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

February 13, 2020

Mr. J. Ed Burchfield, Jr.
Site Vice President
Oconee Nuclear Station
Duke Energy Carolinas, LLC
7800 Rochester Highway
Seneca, SC 29672-0752

SUBJECT: OCONEE NUCLEAR STATION, UNIT 3 – RELIEF REQUEST 19-ON-002 FOR PROPOSED ALTERNATIVE TO REACTOR VESSEL NOZZLE WELD EXAMINATION FREQUENCY REQUIREMENTS IN ASME CODE CASE N-770-2 (EPID NO. L-2019-LLR-0029)

Dear Mr. Burchfield:

By letter RA-19-0027, dated March 28, 2019, Duke Energy Carolinas, LLC. (the licensee), submitted relief request 19-ON-002 to the U.S. Nuclear Regulatory Commission (NRC) for the remainder of the fifth 10-year inservice inspection (ISI) interval for the Oconee Nuclear Station (Oconee), Unit 3.

The licensee requested the NRC to authorize the use of an alternative to the examination frequency requirements of Section XI of the American Society of Mechanical Engineers Boiler and Pressure Vessel (ASME Code) Code Case N-770, "Alternative Examination Requirements and Acceptance Standards for Class 1 PWR 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," as required by 10 CFR 50.55a(g)(6)(ii)(F), with conditions, for reactor pressure vessel (RPV) core flood nozzle dissimilar metal butt welds (DMBWs) at Oconee, Unit 3.

Specifically, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) 50.55a(z)(2), the licensee requested to use an alternative on the basis that complying 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 concluded that the proposed alternative in relief request 19-ON-002 provides reasonable assurance of structural integrity of the subject components and that complying with the specified ASME Code requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety. Accordingly, the NRC staff concludes that the licensee has adequately addressed all the regulatory requirements set forth in 10 CFR 50.55a(z)(2).

Therefore, the NRC staff authorizes the licensee's use of relief request 19-ON-002 at Oconee, Unit 3, proposed alternative request for the remainder of the fifth 10-year ISI interval, which is scheduled to end on July 15, 2024.

All other ASME Code, Section XI requirements for which relief 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 Project Manager, Michael Mahoney at 301-415-3867 or via e-mail at Michael.Mahoney@nrc.gov.

Sincerely,

Michael T. Markley, Chief
Plant Licensing Branch II-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 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

PROPOSED ALTERNATIVE TO REACTOR VESSEL NOZZLE WELD

EXAMINATION FREQUENCY REQUIREMENTS IN CODE CASE N-770-2

DUKE ENERGY CAROLINAS, LLC

OCONEE NUCLEAR STATION, UNIT 3

DOCKET NUMBER 50-287

1.0 INTRODUCTION

By letter RA-19-0027, dated March 28, 2019 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML19087A182), Duke Energy (the licensee) submitted Relief Request No. 19-ON-002 to the U.S. Nuclear Regulatory Commission (NRC or the Commission) for the remainder of the fifth 10-year inservice inspection (ISI) interval for Oconee Nuclear Station (Oconee), Unit 3.

Pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR), Part 50, Paragraph 55a(z)(2), the licensee requested the NRC to authorize the use of an alternative to the examination frequency requirements of Section XI of the American Society of Mechanical Engineers Boiler and Pressure Vessel (ASME Code) Code Case N-770-2, "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," as required by 10 CFR 50.55a(g)(6)(ii)(F), with conditions, for reactor pressure vessel (RPV) core flood nozzle dissimilar metal butt welds (DMBWs) at Oconee, Unit 3.

Specifically, pursuant to 10 CFR 50.55a(z)(2), the licensee requested to use the proposed alternative on the basis that compliance with the specified ASME Code requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

2.0 REGULATORY EVALUATION

Pursuant to 10 CFR 50.55a(g)(4), "Inservice inspection standards requirement 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

requirements, set forth in the ASME Code, Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components," to the extent practical within the limitations of design, geometry, and materials of construction of the components.

