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

December 10, 2020

Mr. Daniel G. Stoddard
Senior Vice President and
Chief Nuclear Officer
Dominion Nuclear
Innsbrook Technical Center
5000 Dominion Blvd.
Glen Allen, VA 23060-6711

SUBJECT: MILLSTONE POWER STATION, UNIT NO. 2 – RELIEF REQUESTS FOR LIMITED COVERAGE EXAMINATIONS PERFORMED IN THE FOURTH 10-YEAR INSERVICE INSPECTION INTERVAL (EPID L-2020-LLR-0024, EPID L-2020-LLR-0025, AND EPID L-2020-LLR-0026)

Dear Mr. Stoddard:

By letter dated February 11, 2020, Dominion Nuclear Connecticut, Inc. (the licensee) submitted Relief Requests RR-04-28, RR-04-29, and RR-04-30, which requested relief from the volumetric examination coverage requirements pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) 50.55a(g)(5)(iii) on the basis that the required examination coverage was impractical due to physical obstructions and limitations imposed by design, geometry, and materials of construction of the subject components for the Millstone Power Station, Unit No. 2 (Millstone 2). The relief is applicable to the second period of the fourth 10-year inservice inspection interval for Millstone 2, which began on April 1, 2010, and ended on March 31, 2020.

The U.S. Nuclear Regulatory Commission (NRC) staff has completed its review of the licensee's subject relief requests for Millstone 2. Pursuant to 10 CFR 50.55a(g)(6)(i), the NRC staff has determined that it is impractical for the licensee to comply with the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (Code), Section XI requirement; that the proposed examinations performed to the extent practical provide reasonable assurance of structural integrity and leaktightness of the subject welds; and that granting relief pursuant to 10 CFR 50.55a(g)(6)(i) is authorized by law and 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 of the regulatory requirements set forth in 10 CFR 50.55a(g)(6)(i). Therefore, the NRC staff grants relief for the subject examinations of the components contained in Relief Requests RR-04-28, RR-04-29, and RR-04-30 for the fourth 10-year inservice inspection interval at Millstone 2.

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

If you have any questions, please contact the Millstone project manager, Richard Guzman, at 301-415-1030 or by e-mail to Richard.Guzman@nrc.gov.

Sincerely,

James G. Danna

Digitally signed by James G. Danna
Date: 2020.12.10 19:37:25 -05'00'

James G. Danna, Chief
Plant Licensing Branch I
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-336

Enclosure:
Safety Evaluation

cc: Listserv

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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELIEF REQUESTS FOR LIMITED COVERAGE EXAMINATION

PERFORMED IN THE FOURTH 10-YEAR INSPECTION INTERVAL

DOMINION ENERGY NUCLEAR CONNECTICUT, INC.

MILLSTONE POWER STATION, UNIT NO. 2

DOCKET NO. 50-336

1.0 INTRODUCTION

By letter dated February 11, 2020 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML20048A006), Dominion Energy Nuclear Connecticut, Inc. (the licensee) submitted Relief Requests (RR) RR-04-28, RR-04-29, and RR-04-30 from certain requirements of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (Code), 2004 Edition, under the provisions of Title 10 of the *Code of Federal Regulations* (10 CFR) 50.55a(g)(5)(iii), for limited coverage examinations performed at Millstone Power Station, Unit No. 2 (Millstone 2) for the fourth 10-year inservice inspection (ISI) interval, which began on April 1, 2010, and ended on March 31, 2020. Specifically, pursuant to 10 CFR 50.55a(g)(5)(iii), the licensee requested relief on the basis that the required examination coverage was impractical due to physical obstructions and limitations imposed by design, geometry, and materials of construction of the subject components.

