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

June 24, 2016

Mr. David A. Heacock
President and Chief Nuclear Officer
Dominion Nuclear Connecticut, Inc.
Innsbrook Technical Center
5000 Dominion Boulevard
Glen Allen, VA 23060-6711

SUBJECT: MILLSTONE POWER STATION, UNIT NO. 3 – RELIEF REQUESTS FOR LIMITED COVERAGE EXAMINATIONS PERFORMED IN THE THIRD 10-YEAR INSERVICE INSPECTION INTERVAL (CAC NOS. MF6570, MF6571, MF6572, MF6573, AND MF6574)

Dear Mr. Heacock:

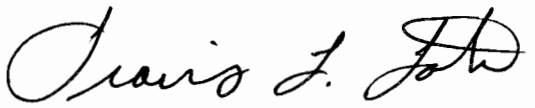
By letter dated July 30, 2015, as supplemented on November 10, 2015, and March 22, 2016, Dominion Nuclear Connecticut, Inc. (the licensee), submitted Relief Request IR-3-19, IR-3-20, IR-3-21, IR-3-22, and IR-3-23, which requested relief from the volumetric examination coverage requirements pursuant to Title 10 of the *Code of Federal Regulations*, Section 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. 3 (MPS3). The relief is requested for the third ten-year inservice inspection interval (ISI) for MPS3, which began on April 23, 2009, and will end on April 22, 2019.

The U.S. Nuclear Regulatory Commission staff has completed its review of the licensee's subject relief requests for MPS3. Pursuant to 50.55a(g)(6)(i), the NRC staff 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 provides reasonable assurance of structural integrity and leak tightness 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 IR-3-19, IR-3-20, IR-3-21, IR-3-22, and IR-3-23 for the third 10-year ISI interval at MPS3.

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 Inservice Inspector.

If you have any questions, please contact the project manager, Richard Guzman, at (301) 415-1030 or Richard.Guzman@nrc.gov.

Sincerely,



Travis L. Tate, Chief
Plant Licensing Branch I-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-423

Enclosure:
Safety Evaluation

cc w/enclosure: Distribution via Listserv

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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

ALTERNATIVE REQUEST FOR IMPLEMENTATION OF EXTENDED

REACTOR VESSEL THIRD INSERVICE INSPECTION INTERVAL REQUEST FOR RELIEF

DOMINION NUCLEAR CONNECTICUT, INC.

MILLSTONE POWER STATION, UNIT NO. 3

DOCKET NO. 50-423

1.0 INTRODUCTION

By letter dated July 30, 2015, (Agencywide Documents Access and Management System (ADAMS), Accession No. ML15216A363), as supplemented by letters dated November 10, 2015, and March 22, 2016 (ADAMS Accession Nos. ML15321A011 and ML16088A208 respectively), Dominion Nuclear Connecticut , Inc. (the licensee), submitted Relief Requests Nos. IR-3-19, IR-3-20, IR-3-21, IR-3-22, and IR-3-23 from certain requirements of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code), 2004 Edition, under the provisions of Title 10 of the *Code of Federal Regulations* (10 CFR), Part 50, Section 50.55a(g)(5)(iii), for limited coverage examinations performed in the first inspection period of the third 10-year inservice inspection (ISI) interval for Millstone Power Station, Unit No. 3 (MPS3). Specifically, pursuant to 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 REQUIREMENTS

Pursuant to 10 CFR 50.55a(g)(4), the 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 In-service 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, which was incorporated by reference in 10 CFR 50.55a(a) 12 months prior to the start of the 120-month interval, subject to the limitations and modifications listed in 10 CFR 50.55a (b)(2).

Pursuant to 10 CFR 50.55a(g)(5)(iii), if the licensee has determined that conformance with the ASME Code requirement is impractical for its facility, the licensee must notify the U.S. Nuclear

Regulatory Commission (NRC) and submit, as specified in 10 CFR 50.4, information to support the determinations. Pursuant to 10 CFR 50.55a(g)(6)(i), the Commission will evaluate determinations under paragraph (g)(5) of 10 CFR 50.55a that ASME Code requirements are impractical. The Commission 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.

The licensee has requested relief from ASME Code requirements pursuant to 10 CFR 50.55a(g)(5)(iii). 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 to grant, the relief requested by the licensee.

3.0 TECHNICAL EVALUATION

3.1 Relief Request IR-3-19 ASME Section XI, Examination Category B-A Pressure Retaining Welds in Reactor Pressure Vessel Welds

ASME Code Components Affected

ASME Code Class:	1
System	Reactor Pressure Vessel (RPV)
Examination Category:	B-A
Item No.	Item B1.40
ISI Component ID:	RPV Closure Head-to-Flange Weld 101-101
Material:	SA533, GR B, CL 1/SA508, CL 1

Applicable Code Edition and Addenda

The code of record for the third 10-year ISI interval is the 2004 Edition, no Addenda of the ASME Code.

Duration of Relief Request

The licensee submitted this relief request for the third 10-year ISI interval which started on April 23, 2009, and ends on April 22, 2019.

ASME Code Requirements

ASME Section XI, 2004 Edition, Examination Category B-A requires volumetric examination of 100 percent (%) of the weld volume as defined in ASME Section XI Table IWB-2500-1 and shown in Figure IWB 2500-5. The alternative requirements of ASME Section XI, Code Case N-460, approved for use in Regulatory Guide (RG) 1.147, Revision 17, "Inservice Inspection Code Case Acceptability, ASME Section XI, Division 1," allows credit for essentially 100 percent coverage of the weld provided greater than 90 percent of the required volume has been examined. ASME Code Case N-460 has been approved for use by the NRC in RG 1.147, Revision 17.

Licensee's Basis for Relief Request (as stated)

> Pursuant to 10 CFR 50.55a(g)(5)(iii), relief is requested from the 100% volumetric examination coverage requirement of the subject weld due to the design of the reactor vessel head with the geometric configuration and permanent obstructions which limit the volumetric coverage that can be obtained.
>
> The reactor vessel head-to-flange weld was examined with a manual ultrasonic technique using pulse echo ultrasonic instruments and search units to achieve the maximum examination coverage practical. No alternative techniques or advanced technologies were considered capable of obtaining complete coverage of the examination volume.

In its response to a request for additional information (RAI) dated November 10, 2015, the licensee noted that the equipment used to perform the subject examinations in Relief Request IR-3-19 consisted of non-encoded manual conventional (non-phased array) examination equipment with procedures written in accordance with ASME Code, Section XI, Appendix I and Section V, Article 4.

