



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

September 28, 2026

Mr. Steven M. Snider
Vice President, Oconee Nuclear Station
Duke Energy Carolinas, LLC
7800 Rochester Highway
Seneca, SC 29672-0752

SUBJECT: OCONEE NUCLEAR STATION, UNITS 1, 2, AND 3 - AUTHORIZATION OF RELIEF REQUEST (RA-22-0258) FOR HIGH PRESSURE INJECTION NOZZLE ALLOY 82/182 WELD EXAMINATIONS (EPID L-2026-LLR-0029)

Dear Mr. Snider:

By letter dated April 30, 2026 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML26120A351), Duke Energy Carolinas, LLC (Duke Energy, the licensee) submitted a request to the U.S. Nuclear Regulatory Commission (NRC) for authorization of a proposed alternative to the encoded examination technique requirements of Title 10 of the *Code of Federal Regulations* (10 CFR) 50.55a(g)(6)(ii)(F)(13) for periodic volumetric examination of certain high pressure injection (HPI) nozzle Alloy 82/182 welds at Oconee Nuclear Station, Units 1, 2, and 3 (ONS).

Specifically, pursuant to 10 CFR 50.55a(z)(2), the licensee requested authorization to use an alternative to the encoded ultrasonic examination technique on the basis that compliance with the specified requirement would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

The NRC staff has reviewed the subject request and concludes, as set forth in the enclosed safety evaluation, that compliance with the specified requirements of 10 CFR 50.55a(g)(6)(ii)(F)(13) would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety. The NRC staff further concludes that the licensee's proposed alternative provides reasonable assurance of the structural integrity and leak tightness of the subject HPI nozzle Alloy 82/182 welds.

The NRC staff concludes that the licensee has adequately addressed all applicable regulatory requirements in 10 CFR 50.55a(z)(2). Therefore, the NRC staff authorizes the proposed alternative for Oconee Nuclear Station, Units 1, 2, and 3, for the remainder of the Sixth ISI interval and through the end of the subsequent renewed operating licenses: February 6, 2053, for Unit 1; October 6, 2053, for Unit 2; and July 19, 2054, for Unit 3.

All other ASME Boiler and Pressure Vessel Code, Section XI, requirements for which an alternative was not specifically requested and approved remain applicable, including third-party review by the Authorized Nuclear Inservice Inspector.

If you have any questions, please contact the ONS Project Manager, Shawn Williams at 301-415-1009 or by email at Shawn.Williams@nrc.gov.

Sincerely,

MICHAEL
MARKLEY

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Michael T. Markley, Chief
Operating Reactor Licensing Branch 2
Division of Licensing Projects I
Office of Nuclear Reactor Regulation

Docket Nos. 50-269, 50-270, and 50-287

Enclosure:
Safety Evaluation

cc: Listserv



UNITED STATES
NUCLEAR REGULATORY COMMISSION
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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

AUTHORIZATION OF

ALTERNATIVE FOR HIGH PRESSURE INJECTION NOZZLE

ALLOY 82/182 WELD EXAMINATIONS

DUKE ENERGY CAROLINAS, LLC (DUKE ENERGY)

OCONEE NUCLEAR STATION, UNIT NOS. 1, 2, AND 3

DOCKET NOS. 50-269, 50-270, AND 50-287

1.0 INTRODUCTION

By letter dated April 30, 2026 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML26120A351), Duke Energy Carolinas, LLC (Duke Energy, the licensee) submitted to the U.S. Nuclear Regulatory Commission (NRC) proposed alternative request RA-22-0258 seeking authorization of an alternative to the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel (BPV) Code, Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components," 2019 Edition, for certain high pressure injection (HPI) nozzle Alloy 82/182 weld examinations at Oconee Nuclear Station, Units 1, 2, and 3 (ONS).

Specifically, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) 50.55a(z)(2), "Hardship without a compensating increase in quality and safety," the licensee requested authorization of an alternative related to the frequency of encoded ultrasonic volumetric examinations required under 10 CFR 50.55a(g)(6)(ii)(F)(13), "Encoded ultrasonic examination," for unmitigated Alloy 82/182 high-pressure injection (HPI) nozzle dissimilar metal butt welds categorized as Inspection Item B-1 under ASME Code Case N-770-7, "Alternative Examination Requirements and Acceptance Standards for Class 1 PWR [Pressurized Water Reactor] Piping and Vessel Nozzle Butt Welds Fabricated with UNS N06082 or UNS W86182 Weld Filler Material With or Without Application of Listed Mitigation Activities, Section XI, Division 1." The licensee stated that complying with the specified encoded examination frequency would result in hardship or unusual difficulty without a compensating increase in the level of quality or safety.