2.0 REGULATORY EVALUATION

Pursuant to 10 CFR 50.55a(g)(4), ASME Code Class 1, 2, and 3 components (including supports) shall 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. The regulations require that inservice examination of components and system pressure tests conducted during the first 10-year interval and subsequent intervals comply with the requirements in the latest edition and addenda of Section XI of the ASME Code, incorporated by reference in 10 CFR 50.55a(a), 12 months prior to the start of the 120-month interval, subject to the conditions listed in 10 CFR 50.55a(b). The code of record for the fourth 10-year interval ISI program is the 2004 Edition of Section XI of the ASME Code.

The regulation at 10 CFR 50.55a(b)(2)(xv)(A) requires that, when applying Supplement 2 (Qualification Requirements for Wrought Austenitic Piping Welds) to the ASME Code,

Section XI, Appendix VIII (Performance Demonstration for Ultrasonic Examination Systems), the following examination coverage criteria be met:

(1) Piping must be examined in two axial directions, and when examination in the circumferential direction is required, the circumferential examination must be performed in two directions, provided access is available. Dissimilar metal welds must be examined axially and circumferentially.

(2) Where examination from both sides is not possible, full coverage credit may be claimed from a single side for ferritic welds. Where examination from both sides is not possible on austenitic welds or dissimilar metal welds, full coverage credit from a single side may be claimed only after completing a successful single-sided Appendix VIII demonstration using flaws on the opposite side of the weld. Dissimilar metal weld qualifications must be demonstrated from the austenitic side of the weld, and the qualification may be expanded for austenitic welds with no austenitic sides using a separate add-on performance demonstration. Dissimilar metal welds may be examined from either side of the weld.

The regulation at 10 CFR 50.55a(b)(2)(xvi)(B) requires, in part, that examinations performed from one side of a ferritic or stainless steel pipe weld must be conducted with equipment, procedures, and personnel that have demonstrated proficiency with single-sided examinations. To demonstrate equivalency to two-sided examinations, the demonstration must be performed to the requirements of Appendix VIII, as conditioned by this paragraph and 10 CFR 50.55a(b)(2)(xv)(A).

The regulation at 10 CFR 50.55a(g)(5)(iii) states, in part, that licensees may determine that conformance with certain ASME Code requirements is impractical and that the licensee shall notify the U.S. Nuclear Regulatory Commission (NRC) and submit information in support of the determination. Determinations of impracticality in accordance with this section must be based on the demonstrated limitations experienced when attempting to comply with the code requirements during the ISI interval for which the request is being submitted. Requests for relief made in accordance with this section must be submitted to the NRC no later than 12 months after the expiration of the initial 120-month inspection interval or subsequent 120-month inspection interval for which relief is sought.

The regulation at 10 CFR 50.55a(g)(6)(i) states that the NRC will evaluate determinations under paragraph (g)(5) of this section that code requirements are impractical. The NRC may grant such relief and may impose such alternative requirements as it determines are authorized by law and will not endanger life or property or the common defense and security and are 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.

Based on the above, and subject to the following technical evaluation, the NRC staff finds that regulatory authority exists for the licensee to request and the NRC staff to grant the relief requested by the licensee.

3.0 TECHNICAL EVALUATION

3.1 Licensee's Relief Request RR-04-28

ASME Code Components Affected

ASME Code Class: Code Class 1
Exam Category: B-D, Full Penetration Welded Nozzles in Vessels - Inspection Program B
Item Numbers: B3.130, Steam Generator (Primary Side), Nozzle-to-Vessel Welds
Weld Identification: SG-1-NH-2-A, 30" Cold Leg Nozzle to Hemisphere
SG-1-NH-4-A, 42" Hot Leg Nozzle to Hemisphere
SG-1-NH-5-A, 30" Cold Leg Nozzle to Hemisphere

Applicable Code Requirements

ASME Code, Section XI, 2004 Edition, Examination Category B-D, requires 100 percent volumetric examination coverage of the pressure-retaining welds as defined in Table IWB-2500-1.

