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

May 4, 2018

Mr. William R. Gideon, 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, UNIT 2 – ALTERNATIVE ISI-08 TO DEFER INSPECTION OF REACTOR VESSEL INSTRUMENTATION NOZZLE 2B11-RPV-N11B UNTIL THE FIRST PERIOD IN THE FIFTH 10-YEAR INSERVICE INSPECTION INTERVAL (EPID L-2017-LLR-0144)

Dear Mr. Gideon:

By letter dated November 29, 2017, as supplemented by letter dated March 7, 2018, Duke Energy Progress, LLC (the licensee) submitted to the U.S. Nuclear Regulatory Commission (NRC) for the use of an alternative to certain American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code) requirements at Brunswick Steam Electric Plant, Unit No. 2 (Brunswick Unit 2).

The proposed alternative, inservice inspection (ISI) Alternative ISI-08, would extend the Brunswick Unit 2 fourth 10-year inspection interval for the reactor pressure vessel (RPV) instrumentation nozzle-to-shell weld 2B11-RPV-N11B until the March 2019 refueling outage (RFO) for Brunswick Unit 2 (i.e., until RFO B2R24). The proposed alternative does not apply to any other ASME Code Class components (including other RPV nozzles) that are required to be inspected in accordance with Title 10 of the *Code of Federal Regulations* (10 CFR) Section 50.55a, and the licensee's ISI program during the fourth 10-year ISI interval of the unit or to any ISI examinations required for ASME Code Class components during subsequent ISI intervals of the unit. Specifically, pursuant to 10 CFR 50.55a(z)(1), the licensee requested to use the proposed alternative on the basis that it will provide an acceptable level of quality and safety.

The NRC staff has reviewed the subject request and concludes, as set forth in the enclosed safety evaluation, that the licensee has adequately addressed all of the regulatory requirements set forth in 10 CFR 50.55a(z)(1). Therefore, the NRC staff authorizes the use of the proposed alternative for Brunswick Unit 2 until the date associated with the completion of the March 2019 refueling outage. 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, Dennis Galvin, at 301-415-6256 or Dennis.Galvin@nrc.gov.

Sincerely,

Brian W. Tindell

Brian W. Tindell, Acting Chief
Plant Licensing Branch II-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-324

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 ISI-08 TO DEFER INSPECTION OF REACTOR VESSEL INSTRUMENTATION NOZZLE 2B11-RPV-N11B UNTIL THE FIRST PERIOD IN THE FIFTH 10-YEAR INSERVICE INSPECTION INTERVAL

DUKE ENERGY PROGRESS, LLC

BRUNSWICK STEAM ELECTRIC PLANT, UNIT 2

DOCKET NO. 50-324

1.0 INTRODUCTION

By letter dated November 29, 2017 (Reference 1), as supplemented by letter dated March 7, 2018 (Reference 2), Duke Energy Progress, LLC (the licensee) submitted to the U.S. Nuclear Regulatory Commission (NRC) relief request inservice inspection (ISI) Alternative ISI-08 for the use of an alternative to certain American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code) requirements at Brunswick Steam Electric Plant, Unit 2 (Brunswick Unit 2).

The proposed alternative, ISI Alternative ISI-08, would extend the Brunswick Unit 2 fourth 10-year inspection interval for the reactor pressure vessel (RPV) instrumentation nozzle-to-shell weld 2B11-RPV-N11B until the March 2019 refueling outage (RFO) for Brunswick Unit 2 (i.e., until RFO B2R24). The proposed alternative does not apply to any other ASME Code Class components (including other RPV nozzles) that are required to be inspected in accordance with Title 10 of the *Code of Federal Regulations* (10 CFR) Section 50.55a, and the licensee's ISI program during the fourth 10-year ISI interval of the unit or to any ISI examinations required for ASME Code Class components during subsequent ISI intervals of the unit. Specifically, pursuant to 10 CFR 50.55a(z)(1), the licensee requested to use the proposed alternative on the basis that it will provide an acceptable level of quality and safety.