Licensee's Proposed Alternative Examination (as stated)

> The geometric configuration and permanent obstructions limit the volumetric examination of the subject weld to approximately 81.2% coverage using the most current examination technology. Access to this weld is limited on one side due to the taper of the flange that is within close proximity to the weld. There is not sufficient distance from the weld to the flange to perform complete scanning on this side of the weld. Additionally, obstructions exist on the top side of the weld due to three permanently attached head lifting lugs that are 8.25 inches wide and located 10.75 inches from the centerline of the weld that restrict scanning on this side of the weld. Based on the configuration and the permanent obstructions, relief is requested from complying with 100% required examination coverage of this weld.
>
> Additionally, a surface magnetic particle examination was performed. One hundred percent coverage was obtained with one recordable indication detected that was evaluated as acceptable in accordance with the acceptance standards of ASME Section XI, IWB-3510.3.
>
> The subject weld received a volumetric examination on the accessible portions of the welds to the maximum extent practical given the limitations caused by the geometric configuration and permanent obstructions. Additionally, a surface examination was performed with 100% coverage obtained, and a visual (VT-2) examination is performed at the end of each refueling outage during the system leakage tests as required by Section XI, IWB-2500-1, Category B-P.
>
> Based upon the examination volume that was obtained with acceptable results, a surface examination obtaining 100% coverage, and the visual (VT-2) examination performed each refueling outage, it is reasonable to conclude that

service induced degradation would be detected. Therefore, these proposed alternatives will provide an acceptable level of quality and safety by providing reasonable assurance of structural integrity of the subject welds.

NRC Staff Evaluation

The ASME Code requires essentially 100 percent volumetric examination of the accessible length of the subject RPV closure head-to-flange weld 101-101. However, the licensee stated that complete examinations are restricted by geometric configuration and permanent obstructions that limit the volumetric examination of the RPV closure head-to-flange weld 101-101. Access to this weld was limited on one side due to the taper of the flange that is within close proximity to the weld. There is not sufficient distance from the weld to the flange to perform complete scanning on this side of the weld. Additionally, obstructions exist on the top side of the weld due to three permanently attached head lifting lugs that are 8.25 inches wide and located 10.75 inches from the centerline of the weld that restrict scanning on this side of the weld. In order to increase the volumetric coverage on the subject welds, the RPV head-to-flange weld would require design modifications. The NRC staff determined that imposing this requirement to make design modifications to the RPV closure head-to-flange weld would place a burden on the licensee; therefore, the ASME Code-required essentially 100 percent volumetric examinations are impractical.

The RPV vessel head-to-flange weld was examined with manual ultrasonic testing (UT) pulse echo ultrasonic instruments techniques in accordance with the applicable requirements of the ASME Code, Appendix I and Section V, Article 4. The weld was examined using 0-degree longitudinal and 45- and 60-degree shear waves to achieve the maximum examination coverage practical. The licensee obtained an examination coverage of 81.2 percent of the RPV closure head-to-flange weld 101-101. The licensee considered other nondestructive (NDE) techniques; however, there were no alternative techniques or advanced technologies capable of obtaining 100 percent coverage of the examination volume. No recordable indications were detected during these examinations.

Full coverage was achieved during the magnetic particle surface examination with one recordable indication detected that was evaluated and was acceptable in accordance with the acceptance standards of ASME Code, Section XI, IWB-3510.3. Also a visual, VT-2, examination was performed at the end of the refueling outage during the system leakage tests as required by ASME Code, Section XI, IWB-2500-1, Category B-P.

The licensee has shown that it is impractical to meet the ASME Code-required essentially 100 percent volumetric examination coverage for the subject welds due to their design and proximity of other components. Based on the volumetric, surface coverage obtained, and VT-2 visual examinations, it is reasonable to conclude that if significant service-induced degradation had occurred in the subject welds, evidence of it would have been detected by the examinations that were performed. Furthermore, the staff determined that the examinations performed provide reasonable assurance of structural integrity and leak tightness of the subject weld.

3.2 Relief Request IR-3-20 ASME Code, Section XI, Table IWB-2500-1, Examination Category B-D, Item Nos. B3.130 and B3.110 Full Penetration Welded Nozzles in Vessels

ASME Code Components Affected

ASME Code Class:	1
System:	Pressurizer and Steam Generator (SG) (Primary Side)
Examination Category:	B-D
Item Numbers:	B3.110 and B3.113
Materials:	Pressurizer: Head – SA533, GR A, CL2 Carbon Steel; Nozzle – SA508, CL2 Carbon Steel; Internal surface clad with stainless steel SG: Head – SA533, GR B, CL1 Carbon Steel; Nozzle – SA508, CL2 Carbon Steel; Internal surface clad with stainless steel

Table 1: ASME Code, Section XI Examination Category B-D Welds

Weld Identification	ASME Code, Section XI, Item No.	Configuration	Examination Coverage Percent
03-003-SW-U	B3.130	SG Outlet Nozzle-to-Head Weld	70.5
03-003-SW-V	B3.130	SG Inlet Nozzle-to-Head Weld	70.5
03-004-SW-U	B3.130	SG Outlet Nozzle-to-Head Weld	70.9
03-004-SW-V	B3.130	SG Inlet Nozzle-to-Head Weld	70.9
03-007-SW-A	B3.110	Pressurizer (PZR) Safety Nozzle-to-Head Weld	82
03-007-SW-E	B3.110	PZR Spray Nozzle-to-Head Weld	82

Applicable Code Edition and Addenda

The code of record for the third 10-year ISI interval is the 2004 Edition, no Addenda of the ASME Code.

Duration of Relief Request

The licensee submitted this relief request for the third 10-year ISI interval which started on April 23, 2009, and ends on April 22, 2019.

ASME Code Requirements

ASME Code, Section XI, 2004 Edition, Examination Category B-D requires volumetric examination of essentially 100 percent of the weld volume as defined in Table IWB-2500-1 and shown in figures IWB-2500-7(a) – (d). The alternative requirements of ASME Section XI, Code Case N-460, approved for use in RG 1.147, Revision 17, allows credit for essentially 100 percent coverage of the welds provided greater than 90 percent of the required volume has been examined.

Licensee's Basis for Relief Request (as stated)

> Pursuant to 10 CFR 50.55a(g)(5)(iii), relief is requested from the 100% volumetric examination coverage requirement of the subject welds due to the geometric configuration which limit the volumetric coverage that can be obtained.
>
> The steam generator nozzle-to-head welds, and the pressurizer spray and safety nozzle-to-head welds were examined with a manual ultrasonic technique using pulse echo ultrasonic instruments and search units to achieve the maximum examination coverage practicable. Limitations imposed by the nozzle configuration preclude obtaining 100% coverage. This configuration with the nozzle outside radius within close proximity of the weld prevents complete scanning in these areas due to lift-off of the search unit that occurs causing a loss of contact between the search unit and the component.
>
> No alternative techniques or advanced technologies were considered capable of obtaining complete coverage of the examination volume.
>
> To increase examination coverage on the subject welds would require a significant design modification or replacement of components with a different design to eliminate the noted obstructions which is considered to be impractical due to the cost, additional radiation exposure and impact to plant equipment.

The welds listed below and their examination limitations and results are listed in Table 1, Attachment 2 of the licensee's submittal.