ASME Code Case N-460, "Alternative Examination Coverage for Class 1 and Class 2 Welds, Section XI, Division 1," as approved for use by the NRC in Regulatory Guide (RG) 1.147, Revision 17, "Inservice Inspection Code Case Acceptability, Section XI, Division 1" (ADAMS Accession No. ML13339A689), states that a reduction in examination coverage due to part geometry or interference for any ASME Class 1 or 2 weld is acceptable, provided that the reduction is less than 10 percent (i.e., greater than 90 percent examination coverage is obtained).

ASME Code, Section XI, 2004 Edition, Mandatory Appendix I, Article I-2120, requires that ultrasonic examination of vessels other than reactor vessels greater than 2 inches in thickness shall be conducted in accordance with Section V, Article 4.

Licensee's Proposed Request for Relief

Pursuant to 10 CFR 50.55a(g)(5)(iii), the licensee requested relief on the basis that compliance with the ASME Code requirement is impractical.

The examination coverages and results as documented in the licensee's request are described in Table A below. Also described below are the access restrictions which prevented full coverage during the ASME Code-required examinations.

Table A: RR-04-28 Volumetric Examination Results

Weld ID	Category / Item No.	Coverage	Results
SG-1-NH-2-A	B-D / B3.130	72.4%	No recordable indications
SG-1-NH-4-A	B-D / B3.130	72.5%	No recordable indications
SG-1-NH-5-A	B-D / B3.130	72.4%	No recordable indications

For the steam generator nozzle-to-vessel welds (welds SG-1-NH-2-A, SG-1-NH-4-A, and SG-1-NH-5-A), the licensee stated that scan limitations were due to the configuration of the nozzle. The ultrasonic examination was performed in accordance with Section XI, Appendix 1, and Section V, Article 4 of the ASME Code.

Additionally, the licensee stated that periodic pressure tests and VT-2 visual examinations performed in accordance with Examination Category B-P will provide assurance of an acceptable level of quality and safety by providing a reasonable assurance of structural integrity.

The licensee concluded that to meet the ASME Code examination coverage requirements, it would be impractical due to cost, increased radiation exposure, and impact to plant equipment.

NRC Staff Evaluation

For the steam generator nozzle-to-vessel welds (welds SG-1-NH-2-A, SG-1-NH-4-A, and SG-1-NH-5-A), the NRC staff confirmed that the geometry of the nozzle restricted access to volumetric examination as stated by the licensee, and that it would be impractical to achieve greater than essentially 100 percent volumetric coverage without extensive weld or component design modifications. The NRC staff also confirmed that volumetric examination in accordance with Article 4, Section V of the ASME Code, was acceptable since Article I-2120 of the ASME Code, Section XI, requires ultrasonic examination of all other vessels greater than 2 inches in thickness to be conducted in accordance with Article 4 of Section V.

In addition to the volumetric examinations required by the ASME Code for Category B-A and B-D welds, the system leakage tests required by the ASME Code for Category B-P pressure-retaining components is an additional line of defense in the detection of service-induced degradation. Table IWB-2500-1 requires a system leakage test for all Category B-P pressure-retaining components each refueling outage. The VT-2 visual examination specified in Tables IWB-2500-1 and IWA-5240 for these leakage tests requires, in part, that:

- accessible external exposed surfaces be examined for evidence of leakage
- the surrounding areas of inaccessible surfaces be examined for evidence of leakage

The acceptance criteria specified in Tables IWB-2500-1 and IWB-3522 for these leakage tests require, in part, that corrective action be taken for identified leakage unless within defined permissible limits.

Based on the examination techniques used, the volumetric coverage obtained, and the system leakage tests performed each refueling outage, it is reasonable to conclude that, if significant service-induced degradation was present in these welds, evidence would have been detected by the examinations performed. Based on operational experience and the extent to which the examinations were performed, the staff has determined with reasonable assurance that the structural integrity of these welds will be maintained throughout the fourth 10-year interval ISI program.