2.0 REGULATORY EVALUATION

The regulations in 10 CFR 50.55a, paragraph section (g)(4), requires components defined as ASME Code Class 1, 2, or 3 components (including ASME Code Class component supports) to meet the requirements set forth in ASME Code, Section XI, except the design and access provisions and the pre-service examination requirements. Furthermore, for these types of components, the regulation in 10 CFR 50.55a(g)(4)(ii) requires the licensee to apply and comply with the requirements in the latest edition and addenda of the ASME Code, Section XI,

incorporated by reference in paragraph (a) of 10 CFR 50.55a 12 months prior to the 120 month (i.e., 10-year) ISI interval, or else to use optional ASME Code Cases listed in NRC Regulatory Guide (RG) 1.147, Revision 18 (Reference 3), as subject to the conditions listed in 10 CFR 50.55a(b).

The regulations in 10 CFR 50.55a(z) permits alternatives to the requirements of paragraph (g) of 10 CFR 50.55a to be used when authorized by the NRC, if the licensee demonstrates that either: (1) the proposed alternative provides an acceptable level of quality and safety (i.e., as specified and permitted by 10 CFR 50.55a(z)(1)), 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 (i.e., as specified and permitted by 10 CFR 10.55a(z)(2)).

Based on the regulatory evaluation provided in the previous paragraphs, the NRC staff finds that regulatory authority exists for the licensee to request the use of an alternative and the staff to authorize the proposed alternative if it meets the authorization criteria in either 10 CFR 50.55a(z)(1) or 10 CFR 50.55a(z)(2).

3.0 TECHNICAL EVALUATION

3.1 Licensee's Request

3.1.1 ASME Code Components Affected

The proposed alternative applies to the inspection of RPV instrumentation nozzle 2B11-RPV-N11B that is required to be performed during the fourth 10-year ISI interval of the facility. The affected component is an ASME Code Class 1 RPV instrumentation nozzle that is adjoined to the RPV using a full penetration pressure retaining weld. The component and its pressure retaining weld constitutes components that are part of the reactor coolant pressure boundary for the facility.

3.1.2 Applicable Code Edition and Addenda

The applicable ASME Code, Section XI, requirements are those given in the 2001 Edition of ASME Code, Section XI, inclusive of the 2003 Addenda, which were the most current edition and addenda of ASME Code, Section XI, incorporated by reference in 10 CFR 50.55a 12 months prior to entry into the fourth 10-year ISI interval for Brunswick Unit 2. The plant's fourth 10-year ISI interval commenced on May 11, 2008, and is currently scheduled to end on May 10, 2018.

3.1.3 Applicable ASME Code, Section XI, Requirements and Applicable Inservice Inspection Alternatives Already Authorized for the Fourth 10-Year Inservice Inspection Interval

The ISI requirements set forth in ASME Code, Section XI, for performing inspections of RPV nozzles adjoined by full penetration pressure retaining welds are given in ASME Code, Section XI, Table IWB-2500-1, Examination Category B-D, Inspection Item B3.90. This ASME code inspection item requires the licensee to perform volumetric inspections of 100 percent of the applicable nozzle-to-vessel welds each ISI interval.

The licensee's current licensing basis for the fourth 10-year ISI interval includes ISI Alternative ISI-05, which was requested on August 29, 2010 (Reference 4), and was authorized by the NRC staff in the safety evaluation (SE) dated January 31, 2011 (Reference 5). The alternative

in ISI Alternative ISI-05 permits the licensee to implement ASME Code Case N-702 as the basis for reducing the volumetric examination sample size of RPV full penetration nozzle welds down to a minimum of 25 percent, with the added stipulation that implementation of the ASME Code Case requires the licensee to perform volumetric inspections of at least one nozzle from each Class 1 plant system and nominal pipe size that is adjoined to the RPV using a full penetration weld configuration.