> SG Outlet Nozzle-to-Head Weld 03-003-SW-U: Scan limitations due to nozzle configuration restricting the scans from the nozzle side. No recordable indications were detected.
>
> SG Inlet Nozzle-to-Head Weld 03-003-SW-V: Scan limitations due to nozzle configuration restricting the scans from the nozzle side. No recordable indications were detected.
>
> SG Outlet Nozzle-to-Head Weld 03-004-SW-U: Scan limitations due to nozzle configuration restricting the scans from the nozzle side. No recordable indications were detected.

SG Inlet Nozzle-to-Head Weld 03-004-SW-V: Scan limitations due to nozzle configuration restricting the scans from the nozzle side. No recordable indications were detected.

PZR Safety Nozzle-to-Head Weld 03-007-SW-A: Scan limitations due to nozzle configuration restricting the scans from the nozzle side. No recordable indications were detected.

PZR Spray Nozzle-to-Head Weld 03-007-SW-E: Scan limitations due to nozzle configuration restricting the scans from the nozzle side. No recordable indications were detected.

In its RAI response dated November 10, 2015, the licensee noted that the equipment used to perform the subject examinations in Relief Request IR-3-20 consisted of non-encoded manual conventional (non-phased array) examination equipment with procedures written in accordance with ASME Code, Section XI, Appendix I and Section V, Article 4.

Licensee's Proposed Altemative Examination (as stated)

The subject welds received a volumetric examination using the best available techniques on the accessible portions of welds to the extent practical. Additionally, a visual (VT-2) examination is performed at the end of each refueling outage during the system leakage tests as required by Section XI, Table IWB-2500-1, Category B-P.

Based upon the examination volumes that were obtained with acceptable results and the visual (VT-2) examination performed each refueling outage, it is reasonable to conclude that service induced degradation would be detected. Therefore, these proposed alternatives will provide an acceptable level of quality and safety by providing reasonable assurance of structural integrity of the subject welds.

NRC Staff Evaluation

The ASME Code requires essentially 100% volumetric examination of ASME Code, Class 1 nozzle-to-vessel welds. However, the licensee stated that limitations due to nozzle configuration restrict the scans from the nozzle side. In order to effectively increase the examination coverage, the nozzle-to-vessel welds would require design modifications. The NRC staff determined this would place a burden on the licensee; thus, essentially 100 percent ASME Code-required volumetric examinations are considered impractical.

The PZR and SG nozzle-to-vessel welds listed in Table 1 above are constructed of carbon steel material with stainless steel inside diameter cladding. The welds on the subject nozzles extend the full thickness of the vessel shell/head. As shown on the sketches and technical descriptions included in the licensee's submittals, examinations of the subject PZR and SG nozzle-to-vessel welds have been completed to the extent practical with volumetric coverage ranging from approximately 70.5 percent to 82 percent (see Table 1 above) of the ASME Code-required volumes. The examination volumes typically included the weld and base materials near the inside surface of the weld joint, which are the highest regions of stress, and where one would

expect degradation sources to be manifested should they occur. The PZR and SG nozzle-to-vessel weld examinations were performed with manual UT pulse echo ultrasonic instruments techniques in accordance with the applicable requirements of the ASME Code, Appendix I and Section V, Article 4. The PZR and SG welds were examined using 0-degree longitudinal and 45- and 60-degree shear waves. There were no indications detected on the SG and PRZ nozzles examinations.

Although UT scans were primarily limited to the vessel side, recent studies have found that inspections conducted through carbon steel are equally effective whether the UT waves have only to propagate through the base metal, or have to also propagate through the carbon steel weldment[1]. Therefore, it is expected that the UT techniques employed by the licensee would detect structurally significant flaws that might occur on either side of the subject welds due to the fine-grained carbon steel microstructures.

The licensee has shown that it is impractical to meet the ASME Code-required essentially 100 percent volumetric examination coverage for the subject nozzle-to-vessel welds due to their design. Based on the volumetric coverage obtained for the subject welds, and considering the licensee's performance of UT techniques employed to maximize this coverage, it is reasonable to conclude that if significant service-induced degradation had occurred, evidence of it would have been detected by the examinations that were performed. In addition a visual VT-2 examination was performed at the end of the refueling outage during the system leakage tests as required ASME Code, Section XI, Table IWB-2500-1, Category B-P. Furthermore, the staff determined that the UT and VT-2 examinations performed provide reasonable assurance of structural integrity and leak tightness of the subject components.

3.3 Relief Request IR-3-21 ASME Code, Section XI, Table IWC-2500-1, Examination Category C-A, Item C1.10 Pressure Retaining Welds in Pressure Vessels

ASME Code Components Affected

ASME Code Class:	2
System:	SG
Examination Category:	C-A
Item No.:	Item C1.10
ISI Component ID:	SG Shell-to-transition cone weld 03-053-SW-G
Material:	SA 533, GR A, CL 2

Applicable Code Edition and Addenda

The code of record for the third 10-year ISI interval is the 2004 Edition, no Addenda of the ASME Code.

Duration of Relief Request

The licensee submitted this relief request for the third 10-year ISI interval which started on April 23, 2009, and ends on April 22, 2019.

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1 P. G. Heasler, and S. R. Doctor, 1996. *Piping Inspection Round Robin*, NUREG/CR-5068, PNNL-10475, U.S. Nuclear Regulatory Commission, Washington, DC.

ASME Code Requirements

ASME Code, Section XI, 2004 Edition, Category C-A requires volumetric examination of 100 percent of the weld length as defined in Table IWC-2500-1 and shown in Figure IWC 2500-1. The alternative requirements of ASME Section XI, Code Case N-460, approved for use in RG 1.147, Revision 17, allows credit for essentially 100 percent coverage of the welds provided greater than 90 percent of the required volume has been examined.

Licensee's Basis for Relief Request (as stated)

> Pursuant to 10 CFR 50.55a(g)(5)(iii), relief is requested from the 100% volumetric examination coverage requirement of the subject welds due to the geometric configuration and permanent obstructions which limit the volumetric coverage that can be obtained.
>
> The Steam Generator shell-to-transition cone weld 03-053-SW-G was examined with a manual ultrasonic technique using pulse echo ultrasonic instruments and search units to achieve the maximum examination coverage practical. No alternative techniques or advanced technologies were considered capable of obtaining complete coverage of the examination volume.
>
> The configuration of the weld joint has an angular surface transition between the shell and transition cone that limits the contact of the search unit in this area for the parallel scans, limiting coverage of the weld volume to 96.8% and base metal volume to 81.7% for a combined total examination coverage of 89.3%.
>
> To increase examination coverage on the subject weld would require a significant design modification or replacement of the component with a different design to eliminate the noted obstructions. This option to meet the 100% Code examination requirement is considered impractical due to the cost, increased radiation exposure and impact to plant equipment.

