

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

December 18, 2020

Mr. John A. Krakuszeski Site Vice President Brunswick Steam Electric Plant Duke Energy Progress, LLC 8470 River Rd., SE (M/C BNP001) Southport, NC 28461

SUBJECT: BRUNSWICK STEAM ELECTRIC PLANT, UNITS 1 AND 2 –REQUEST FOR ALTERNATIVE TO EXAMINATION CATEGORY B-N-1 (VT-3) VISUAL EXAMINATION OF ACCESSIBLE AREAS OF THE REACTOR VESSEL INTERIOR (EPID L-2020-LLR-0048)

Dear Mr. Krakuszeski:

By letter dated March 31, 2020 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML20091F213), Duke Energy Progress, LLC (Duke Energy or the licensee) submitted a request for alternatives to the U.S. Nuclear Regulatory Commission (NRC). It requested for alternatives to the requirements of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code, Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components," at the Brunswick Steam Electric Plant (BSEP), Units 1 and 2.

Specifically, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) 50.55a(z)(1), the licensee requested to use the proposed alternative on the basis that the alternative provides an acceptable level of quality and safety.

The NRC staff determines that granting the request for alternative pursuant to 10 CFR 50.55a(z)(1) is authorized by law, will not endanger life or property or the common defense and security, and is otherwise in the public interest, giving due consideration to the burden upon the licensee that could result if the requirements were imposed on the facility. Accordingly, the NRC staff concludes that the licensee has adequately addressed all the regulatory requirements set forth in 10 CFR 50.55a(z)(1). Therefore, the NRC staff authorizes the use of proposed alternative RA-20-0045 at BSEP Units 1 and 2 for the remainder of the Fifth Inservice Inspection Interval for ASME Section XI, Examination Category B-N-1, Item Number B13.10.

All other ASME Code, Section XI requirements for which relief was not specifically requested and authorized herein by the NRC staff remain applicable, including the third-party review by the Authorized Nuclear In-service Inspector. If you have any questions, please contact the Project Manager, Andrew Hon, at 301-415-8480 or <u>Andrew.Hon@nrc.gov</u>.

Sincerely,

Undine S. Shoop, Chief Plant Licensing Branch II-2 Division of Operating Reactor Licensing Office of Nuclear Reactor Regulation

Docket No. 50-324 and 50-325

Enclosure: Safety Evaluation

cc: Listserv



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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

PROPOSED ALTERNATIVE RELIEF REQUEST

FIFTH INSERVICE INSPECTION INTERVAL

DUKE ENERGY PROGRESS, LLC

BRUNSWICK STEAM ELECTRIC PLAN UNITS 1 AND 2

DOCKET NOS. 50-324, 50-325

1.0 INTRODUCTION

By letter dated March 31, 2020, (Agencywide Documents Access & Management System (ADAMS) Accession No. ML20091F213), Duke Energy Progress, LLC (Duke Energy or the licensee), submitted a request for an alternative to the requirements of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (B&PV Code), Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components," for Brunswick Steam Electric Plant (BSEP) Units 1 and 2. Specifically, the licensee requested to eliminate the ASME Section XI, Division 1, Table IWB-2500-1, Examination Category B-N-1, Item Number B13.10, visual examination of the spaces above and below the reactor core that are made accessible for examination by removal of components during normal refueling outages for the Fifth Inservice Inspection (ISI) Interval at BSEP Units 1 and 2.

Pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR), Paragraph 50.55a(z)(1), the licensee requested to use the proposed alternative on the basis that the alternative provides an acceptable level of quality and safety.

2.0 REGULATION EVALUATION

Adherence to Section XI of the ASME Code is mandated by 10 CFR 50.55a(g)(4), which states, in part, that ASME Code Class 1, 2, and 3 components will meet the requirements, except the design and access provisions and the pre-service examination requirements, set forth in Section XI of the ASME Code.

Title 10 CFR 50.55a(z) states that alternatives to the requirements of paragraphs (b) through (h) of 10 CFR 50.55a or portions thereof may be used when authorized by the Director, Office of Nuclear Reactor Regulation. A proposed alternative must be submitted and authorized prior to implementation. The licensee must demonstrate that: (1) the proposed alternatives 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.