Pursuant to 10 CFR 50.55a(g)(6)(ii), "Augmented ISI program," the NRC may require licensees to follow an augmented ISI program for systems and components for which the Commission deems that added assurance of structural reliability is necessary.

Pursuant to 10 CFR 50.55a(g)(6)(ii)(F), "Augmented ISI requirements: Examination requirements for Class 1 piping and nozzle dissimilar-metal butt welds - (1) Implementation," licensees shall implement the requirements of ASME Code Case N-770-2 instead of ASME Code Case N-770-1, subject to the conditions specified in paragraphs (g)(6)(ii)(F)(2) through (13) of the section, by the first refueling outage starting after August 17, 2017.

Pursuant to 10 CFR 50.55a(z)(2), alternatives to the requirements of paragraphs (b) through (h) of Section 50.55a, or portions thereof, may be used when authorized by the NRC if the licensee demonstrates that compliance with the specified requirements of this section would result in hardship or unusual difficulty without a compensating increase in the level of quality or safety.

Based on the above, and subject to the following technical evaluation, the NRC staff finds that regulatory authority exists for the NRC to authorize the licensee's proposed alternative for the remainder of the fifth 10-year ISI interval for Oconee, Unit 3. Accordingly, the NRC staff reviewed and evaluated the licensee's request pursuant to 10 CFR 50.55a(z)(2).

3.0 TECHNICAL EVALUATION

3.1 ASME Code Components Affected by the Proposed Alternative

The licensee's request is applicable to the following core flood nozzle-to-safe end DMBWs:

Weld ID	Description
3-RPV-WR53	RPV Core Flood Nozzle-to-Safe End, 14" DMBW
3-RPV-WR53A	RPV Core Flood Nozzle-to-Safe End, 14" DMBW

3.2 Applicable Code Edition, Addenda, and Requirements

Oconee, Unit 3, is in the fifth 10-year ISI interval with a scheduled end date of July 15, 2024. The code of record for the fifth 10-year ISI interval at Oconee, Unit 3, is the ASME Code, Section XI, 2007 Edition and 2008 Addenda.

Paragraph 50.55a(g)(6)(ii)(F)(1) of 10 CFR requires the use of ASME Code Case N-770-2.

ASME Code Case N-770-2, Table 1, Item B requires volumetric examination of unmitigated butt welds at cold leg operating temperatures greater than or equal to 525 degrees Fahrenheit (°F) and less than 580°F every second inspection period not to exceed 7 years.

ASME Code Case N-770-5, Table 1, Item B-2 requires volumetric examination of unmitigated butt welds at Cold Leg operating temperature greater than or equal to 525°F and less than 580°F NPS [nominal pipe size] of 14 inches or larger once per interval.

Note 11(d) to N-770-5, Table 1 states that, "Examinations for Inspection Item B-2 may be deferred to the end of the interval and performed coincident with the reactor vessel nozzle examinations required by Examination Category B-D, as provided by IWA-2430. The time between examinations shall not exceed 13 yr."

3.3 Reason for Request

The licensee proposed the alternative of extending the required examination frequency from every second inspection period (7-year maximum) to every 10-year inspection interval (13-year maximum as permitted by ASME Code Case N-770-5), so that the examinations will coincide with the core barrel removal for the Oconee, Unit 3, RPV weld inspections.

The licensee explained that the plant design limits access to the outer surface of the subject DMBWs. With the core barrel removed, the licensee noted that examination coverage of these welds can be achieved without significant hardship when approached from the inner diameter of the weld. The outer surfaces of these welds are located underneath the annulus shield blocks in the approximately 3-foot wide RPV annulus. The licensee noted that these physical interferences and the high dose rates associated with the weld location are significant hardships. In addition, the licensee explained that each core barrel removal is a hardship that produces increased plant risk and elevates the outage dose to workers.

