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

August 24, 2016

Mr. David A. Heacock
President and Chief Nuclear Officer
Virginia Electric and Power Company
Innsbrook Technical Center
5000 Dominion Blvd.
Glenn Allen, VA 23060-6711

SUBJECT: SURRY POWER STATION, UNIT NO. 1 – REQUESTS FOR RELIEF LMT-R01, LMT-R02, LMT-R03, LMT-P01, AND LMT-C01 – REQUIREMENTS FOR LIMITED COVERAGE EXAMINATIONS PERFORMED IN THE FOURTH 10-YEAR INSERVICE INSPECTION INTERVAL (CAC NOS. MF7032, MF7033, MF7034, MF7035, AND MF7036)

Dear Mr. Heacock:

By letter dated October 9, 2015 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML15293A124), as supplemented by letter dated June 21, 2016 (ADAMS Accession No. ML16179A204), Virginia Electric and Power Company (Dominion, the licensee), submitted Relief Requests (RRs) LMT-R01, LMT-R02, LMT-R03, LMT-P01, and LMT-C01, to the U.S. Nuclear Regulatory Commission (NRC). Dominion is seeking relief from certain American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code) requirements specifically related to ASME Code Case N-460, "Alternative Examination Coverage for Class 1 and Class 2 Welds, Section XI, Division 1," for the fourth 10-year inservice inspection (ISI) interval, which commenced on October 14, 2003, and ended, as extended, on October 13, 2014, at the Surry Power Station, Unit No. 1. The examinations of certain components conducted during the fourth interval received less than the required examination coverage.

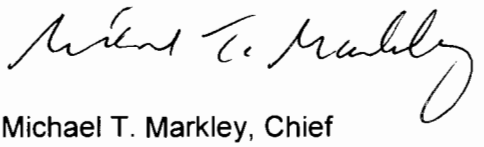
Specifically, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) 50.55a(g)(6)(i), the licensee requested relief from the required examination coverage and to use alternative requirements (if necessary), ISI of the welds on the basis that the ASME Code requirement is impractical.

The NRC staff reviewed the RRs and concludes, as set forth in the enclosed safety evaluation, that Dominion 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 requested components at the Surry Power Station, Unit No. 1, for the fourth 10-year ISI interval, which commenced on October 14, 2003, and ended, as extended, on October 13, 2014.

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

If you have any questions, please contact the Project Manager, Karen Cotton Gross, at 301-415-1438 or by e-mail at Karen.Cotton@nrc.gov.

Sincerely,



Michael T. Markley, Chief
Plant Licensing Branch 2-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-280

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

RELIEF REQUESTS LMT-R01, LMT-R02, LMT-R03, LMT-P01, AND LMT-C01

RELATED TO LIMITED COVERAGE EXAMINATIONS PERFORMED IN THE

FOURTH 10-YEAR INSERVICE INSPECTION INTERVAL

VIRGINIA ELECTRIC AND POWER COMPANY

SURRY POWER STATION, UNIT NO. 1

DOCKET NO. 50-280

1.0 INTRODUCTION

By letter dated October 9, 2015 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML15293A124), as supplemented by letter dated June 21, 2016 (ADAMS Accession No. ML16179A204), Virginia Electric and Power Company (Dominion, the licensee), submitted Relief Requests (RRs) LMT-R01, LMT-R02, LMT-R03, LMT-P01, and LMT-C01, to the U.S. Nuclear Regulatory Commission (NRC, the Commission). Dominion is seeking relief from certain American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code) requirements specifically related to ASME Code Case N-460, "Alternative Examination Coverage for Class 1 and 2 Welds, Section XI, Division 1," for the fourth 10-year inservice inspection (ISI) interval, which commenced on October 14, 2003, and ended, as extended, on October 13, 2014, at the Surry Power Station (Surry), Unit No. 1. The examinations of certain components conducted during the fourth interval received less than the required examination coverage.

Specifically, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) 50.55a(g)(6)(i), the licensee requested relief from the required examination coverage and to use alternative requirements (if necessary), for inservice inspection (ISI) of the welds on the basis that the ASME Code requirement is impractical.

2.0 REGULATORY EVALUATION

Pursuant to 10 CFR 50.55a(g)(4), ASME Code Class 1, 2, and 3 components (including supports) must meet the requirements, except the design and access provisions and the pre-service 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 ISI interval and subsequent intervals complies with the requirements in the latest edition and addenda of Section XI of the ASME Code incorporated by reference in Title 10 of the *Code of Federal*

Regulations (10 CFR) 50.55a(a)(1)(ii), 12 months prior to the start of the 120-month interval, subject to the conditions listed in 10 CFR 50.55a(b)(2).

