From: Wiebe, Joel
Sent: Friday, April 1, 2022 7:09 AM
To: Loomis, Thomas R:
Cc: Mayer, Annie
Subject: Braidwood and Byron - Final RAI Regarding Proposed Alternative for Various Pressurizer Welds (EPID L-2021-LLR-0035 and 0036)

Hi Tom,

This RAI replaces the RAI that was withdrawn by my e-mail dated February 24, 2022. A response is requested within 30 days.

Joel

By letter dated May 12, 2021 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML21133A297), Exelon Generation Company, LLC (the licensee) requested U.S. Nuclear Regulatory Commission (NRC) approval of an alternative to the requirements of American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code) at Braidwood Station, Units 1 and 2 (Braidwood); Bryon Station, Units 1 and 2 (Byron); and Calvert Cliffs Nuclear Plant, Units 1 and 2 (Calvert Cliffs). This request for additional information (RAI) is specific to Byron and Braidwood. The proposed alternative would allow the licensee to forego ASME Code, Section XI-required examinations of various pressurizer welds through the end of the operating license. On February 1, 2022 (ADAMS Accession No. ML22032A333), Exelon Generation Company, LLC was renamed Constellation Energy Generation, LLC.

Specifically, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR), Part 50, Paragraph 50.55a(z)(1), the licensee proposed to extend the inservice inspection (ISI) interval for various pressurizer welds to the end of the current approved operating license, instead of the current ASME Code Section, Section XI requirement of every 10 years. 10 CFR 50.55a(z)(1) requires the licensee to demonstrate that the proposed alternative provides an acceptable level of quality and safety. In its application, the licensee referred to the analyses in nonproprietary Electric Power Research Institute (EPRI) Report No. 3002015905, "Technical Bases for Inspection Requirements for PWR Pressurizer Head, Shell-to-Head, and Nozzle-to-Vessel Welds", December 2019 (ADAMS Accession No. ML21021A271), and included an applicability evaluation of EPRI report 3002015905 to Byron and Braidwood.

The NRC staff has determined that additional information related to performance monitoring of the subject components is needed to complete the staff's review.

Regulatory Basis

The requirements for the 10-year ISI intervals after the first ISI interval are established by 10 CFR 50.55a(g)(4)(ii), which require licensees to comply with the ASME Code requirements incorporated by reference in 10 CFR 50.55a(a) 18 months prior to the start of the ISI interval. In accordance with 10 CFR 50.55a(z)(1), the NRC staff may authorize an alternative to an ASME Code, Section XI requirement established through 10 CFR 50.55a(g)(4)(ii) if the licensee demonstrates that the proposed alternative provides an acceptable level of quality and safety.

Regulatory Guide 1.174, Revision 3, "An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis" (ADAMS Accession No.

ML17317A256), provides general guidance concerning analysis of the risk associated with proposed changes in plant design and operation, including the general principles of risk-informed decision making: meeting current regulations, consistency with defense in depth philosophy, maintaining safety margins, small changes in risk, and performance monitoring.

Issue

The licensee referenced probabilistic and deterministic analyses (the EPRI Report) to estimate potential fatigue growth in the subject weld and nozzle components. The licensee presented plant-specific information to demonstrate that the referenced EPRI analyses would bound the subject components, including high-level results from previous ISI of the subject components. The licensee also provided limited discussion of performance monitoring, primarily focused on justifying application of the analyses to the proposed ISI interval extension for the subject components (i.e., that leakage would be detected).

Leveraging probabilistic fracture mechanics (PFM) to define the basis for risk-informing inspection requirements requires knowledge of both the current and future behavior of the material degradation and the associated uncertainties applicable to the subject components. Confidence in the results of these analyses hinges on the assurance that the PFM model adequately represents, and will continue to represent, the degradation behavior in the subject components. The NRC staff has determined that, when considering extended examination intervals, adequate performance monitoring through inspections is needed to ensure that the PFM model continues to predict the material behavior and that emergent degradation is discovered and dispositioned in a timely fashion.

The licensee discusses the system leakage test as providing further assurance for the proposed alternative. However, the NRC staff notes that the visual examinations performed during system leakage tests may not provide sufficient information to ensure that the PFM model continues to predict the material behavior and that emergent degradation is discovered and dispositioned in a timely fashion. Specifically, visual examinations may not directly detect pertinent integrity conditions (e.g., presence or extent of degradation); may not provide direct detection of aging effects prior to potential loss of structure or intended function; and do not provide sufficient validating data necessary to confirm the modeling of degradation behavior in the subject components.

Request

Describe the performance monitoring that will be implemented with this proposed alternative to ensure that the PFM model adequately represents, and will continue to represent, the degradation behavior in the subject components commensurate with the duration of the proposed alternative. Justify that this performance monitoring will meet this objective and address the concerns discussed above. Explain how this performance monitoring will provide, over the extended examination interval, (1) direct evidence of the presence and extent of degradation, (2) validation and confirmation of the continued adequacy of the PFM model; and (3) timely detection of novel or unexpected degradation. Describe any actions that will be taken if issues are identified through this performance monitoring to ensure that the integrity of the subject components are adequately maintained.

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