3.4 Licensee's Proposed Alternative

The licensee's proposed alternative is to extend the weld examination frequency required by ASME Code Case N-770-2, Table 1, Item B for the Oconee, Unit 3, RPV core flood nozzle-to-safe end DMBWs listed in Section 3.1 of this safety evaluation from, "every second inspection period not to exceed 7 years," to every interval not to exceed 13 years from the previous examination, as permitted in ASME Code Case N-770-5, Table 1, Item B-2.

3.5 Licensee's Bases for Use

The licensee explained that its proposed alternative would allow the ASME Code Case N-770-2 inspections of the subject welds to coincide with the 10-year ISI refueling outage for Oconee, Unit 3 (03R32), currently scheduled for Spring 2024. The licensee is seeking NRC authorization of the proposed alternative in accordance with 10 CFR 50.55a(z)(2) on the basis that compliance with the required examination frequency would result in hardship or unusual difficulty without a compensating increase in the level of quality or safety. The licensee cited the increased risk of an additional core barrel pull just to inspect the subject welds.

The subject Oconee, Unit 3, welds had volumetric examinations performed during their last reactor vessel 10-year ISI in the spring of 2014 with essentially 100% coverage. The inspections were performed in accordance with ASME Section XI, Appendix VIII, Supplement 10 requirements and found no reportable circumferential or axial indications.

Guidance in ASME Code Case N-770-5 was approved by ASME on November 7, 2016. One of the major changes between ASME Code Case N-770-2 and N-770-5 is Table 1, Inspection Item B was replaced with B-1 and B-2, separating welds for pipes with NPS of less than 14 inches and 14 inches or greater. ASME Code Case N-770-5 examinations for item B-2 (NPS of 14 inches or greater) may be deferred to the end of the interval and performed coincident with the reactor vessel nozzle examinations and the time between examinations shall not exceed 13 years.

The licensee stated that the basis for the change to Table 1 related to extending the inspection frequency for cold leg temperature dissimilar metal butt welds 14 inches and greater is discussed in the Proceedings of 2011 ASME Pressure Vessels and Piping Conference PVP2011-57829, "Changing the Frequency of Inspections for PWSCC [Primary Water Stress-Corrosion Cracking] Susceptible Welds at Cold Leg Temperatures", July 17-21, 2011. This reference indicates that the flaw tolerance of large diameter cold leg pipes is very good and example calculations show that reasonably large flaws are acceptable for ten years. In addition, the probability of cracks initiating in cold leg piping is significantly lower than that for piping at hotter temperatures.

3.6 Duration of Proposed Alternative

The licensee requested that the NRC authorize the alternative for the remainder of the fifth 10-year ISI interval for Oconee, Unit 3, which is scheduled to end on July 15, 2024.

3.7 NRC Staff's Technical Evaluation

By letter dated October 3, 2017 (ADAMS Accession No. ML117279A108), the licensee submitted a similar relief request, for Oconee, Units 1 and 2, which was approved by the NRC by letter dated April 13, 2018 (ADAMS Accession No. ML18100A005).

The NRC staff has reviewed and evaluated the licensee's request on the basis that compliance with the specified requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety. The use of ASME Code Cases is not mandatory unless specifically required by 10 CFR 50.55a. 10 CFR 50.55a(g)(6)(ii)(F) requires the use of ASME Code Case N-770-2, with conditions. As discussed above, ASME Code Case N-770-2 requires that that the subject 14-inch RPV core flood nozzle-to-safe end DMBWs receive a volumetric examination in accordance with ASME Code, Section XI, Appendix VIII every second inspection period not to exceed 7 years. The licensee performed these examinations during their last reactor vessel 10-year ISI in the spring of 2014 and found no reportable indications.

In lieu of performing the required examinations at Oconee, Unit 3, no later than spring 2020 (7 years from the last inspection) as required by ASME Code Case N-770-2, the licensee's proposed alternative is to follow the inspection frequency listed in ASME Code Case N-770-5 which specifies that the subject welds are to be inspected once per interval. Note 11(d) to Table 1 of the ASME Code Case N-770-5, states that the examinations may be deferred to the end of the interval and performed coincident with the RPV nozzle examinations required by Examination Category B-D, as provided by IWA-2430. Note 11(d) also states that the time between examinations shall not exceed 13 yr.

