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

February 7, 2022

OCONEE NUCLEAR STATION, UNITS 1, 2, AND 3 – AUTHORIZATION AND SAFETY EVALUATION FOR RELIEF REQUEST RA-20-0334 FOR USE OF ALTERNATIVE ACCEPTANCE CRITERIA IN CODE CASE N-853 (EPID L-2021-LLR-0032)

LICENSEE INFORMATION

Recipient's Name and Address: Steven M. Snider
Site Vice President, Oconee Nuclear Station
Duke Energy Carolinas, LLC
7800 Rochester Highway
Seneca, SC 29672-0752

Licensee: Duke Energy Company (the licensee)

Plant Name and Unit: Oconee Nuclear Station (Oconee), Units 1, 2 and 3

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

APPLICATION INFORMATION

Submittal Date: May 4, 2021

Submittal Agencywide Documents Access and Management System (ADAMS) Accession No.: ML21124A170

Supplement Date(s): August 31, 2021, October 28, 2021, and January 20, 2022

Supplement ADAMS Accession Nos.: ML21243A515, ML21301A018, and ML22020A152

Applicable Inservice Inspection (ISI) Program Interval and Interval Start/End Dates: The alternative is applicable for the remainder of the fifth 10-year inservice inspection (ISI) interval for Oconee, Units 1, 2, and 3. The Fifth 10-year ISI interval began on July 15, 2014 and is scheduled to end on July 15, 2024.

Alternative Provision: The licensee requested the alternative for Oconee, Units 1, 2, and 3, in accordance with Title 10 of the *Code of Federal Regulations* (10 CFR), paragraph 50.55a(z)(1), on the basis that the alternatives provide an acceptable level of quality and safety.

ISI Requirement and Affected Components: The American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code) requirements applicable to this request originate in Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components," Article IWA-4000. ASME Code, Section XI, paragraph IWA-4421 states, in part, that defects shall be removed or mitigated. As an alternative, the licensee proposes to use ASME Code Case N-853, "PWR Class 1 Primary Piping Alloy 600 Full Penetration Branch Connection Weld Metal Buildup for Material Susceptible to Primary Water Stress Corrosion Cracking, Section XI." This ASME Code Case has been incorporated by reference into 10 CFR 50.55a via inclusion in

Regulatory Guide (RG) 1.147, Revision 19, “Inservice Inspection Code Case Acceptability, ASME Section XI, Division 1” (ADAMS Accession No. ML19128A244), with no condition.

Guidance in ASME Code Case N-853, Section 3, paragraph (d)(3) states that the branch connection weld metal buildup (BCWMB) and the ferritic heat-affected-zone beneath the BCWMB, as shown in Figure 6 of the ASME Code Case, shall be ultrasonically examined for acceptance in accordance with the Construction Code or ASME Code, Section III, NB-5330 criteria to assure adequate fusion (i.e., bond) with the base materials, and to detect welding flaws such as interbead lack of fusion, inclusions, or cracks. As stated by the licensee, the following affected components are covered by RA-020-0334:

Unit 1 Affected Components:

- Three 1A Hot Leg RTE Mounting Boss Alloy 600 Nozzle Welds (1-PHA-13, 1-PHA-14, 1-PHA-15)
- Three 1B Hot Leg RTE Mounting Boss Alloy 600 Nozzle Welds (1-PHB-13, 1-PHB-14, 1-PHB-15)
- Four Cold Leg RTE Mounting Boss Alloy 600 Nozzle Welds (1-PIA1-12, 1-PIA2-12, 1-PIB1-12, 1-PIB2-12)

Units 2 Affected Components:

- Three 2A Hot Leg RTE Mounting Boss Alloy 600 Nozzle Welds (2-PHA-13, 2-PHA-14, 2-PHA-15)
- Three 2B Hot Leg RTE Mounting Boss Alloy 600 Nozzle Welds (2-PHB-13, 2-PHB-14, 2-PHB-15)
- Four Cold Leg RTE Mounting Boss Alloy 600 Nozzle Welds (2-PIA1-12, 2-PIA2-12, 2-PIB1-12, 2-PIB2-12)