3.2 Relief Request RR-04-29

ASME Code Components Affected

ASME Code Class:	Code Class 2
Exam Category:	C-B, Pressure Retaining Nozzle Welds in Vessels
Item Numbers:	C2.21, Nozzle-to-Shell Welds
Weld Identification:	SG-1-FW-1, Steam Generator No. 1 Feed Water Nozzle-to-Shell SG-2-MS-1, Main Steam Nozzle to Head

Applicable Code Requirements

ASME Code, Section XI, 2004 Edition, Examination Category C-B, requires 100 percent surface and volumetric examination coverage of the pressure-retaining welds as defined in Table IWC-2500-1.

ASME Code Case N-460, as approved for use by the NRC in RG 1.147, Revision 17, states that a reduction in examination coverage due to part geometry or interference for any ASME Class 1 or 2 weld is acceptable, provided that the reduction is less than 10 percent (i.e., greater than 90 percent examination coverage is obtained).

ASME Code, Section XI, 2004 Edition, Mandatory Appendix I, Article I-2120, requires that ultrasonic examination of vessels other than reactor vessels greater than 2 inches in thickness shall be conducted in accordance with Section V, Article 4.

Licensee's Proposed Request for Relief

Pursuant to 10 CFR 50.55a(g)(5)(iii), the licensee requested relief on the basis that compliance with the ASME Code requirement is impractical.

The examination coverages and results as documented in the licensee's request are described in Table B below. Also described below are the access restrictions which prevented full coverage during the ASME Code-required examinations.

Table B: RR-04-29 Volumetric Examination Results

Weld ID	Category / Item No.	Coverage	Results
SG-1-FW-1	C-B / C2.21	88.8%	No recordable indications
SG-2-MS-1	C-B / C2.21	73.6%	No recordable indications

For both Category C-B nozzle-to-shell welds, the licensee stated the scan limitations were due to the configuration of the nozzle restricting the scans from the nozzle side of the weld. Additionally, the licensee stated that for the main steam nozzle to head weld (weld SG-2-MS-1), there was an added restriction from the head side of the weld due to six permanently welded insulation retaining lugs. For both Category C-B welds, the ultrasonic examinations were performed in accordance with Section XI, Appendix 1, and Section V, Article 4.

Additionally, the licensee stated that a magnetic particle examination of 100 percent of the surface of both Category C-B welds was performed.

The licensee further stated that periodic pressure tests and VT-2 visual examinations performed in accordance with Examination Category C-H for Class 2 welds will provide assurance of an acceptable level of quality and safety by providing a reasonable assurance of structural integrity.

The licensee concluded that to meet the ASME Code examination coverage requirements, it would be impractical due to cost, increased radiation exposure, and impact to plant equipment.

NRC Staff Evaluation

For the steam generator feedwater nozzle-to-shell weld (weld SG-1-FW-1), the NRC staff confirmed that the geometry of the nozzle restricted access to volumetric examination as stated by the licensee, and that it would be impractical to achieve greater than essentially 100 percent volumetric coverage without extensive weld or component design modifications. The staff also confirmed that volumetric examination in accordance with Article 4, Section V of the ASME Code, was acceptable since Article I-2120 of the ASME Code, Section XI, requires ultrasonic examination of all other vessels greater than 2 inches in thickness to be conducted in accordance with Article 4 of Section V. Access for surface examination was not restricted, and the licensee was able to achieve 100 percent coverage for the surface examination required by Table IWC-2500-1 for Examination Category C-B, Item No. C2.21 welds.

