From:	Mahesh Chawla
To:	Couture III, Philip
Cc:	Clark, Robert; Keele Jr, Riley D; REID, MARK
Subject:	Final Request for Additional Information - Arkansas Nuclear One - Units 1 and 2 - Proposed Alternatives for Examinations of SG Pressure Retaining Welds and Full Penetration Welded Nozzles - EPID: L-2024-LLR-0038
Date:	Monday, September 23, 2024 2:35:00 PM
Attachments:	RAI-10335-R1-Final.docx

Dear Sir,

By letter dated June 6, 2024 (Agencywide Documents Access and Management System Accession No. ML24158A389), in accordance with 10 CFR 50.55a(z)(1), Entergy Operations, Inc. (Entergy, the licensee) requested Nuclear Regulatory Commission (NRC) approval of proposed alternatives for Arkansas Nuclear One, Units 1 and 2 (ANO-1 and ANO-2, respectively). Alternative Requests ANO1-ISI-24-01 and ANO2-ISI-24-01 are to defer the in-service inspection (ISI) examinations for select examination categories and item numbers for the steam generators (SG) at ANO-1 and ANO-2 from the current American Society of Mechanical Engineers (ASME) Code, Section XI 10-year requirements to the end of licensed operating life, which is scheduled to end on May 20, 2034, and July 17, 2038, respectively. The proposed alternatives are based on two Electric Power Research Institute (EPRI) topical reports (TR), “Technical Bases for Inspection Requirements for PWR Steam Generator Feedwater and Main Steam Nozzle-to-Shell Welds and Inside Radius Sections.” 3002014590 (TR 14590) (ML19347B107) and “Technical Bases for Inspection Requirements for PWR Steam Generator Class 1 Nozzle-to-Vessel Welds and Class 1 and Class 2 Vessel Head, Shell, Tube sheet-to-Head and Tube sheet-to-Shell Welds.” 3002015906 (TR 15906) (ML20225A141).

To complete its review, the Nuclear Regulatory Commission (NRC) staff’s request for additional information (RAI) (Draft) was transmitted to the licensee on September 11, 2024. A clarification call was held on September 23, 2024, with the NRC staff to discuss the subject draft RAIs. The discussion did not result in any changes to the draft RAIs. In an email, Robert Clark from ANO agreed to provide the response on the docket within 30 days of the receipt of the final RAIs. Therefore, the subject RAIs are now transmitted as the final RAIs. Thanks

Sincerely,

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DATE	9/23/24	9/23/24

FINAL REQUEST FOR ADDITIONAL INFORMATION
BY THE OFFICE OF NUCLEAR REACTOR REGULATION
ANO 1 AND 2 - PROPOSED ALTERNATIVES FOR EXAMINATIONS OF SG PRESSURE RETAINING WELDS AND FULL PENETRATION WELDED NOZZLES
ENTERGY NUCLEAR OPERATIONS, INC.
ARKANSAS NUCLEAR ONE, UNITS 1, 2
DOCKET NO. 05000313, 05000368

Background

By letter dated June 6, 2024 (Agencywide Documents Access and Management System Accession No. ML24158A389), in accordance with 10 CFR 50.55a(z)(1), Entergy Operations, Inc. (Entergy, the licensee) requested Nuclear Regulatory Commission (NRC) approval of proposed alternatives for Arkansas Nuclear One, Units 1 and 2 (ANO-1 and ANO-2, respectively). Alternative Requests ANO1-ISI-24-01 and ANO2-ISI-24-01 are to defer the in-service inspection (ISI) examinations for select examination categories and item numbers for the steam generators (SG) at ANO-1 and ANO-2 from the current American Society of Mechanical Engineers (ASME) Code, Section XI 10-year requirements to the end of licensed operating life, which is scheduled to end on May 20, 2034, and July 17, 2038, respectively..

The proposed alternatives are based on two Electric Power Research Institute (EPRI) topical reports (TR), “Technical Bases for Inspection Requirements for PWR Steam Generator Feedwater and Main Steam Nozzle-to-Shell Welds and Inside Radius Sections.” 3002014590 (TR 14590) (ML19347B107) and “Technical Bases for Inspection Requirements for PWR Steam Generator Class 1 Nozzle-to-Vessel Welds and Class 1 and Class 2 Vessel Head, Shell, Tube sheet-to-Head and Tube sheet-to-Shell Welds.” 3002015906 (TR 15906) (ML20225A141).

To complete its review, the Nuclear Regulatory Commission (NRC) staff requests for additional information as shown below.

Regulatory Basis

The SG pressure-retaining welds and nozzles at the subject units are ASME Code Class 1 and Class 2 components, whose inservice inspections (ISIs) are performed in accordance with the applicable edition of Section XI, “Rules for Inservice Inspection of Nuclear Power Plant Components,” of the ASME Code, as required by 10 CFR 50.55a(g).