In its RAI response dated November 10, 2015, the licensee noted that the equipment used to perform the subject examinations in Relief Request IR-3-21 consisted of non-encoded manual conventional (non-phased array) examination equipment with procedures written in accordance with ASME Code, Section XI, Appendix I and Section V, Article 4.

Licensee's Proposed Alternative Examination (as stated)

> The subject weld received a volumetric ultrasonic examination using the best available techniques on the accessible portions of weld to the maximum extent practical. Additionally, a visual (VT-2) examination is performed during each inspection period during the system leakage tests as required by Section XI, Table IWC-2500-1, Category C-H.
>
> Based upon the examination volume that was obtained with acceptable results along with the visual (VT-2) examination performed each inspection period, it is reasonable to conclude that service induced degradation would be detected.

Therefore, these proposed alternatives will provide an acceptable level of quality and safety by providing reasonable assurance of structural integrity of the subject weld.

NRC Staff Evaluation

The ASME Code requires essentially 100 percent volumetric examination of SG shell-to-transition cone weld 03-053-SW-G for Class 2 pressure vessels. However, the licensee stated that the configuration of the weld joint has an angular surface transition between the shell and transition cone that limits the contact of the search unit in this area for the parallel scans, limiting coverage of the weld volume to 96.8 percent and base metal volume to 81.7 percent for a combined examination coverage of 89.3 percent. In order to achieve greater volumetric coverage, the SG shell-to-transition cone would have to be redesigned and modified. The NRC staff determined that this would place a burden on the licensee, therefore the ASME Code examinations are considered impractical.

As shown in the sketches and technical descriptions included in the licensee's submittals, examinations of the SG shell-to-transition cone weld 03-053-SW-G have been performed to the extent practical, with the licensee obtaining 89.3 percent of the required ASME Code examination volume. The licensee examined these welds with manual UT pulse echo ultrasonic instrument techniques in accordance with the applicable requirements of the ASME Code, Appendix I and Section V, Article 4. The SG shell-to-transition cone weld 03-053-SW-G was examined using 0-degree longitudinal and 45- and 60-degree shear waves to achieve the maximum possible coverage along the weld length. No inservice related flaws were detected by the licensee during the examinations. The licensee also performs visual VT-2 examinations each inspection period per ASME Code, Section XI, Table IWC-2500-1, Category C-H.

The licensee has shown that it is impractical to meet the ASME Code-required volumetric examination coverage for the subject weld due to the configuration of the weld joint that has an angular surface transition between the shell and transition cone which limits the contact of the search unit in this area for the parallel scans. However, based on the volumetric coverage obtained, and the UT techniques employed, it is reasonable to conclude that, if significant service-induced degradation had occurred in the subject welds, evidence of it would have been detected by the examinations performed. Furthermore, the staff determined that the UT and VT-2 examinations performed to the extent practical on the subject welds provide reasonable assurance of structural integrity and leak tightness of the SG shell-to-transition cone weld 03-053-SW-G.

3.4 Request for Relief IR-3-22, ASME Code, Section XI, Code Class 2, Examination Category C-F-1, Items C5.11 and C5.21, Pressure Retaining Welds in Austenitic Stainless Steel or High Alloy Piping

ASME Code Components Affected

The components affected are ASME Code Class 2 pressure boundary components. In accordance with ASME Code, Section XI, Table IWC-2500-1, they are classified as Examination Category C-F-1, Item Numbers C5.11 and C5.21. The licensee identified the specific components as listed in Table 2 below.

Table 2: Examination Category C-F-1 Welds with Limited Volumetric Coverage

Weld Number	Code Item #	System Configuration Material	Examination Angle and Wave Mode
CHS-31-FW-1	C5.21	Chemical And Volume Control 4" Pipe-To-Valve Type 316 Stainless Steel, Schedule 160	45° Shear Wave 60° Shear Wave 60° Longitudinal Wave
CHS-31-FW-3	C5.21	Chemical And Volume Control 3" Reducer-To- Valve Type 316 Stainless Steel, Schedule 160	45° Shear Wave 60° Shear Wave 60° Longitudinal Wave
CHS-32-1-SW-D	C5.21	Chemical And Volume Control 4" Pipe-To-Elbow Type 316 Stainless Steel, Schedule 160	45° Shear Wave 60° Shear Wave 60° Longitudinal Wave
CHS-32-FW-1	C5.21	Chemical And Volume Control 4" Pipe-To-Valve Type 316 Stainless Steel, Schedule 160	45° Shear Wave 60° Shear Wave 60° Longitudinal Wave
CHS-33-1-SW-B	C5.21	Chemical And Volume Control 4" Flange-To-Pipe Type 316 Stainless Steel, Schedule 160	45° Shear Wave 60° Shear Wave 60° Longitudinal Wave
CHS-33-FW-1	C5.21	Chemical And Volume Control 4" Pipe-To-Valve Type 316 Stainless Steel, Schedule 160	45° Shear Wave 60° Shear Wave 60° Longitudinal Wave
CHS-33-FW-17	C5.21	Chemical And Volume Control 4" Flange-To-Pipe Type 316 Stainless Steel, Schedule 160	45° Shear Wave 60° Shear Wave 60° Longitudinal Wave
CHS-33-FW-4	C5.21	Chemical And Volume Control 3" Valve-To-Pipe Type 316 Stainless Steel, Schedule 160	45° Shear Wave 60° Shear Wave 70° Longitudinal Wave
RHS-9-2-SW-K	C5.11	Residual Heat Removal 14" Pipe-To- Flange Type 304 Stainless Steel, Schedule 40	45° Shear Wave 70° Shear Wave
RHS-9-3-SW-B	C5.11	Residual Heat Removal 14" Flange-To- Pipe Type 304 Stainless Steel, Schedule 40	45° Shear Wave 70° Shear Wave
RHS-9-FW-2	C5.11	Residual Heat Removal 12" Pipe-To-Valve Type 316 Stainless Steel, Schedule 40	45° Shear Wave 70° Shear Wave

Weld Number	Code Item #	System Configuration Material	Examination Angle and Wave Mode
SIL-157-FW-3	C5.11	Safety Injection 10" Valve-To-Pipe Type 316 Stainless Steel, Schedule 140	45° Shear Wave 60° Shear Wave 70° Shear Wave 60° Longitudinal Wave
SIL-43-FW-1	C5.11	Safety Injection 6" Valve-To-Pipe Type 316 Stainless Steel, Schedule 160	45° Shear Wave 60° Shear Wave 60° Longitudinal Wave
SIL-43-FW-16	C5.11	Safety Injection 6" Pipe-To-Valve Type 316 Stainless Steel, Schedule 160	45° Shear Wave 60° Shear Wave 70° Shear Wave 60° Longitudinal Wave
SIL-504-1-SW-7	C5.11	Safety Injection 6" Reducer-To- Pipe Type 316 Stainless Steel, Schedule 160	45° Shear Wave 60° Shear Wave 70° Shear Wave 60° Longitudinal Wave
SIL-504-FW-15	C5.11	Safety Injection 6" Pipe-To-Valve Type 316 Stainless Steel, Schedule 160	45° Shear Wave 60° Shear Wave 60° Longitudinal Wave
SIL-8-FW-3	C5.11	Safety Injection 10" Transition Piece-To-Valve Type 316 Stainless Steel, Schedule 160	45° Shear Wave 60° Shear Wave 60° Longitudinal Wave

Applicable Code Edition and Addenda

The code of record for the third 10-year ISI interval is the 2004 Edition, no Addenda of the ASME Code.