For the main steam nozzle-to-head weld (weld SG-2-MS-1), the NRC staff confirmed that the geometry of the nozzle and the welded insulation retaining lugs restricted access to volumetric examination as stated by the licensee, and that it would be impractical to achieve greater than essentially 100 percent volumetric coverage without extensive weld or component design modifications. The NRC staff also confirmed that volumetric examination in accordance with Article 4, Section V of the ASME Code, was acceptable since Article I-2120 of the ASME Code, Section XI, requires ultrasonic examination of all other vessels greater than 2 inches in thickness to be conducted in accordance with Article 4 of Section V. Access for surface examination was not restricted, and the licensee was able to achieve 100 percent coverage for the surface examination required by Table IWC-2500-1 for Examination Category C-B, Item No. C2.21 welds.

In addition to the volumetric examinations required by the ASME Code for Category C-B welds, the system leakage tests required by the ASME Code for Category C-H pressure-retaining components are an additional line of defense in the detection of service-induced degradation. Table IWC-2500-1 requires a system leakage test for all Category C-H pressure-retaining components each inspection period. The VT-2 visual examination specified in Tables IWC-2500-1 and IWA-5240 for these leakage tests requires, in part, that:

- accessible external exposed surfaces be examined for evidence of leakage
- the surrounding areas of inaccessible surfaces be examined for evidence of leakage

The acceptance criteria specified in Tables IWC-2500-1 and IWC-3516 for these leakage tests requires, in part, that corrective action be taken for identified leakage unless within defined permissible limits.

Based on the examination techniques used, the volumetric coverage obtained, and the system leakage tests performed each inspection period, it is reasonable to conclude that, if significant service-induced degradation was present in these welds, evidence would have been detected by the examinations performed. Based on operational experience and the extent to which the examinations were performed, the staff has determined with reasonable assurance that the structural integrity of these welds will be maintained throughout the fourth 10-year interval ISI program.

3.3 Relief Request RR-04-30

ASME Code Components Affected

ASME Code Class:	Code Class 1 and 2
Exam Category:	R-A, Risk-Informed Piping Examinations
Item Numbers:	R 1.11, Elements Subject to Thermal Fatigue R 1.20, Elements not Subject to a Degradation Mechanism R 1.16, Elements Subject to Intergranular or Transgranular Stress Corrosion Cracking
Weld Identification:	BCH-C-1007A, Charging, 2" Pipe-to-Tee BSI-C-3010-A, Safety Injection, 12" Pipe-to-Valve BSI-C-3012-A, Safety Injection, 12" Pipe-to-Valve BPV-C-5104A, Reactor Coolant, 4" Pipe-to-Tee FWB-C-G-17-A, Main Feedwater, 6" Pipe-to-Valve SI-CF-D-035, High Pressure Safety Injection, 3" Pipe-to-Valve

Applicable Code Requirements

The examination requirements for Class 1 and 2 piping welds are governed by the risk-informed ISI program, which was developed in accordance with ASME Code Case N-716, “Alternative Classification and Examination Requirements, Section XI, Division 1.” Table 1 of Code Case N-716 requires that Examination Category R-A, Item Nos. R1.11, R1.16, and R1.20 welds receive essentially 100 percent volumetric examinations. ASME Code Class 1 and 2, Examination Category R-A, Item No. R1.20, pertains to high safety-significant pressure-retaining welds, which are not subject to any degradation method, while Item Nos. R1.16 and R1.11 are high safety-significant pressure-retaining welds subject to intergranular or transgranular stress corrosion cracking and thermal fatigue, respectively. The risk-informed ISI program was approved by the NRC staff by letter dated March 27, 2012 (ADAMS Accession No. ML120800433).

The licensee adopted ASME Code Case N-460, which defines “essentially 100%” as greater than 90 percent coverage of the examination volume or surface area, as applicable. The 90 percent minimum coverage was applied to all surface and volumetric examinations required by the ASME Code, Section XI.

Licensee’s Proposed Request for Relief

Pursuant to 10 CFR 50.55a(g)(5)(iii), the licensee requested relief on the basis that meeting the essentially 100 percent volumetric examination requirement is impractical.

The examination coverages and results for RR-04-30, as documented in the licensee’s request, are summarized in Table C below. Also described below are the access restrictions that prevented full coverage during the ASME Code-required examinations.