The regulations in 10 CFR 50.55a(g)(4) state, in part, components that are classified as ASME Code Class 1, 2, and 3 must meet the requirements, except the design and access provisions and the preservice examination requirements, set forth in the ASME Code, Section XI, to the extent practical within the limitations of design, geometry, and materials of construction of the components.

The regulations in 10 CFR 50.55a(z) state, in part, that alternatives to the requirements in paragraphs (b) through (h) of 10 CFR 50.55a may be used when authorized by the NRC if the licensee demonstrates that: (1) the proposed alternative would provide an acceptable level of quality and safety, or (2) compliance with the specified requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

Question 1

RAI-1

Issue

On its cover letter dated June 6, 2024, the licensee stated that the end of the fourth ISI interval for ANO-2 was March 25, 2021. On Page 6 of the Enclosure, the licensee stated that for ANO-2, "…[t]he new SG welds and components received the required PSI examinations followed by ISI examinations through the first period of the current fifth inspection interval…"

Table 2-6 of the Enclosure, Attachment 2 provides the dates of the past SG weld and nozzle inner radius examination at ANO-2. Based on the dates of inspections in Table 2-6 and dates of the end of the fourth ISI interval, it seems that the latest inspections were performed in the fourth, not fifth, ISI interval for SG welds at ANO-2. It seems that no inspections of the SG welds were performed in the fifth ISI interval at ANO-2.

Request

(a) Clarify whether any SG welds in the scope of the Alternative Request were examined during the first period (or any period up to the present) of the fifth ISI interval at ANO-2. As part of the discussion, please provide the beginning date and end date of third, fourth, fifth and sixth 10-year ISI intervals at ANO-2.

Question 2

RAI-2

Issue

The licensee referenced probabilistic fracture mechanics (PFM) and deterministic fracture mechanics analyses in TR 14590 and TR 15906 to support the proposed elimination of the SG welds and nozzle inner radius examinations. The NRC staff notes that leveraging PFM analyses 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 SG welds. 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 SG welds.

The NRC staff has determined that, when considering proposed elimination of examinations, adequate performance monitoring through inspections is needed to ensure that the assumptions of the PFM model remain valid, and that novel or unexpected degradation is detected and dispositioned in a timely fashion. Further, the staff has communicated concepts that licensees can implement on a fleet-wide basis to develop a performance monitoring plan and bolster the technical basis for alternative requests (see presentation slide packages dated January 30, 2023, and April 27, 2023, at ML23033A667 and ML23114A034, respectively). A recent precedent regarding performance monitoring of SG welds could be found in the NRC's safety evaluation dated September 25, 2023 (ML23256A088). On June 27, 2024, the NRC staff made a presentation regarding the concept of performance monitoring of components as part of the risk-informed materials assessment project (ML24193A005).

Table 1-5 of the Enclosure, Attachment 1 provides the dates of the SG weld and nozzle inner radius examinations after the new SGs were installed at ANO-1. Table 2-6 of Enclosure, Attachment 2 provides the dates of the SG weld and nozzle inner radius examination after the new SGs were installed at ANO-2. On pages 5 and 6 of the Enclosure, the licensee stated that the operating licenses for ANO-1 and ANO-2 expire in years 2034 and 2038, respectively.

Based on the dates of the latest examination as shown in Tables 1-5 and 2-6 and the year when the operating license expires, the NRC staff has identified the following SG welds that will be in operation for an extended period without an examination.

For ANO-1, welds 03-104, 03-117, 03-118, and 03-115IR.

For ANO-2, welds 04-004, 03-005, 04-005, 03-006, 04-006, 03-007, 04-007, 04-001, 04-002, and 04-002IR.

Request

(a) Describe a performance monitoring that could be implemented to examine ANO-2 SG welds in the fifth ISI interval 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 requested alternative.

(b) 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.

(c) If through this performance monitoring, indications are detected that exceed the acceptance standards of the ASME Code, Section XI, IWB-3500, confirm that they will be evaluated as required by the ASME Code, Section XI (which includes requirements for successive inspections and additional examinations) and describe other actions (if any) specified in the

plant's corrective action program to ensure that the integrity of the component is adequately maintained.

(d) If through this performance monitoring, indications are detected that exceed the acceptance standards of the ASME Code, Section XI, IWB-3500, scope expansion may be appropriate to assess extent of condition. Furthermore, if this performance monitoring plan or industry-wide operating experience indicates that a new or novel degradation mechanism is possible in SG welds or nozzle inner radii, scope expansion may be appropriate to ensure that no such mechanism is occurring in the subject plants. Discuss the detailed scope expansion plans for these scenarios.

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