Units 3 Affected Components:

- Three 3A Hot Leg RTE Mounting Boss Alloy 600 Nozzle Welds (3-PHA-13, 3-PHA-14, 3-PHA-15)
- Three 3B Hot Leg RTE Mounting Boss Alloy 600 Nozzle Welds (3-PHB-13, 3-PHB-14, 3-PHB-15)
- Two 3A Hot Leg Flow Meter Alloy 600 Nozzle Welds (*Nearest Nozzle Butt Welds 3-RC-287-3 and 3-RC-287-63V)
- Two 3B Hot Leg Flow Meter Alloy 600 Nozzle Welds (*Nearest Nozzle Butt Welds 3-RC-286-11 and 3-RC-286-58V)
- Four Cold Leg RTE Mounting Boss Alloy 600 Nozzle Welds (3-PIA1-9, 3-PIA2-9, 3-PIB1-11, 3-PIB2-9)
- One 3B1 Cold Leg Level Tap Alloy 600 Nozzle Weld (*Nearest Nozzle Butt Weld 3-50-37-1)
- Three Cold Leg Drain Alloy 600 Nozzle Welds (3-PIA1-10, 3-PIA2-10, 3-PIB2-10)

  Note *: Small Bore Piping (1” NPS) Nozzle Welds are not given explicit weld IDs on the original Drawings. These nine specific Small Bore Nozzle Welds are located by the nearest documented branch connection butt weld.

Materials of construction for all locations referenced above are:

- Reactor Coolant System Piping (RCS) – SA-106 Grade B (P-No. 1)
- Alloy 600 Nozzle – SB-166 UNS N06600 (P-No. 43)

- Alloy 82/182 Dissimilar Metal Weld (DMW) – ERNiCr-3, Spec. SFA 5.14 / ENiCrFe-3, Spec. SFA 5.11 (F-No. 43)

Applicable Code Edition and Addenda:
The code of record for the fifth 10-year ISI interval of Oconee, Units 1, 2, and 3, is the 2007 Edition with 2008 Addenda of the ASME Code, Section XI. The original Construction Code of Oconee is the 1969 Edition of ASME B31.7, "Nuclear Power Piping." The repair/replacement activities at Oconee are performed in accordance with the 1983 Edition with no addenda of the ASME Code, Section III, "Rules for Construction of Nuclear Facility Components."

Brief Description of the Proposed Alternative: The licensee proposed to use the criteria of ASME Code, Section XI, IWB-3514 for acceptance and disposition of defects detected during ultrasonic testing (UT) of the stress corrosion cracking resistant Alloy 52M weld pad in lieu of the ASME Code, Section III, NB-5330 criteria as required in ASME Code Case N-853. Figure 6 of ASME Code Case N-853 specifies the examination volume to be scanned by the UT probe.

Section 1 of Enclosure 1 to the letter dated May 4, 2021, provides description, location, and materials of construction for the 38 ASME Code Class 1 Alloy 600 and Alloy 82/182 DMW nozzles with full penetration branch connection DM welds.

NRC STAFF EVALUATION

The NRC staff evaluated proposed alternative RA-20-0334 pursuant to 10 CFR 50.55a(z)(1), to determine whether the alternative (i.e., use of ASME Code, Section XI, IWB-3514 criteria for acceptance of a weld pad) provides an acceptable level of quality and safety.

Guidance in ASME Code Case N-853 requires use of ASME Code, Section III, NB-5330 for acceptance of a weld pad to assure that no planar fabrication defects regardless of length or depth left in service will grow to compromise the structural integrity of the weld pad, and the reactor coolant pressure boundary (RCPB). Based on the above, this Code Case allows the subsequent ISI of a weld pad to be only a visual examination. In any precedents (e.g., ADAMS Accessions ML070850915 and ML071280781) where an alternative approved by the NRC have allowed use of IWB-3514 instead of NB-5330 for similar applications (e.g., weld overlay), the subsequent ISI of the location would be a volumetric not a visual examination, to ensure the planar fabrication defects left in service under IWB-3514 would be periodically monitored to confirm dormancy, and eventually the structural integrity of the components.

