

From: [Shawn Williams](#)
To: [Treadway, Ryan I](#)
Cc: [Vaughan, Jordan L](#); [Sigmon, Chet Austin](#)
Subject: Duke Fleet - Request for Additional Information RE: Proposed Alternative for Pressurizer Welds in Accordance with 10 CFR 50.55a(z)(1) (EPID L-2023-LLR-0020)
Date: Tuesday, May 30, 2023 4:22:09 PM
Attachments: [RAIs - Duke Fleet Alternative Request for PZR Welds \(EPID L-2023-LLR-0020\).docx](#)

Dear Mr. Treadway,

By letter dated February 17, 2023 (Agencywide Document Access and Management System Accession Number ML23048A148), Duke Energy Carolinas, LLC (the licensee) submitted a proposed alternative to the inservice inspection requirements of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code, Section XI, regarding Pressurizer Pressure-Retaining Welds and Full-Penetration Welded Nozzles for Catawba Nuclear Generation Station Units 1 and 2; McGuire Nuclear Station Units 1 and 2; Oconee Nuclear Station Units 1, 2, and 3; Shearon Harris Nuclear Power Plant Unit 1, and H.B. Robinson Steam Electric Plant Unit 2.

The U.S. Nuclear Regulatory Commission staff has determined that additional information is needed as provided below. A clarification call to ensure mutual understanding was conducted on May 30, 2023.

Please respond by July 14, 2023. Please note that the NRC staff's review is continuing and further requests for information may be developed.

If you have any questions, please contact Shawn Williams at 301-415-1009 or via e-mail at Shawn.Williams@nrc.gov.

Shawn Williams, Senior Project Manager
Plant Licensing Branch, II-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket Nos.
50-269, 50-270, 50-287,
50-413, 50-414, 50-369,
50-370, 50-400, 50-261

cc: Listserv

REQUEST FOR ADDITIONAL INFORMATION
BY THE OFFICE OF NUCLEAR REACTOR REGULATION
INSPECTION INTERVAL EXTENSION FOR PRESSURIZER
PRESSURE-RETAINING WELDS AND FULL PENETRATION WELDED NOZZLES
DUKE ENERGY CAROLINAS, LLC AND DUKE ENERGY PROGRESS, LLC
CATAWBA NUCLEAR STATION, UNITS 1 AND 2
SHEARON HARRIS NUCLEAR POWER PLANT, UNIT 1
MCGUIRE NUCLEAR STATION, UNITS 1 AND 2
OCONEE NUCLEAR STATION, UNITS 1, 2, AND 3
H.B. ROBINSON STEAM ELECTRIC PLANT, UNIT 2

DOCKET NOS. 50-413, 50-414, 50-400, 50-369, 50-370, 50-269, 50-270, 50-287, AND 50-261

EPID NO.: L-2023-LLR-0020

Background

By letter dated February 17, 2023 (Agencywide Document Access and Management System Accession Number ML23048A148), Duke Energy Carolinas, LLC and Duke Energy Progress, LLC (the licensee) submitted to the United States Nuclear Regulatory Commission (NRC), a proposed alternative to the inservice inspection (ISI) requirements of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code) regarding the pressurizer (PZR) welds at Catawba Nuclear Generation Station Units 1 and 2; McGuire Nuclear Station Units 1 and 2; Oconee Nuclear Station Units 1, 2, and 3; Shearon Harris Nuclear Power Plant Unit 1, and H.B. Robinson Steam Electric Plant Unit 2.

Specifically, pursuant to Title 10 of the *Code of Federal Regulations*, Part 50, Section 55a, Paragraph (z)(1) (10 CFR 50.55a(z)(1)), the licensee is proposing to defer the required volumetric examinations of the subject PZR welds from the current ASME Code, Section XI 10-year requirement, for varying lengths of time, depending on the site. The licensee referred to the results of the probabilistic fracture mechanics (PFM) analyses in the following Electric Power Research Institute (EPRI) non-proprietary report as the primary basis for the deferral of the ISI examinations:

- EPRI Technical Report 3002015905, "Technical Bases for Inspection Requirements for PWR [Pressurized Water Reactor] Pressurizer Head, Shell-to-Head, and Nozzle-to-Vessel Welds," 2019 (hereafter referred to as "EPRI Report 3002015905," ML21021A271).

The NRC staff needs additional information to complete its review and approval of the licensee's submittal.

Regulatory Basis

The NRC has established requirements in 10 CFR Part 50 to protect the structural integrity of structures and components in nuclear power plants. Among these requirements are the ISI requirements of Section XI of the ASME Code incorporated by reference in 10 CFR 50.55a to

ensure that adequate structural integrity of PZR vessels (including their welds) is maintained through the service life of the vessels. Therefore, the regulatory basis for the following requests for additional information (RAIs) has to do with demonstrating that the proposed alternative ISI requirements would ensure adequate structural integrity of the licensee's PZR welds, and thereby would provide an acceptable level of quality and safety per 10 CFR 50.55a(z)(1).

RAI-1

Issue

The licensee referenced probabilistic and deterministic analyses in the above EPRI report to estimate potential fatigue crack growth in the subject PZR welds and to justify application of these analyses to the proposed examination deferral for the welds. The licensee presented plant-specific information to demonstrate that the referenced analyses in the EPRI report would bound the subject PZR welds, including the ISI history of the welds.

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 PZR 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 PZR welds. The NRC staff has determined that, when considering proposed deferral 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 slide packages dated January 30, 2023, and April 27, 2023, at ML23033A667 and ML23114A034, respectively). In Section 5.0 of the enclosure to the submittal, the licensee described the various plant-specific examination scenarios and the proposed deferral of examinations. The licensee stated that the proposed alternative results in a maximum time period of approximately 20 years from the end of the interval in which the Section XI requirements were met in full until the end of the proposed alternative. The licensee did not provide a performance monitoring schema for the subject PZR welds.

The licensee discusses the system leakage test as "providing further assurance of safety" 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 the 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 PZR welds.

Request

- a. 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 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 ASME Code, Section XI, IWB-3500, confirm that they will be evaluated as required by 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 ASME Code, Section XI, IWB-3500, then 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 PZR welds, 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.

RAI-2

Issue

Section 7.1.2.2 of EPRI Report 3002015905 describes the application of piping interface loads due to thermal stratification for the surge nozzle stress analysis. However, in the plant-specific stress analysis for Oconee Nuclear Station Units 1, 2, and 3 in Attachment 7 to the submittal (Structural Integrity Associates [SIA] calculation 2100561.302, Revision 1), piping interface loads due to thermal stratification appear to have not been applied.

Request

Justify not applying piping interface loads due to thermal stratification in the stress analysis in SIA calculation 2100561.302, Revision 1.

RAI-3

Issue

It is not clear whether the information provided regarding ISI program results includes indications that may have been dispositioned during the earlier 10-year ISI intervals for the Duke units in the request (for example, there is no information prior to the 4th 10-year ISI interval at the ONS units provided in Attachment 5 to the submittal).

Request

Please confirm that the tables detailing inspection history in the submittal include all indications detected by the listed inspections regardless of whether they were dispositioned prior to the intervals cited (e.g., detected during 1st interval and dispositioned then).