Duration of Relief Request

The licensee submitted this relief request for the third 10-year ISI interval which started on April 23, 2009, and ends on April 22, 2019.

ASME Code Requirement

ASME Section XI, Examination Category C-F-1 requires 100 percent (%) volumetric examination coverage for circumferential piping welds. The alternative requirements of ASME Section XI, Code Case N-460, approved for use in RG 1.147, Rev. 17, allows credit for essentially 100 percent coverage of the weld provided greater than 90 percent of the required volume has been examined.

Paragraph 10 CFR 50.55a(b)(2)(xv)(A), requires the following examination coverage criteria when applying Supplement 2 to Appendix VIII:

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.

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, 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.

Paragraph 10 CFR 50.55a(b)(2)(xvi)(B) requires 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-side examinations. To demonstrate equivalency to two-sided examinations, the demonstration must be performed to the requirements of Appendix VIII as modified by this paragraph and 10 CFR 50.55a(b)(2)(xv)(A).

Impracticality of Compliance

The licensee states that the subject welds were examined with a manual ultrasonic technique using pulse echo ultrasonic instruments and search units to achieve the maximum examination coverage practical. The licensee also stated that the examinations were performed using personnel, equipment and procedures qualified in accordance with ASME Section XI, Appendix VIII as implemented by the Performance Demonstration Initiative (PDI).

There are currently no PDI qualified single-side examination procedures that demonstrate equivalency to two-sided examination procedures on austenitic piping welds. Current technology is not capable of reliably detecting or sizing flaws on the far side of an austenitic weld for configurations common to US nuclear applications.

The Performance Demonstration Qualification Summary certificates (part of the PDI) for austenitic piping list the limitation that single-side examination is performed on a best effort basis. The best effort qualification is provided in place of a complete single-side qualification to demonstrate that the examiners qualification and the subsequent weld examination is based on application of the best available technology.

When the area successfully scanned is limited to one side of an austenitic weld, examination coverage does not comply with 10 CFR 50.55a(b)(2)(xv)(A), proficiency demonstrations do not comply with 10 CFR 50.55a(b)(2)(xvi)(B) and full coverage credit may not be claimed.

The licensee stated that the ASME code-required volume of these welds was interrogated ultrasonically to the maximum extent possible. No alternative methods or advanced technologies were considered capable of obtaining complete coverage of the examination volume.

Since the configuration of the piping limits access to a single side, relief is requested from complying with the essentially 100 percent required examination coverage for the piping welds listed in Table 2. Note that the examination coverage listed is that which was obtained during the examination with no credit taken for the far side of each weld (in which the examination from that side could not be performed).

Supplemental scanning was performed to provide additional best effort (non-code) coverage as documented on the enclosed coverage calculation for each weld.

Coverage calculations were provided in the original relief request for each of the effected welds.

Basis for Relief

The licensee stated that the subject welds received a volumetric examination to the maximum extent practical on the accessible portions of the welds using the best available techniques. Additionally, a surface examination was performed with 100 percent coverage obtained and a visual (VT-2) examination was performed each inspection period during the system leakage tests as required by Section XI, Table IWC- 2500-1, Category C-F-1.

Based upon the volumetric examination coverage that was obtained with acceptable results, the surface examination obtaining 100 percent coverage with acceptable results, and the visual (VT-2) examination performed each period, it is reasonable to conclude that service-induced degradation would have been detected. Therefore, the proposed alternatives will provide an acceptable level of quality and safety by providing reasonable assurance of structural integrity of the subject welds.

The licensee indicated that the 50 percent coverage reported in Attachment 4 of Relief Request IR-3-22 is the aggregate coverage obtained from scanning the welds in both circumferential and axial directions from the pipe side (single-sided examination). They also included documentation that shows that they used refracted longitudinal (L)-waves to examine the far-side (i.e., the required examination volume in the valve side) as a "Best Effort" examination. The licensee has stated that as a minimum, the region of the weld root has been examined.

Information provided by the licensee stated that they had considered the use of alternative volumetric examination techniques. The use of RT was not desirable, because RT is limited in its ability to detect service-induced flaws. Additionally, the use of other conventional or phased-array techniques was considered, but these would not increase the coverage due to the limitations created by the component configurations.

The licensee stated that for the connections in questions, the construction or preservice inspections (PSI) and previous ISI had not identified any relevant indications. Additionally, the licensee stated that it found no significant internal and external operating experience regarding potential degradation and severe loading for the subject welds. It was also noted that the subject welds are not within the areas of concern identified by the latest version of Electric Power Research Institute (EPRI) Materials Reliability Program (MRP)-146, "Management of Thermal Fatigue in Normally Stagnant Non-Isolable Reactor Coolant System Branch Lines" and MRP interim guidance related to thermal fatigue.

The licensee stated that online leakage monitoring systems (e.g., floor sump) as well as daily walk-downs provide additional assurance that evidence of a through wall flaw would be detected. Several of the welds, indicated in the response to RAI dated March 22, 2016, are located in containment and, therefore, are normally inaccessible during plant operation. For these, the reactor coolant system leakage detection system provides for the detection of unidentified leakage. The remaining welds identified in Relief Request IR-3-22 are located

outside containment. These areas are walked down once per shift during operator rounds. Any significant leakage would likely be identified during these rounds.

Proposed Alternative

In this relief request, the licensee reported the percentage of coverage achieved by the UT in the examination performed as listed in Table 3. The licensee also provided the results of the surface examinations for each of the welds.