3.1.4 Reason for the Request

The criteria in ASME Code, Section XI, Table IWB-2500-1, Examination Category B-D, Inspection Item B.3.90, requires the licensee to volumetrically inspect 100 percent RPV nozzles that are welded to the RPV with full penetration pressure-retaining welds each 10-year ISI interval. In the SE of January 31, 2011 (Reference 5), the NRC staff granted the licensee authorization to perform the ISI examinations of these nozzles in accordance ISI Alternative ISI-05 (Reference 4), and the alternative ISI methodology in ASME Code Case N-702. Although the licensee performed a volumetric inspection of the RPV instrumentation nozzle 2B11-RPV-N11B during the first RFO in the fourth 10-year ISI interval of the reactor, the inspection was credited for compliance with the ASME Code, Section XI, Inspection Item B.3.90, requirements for the third 10-year ISI interval of the facility. The licensee indicated that, although an inspection of the RPV instrumentation nozzle B211-RPV-N11B is needed to satisfy the reduced nozzle sample-size requirements in ASME Code Case N-702 for the fourth 10-year ISI interval, the previous inspection of the nozzle during the fourth 10-year ISI interval cannot be credited for compliance with the applicable ASME Code, Section XI, Inspection Item B.3.90, requirements or the alternative ISI nozzle requirements in ISI Alternative ISI-05 for the interval. The licensee also stated that it does not have any RFOs remaining in the fourth 10-year ISI interval upon which a re-inspection of RPV instrumentation nozzle B211-RPV-N11B could be performed and credited for the fourth 10-year ISI interval of the facility.

3.1.5 Proposed Alternative

The licensee's alternative in ISI Alternative ISI-08, as amended in the licensee's letter of March 7, 2018, proposes to extend the applicability of the alternative in ISI Alternative ISI-05 to the end of the March 2019 RFO for the facility (Outage B2R24), as applied solely to the volumetric inspection that will be needed to be performed on RPV instrumentation nozzle B211-RPV-N11B for credit during the fourth 10-year ISI interval for the unit. The licensee also stated that the inspection of RPV instrumentation nozzle B211-RPV-N11B during Outage B2R24 will be performed in accordance with ASME Code Case N-702, and that the extension of the fourth 10-year ISI interval is not being requested for, and will not be applied to, any other component covered by the Brunswick Unit 2 ISI program.

3.2 NRC Staff Evaluation

The NRC staff reviewed the alternative in ISI Alternative ISI-08, as amended in the letter of March 7, 2018, against the basis for reviewing and authorizing proposed alternatives in accordance with requirement in 10 CFR 50.55a(z)(1). The NRC staff also reviewed the proposed alternative in accordance with the staff's previous basis for authorizing ISI Alternative ISI-05, as previously requested and authorized (References 4 and 5). If authorized by the NRC staff, ISI Alternative ISI-08, as amended, would allow the previous authorization in ISI Alternative ISI-05 to be extended until the March 2019 RFO for the facility (i.e., Outage B2R24), upon which the licensee will perform an inspection of RPV instrumentation nozzle B211- RPV-N11B in accordance ASME Code N-702. The March 2019 RFO is currently

scheduled to commence during the first inspection period in the fifth 10-year ISI interval for the facility.

The NRC staff observed that the alternative ISI requirements and criteria in ASME Code Case N-702 were approved by the NRC staff as part of the ASME Code, Section XI, Code Cases that have been endorsed in RG 1.147, Revision 18. The RG states that use of ASME Code Case N-702 is subject to the following condition on implementation of the Code Case methodology:

> "The technical basis supporting the implementation of this Code Case is addressed by BWRVIP-108: BWR [Boiling Water Reactor] Vessel and Internals Project, "Technical Basis for the Reduction of Inspection Requirements for the Boiling Water Reactor Nozzle-to-Vessel Shell Welds and Nozzle Blend Radii," EPRI Technical Report 1003557, October 2002 [Agencywide Documents Access and Management System (ADAMS) Accession No.] (ML023330203) and BWRVIP-241: BWR Vessels and Internals Project, "Probabilistic Fracture Mechanics Evaluation for the Boiling Water Reactor Nozzle-to-Vessel Shell Welds and Nozzle Blend Radii," EPRI Technical Report 1021005, October 2010 [ADAMS Accession No.] (ML11119A041). The applicability of Code Case N-702 must be shown by demonstrating that the criteria in Section 5.0 of NRC Safety Evaluation regarding BWRVIP-108 dated December 18 [19], 2007 [ADAMS Accession No.] (ML073600374) or Section 5.0 of NRC Safety Evaluation regarding BWRVIP-241 dated April 19, 2013 (ML13071A240) are met. The evaluation demonstrating the applicability of the Code Case shall be reviewed and approved by the NRC prior to the application of the Code Case."