The licensee intends to perform the examinations when the core barrel is removed in the 10-year RPV ISI refueling outage currently scheduled to occur in spring 2024. The last inspection of the subject RPV core flood nozzle-to-safe end DMBWs was spring 2014. The NRC staff notes that the duration of the proposed alternative is until the end of the fifth 10-year ISI interval which is scheduled for July 15, 2024. Therefore, the licensee's current proposed alternative would extend the examination frequency from 7 years to 10 years.

On November 9, 2018, the NRC published in the *Federal Register* (83 FR 56156) a proposed rule which, in part, would require licensees to implement ASME Code Case N-770-5 instead of

ASME Code Case N-770-2, subject to the conditions specified in 10 CFR 50.55a(g)(6)(ii)(F)(2) through (13). As discussed above, ASME Code Case N-770-5 extends to inspection frequency for DMBWs NPS of 14 inches and larger that operate at cold leg operating temperatures to every inspection interval not to exceed 13 years. None of the proposed NRC conditions in 10 CFR 50.55a(g)(6)(ii)(F)(2) through (13) impact the change in inspection frequency in ASME Code Case N-770-5 related to the subject Oconee, Unit 3, DMBWs.

To date, the NRC has not received any public comments on the above proposed rule regarding the increase in inspection frequency for cold leg DMBWs NPS of 14 inches and larger. In addition, the NRC is not aware of any operating experience related to cold leg DMBWs NPS of 14 inches and larger that would require any additional conditions on the use of the inspection frequency listed in ASME Code Case N-770-5 for these welds.

The licensee explained that performance of the qualified volumetric examination from the inside diameter would require access via removal of the core barrel. In order to perform this inspection, the core barrel would have to be removed solely for the inspection of the subject welds, followed by an additional core barrel removal in spring 2024 to perform the required 10-year RPV ISI. Therefore, the NRC staff finds that the additional removal of the core barrel for inside diameter access for the required volumetric inspection of these welds is a hardship.

The licensee would also have the option of performing the qualified volumetric examination from the outside diameter of the subject DMBWs. However, the licensee has identified that the outer surfaces of the subject DMBWs are confined within an approximately 3-foot wide RPV annulus and underneath the annulus shield blocks. The licensee also noted that the inspection of the subject DMBWs from the outside diameter would result in significant dose for the inspectors.

Historically, the NRC staff has found that physical limitations and high radiological dose rates constitute hardships in performing these types of outside diameter volumetric inspections. Therefore, the NRC staff finds that the performance of the required volumetric inspection of these welds from the outside diameter is a hardship. Given these licensee-identified hardships, the NRC staff finds that the licensee has demonstrated an overall hardship in performing the volumetric examinations within the required inspection frequency of 7 years.

Given the licensee's identified hardship and the NRC staff's proposed rule in *Federal Register* (83 FR 56156) to mandate the use of ASME Code Case N-770-5, which will permit an inspection frequency of the subject welds consistent with the licensee's proposed alternative, the NRC staff finds the licensee's proposed alternative is acceptable on the basis that compliance with the specified requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

4.0 CONCLUSION

The NRC staff has concluded that the proposed alternative in relief request 19-ON-002 provides reasonable assurance of structural integrity of the subject components and that complying with the specified ASME Code requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety. Accordingly, the NRC staff concludes that the licensee has adequately addressed all the regulatory requirements set forth in 10 CFR 50.55a(z)(2).

Therefore, the NRC staff authorizes the licensee's use of proposed alternative request 19-ON-002 at Oconee, Unit 3, for the remainder of the fifth 10-year ISI interval, which is scheduled to end on July 15, 2024.

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

Principal Contributor: R. Davis, NRR

Date: February 13, 2020

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