Based on the above, and subject to the following technical evaluation, the NRC staff finds that regulatory authority exists for the licensee to request the use of an alternative and the NRC to authorize the proposed alternative.

3.0 TECHNICAL EVALAUATION

3.1 ASME Code Component Affected

The affected components at BSEP Units 1 and 2 belong to Examination Category B-N-1, "Interior of Reactor Vessel," under Examination Item Number B13.10.

3.2 Applicable Code Edition and Addenda

This request applies to the Fifth ISI Interval, in which the licensee has adopted the 2007 Edition with 2008 Addenda of the ASME Code Section XI as the Code of Record.

3.3 Applicable Code Requirements

ASME Section XI, Table IWB-2500-1, Examination Category B-N-1, Examination Item Number B13.10 requires a visual examination of accessible areas of the vessel interior.

3.4 Licensee's Proposed Alternative

The licensee proposed to implement a provision of ASME Section XI, Division 1, Code Case N-885 in lieu of ASME Section XI, Table IWB-2500-1, Examination Category B-N-1, Item Number B13.10. This alternative eliminates the Examination Category B-N-1, Item Number B13.10, VT-3 visual examination of spaces above and below the reactor core that are made accessible for examination by removal of components during normal refueling outages. The licensees stated that his request for an alternative does not apply to the requirements of ASME Section XI, Examination Category B-N-2, Item Numbers B13.20, B13.30, or B13.40.

The licensee stated it will continue to perform the Examination Category B-N-2, Item Number B13.20, VT-1 visual examination of accessible welds of the reactor vessel interior attachments within the beltline region of the reactor core. The licensee also stated it will continue to perform the Examination Category B-N-2, Item Numbers B13.30 and B13.40, VT-3 visual examination of accessible welds of reactor vessel interior attachments beyond the beltline region of the reactor core and of the accessible surfaces of the core support structure, respectively.

3.5 Licensee's Bases for Alternative

The licensee stated that the adoption of this provision of Code Case N-885 provides an acceptable level of quality and safety because:

- The B-N-1 examinations are not required for vessel integrity;
- Examination of the vessel cladding is not required to support vessel integrity; and
- Procedures and practices are in place to address foreign material and debris in the reactor vessel.

In its submittal, the licensee provided further discussion for each of these reasons.

3.5.1 <u>Examinations of Spaces Above and Below the Reactor Core are Not Required for Vessel</u> <u>Integrity</u>

The licensee stated that the purpose of the ASME Section XI Examination Category B-N-1 requirement is to detect foreign material and other debris in the "accessible spaces" of the interior areas above and below the reactor core of the reactor vessel, which is clarified by Table IWB-2500-1, Note 1. The licensee stated that, with the elimination of Examination Category B-N-1 (VT-3) visual examination of the "accessible spaces" above or below the reactor core, continuing the Examination Category B-N-2, Item Numbers B13.20, B13.30, and B13.40, (VT-1 and VT-3) visual examinations of reactor vessel interior welded attachments and surfaces of the core support structure provide an acceptable level of quality and safety.

3.5.2 Examination of the Vessel Cladding is Not Required to Support Vessel Integrity

The licensee stated that early versions of ASME Section XI contained a requirement for cladding examinations under Examination Category B-I-1, but were removed with an issuance of the Summer 1976 Addenda. The licensee stated that eliminating these visual examinations will not have a significant impact on reactor vessel integrity. The licensee stated that relevant cladding degradation mechanisms include general corrosion, localized corrosion, wear, and cracking of the underlying low-alloy steel. Based upon evaluations of industry operating experience, the licensee stated that boiling water reactors implement various activities to mitigate corrosion, such as effective hydrogen water chemistry and adherence to industry water chemistry guidelines. The licensee further stated that BSEP has implemented design and operational changes to mitigate thermal fatigue cracking of the cladding and have conducted pressurized thermal shock assessments of the cladding.