Pursuant to 10 CFR 50.55a(g)(4)(ii), inservice examination of components during successive 120-month inspection intervals must comply with the requirements of the latest edition and addenda of the Code incorporated by reference in paragraph (a) of 10 CFR 50.55a 12 months before the start of the 120-month inspection interval (or the optional ASME Code Cases listed in Regulatory Guide 1.147, Revision 17, "Inservice Inspection Code Case Acceptability, ASME Section XI, Division 1," when using Section XI, which are incorporated by reference in paragraphs (a)(3)(ii) and (iii) of 10 CFR 50.55a, subject to the conditions listed in paragraph (b) of 10 CFR 50.55a.

The regulations in 10 CFR 50.55a(g)(4)(iv) state that inservice examination of components and system pressure tests may meet the requirements set forth in subsequent editions and addenda that are incorporated by reference in paragraph 10 CFR 50.55a(a), subject to the limitations and modifications listed in 10 CFR 50.55a(b) and subject to Commission approval. Portions of editions or addenda may be used provided that all related requirements of the respective editions or addenda are met.

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 NRC and submit, as specified in 10 CFR 50.4, information to support the determinations. Determinations of impracticality in accordance with 10 CFR 50.55a 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.

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.

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

3.0 TECHNICAL EVALUATION

The information referenced hereafter as "stated by the licensee" is from incoming letters dated October 9, 2015, and supplemented June 21, 2016.

Background

By letter dated December 16, 1998 (ADAMS Legacy Library Accession No. 9812280276), the NRC approved the Surry, Unit No. 1, original risk-informed inservice inspection (RI-ISI) program covering the Class 1 piping welds (Examination Category B-F and B-J), the Class 2 piping

welds (Examination Category C-F-I and C-F-2), and the Class 3 piping welds. The licensee developed the RI-ISI program in accordance with the NRC-approved methodology of the Westinghouse Owners Group WCAP-14572, Revision 1-NP-A, "Application of Risk-Informed Methods to Piping Inservice Inspection Topical Report" (ADAMS Accession No. ML012630349).

Applicable Code Edition and Addenda

The code of record for the fourth 10-year ISI interval is the 1998 Edition through 2000 Addenda of the ASME Code, Section XI.

Duration of Relief Request

The licensee submitted this RR for the fourth 10-year ISI interval which commenced on October 14, 2003, and ended, as extended, on October 13, 2014.

The licensee stated that an extension of 1 year was applied to the fourth 10-year ISI interval as allowed by ASME Code, Section XI, subparagraph IWA-2430(d).

ASME Code Requirement

The ASME Code requirements applicable to this RR originate in Section XI, Table IWB-2500-1 and Table IWC-2500-1. The licensee developed the alternative to the ASME Code requirements for the RI-ISI program at Surry, Unit No. 1, in accordance with the NRC-approved methodology in WCAP-14572, Revision 1-NP-A, which was authorized by the NRC in a safety evaluation (SE) dated December 16, 1998. In both the ASME Code requirements and the NRC SE, the welds under this RR are required to be volumetrically examined during each 10-year ISI interval, and 100 percent coverage of the required examination volume must be achieved. The extent of required examination coverage is reduced to essentially 100 percent (greater than 90 percent) by ASME Code Case N-460. This Code Case has been incorporated by reference into 10 CFR 50.55a by inclusion in RG 1.147, Revision 17.

3.1 Relief Request LMT-R01, Category R-A, Risk Informed Piping Welds on Stainless Steel Piping

Components Affected

In this RR, the affected components are ASME Code Class 1 and 2 piping welds. The licensee identified these welds in Tables 4a, 4b, and 4c of Attachment 1 to this RR.

- The welds listed in Table 4a of the RR are the reactor coolant pump to pipe welds. These welds are classified as Examination Category R-A, Item Number R1.11 (elements subject to thermal fatigue) in accordance with Table 4.1-1 of WCAP-14572, Revision 1-NP-A, Supplement 2 (ADAMS Accession No. ML012630327).

- The welds listed in Table 4b of the RR are valve-to-elbow welds, pipe-to-valve welds, elbow-to-weldolet welds, and pipe-to-branch-connection welds in the reactor coolant system piping. These welds are classified as Examination Category R-A, Item

Number R1.11 (elements subject to thermal fatigue) in accordance with Table 4.1-1 of WCAP-14572, Revision 1-NP-A, Supplement 2.

