability needed to

accomplish the SFP cooling strategies is evaluated for seismic adequacy against the reevaluated seismic hazard.

The licensee's letter dated December 5, 2017, states that Vogtle's SFP cooling strategy relies on a flexible hose from the discharge of the portable SFP pump directly to the pool. The letter states that hoses will be deployed inside the fuel handling building prior to the SFP reaching 200 degrees Fahrenheit in order to minimize the need for personnel access to the SFP area, which may have degraded environmental conditions during an extended loss of alternating-current power. The December 5, 2017, letter further states that, under the most limiting non-outage conditions, the SFP is estimated to boil approximately 14 hours after the loss of SFP cooling due to the initiating event.

The licensee supplemented the December 5, 2017, MSA with another letter dated June 25, 2018 (ADAMS Accession No. ML18176A148), that presented more information on the strategy for SFP cooling. The June 25, 2018, supplement stated that the relied upon strategy to provide makeup water to the SFPs is via a gravity feed from the refueling water storage tank (RWST). The licensee's supplement cited Table A-1 from the Expedited Seismic Evaluation Program (ESEP) report (ADAMS Accession No. ML15049A517), which shows that the high confidence of low probability of failure (HCLPF) capacity value of the RWST corresponds to a peak ground acceleration (PGA) of 0.51g. This HCLPF capacity value is greater than the 0.436g PGA demand of the 10^{-4} uniform hazard response spectra that was used in the fragility evaluation. Therefore, the RWST is expected to be available following a seismic event at least the magnitude of the reevaluated seismic hazard. Additionally, the licensee's supplement states that no significant differential ground settlements were computed; thus, the piping to facilitate gravity feed from the RWST to the SFPs is also expected to be intact.

The June 25, 2018, supplement also provided information about the protection, deployment, and suction sources of a defense-in-depth SFP cooling strategy and capability using onsite portable equipment that the licensee expects to be available following a beyond-design-basis seismic event. In general, the licensee's site-specific SFP cooling evaluation concludes that portable equipment used to provide makeup water to the SFP will not be needed for at least 72 hours based on the capacity of the RWST. Portable equipment from offsite is expected to be available from the National Strategic Alliance for FLEX Emergency Response (SAFER) Response Center to continue the SFP cooling strategy within 72 hours, but the onsite equipment, for which the licensee has provided a justification for the expectation that it will be available, represents a defense-in-depth strategy and capability that the staff recognizes.

Therefore, the NRC staff concludes that the licensee has demonstrated that the strategy to maintain SFP cooling is reasonably protected against the reevaluated seismic hazard in accordance with NEI 12-06, Revision 4 and ISG-2012-01, Revision 2.

4.0 AUDIT REPORT

The NRC staff previously issued a generic audit plan dated December 5, 2016 (ADAMS Accession No. ML16259A189), that described the NRC staff's intention to conduct audits related to MSAs and issue an audit report that summarizes and documents the NRC's regulatory audit of the licensee's MSA. The NRC staff activities have been limited to performing the reviews described above. Because this staff assessment appropriately summarizes the results of those reviews, the NRC staff concludes that a separate audit summary report is not

necessary, and that this document serves as the final audit report described in the December 5, 2016, letter.

5.0 CONCLUSION

The NRC staff has reviewed the information presented by the licensee in the MSA for Vogtle and finds that the licensee's seismic hazard MSA was performed consistent with the guidance in Appendix H of NEI 12-06, Revision 4. Based on the NRC's assessment of the technical adequacy of the licensee's SPRA and the results compared to the screening criteria of Section H.4.5.3 of NEI 12-06, Revision 4, and the evaluation of the SFP cooling strategy, the NRC staff concludes that the licensee has demonstrated that the alternate mitigation strategies at Vogtle exhibit reasonable protection against the reevaluated seismic hazard.

SUBJECT: VOGTLE ELECTRIC GENERATING PLANT, UNITS 1 AND 2 – SEISMIC HAZARD MITIGATION STRATEGIES ASSESSMENT DATED July 10, 2018

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ADAMS Accession No. ML18180A314

***via email**

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