Table C: RR-04-30 Volumetric Examination Results

Weld ID	Category / Item No.	Coverage	Results
BCH-C-1007A	R-A / R1.11	82.5%	No recordable indications
BSI-C-3010-A	R-A / R1.16	50%	No recordable indications

Weld ID	Category / Item No.	Coverage	Results
BSI-C-3012-A	R-A / R1.16	50%	No recordable indications
BPV-C-5104A	R-A / R1.20	89.5%	No recordable indications
FWB-C-G-17-A	R-A / R1.20	81.2%	One recordable indication, evaluated as acceptable weld root geometry
SI-CF-D-035	R-A / R1.20	50%	One recordable indication, evaluated as acceptable weld root geometry

Specifically, conformance to the requirement would require extensive modifications to, or replacement of, the subject components to make the examination volume more accessible. Implementing these adjustments would have an impact on other associated plant equipment, create an excessive financial burden for the licensee, and increase radiation exposure to staff.

The licensee determined that the ASME Code-required volumes of the subject welds were examined to the maximum extent possible using Performance Demonstration Initiative (PDI) qualified ultrasonic testing (UT) techniques. Additionally, the licensee stated that no alternative methods or advanced technologies, including the use of phased array, were considered capable of obtaining complete coverage of the examination volume.

The subject welds have either a pipe-to-valve or pipe-to-tee configuration. The proximity of the welds to the tapered surface of the valve or the branch of the tee limits the access of the transducer to the far side of the weld. This limited access limits the ability to perform the complete examination from that side of the weld.

There are currently no PDI-qualified single-sided examination procedures that demonstrate equivalency to two-sided examination procedures on austenitic piping welds. None of the current technology is capable of reliably detecting or sizing flaws on the opposite side of an austenitic weld. Therefore, the licensee requested relief from complying with the ASME Code-required volumetric examinations of the subject components.

In lieu of satisfying the examination coverage in accordance with the ASME Code, Section XI requirement, the licensee proposed the alternate examination coverage for the subject welds shown in Table 1 of the relief request for RR-04-30, “Examination Category R-A Welds with Limited Volumetric Coverage.” The basis of the proposed alternative is that the licensee has performed the ASME Code, Section XI required examinations to the maximum extent practical utilizing PDI-qualified personnel, techniques, and equipment. The licensee explained that due to the physical interferences causing these limitations, there are no alternative examination techniques currently available to increase coverage. Furthermore, in combination with additional monitoring methods that the welds are subject to, the examinations performed provide reasonable assurance that service-induced degradation or leakage will be detected.

NRC Staff Evaluation

Applicable to all of the subject components in this safety evaluation, ASME Code Case N-716, Table 1, Examination Category R-A, requires essentially 100 percent volumetric and surface examinations. The NRC staff notes that ASME Code Case N-460 permits examination coverage of less than 100 percent but greater than 90 percent to satisfy the examination coverage requirement of Table IWB-2500-1 of the ASME Code, Section XI. However, complete

volumetric examinations are restricted by geometric configurations that limit access to the full required volume. The breadth of the NRC staff's review included verifying the examination coverages reported in the relief request, confirming the impracticality of achieving the required coverage, and determining whether the structural integrity can be ensured.

Category R-A, Item Number R1.11 - Elements Subject to Thermal Fatigue

The licensee indicated that it obtained 82.5 percent examination coverage for the BCH-C-1007A pipe-to-tee weld. The licensee attributed the limitation in obtaining further coverage primarily to the tee configuration on the upstream side. Particularly, the proximity of the branch of the tee-to-the weld does not provide sufficient distance for the scanner to perform any examinations from the tee side of the weld. Page 8 of Attachment 3 to the licensee's submittal contains the diagram of sonification of the UT beams in the examination of the subject weld. The NRC staff reviewed the diagram and verified the examination coverage obtained, along with the licensee's coverage calculations, and confirmed that no further coverage could be obtained. Additionally, the licensee performed a best-effort examination from the pipe side and obtained an additional 3.9 percent coverage of the tee side, although it cannot be credited to the ASME Code-required examination coverage. The NRC staff finds that the percentage of examination coverage is reasonably calculated, and further coverage is not feasible. No recordable indications were observed during the exams.