Table 3: Examination Category C-F-1 Welds Ultrasonic Coverage and Surface Examination Results

Weld Number	Ultrasonic Examination Coverage	Surface Examination Results
CHS-31-FW-1	50%	Liquid penetrant examination performed obtaining 100 percent coverage. No recordable indications detected.
CHS-31-FW-3	50%	Liquid penetrant examination performed obtaining 100 percent coverage. No recordable indications detected.
CHS-32-1-SW-D	50%	Liquid penetrant examination performed obtaining 100 percent coverage. No recordable indications detected.
CHS-32-FW-1	50%	Liquid penetrant examination performed obtaining 100 percent coverage. No recordable indications detected.
CHS-33-1-SW-B	50%	Liquid penetrant examination performed obtaining 100 percent coverage. No recordable indications detected.
CHS-33-FW-1	50%	Liquid penetrant examination performed obtaining 100 percent coverage. No recordable indications detected.
CHS-33-FW-17	50%	Liquid penetrant examination performed obtaining 100 percent coverage. No recordable indications detected.
CHS-33-FW-4	50%	Liquid penetrant examination performed obtaining 100 percent coverage. No recordable indications detected.
RHS-9-2-SW-K	50%	Liquid penetrant examination performed obtaining 100 percent coverage. No recordable indications detected.
RHS-9-3-SW-B	50%	Liquid penetrant examination performed obtaining 100 percent coverage. No recordable indications detected.
RHS-9-FW-2	50%	Liquid penetrant examination performed obtaining 100 percent coverage. No recordable indications detected.
SIL-157-FW-3	50%	Liquid penetrant examination performed obtaining 100 percent coverage. No recordable indications detected.
SIL-43-FW-1	50%	Liquid penetrant examination performed obtaining 100 percent coverage. No recordable indications detected.
SIL-43-FW-16	50%	Liquid penetrant examination performed obtaining 100 percent coverage. No recordable indications detected.
SIL-504-1-SW-7	50%	Liquid penetrant examination performed obtaining 100 percent coverage. No recordable indications detected.
SIL-504-FW-15	50%	Liquid penetrant examination performed obtaining 100 percent coverage. One recordable indication was detected that was evaluated as acceptable per ASME Section XI, IWB-3514 acceptance standards.

SIL-8-FW-3	50%	Liquid penetrant examination performed obtaining 100 percent coverage. No recordable indications detected.

The licensee proposes to use their best effort coverage as an alternative to the ASME Code requirement (which calls for essentially 100 percent coverage of the required examination volume). The licensee stated that the subject welds received a volumetric examination to the maximum extent practical on the accessible portions of the welds using the best available techniques. Additionally, a surface examination was performed with 100 percent coverage obtained and a visual (VT-2) examination was performed each inspection period during the system leakage tests as required by Section XI, Table IWC- 2500-1, Category C-F-1.

The licensee stated that based upon the volumetric examination coverage that was obtained with acceptable results, the surface examination obtaining 100 percent coverage with acceptable results, and the visual (VT-2) examination performed each period, it is reasonable to conclude that service-induced degradation would have been detected. Therefore, the licensee proposes that these alternatives will provide an acceptable level of quality and safety by providing reasonable assurance of structural integrity of the subject welds.

NRC Staff Evaluation

Impracticality of compliance

As described and demonstrated in coverage summaries of Relief Request IR-3-22, the predominant limitations that prevented the licensee's UT to achieve essentially 100 percent coverage of the ASME Code-required volume were the valve-to-pipe, flange-to-pipe and elbow-to-pipe configurations (i.e., a single sided access to the weld). The licensee performed the ultrasonic scanning from only the pipe side of the welds due to the valve geometry. The NRC staff agrees that the design configurations of these welds would limit the effectiveness of alternative (or advanced UT) technologies from increasing the coverage of the examination volume. To effectively increase the examination coverage, the licensee would have to make major design modifications or replace the components. Therefore, the NRC staff finds that a technical justification exists to support the determination that achieving essentially 100 percent coverage is impractical.

Burden of compliance

The licensee proposed that making the welds accessible for inspection from both sides would require major design changes and component replacement. The NRC staff finds that making design changes and replacing the components of these welds is the only reasonable means to achieve dual sided coverage of these welds, and that replacement and design changes to these welds constitutes a burden on the licensee.

Other Potential Modes of Degradation

The licensee also discussed their industry or plant-specific operating experience regarding potential degradation (e.g., stress corrosion cracking and corrosion) and potential severe loading (e.g., vibration, water hammer, and overloading) for the subject welds and associated components. They state that none of the welds covered by Relief Request IR-3-22 are

subjected to these types of potential degradation or severe loadings. Based upon the discussion above, the NRC staff finds that there is reasonable assurance that the subject welds will not be subjected to other modes of potential degradation or severe loading.

Examination coverage achieved

In evaluating the licensee's proposed alternative, the NRC staff assessed whether it appeared that the licensee obtained as much coverage as reasonably possible and the manner in which the licensee reported the coverage achieved. From review of coverage summaries in Relief Request IR-3-22, the NRC staff agrees that the licensee obtained the maximum coverage achievable (i.e., percentage of the required examination volume covered by the UT using applicable ultrasonic modes of propagation, probe angles, and scanning directions). The coverage obtained represents the aggregate coverage of the required UT performed (axial and circumferential scanning directions combined). The licensee performed the UT with the procedure developed and qualified in accordance with Supplement 2 of Appendix VIII to the ASME Code, Section XI, under the PDI program. In the volumes examined by the ASME Code-required UT, the licensee did not identify any unacceptable indications in the welds. The NRC staff agrees that the physical access, the design configuration, or the material type would limit the effectiveness of alternative (or advanced UT) technologies from increasing the coverage of the examination volume. Therefore, the NRC staff finds that the licensee made a reasonable attempt to obtain as much coverage as possible with the ASME Code required UT.

Safety significance of unexamined volumes - unachievable coverage

In addition to the coverage analysis described above, the NRC staff evaluated the safety significance of the unexamined volumes of weld - unachievable coverage. From a review of the coverage summaries in Relief Request IR-3-22, the NRC staff verified that the licensee's UT has covered, to the extent possible, the regions (i.e., the weld root and the heat-affected zone (HAZ) of the base materials near the ID surface of the joint) that are typically susceptible to higher stresses and, therefore, potential degradation. The NRC staff notes that the coverage obtained for axial scans was limited to the volume up to the weld centerline (near-side or pipe side), because claiming coverage for the volume on the opposite side of the weld centerline (far-side or valve side) requires meeting the 10 CFR 50.55a(b)(2)(xv)(A)(2) far-side UT qualifications, which has not been demonstrated in any qualification attempts to date. As an extra effort to interrogate the examination volume on the far-side in a single-sided examination, the licensee conducted a supplemental UT as a "Best Effort" examination which is not included in the aggregate coverage. The refracted longitudinal waves have been shown to have better penetration capability and lower distortion in the cast austenitic stainless steel materials. In the volumes examined by the supplemental UT, the licensee did not identify any unacceptable indications in the subject welds. Therefore, the NRC staff determined that based on the coverage achieved by the qualified UT, the supplemental "Best Effort" examinations, and the examination of the weld root and its HAZ to the extent possible, it is reasonable to conclude that if significant service induced degradation had occurred, evidence of it would have been detected by the examinations that the licensee performed.

In performing this analysis, the NRC staff noted that the piping and welds under consideration are made of austenitic stainless steel materials. Their inspections are governed by the MPS3 risk-informed (RI)-ISI program. The NRC staff also notes that the joints could be subject to degradation by thermal fatigue. To address this, the licensee has in place an augmented

program for managing thermal fatigue. The subject welds of Relief Request IR-3-22 have been surveyed with respect to the MRP-146 and its most recent interim guidance. The licensee states that none of the subject welds of Relief Request IR-3-22 are covered under MRP-146, or its interim guidance, so the expectation of damage due to thermal fatigue of these joints is low. Therefore, the NRC staff finds that significant service induced degradation would not likely be a concern.