In the letter dated January 20, 2022, the licensee confirmed that it will comply with the ASME Code Case N-853, Section 3, paragraph (d)(3) requirements with the following proposed conditions when performing UT to accept the weld pads installed on the nozzle components listed in Section 1 of Enclosure 1 to Alternative RA-20-0334. The NRC staff's evaluation of the licensee's proposed conditions is discussed below.

- If the results of the UT performed on a weld pad are found acceptable under NB-5330 criteria, the licensee will follow ASME Code Case N-853-required subsequent ISI for that weld pad (i.e., visual examination).

The NRC staff finds the licensee's proposed inspection acceptable because no planar fabrication defects regardless of length or depth will be left in service that requires periodic volumetric monitoring. The ASME Code Case N-853-required subsequent visual examinations is adequate to ensure leak tightness of the weld pad and associated components of the repaired nozzle during plant operating license.

- If the results of the UT performed on a weld pad identifies a defect that is rejectable under NB-5330 but acceptable under IWB-3514, the licensee will perform a subsequent, one-time volumetric examination of that weld pad during the first or second refueling outage following installation. If the one-time volumetric examination shows no indication of crack growth or new cracking, that weld pad shall be placed into a population (i.e., the population contains the weld pads found acceptable under IWB-3514) to be examined on a sample basis. Twenty-five percent of this population shall be added to the ISI program and shall be examined volumetrically once each inspection interval. If during the one-time or subsequent volumetric examinations of the weld pad there is an indication of crack growth or new cracking, the licensee shall evaluate the condition of the weld pad and take appropriate corrective action (e.g., repair or re-examinations) in accordance with the ASME Code, Section XI requirements.

The NRC finds the licensee's proposed inspection acceptable because the location and vicinity of the planar fabrication defects left in service under IWB-3514 will receive periodic volumetric examinations during plant operating license, and the licensee will take corrective action if it identifies, through subsequent examination and monitoring, the planar fabrication defects are growing or new defects are identified in the area or volume scanned.

The licensee stated that the examination coverage of a subsequent, one-time volumetric examination may be limited due to obstructions from the nozzle, as shown in Figure 3 of ASME Code Case N-853. The licensee confirmed that it will remove any defects left in service under IWB-3514 in the weld pad volume that cannot be periodically monitored due to the existence of the nozzle, therefore, the NRC staff finds this acceptable since the purpose of the subsequent, one-time volumetric examination is to monitor the fully accessible defects in the weld pad.

In the letter dated August 31, 2021, the licensee confirmed that when performing UT of the weld pad at the repaired nozzle, it will use a manual phased array UT procedure:

- That meets the demonstration requirements of the ASME Code, Section V, "Nondestructive Examination,"
- That utilizes technical elements of performance demonstration initiative (PDI) qualified ASME Code, Section XI, Appendix VIII, Supplement 11, "Qualification Requirements for Full Structural Overlaid Wrought Austenitic Piping Welds," procedures,
- That is implemented by a PDI-qualified Supplement 11 examiners.

The NRC staff finds the licensee's UT personal qualification and procedure demonstration acceptable because there is no PDI or ASME Code, Appendix VIII qualified UT for a weld pad.

Based on the above, the NRC staff finds that the licensee has provided adequate basis to demonstrate that its proposed alternative with the conditions identified would provide reasonable assurance of structural integrity and leak tightness of the weld pad and the RCPB.

CONCLUSION

The NRC staff has determined that the proposed alternative provides an acceptable level of quality and safety by providing reasonable assurance of the structural integrity of the weld pad and the RCPB. The NRC staff concludes that the licensee has adequately addressed all regulatory requirements set forth in 10 CFR 50.55a(z)(1). Therefore, the NRC staff authorizes use of RA-20-0334 with the conditions for remainder of the fifth 10-year ISI interval of Oconee, Units 1, 2, and 3, which is scheduled to end on July 14, 2024.

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

Principal Contributor(s): Ali Rezai

Date: February 7, 2022

Michael T. Markley

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