The licensee stated that it conducts other visual and volumetric examinations of reactor vessel components that provide an opportunity for detecting any adverse conditions at vulnerable regions of cladding. These include other ASME Section XI examinations each ISI interval, such as Examination Category B-A, B-D, and B-N-2 examinations. The licensee also conducts boiling water reactor vessel and internals project examinations, which include reactor pressure vessel attachment welds, core spray piping welds, jet pump assembly welds, shroud support welds, feedwater sparger assemblies, and top guide grid cells and dry-tubes. The licensee stated that these examinations have found no recordable indications. The licensee further stated, during the refueling outages of the Fourth ISI Interval, VT-3 examinations of all accessible regions of the reactor vessel cladding were performed and found no recordable indications.

3.5.3 <u>Alternative Guidance and Practices are in Place to Address Foreign Material and Debris in</u> <u>the Reactor Vessel</u>

The licensee stated that the industry has developed foreign material exclusion guidance and work practices to help reduce the amount of foreign material or debris that may be introduced into the reactor coolant system as a result of human error. The licensee stated it performs inspection for foreign material in the reactor vessel through foreign material search and retrieval activities performed during every refueling outage. The licensee stated that loose or missing parts and foreign material and debris are observed during fuel movement and core verification activities, routine inservice inspection activities, and during removal of reactor vessel components during refueling outages. The licensee stated that once foreign material or debris

is observed, maintenance practices are established to either remove the foreign material, or evaluate the consequences if not removing, prior to the reactor vessel head closure. The licensee stated that these routine inspections and other vessel interior activities adequately address the concern of foreign materials or debris within the reactor vessel, which makes such examinations under Examination Category B-N-1 redundant.

3.6 Duration of Proposed Alternative

This request is for the remainder of the fifth inservice inspection intervals for BSEP Units 1 and 2, scheduled to end May 10, 2028.

3.7 NRC Staff Evaluation

The licensee proposed an alternative to implement a provision of ASME Section XI, Division 1, Code Case N-885 in lieu of ASME Section XI, Table IWB-2500-1, Examination Category B-N-1, Item Number B13.10 examinations, for the remainder of the Fifth Ten-Year ISI Interval.

For Examination Category B-N-1, Examination Item Number B13.10, Code Case N-885 eliminates the visual examination of accessible areas of the vessel interior. The licensee stated that this VT-3 visual examination is not needed to ensure the integrity of the vessel and is redundant to other foreign material examinations performed during an outage. The NRC staff finds that limiting the B-N-1 examination category to examination for loose or missing parts and debris above and below the reactor core is acceptable. In its submittal, the licensee discussed the foreign material exclusion guidance and work practices that it implements every refueling outage. The NRC staff finds that these activities will observe the top of the fuel where loose or missing parts and debris accumulate and accomplish the purpose of the Examination Category B-N-1 examinations.

The licensee also stated that these Examination Category B-N-1 visual inspections are not necessary to detect corrosion or cracking of the reactor vessel cladding. The licensee discussed the various mitigation activities, reactor vessel integrity assessments, and visual and volumetric examinations that provide opportunities to detect adverse conditions at vulnerable regions of cladding. The licensee stated that these examinations have found no recordable indications. The staff notes that, since the purpose of the Examination Category B-N-1 visual inspections are to detect foreign material and debris, expansion of the scope to include accessible regions of the vessel cladding is conservative. With the implementation of its various mitigation activities, reactor vessel integrity assessments, and visual and volumetric examinations, the NRC staff finds that the Examination Category B-N-1 visual inspections are not needed to ensure the integrity of the vessel cladding.

Based on these reasons, the NRC staff finds that the proposed alternative to eliminate the Examination Category B-N-1, Examination Item Number B13.10 examinations provide an acceptable level of quality and safety. In addition, by letter dated January 31, 2020 (ADAMS Accession No. ML20013F353), the NRC intends to include Code Case N-855 in the proposed Revision 20 to Regulatory Guide 1.147, "Inservice Inspection Code Case Acceptability, ASME Section XI, Division 1."

4.0 <u>CONCLUSION</u>

As set forth above, the NRC staff determines that the licensee has demonstrated that the proposed alternative provides an acceptable 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)(1). Therefore, the NRC staff authorizes the use of proposed alternative RA-20-0045 at BSEP Units 1 and 2 for the remainder of the Fifth ISI Interval for ASME Section XI, Examination Category B-N-1, Item Number B13.10.

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

Principal Contributor: Mark Yoo, RES/DE/CIB

Date: December 18, 2020

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