Category R-A, Item Number R1.16 - Elements Subject to Intergranular or Transgranular Stress Corrosion Cracking

The licensee indicated that it obtained 50 percent examination coverage for the safety injection Class 1 pipe-to-valve welds BSI-C-3010-A and BSI-C-3012-A. Both were preservice examinations associated with new welds. The licensee attributed the limitations in obtaining further coverage to the proximity of the weld to the taper of the valve that does not provide sufficient distance for the scanner to perform any examinations from the pipe side of the weld. Pages 9 and 10 of Attachment 3 to the licensee's submittal contain the diagrams of sonification of the UT beams in the examination of welds BSI-C-3010-A and BSI-C-3012-A, respectively. The NRC staff reviewed the diagram and verified the examination coverage obtained, along with the licensee's coverage calculations, and confirmed that no further coverage could be obtained. Additionally, the licensee performed best-effort examinations from the pipe side of the welds and obtained an additional 93.9 percent and 100 percent coverage of the valve side, although it cannot be credited to the ASME Code-required examination coverage. The NRC staff finds that the percentages of examination coverage are reasonably calculated, and further, coverage is not feasible. No recordable indications were observed during the exams.

Category R-A, Item Number R1.20 - Elements Not Subject to a Degradation Mechanism

The licensee claimed to obtain 89.5 percent, 81.2 percent, and 50 percent examination coverages for reactor coolant Class 1 pipe-to-tee weld BPV-C-5104A, main feedwater Class 2 pipe-to-valve weld FWB-C-G-17-A, and high pressure safety injection Class 1 pipe-to-valve weld SI-CF-D-035, respectively. The pipe-to-valve welds were preservice examinations associated with new welds. The licensee attributed the limitation in obtaining further coverage of the pipe-to-tee weld to the proximity of the branch of the tee to the weld. The staff notes there is not enough room between the tee and the weld for the scanner to perform examinations from the tee side of the weld. Similarly, in the pipe-to-valve welds, the proximity of the weld to the taper of the valve does not leave enough distance to perform scanning from the valve side of the weld. Pages 11-13 of Attachment 3 to the licensee's submittal contain the diagrams of

sonification of the UT beams in the examination of welds BPV-C-5104A, FWB-C-G-17-A, and SI-CF-D-035, respectively.

The NRC staff reviewed the diagrams and verified the examination coverage obtained, along with the licensee's coverage calculations, and confirmed that no further coverage could be obtained. Supplementary best-effort examinations were performed from the pipe side of welds BPV-C-5104A and SI-CF-D-035, obtaining an additional 42 percent and 85 percent coverage of the tee and valve sides of the welds, respectively. Again, this coverage cannot be credited to the ASME Code-required examination coverage. The NRC staff finds that the percentage of examination coverage is reasonably calculated, and further, coverage is not feasible. No recordable indications were observed during the exam of the pipe-to-tee weld, and one recordable indication was found in both pipe-to-valve welds. The licensee evaluated these indications and determined that they were acceptable weld root geometries.

The examinations performed were limited due to the configuration of the components that restricted full examinations of the welds. The configurations also prevent alternative examination techniques from achieving greater credited coverage. The components were designed and fabricated prior to the examination requirements of the ASME Code, Section XI, being published; therefore, the plant was not designed specifically to meet the requirements. The NRC staff finds these limitations to be an acceptable basis for impracticality of conforming to the requirements and finds that the modification necessary to achieve the required coverage constitutes a burden upon the licensee.