In this analysis, the NRC staff also notes that if, in an unlikely event, one of these welds developed a through wall flaw and a leak, the existing plant leakage monitoring system (e.g., drain sump) will be able to identify the leakage during normal operation, and the licensee will take appropriate corrective actions in accordance with the plant technical specifications.

The NRC staff considered whether the licensee's proposed alternative provided reasonable assurance of structural integrity and leak tightness of the subject welds based on: (1) the examination coverage achieved and (2) safety significance of unexamined volumes - unachievable coverage (e.g., the presence or absence of known active degradation mechanisms, the significance of a leak and/or structural failure of the subject weld, and essentially 100 percent coverage achieved for similar welds in similar environments subject to similar degradation mechanisms). The NRC staff finds that the volumetric examinations performed to the extent possible and accompanied by other examinations (visual, walked down, and/or augmented) provide a reasonable assurance of structural integrity and leak tightness of the subject welds. Compliance with the ASME Code requirements for these welds would be a burden on the licensee.

The NRC staff has evaluated Relief Request IR-3-22 pursuant to 10 CFR 50.55a(g)(6)(i). The NRC staff's evaluation focused on: (1) whether a technical justification exists to support the determination that the ASME Code requirement is impractical; (2) that imposition of the Code required inspections would result in a burden to the licensee; and (3) that the licensee's proposed alternative (accepting the reduced inspection coverage in this case) provides reasonable assurance of structural integrity and leak tightness of the subject weld. The NRC staff finds that because these three criteria have been met then the requirements of 10 CFR 50.55a(g)(6)(i), (i.e., granting the requested relief 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") have also been met.

3.5 Request for Relief IR-3-23, ASME Code, Section XI, Code Class 2, Examination Category C-F-2, Item C5.51, Pressure Retaining Welds in Carbon or Low-Alloy Steel Piping

Components Affected

The components affected are ASME Code Class 2 pressure boundary components. In accordance with ASME Code, Section XI, Table IWC-2500-1, they are classified as Examination Category C-F-2, Item Numbers C5.51. The licensee identified the specific components as listed in Table 4 below.

Table 4: Examination Category C-F-2 Welds with Limited Volumetric Coverage

Weld Number	Code Item #	System Configuration Material	Examination Angle and Wave Mode
DTM-25-FW-1	C5.51	Main Steam 6" Weldolet-To-Pipe SA106 GR B, Schedule 80	45° Shear Wave
MSS-32-FW-2	C5.51	Main Steam 8" Pipe-To-Valve SA106 GR B, Schedule 100	45° Shear Wave
MSS-32-FW-3	C5.51	Main Steam 8" Pipe-To-Valve SA106 GR B, Schedule 100	45° Shear Wave

Applicable Code Edition and Addenda

The code of record for the third 10-year ISI interval is the 2004 Edition, no Addenda of the ASME Code.

Duration of Relief Request

The licensee submitted this relief request for the third 10-year ISI interval which started on April 23, 2009, and ends on April 22, 2019.

ASME Code Requirement

ASME Section XI, Examination Category C-F-1 requires 100 percent volumetric examination coverage for circumferential piping welds. The alternative requirements of ASME Section XI, Code Case N-460, approved for use in RG 1.147, Rev. 17, allows credit for essentially 100 percent coverage of the weld provided greater than 90 percent of the required volume has been examined.

Impracticality of Compliance

The licensee states that the subject welds were examined with a manual ultrasonic technique using pulse echo ultrasonic instruments and search units to achieve the maximum examination coverage practical. The licensee also stated that the examinations were performed using personnel, equipment and procedures qualified in accordance with ASME Section XI, Appendix VIII as implemented by the PDI.

The subject welds include configurations that consist of either pipe to valve or pipe to weldolet that limit the circumferential scans on the upstream side. The licensee stated that due to the tapered surface of the valve or weldolet, within close proximity of the weld, no circumferential scans could be performed on the valve or weldolet side of these welds.

The ASME code-required volume of these welds was interrogated ultrasonically to the maximum extent possible. No alternative methods or advanced technologies were considered capable of obtaining complete coverage of the examination volume.

Since the configuration of the piping limits access to a single side, relief is requested on complying with the essentially 100 percent required examination coverage for the piping welds listed in Table 4. Note that the examination coverage listed is that which was obtained during the examination with no credit taken for the far side of each weld in which the examination from that side could not be performed.

Coverage calculations were provided in the original relief request for each of the effected welds.

Basis for Relief

The licensee stated that the subject welds received a volumetric examination to the maximum extent practical on the accessible portions of the welds using the best available techniques. Additionally, a surface examination was performed with 100 percent coverage obtained and a visual (VT-2) examination was performed each inspection period during the system leakage tests as required by Section XI, Table IWC- 2500-1, Category C-F-2.

The licensee stated that based upon the volumetric examination coverage that was obtained with acceptable results, the surface examination obtaining 100 percent coverage with acceptable results, and the visual (VT-2) examination performed each period, it is reasonable to conclude that service-induced degradation would have been detected. Therefore, the licensee stated the proposed alternatives will provide an acceptable level of quality and safety by providing reasonable assurance of structural integrity of the subject welds.

The licensee stated that the 75 percent coverage reported in Attachment 4 of Relief Request IR-3-23 is the aggregate coverage obtained from scanning the welds in both axial directions from both sides, and scanning the welds in the circumferential direction from the pipe side. They also included documentation that shows that they used refracted longitudinal (L)-waves to examine the far-side (i.e., the required examination volume in the valve side) as a "Best Effort" examination. The licensee stated that as a minimum, the region of the weld root and the base material HAZ on the far side of the weld has effectively been examined.

Information provided by the licensee stated that they had considered the use of alternative volumetric examination techniques. The use of RT was not desirable, because RT is limited in its ability to detect service-induced flaws. Additionally, the use of other conventional or phased-array techniques was considered, but these would not increase the coverage due to the limitations created by the component configurations.

The licensee stated that for the connections in questions, the construction or PSI and previous ISI had not identified any relevant indications. Additionally, the licensee stated that it found no significant internal and external operating experience regarding potential degradation and severe loading for the subject welds.

The welds identified in Relief Request IR-3-23, as indicated in the response to RAI dated March 22, 2016, are located outside of containment. These areas are walked down once per shift

during operator rounds. Consequently, any significant leakage would likely be identified during these rounds.

Proposed Alternative

In this relief request, the licensee reported the percentage of coverage achieved by the UT in the examination performed as listed in Table 5. The licensee also provided the results of the surface examinations for each of the welds.