2.0 REGULATORY EVALUATION

Pursuant to 10 CFR 50.55a(g)(4), "Inservice inspection standards requirements for operating plants," ASME Code Class 1, 2, and 3 components (including supports) must meet the requirements, except the design and access provisions and the preservice examination

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requirements, set forth in the ASME BPV Code, Section XI, to the extent practical within the limitations of design.

The regulations in 10 CFR 50.55a(z), "Alternatives to codes and standards requirements," allow the licensee to propose alternatives to the ASME BPV Code, Section XI, requirements. Specifically, 10 CFR 50.55a(z)(2) states that the NRC may authorize an alternative to the prescribed requirements if the licensee demonstrates that compliance with the specified requirement would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

The regulations in 10 CFR 50.55a(g)(6)(ii)(F), "Augmented ISI requirements: Examination requirements for Class 1 piping and nozzle dissimilar-metal butt welds," require, in part, that licensees of PWRs augment the inservice inspection (ISI) program with ASME Code Case N-770-7, subject to the conditions specified in 10 CFR 50.55a(g)(6)(ii)(F)(2) through (16). Paragraph 50.55a(g)(6)(ii)(F)(13) of 10 CFR requires that ultrasonic volumetric examinations of unmitigated or cracked mitigated Alloy 82/182 dissimilar metal butt welds be performed using an encoded examination technique.

The applicable Code of Record for the Sixth 10-year ISI interval at ONS is the ASME BPV Code, Section XI, 2019 Edition. The sixth inspection interval began on July 15, 2024, and is scheduled to end on July 14, 2036.

The licensee submitted proposed alternative request RA-22-0258 to the NRC in accordance with 10 CFR 50.55a(z)(2), requesting authorization of an alternative to the encoded ultrasonic examination technique requirements of 10 CFR 50.55a(g)(6)(ii)(F)(13) for the periodic volumetric examination of certain HPI nozzle Alloy 82/182 welds.

Based on the above, and subject to the following technical evaluation, the NRC staff finds that regulatory authority exists under 10 CFR 50.55a(z)(2) for the licensee to request, and for the NRC to authorize, the proposed alternative.

3.0 TECHNICAL EVALUATION

3.1 Applicable ASME Code Requirement and Components Affected

The Code of Record for the current inservice inspection (ISI) interval at ONS is the ASME BPV Code, Section XI, 2019 Edition. In accordance with 10 CFR 50.55a(g)(6)(ii)(F), licensees must implement ASME Code Case N-770-7, subject to NRC conditions, including the encoded ultrasonic testing (UT) requirement in 10 CFR 50.55a(g)(6)(ii)(F)(13) for unmitigated Alloy 82/182 dissimilar metal butt welds categorized as Inspection Item B-1.

Inspection Item B-1 welds are defined as unmitigated Alloy 82/182 butt welds located in cold-leg operating temperature regions (≥ 525 degrees Fahrenheit ($^{\circ}\text{F}$) and $< 580^{\circ}\text{F}$) and with a nominal pipe size less than 14 inches in diameter. The affected Oconee welds meet these criteria and therefore fall under Item B-1.

The affected HPI nozzle Alloy 82/182 dissimilar metal welds included in this alternative request are:

Oconee Unit 1:

- 1A1 Cold-Leg HPI Nozzle Alloy 82/182 Weld (1-PDA1-11)
- 1A2 Cold-Leg HPI Nozzle Alloy 82/182 Weld (1-PDA2-11)
- 1B1 Cold-Leg HPI Nozzle Alloy 82/182 Weld (1-PDB1-11)
- 1B2 Cold-Leg HPI Nozzle Alloy 82/182 Weld (1-PDB2-11)

Oconee Unit 2:

- 2B2 Cold-Leg HPI Nozzle Alloy 82/182 Weld (2-PDB2-11)

Oconee Unit 3:

- 3B1 Cold-Leg HPI Nozzle Alloy 82/182 Weld (3-RC-212-53V)
- 3B2 Cold-Leg HPI Nozzle Alloy 82/182 Weld (3-PDB2-11)

These welds are unmitigated Alloy 82/182 dissimilar metal butt welds susceptible to primary water stress corrosion cracking (PWSCC) and are, therefore, subject to the augmented examination requirements of ASME Code Case N-770-7, Table 1, Inspection Item B-1. Under NRC conditions, these welds must undergo encoded UT volumetric examinations every second inspection period, not to exceed 7 years, as required by 10 CFR 50.55a(g)(6)(ii)(F)(13).

3.2 Reason for Request

The licensee requested an alternative to the encoded UT requirement of 10 CFR 50.55a(g)(6)(ii)(F)(13) for the seven Alloy 82/182 HPI nozzle welds in Section 3.1, above. Under NRC conditions applied to ASME Code Case N-770-7, these Item B-1 welds must receive encoded UT every second inspection period (≤ 7 years).

In its submittal, the licensee stated, in part, that, "The typical amount of dose received during the encoded inspections is approximately 2.0 rem. The significant dose received while performing the encoded examinations coupled with the requirement to contract a qualified outside vendor poses a hardship without a compensating increase in the level of quality and safety."