The required examination volumes include the volume surrounding the weld, weld heat affected zone, and base metal, where applicable, in the crevice region. The intent of the examinations is to detect cracks initiating and propagating from the inner surface. The licensee performed the required volumetric examination of the welds using UT to the extent practical and achieved the coverages stated above. The NRC staff reviewed the scan diagrams and coverage sheets, which showed that the examined volumes included weld and base materials in the inner region where degradation is expected to occur (if it occurs), and determined that the limited coverages for these welds are acceptable. Aside from the weld root geometric indications found in the preservice examinations, no recordable indications were observed. The licensee stated that none of the welds detailed in the relief request are within the scope of the Electric Power Research Institute Material Reliability Program: MRP-146 (Management of Thermal Fatigue in Normally Stagnant Non-Isolable Reactor Coolant System Branch Lines). The NRC staff finds that any thermal fatigue-induced degradation that could affect the volumes covered would likely have been detected.

In addition to the ASME Code-required volumetric examinations, the welds are subject to further defense-in-depth measures. These components are monitored for through-wall leakage as part of the ASME Code, Section XI, System Pressure Test Program, and receive a VT-2 visual examination at the end of each refueling outage during system leakage tests as required by Section XI, Table IWB-2500-1, Category B-P, for Class 1 components and Table IWC-2500-1, Category C-H, for Class 2 components. The NRC staff finds that the coverage obtained with the UT examinations, combined with ongoing leakage testing, provides reasonable assurance that any significant service-induced degradation would be observed and mitigated in a timely manner to maintain structural integrity.

Based on the above discussion, the NRC staff determined that obtaining the ASME Code-required examination volume for the items discussed above is impractical because of the stated limitations and that the modifications necessary to obtain the required coverage would

impose a burden upon the licensee. The NRC staff determined that the volumetric examinations were performed to the maximum extent practical, and the licensee has implemented compensatory measures that effectively monitor the weld volumes that could not be examined. Lastly, the NRC staff concluded that there is reasonable assurance that the structural integrity of the welds will be maintained, considering the following: (1) the majority of the most susceptible portions of the welds were examined, (2) no indications were found suggesting that cracks are developing or growing from previous intervals, (3) these welds will likely leak before breaking, and (4) the licensee has defense-in-depth measures to monitor these welds for leakage outside of the volumetric examinations.

4.0 CONCLUSION

Pursuant to 10 CFR 50.55a(g)(6)(i), the NRC staff has determined that it is impractical for the licensee to comply with the ASME Code, Section XI requirement; that the proposed examinations performed to the extent practical provide reasonable assurance of structural integrity and leaktightness of the subject welds; and that granting relief pursuant to 10 CFR 50.55a(g)(6)(i) is authorized by law and 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. Furthermore, based on the examination techniques used, the volumetric coverage obtained, and the system leakage tests performed, it is reasonable to conclude that, if significant service-induced degradation was present, evidence of it would have been detected by the examinations that were performed.

Accordingly, the NRC staff concludes that the licensee has adequately addressed all of the regulatory requirements set forth in 10 CFR 50.55a(g)(6)(i). Therefore, the NRC grants relief for the subject examinations of the components contained in Relief Requests RR-04-28, RR-04-29, and RR-04-30 at Millstone 2 for the fourth 10-year ISI interval, which began on April 1, 2010, and ended on March 31, 2020.

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

Principal Contributors: J. Jenkins
A. Young

Date: December 10, 2020

SUBJECT: MILLSTONE POWER STATION, UNIT NO. 2 – RELIEF REQUESTS FOR LIMITED COVERAGE EXAMINATIONS PERFORMED IN THE FOURTH 10-YEAR INSERVICE INSPECTION INTERVAL (EPID L-2020-LLR-0024, EPID L-2020-LLR-0025, AND EPID L-2020-LLR-0026) DATED DECEMBER 10, 2020

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