The NRC staff noted that the licensee previously met the condition on application of the Code Case methodology through its submittal of ISI Alternative ISI-05 (Reference 4), which was authorized for implementation during the fourth 10-year ISI Interval in the NRC staff's SE of January 31, 2011 (Reference 5). However, the NRC staff determined that the authorization of ISI Alternative ISI-05 and the applicant's request to apply the ISI methodology in ASME Code Case N-702 for the fourth 10-year ISI Interval expires on May 10, 2018. Therefore, the NRC staff determined that the new request in ISI Alternative ISI-08 to extend the end date of the previous alternative in ISI Alternative ISI-05 was necessary, but should be limited only to the inspection that would need to be performed on RPV instrumentation nozzle B211-RPV-N11B during the fourth 10-year ISI interval for the unit. The licensee addressed this need by amending ISI Alternative ISI-08 in a letter dated March 7, 2018 (Reference 2). In this amendment of the request, the licensee limited the proposed ISI Alternative ISI-08 only to the deferred inspection that would need to be performed on RPV instrumentation nozzle B211-RPVN11B during the March 2019 RFO, as will be credited for compliance with the alternative ASME Code, Section XI, Code Case N-702, requirements for the nozzle during the fourth 10-year ISI interval.

The NRC staff noted that the basis in ISI Alternative ISI-08 (as amended) indicates that the licensee's previous volumetric inspection of RPV instrumentation nozzle B211-RPV-N11B in March of 2009 (as performed for compliance with ISI requirements for the third 10-year ISI interval), achieved a better than 90 percent coverage of the weld and did not identify any relevant flaw indications or form of age-related degradation in the nozzle or its nozzle-to-vessel pressure retaining weld. These previous inspection results support a basis for approving ISI Alternative ISI-08 and the licensee's basis for claiming that the plant can be operated until a volumetric inspection of RPV instrumentation nozzle B211-RPV-N11B can be performed during Outage B2R24.

Therefore, based on this review, the NRC staff finds that the licensee has provided an acceptable basis for deferring the volumetric inspection of RPV instrumentation nozzle B211-RPV-N11B until the end of the March 2019 RFO (i.e., to the end of Outage B2R24), as based on the following factors for approving and authorizing the request proposed in ISI Alternative ISI-08:

(a) With the exception of the ISI that needs to be performed on RPV nozzle B211-RPV-N11B, the licensee has completed the ISIs of all other RPV nozzles that are required to be inspected during the fourth 10-year ISI Interval in accordance the alternative ISI requirements in ASME Code Case N-702.

(b) Even with the pending approval authorizing ISI Alternative ISI-08, the licensee will still inspect RPV instrumentation nozzle B211-RPV-N11B about 10 years from the previous volumetric inspection of the nozzle in the fourth 10-year ISI Interval, as performed in March 2009 and credited for third 10-year ISI interval of the reactor.

(c) The past volumetric inspection of RPV instrumentation nozzle B211-RPV-N11B in March 2009 did not indicate the presence of any existing flaws that, otherwise if detected, might indicate the presence of age-related degradation effects (i.e., the presence of cracks or pits) in the nozzle and the need for initiating further corrective actions or regulatory justifications by the licensee.

(d) The licensee has acknowledged that it will still need to perform a volumetric examination of RPV instrumentation nozzle B211-RPV-N11B for the fourth 10-year ISI Interval using the methodology in ASME Code Case N-702 and will be scheduling the inspection for the March 2019 RFO.

(e) Authorization of ISI Alternative ISI-08 and implementation of the required volumetric inspection of the nozzle during Outage B2R24, will maintain the licensee's ISI Program in compliance with 10 CFR 50.55a for the fourth 10-year ISI Interval of the unit.

(f) The licensee will not be applying the extension of ISI Alternative ISI-05, as proposed in ISI Alternative ISI-08, to any other ASME Code Class components that are required to be inspected in accordance with the licensee's ISI Program.

(g) The licensee will not credit the examination of nozzle-to-vessel weld 2B11-RPV-N11B in refueling outage B2R24 towards satisfying the examination requirements for the fifth 10-year ISI Interval.