These factors, according to the licensee, do not produce a compensating increase in safety or examination quality. The licensee further noted that manual (unencoded) phased array UT examinations are already performed every other refueling outage (approximately 4 years) and would continue, thereby maintaining defense in depth and the examination frequency required by ASME Code Case N-770-7.

Accordingly, the licensee requested authorization to perform encoded UT once per inspection interval (not to exceed 13 years), supplemented by continued manual (unencoded) phased array UT examinations, to reduce hardship while maintaining reasonable assurance of structural integrity and leak tightness.

3.3 Licensee's Proposed Alternative and Basis for Use

The licensee proposed to extend the encoded UT frequency from every second inspection period (≤ 7 years) to once per inspection interval, not to exceed 13 years, with manual

(unencoded) phased array UT examinations performed every other refueling outage (approximately 4 years).

In its submittal, the licensee provided a plant-specific circumferential crack growth evaluation for the subject Alloy 82/182 welds. The evaluation demonstrated that the limiting time for a detectable circumferential flaw to grow from 10 percent through-wall to the maximum allowable flaw depth (75 percent through-wall) is 14.4 years, which exceeds the proposed maximum encoded UT interval of 13 years.

The licensee stated, in part, that the combination of periodic manual (unencoded) phased array UT examinations, encoded UT performed once per interval, daily reactor coolant system (RCS) leakage monitoring, and VT-2 visual examinations during system pressure tests would maintain defense in depth and ensure structural integrity and leak tightness.

3.4 Duration of Proposed Alternative

The proposed alternative would apply for the remainder of the Sixth ISI interval, that began on July 15, 2024, and ends on July 14, 2036, and the authorization would continue through the end of the subsequent renewed operating license: February 6, 2053, for Unit 1; October 6, 2053, for Unit 2; and July 19, 2054, for Unit 3.

3.5 NRC Staff Evaluation

The NRC staff evaluated the proposed alternative under 10 CFR 50.55a(z)(2), which allows authorization of an alternative when compliance with the specified requirement would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety. The NRC staff determined that the licensee correctly identified the applicable ASME Code Case N-770-7 requirements and the associated NRC conditions, including the encoded UT requirement of 10 CFR 50.55a(g)(6)(ii)(F)(13).

The NRC staff reviewed the licensee's hardship basis and found that performing encoded UT examinations at the current required frequency (every second inspection period, not to exceed 7 years) would result in significant personnel radiation dose (approximately 2.0 rem per campaign) and longer examination times, as described in the licensee's submittal. The NRC staff concludes that these burden factors constitute hardship in accordance with 10 CFR 50.55a(z)(2).

The NRC staff also reviewed the technical justification supporting the proposed alternative. The plant-specific circumferential crack growth evaluation provided by the licensee demonstrates that, in the limiting case, a detectable circumferential flaw in an Alloy 82/182 HPI nozzle weld would require 14.4 years to grow from 10 percent through-wall to the maximum allowable flaw depth (75 percent through-wall). This duration exceeds the proposed maximum interval between encoded UT examinations (13 years) and demonstrates that structural integrity will be maintained under the alternative. The NRC staff finds that this analysis provides reasonable assurance of safety.

Additionally, the NRC staff considered defense-in-depth measures, including manual (unencoded) phased array UT examinations every other refueling outage (approximately every 4 years), RCS leak monitoring, and VT-2 visual examinations performed during system pressure tests. The NRC staff finds that these measures provide supplemental assurance of weld integrity between encoded examinations.

Based on its review, the NRC staff concludes that the proposed alternative provides reasonable assurance of structural integrity and leak tightness, and that the licensee has demonstrated hardship without a compensating increase in quality and safety. Therefore, the NRC staff finds the proposed alternative acceptable in accordance with 10 CFR 50.55a(z)(2).

4.0 CONCLUSION

Based on the above, the NRC staff determined that complying with the specified requirements of 10 CFR 50.55a(g)(6)(ii)(F)(13) would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety. The licensee's proposed alternative provides reasonable assurance of the structural integrity of and leak tightness for the subject HPI nozzle Alloy 82/182 welds.

Accordingly, the NRC staff concludes that the licensee has adequately addressed all regulatory requirements in 10 CFR 50.55a(z)(2). Therefore, the NRC staff authorizes the proposed alternative for Oconee Nuclear Station, Units 1, 2, and 3, for the remainder of the Sixth ISI interval and through the end of the subsequent renewed operating licenses: February 6, 2053, for Unit 1; October 6, 2053, for Unit 2; and July 19, 2054, for Unit 3.

All other ASME BPV Code requirements for which an alternative is not specifically requested and approved remain applicable, including third-party review by the Authorized Nuclear Inservice Inspector.

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DATED SEPTEMBER 28, 2026

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