Table 5: Examination Category C-F-2 Welds Ultrasonic Coverage and Surface Examination Results

Weld Number	Ultrasonic Examination Coverage	Surface Examination Results
DTM-25-FW-1	75%	Magnetic particle examination performed obtaining 100 percent coverage. No recordable indications detected.
MSS-32-FW-2	75%	Magnetic particle examination performed obtaining 100 percent coverage. No recordable indications detected.
MSS-32-FW-3	75%	Magnetic particle examination performed obtaining 100 percent coverage. No recordable indications detected.

The licensee proposes to use their best effort coverage as an alternative to the ASME Code requirement (which calls for essentially 100 percent coverage of the required examination volume). The licensee stated that the subject welds received a volumetric examination to the maximum extent practical on the accessible portions of the welds using the best available techniques. Additionally, a surface examination was performed with 100 percent coverage obtained and a visual (VT-2) examination was performed each inspection period during the system leakage tests as required by Section XI, Table IWC- 2500-1, Category C-F-2.

The licensee stated that based upon the volumetric examination coverage that was obtained with acceptable results, the surface examination obtaining 100 percent coverage with acceptable results, and the visual (VT-2) examination performed each period, it is reasonable to conclude that service-induced degradation would have been detected. Therefore, the licensee proposes that these alternatives will provide an acceptable level of quality and safety by providing reasonable assurance of structural integrity of the subject welds.

NRC Staff Evaluation

Impracticality of compliance

As described and demonstrated in coverage summaries of Relief Request IR-3-23, the predominant limitations that prevented the licensee's UT to achieve essentially 100 percent coverage of the ASME Code required volume were the valve-to-pipe or weldolet-to-pipe configurations (i.e., a single sided access to the weld). The licensee performed the ultrasonic scanning from only the pipe side of the welds due to the valve geometry. The NRC staff agrees that the design configurations of these welds would limit the effectiveness of alternative (or

advanced UT) technologies from increasing the coverage of the examination volume. To effectively increase the examination coverage, the licensee would have to make major design modifications or replace the components. Therefore, the NRC staff finds that a technical justification exists to support the determination that achieving essentially 100 percent coverage is impractical.

Burden of compliance

The licensee proposed that making the welds accessible for inspection from both sides would require major design changes and component replacement. The NRC staff finds that making design changes and replacing the components of these welds is the only reasonable means to achieve dual sided coverage of these welds, and that replacement and design changes to these welds constitutes a burden on the licensee.

Other Potential Modes of Degradation

The licensee also discussed their industry or plant-specific operating experience regarding potential degradation (e.g., stress corrosion cracking and corrosion) and potential severe loading (e.g., vibration, water hammer, and overloading) for the subject welds and associated components. They state that none of the welds covered by Relief Request IR-3-23 are subjected to these types of potential degradation or severe loadings. The NRC staff finds that there is reasonable assurance that the subject welds will not be subjected to other modes of potential degradation or severe loading.

Examination coverage achieved

In evaluating the licensee's proposed alternative, the NRC staff assessed whether it appeared that the licensee obtained as much coverage as reasonably possible and the manner in which the licensee reported the coverage achieved. From review of coverage summaries in Relief Request IR-3-23, the NRC staff agrees that the licensee obtained the maximum coverage achievable (i.e., percentage of the required examination volume covered by the UT using applicable ultrasonic modes of propagation, probe angles, and scanning directions). The coverage obtained represents the aggregate coverage of the required UT performed (axial and circumferential scanning directions combined). In the volumes examined by the ASME Code-required UT, the licensee did not identify any unacceptable indications in the welds. The NRC staff agrees that the physical access, the design configuration, or the material type would limit the effectiveness of alternative (or advanced UT) technologies from increasing the coverage of the examination volume. Therefore, the NRC staff finds that the licensee made a reasonable effort to obtain as much coverage as possible with the ASME Code required UT.

Safety significance of unexamined volumes - unachievable coverage

In addition to the coverage analysis described above, the NRC staff evaluated the safety significance of the unexamined volumes of weld - unachievable coverage. From review of coverage summaries in Relief Request IR-3-23, the NRC staff verified that the licensee's UT has covered, to the extent possible, the regions (i.e., the weld root and the HAZ of the base materials near the ID surface of the joint) that are typically susceptible to higher stresses and, therefore, potential degradation. The NRC staff notes that the coverage obtained for axial-direction scans was both near- and far-side, while coverage for the circumferential-direction

scans was limited to the pipe side of the weld. The NRC staff determined that based on the coverage achieved by the qualified UT and the examination of the weld root and its HAZ to the extent possible, it is reasonable to conclude that if significant service induced degradation had occurred, evidence of it would have been detected by the examinations that the licensee performed.

In this analysis, the NRC staff also notes that if, in an unlikely event, one of these welds developed a through wall flaw and a leak, these welds are outside of containment, and therefore subject to daily walk-down inspections. It is likely that operators will be able to identify the leakage during normal operation, and the licensee will take appropriate corrective actions in accordance with the plant technical specifications.

The NRC staff considered whether the licensee's proposed alternative provided reasonable assurance of structural integrity and leak tightness of the subject welds based on: (1) the examination coverage achieved and (2) safety significance of unexamined volumes - unachievable coverage (e.g., the presence or absence of known active degradation mechanisms, the significance of a leak and/or structural failure of the subject weld, and essentially 100 percent coverage achieved for similar welds in similar environments subject to similar degradation mechanisms). The NRC staff finds that the volumetric examinations performed to the extent possible and accompanied by other examinations (visual, walked down, and/or augmented) provide a reasonable assurance of structural integrity and leak tightness of the subject welds. Compliance with the ASME Code requirements for these welds would be a burden on the licensee.

The NRC staff has evaluated Relief Request IR-3-23 pursuant to 10 CFR 50.55a(g)(6)(i). The NRC staff's evaluation focused on: (1) whether a technical justification exists to support the determination that the ASME Code requirement is impractical; (2) that imposition of the Code required inspections would result in a burden to the licensee; and (3) that the licensee's proposed alternative (accepting the reduced inspection coverage in this case) provides reasonable assurance of structural integrity and leak tightness of the subject weld. The NRC staff finds that because these three criteria have been met then the requirements of 10 CFR 50.55a(g)(6)(i), (i.e., granting the requested relief 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") have also been met.

4.0 CONCLUSION

The NRC staff has completed its review of the licensee's subject relief requests for MPS3. Pursuant to 50.55a(g)(6)(i), the NRC staff determines 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 provides reasonable assurance of structural integrity and leak tightness 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 IR-3-19, IR-3-20, IR-3-21, IR-3-22, and IR-3-23 for the third 10-year ISI interval at MPS3.

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 Inservice Inspector.

Principal Contributors: Thomas McLellan
Donald Becker

Date: June 24, 2016

If you have any questions, please contact the project manager, Richard Guzman, at (301) 415-1030 or Richard.Guzman@nrc.gov.

Sincerely,

/RA/

Travis L. Tate, Chief
Plant Licensing Branch I-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-423

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