3.3 Technical Conclusion

As set forth above, the NRC staff determines that the licensee may extend the time period for performing a Code Case N-702 based volumetric inspection of RPV instrumentation nozzle B211-RPV-N11B until the end of the March 2019 RFO for Brunswick Unit 2.

Therefore, the NRC staff authorizes ISI Alternative ISI-08 and the proposed extension of ISI Alternative ISI-05 until the date associated with the completion of the March 2019 RFO (Outage B2R24) scheduled for the unit, with the authorization being limited only to the volumetric inspection that is required to be performed on RPV instrumentation nozzle B211-RPV-N11B during the fourth 10-year ISI interval of the unit. The staff's authorization of the licensee's

proposal in ISI Alternative ISI-08 and the extension of the end date of ISI Alternative ISI-05 does not apply to any other ASME Code Class components (including other RPV nozzles) that are required to be inspected in accordance with 10 CFR 50.55a and the licensee's ISI program during the fourth 10-year ISI interval of the unit or to any ISI examinations required for ASME Code Class components during subsequent ISI intervals of the unit.

4.0 CONCLUSION

As set forth above, the NRC staff determined that the licensee's proposed alternative provides an acceptable level of quality and safety. Accordingly, the NRC staff concludes that the licensee has adequately addressed all of the regulatory requirements set forth in 10 CFR 50.55a(z)(1). Therefore, the NRC staff authorizes the use of the proposed alternative at Brunswick Unit 2 requested in the licensee's application, as supplemented, until the date associated with the completion of the March 2019 RFO (Outage B2R24).

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.

5.0 REFERENCES

1. Wooten, B. B,, Duke Energy Progress, LLC, letter to U.S. Nuclear Regulatory Commission, "Brunswick Steam Electric Plant, Unit No. 2, Renewed Facility Operating License No. DPR-62, Docket No. 50-324, "Proposed Alternative in Accordance with 10 CFR 50.55a(z)(1), for Reactor Pressure Vessel Nozzle-to-Vessel Weld Examination," November 29, 2017 (Agencywide Documents Access and Management (ADAMS) Accession No. ML17334A109).

2. Wooten, B. B,, Duke Energy Progress, LLC, letter to U.S. Nuclear Regulatory Commission, , "Brunswick Steam Electric Plant, Unit No. 2, Renewed Facility Operating License No. DPR-62, Docket No. 50-324, "Additional Information Regarding Proposed Alternative in Accordance with 10 CFR 50.55a(z)(1) for Reactor Pressure Vessel Nozzle-to-Vessel Examination," March 7, 2018 (ADAMS Accession No. ML18067A155).

3. U.S. Nuclear Regulatory Commission, Regulatory Guide 1.147, "Inservice Inspection Code Case Acceptability, ASME Section XI, Division 1," Revision 18, March 2017 (ADAMS Accession No. ML16321A336).

4. Mentel, P. N., Carolina Power & Light Company, letter to U.S. Nuclear Regulatory Commission, "Brunswick Steam Electric Plant, Unit Nos. 1 and 2, Renewed Facility Operating License Nos. DPR-71 and DPR-62, Docket Nos. 50-325 and 50-324, Request for Alternative to Nozzle-to-Vessel Shell Weld and Inner Radius Section Examinations," April 29, 2010 (ADAMS Accession No. ML101310390)

5. Broadus, D. A., U.S. Nuclear Regulatory Commission, S letter to M. J. Annacone, Carolina Power and Light Company, "Brunswick Steam Electric Plant, Units 1 and 2 – Request for Alternatives to the Reactor Pressure Vessel Nozzle-to-Vessel Weld and Inner Radius Examinations (TAC Nos. ME3854 AND ME3855)," January 31, 2011. (ADAMS Accession No. ML110060504)

Principal Contributor: James Medoff

SUBJECT: BRUNSWICK STEAM ELECTRIC PLANT, UNIT 2 –ALTERNATIVE TO DEFER INSPECTION OF REACTOR VESSEL INSTRUMENTATION NOZZLE 2B11-RPV-N11B UNTIL THE FIRST PERIOD IN THE 5TH 10-YEAR ISI INTERVAL (EPID L-2017-LLR-0144) DATED MAY 4, 2018

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ADAMS Accession No.: ML18117A191 *by e-mail

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