- The welds listed in Table 4c are the pipe-to-valve welds, valve-to-elbow welds, branch connection-to-pipe welds, and pipe-to-flange welds in the safety injection system piping, the recirculation spray system piping, and the residual heat removal system piping. These welds are classified as Examination Category R-A, Item Number R1.11 (elements subject to thermal fatigue) and Item Number R1.16 (elements subject to intergranular stress corrosion cracking (IGSCC)) in accordance with Table 4.1-1 of WCAP-14572, Revision 1-NP-A, Supplement 2.

- Tables 4a, 4b, and 4c of the RR provide the ASME Code classification, the diameter, the nominal wall thickness, and the materials of construction for the pipe. The licensee stated that the materials of construction for the weld metal and the associated component are stainless steel. The operating temperature and pressure for each weld are provided in Attachment 1 of the June 21, 2016, letter.

Impracticality of Compliance

The licensee stated that it was not possible to obtain greater than 90 percent of the required examination volume of each weld because of the geometric configurations (i.e., pipe to pump, pipe to valve, valve to elbow, elbow to weldolet, pipe to flange, or branch connections). The welds listed in Tables 4a, 4b, and 4c of Attachment 1 to the RR were only scanned from one side of the weld (single sided scan). The schematic diagram provided for each weld in Attachment 1 to the RR illustrates the geometrical difficulties associated with dual-sided scan, and impracticality of compliance with the ASME Code examination coverage requirement.

The licensee stated that compliance with the ASME Code requirements would require extensive modification or replacement of components. The option to rebuild components would create unnecessary burden.

Basis for Relief

The licensee stated that the ISI requirements for the Class 1, 2, and 3 piping welds are governed by the Surry, Unit No. 1, RI-ISI program in the fourth 10-year ISI interval. The welds in this RR were selected for volumetric examination by the RI-ISI program due to potential susceptibility to thermal fatigue and/or intergranular stress corrosion cracking. In accordance with the Surry, Unit No. 1, RI-ISI program, some welds in a segment shall be inspected (inspection is mandatory) regardless of whether limited coverage will be attained. If inspection of a weld is not mandatory, alternative welds may be selected to provide greater examination coverage. Details of the licensee's selection process for the ISI are discussed in the submittal.

The licensee stated that the welds in Table 4b of the RR are within scope of the industry guidelines in Materials Reliability Program (MRP)-146, "Management of Thermal Fatigue in Normally Stagnant Non-isolable Reactor Coolant System Branch Lines." This program is part of the Surry augmented inspection program under which selected welds and pipe areas receive periodic examination as required by the guidelines. Furthermore, the Surry augmented program

has been updated with the guidance of MRP-146, Revision 1, "Thermal Fatigue in Normally Stagnant Non-Isolable RCS Branch Lines," and MRP-2015-019 letter, "Implementation of NEI 03-08 Needed and Good Practice Interim Guidance Requirements for Management of Thermal Fatigue."

The licensee stated that the welds included in Tables 4a and 4c of the RR are not part of any augmented inspection programs.

The licensee stated that it performed the ultrasonic testing (UT) of each weld to the maximum extent possible, utilizing personnel qualified and procedures demonstrated in accordance with Appendix VIII of the ASME Code, Section XI. The licensee did not find any unacceptable indications in the subject welds during the fourth 10-year ISI interval.

The licensee stated that the ultrasonic scanning of each weld was only possible from one side of the weld (single-sided scan). In Tables 4a, 4b, and 4c, and the figures provided in Attachment 1 to the RR, the licensee documented the insonification angles and the ultrasonic wave modes (e.g., refracted shear and longitudinal waves) utilized for scanning of each weld. The licensee did not detect any unacceptable indications in the subject welds.

The licensee stated that when the examination by the UT is limited to one side of an austenitic weld, claiming coverage for the volume on the opposite side of the weld centerline (far-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. Therefore, full coverage credit cannot be claimed. The licensee also stated that, as applicable, it performed the "best effort" examination to investigate the far side of the weld. The "best effort" examination is not a SAME Code or regulatory requirement; however, it provides an extra effort on the part of a licensee to examine the far side of the weld for any indication. To scan the far side of the weld, the refracted longitudinal (L)-waves are generally utilized for welds with wall thickness greater than 0.5 inch and the 70-degree refracted shear waves were generally used for welds with wall thickness equal or less than 0.5 inch. The licensee did not claim credits for any coverage past the weld centerline (on the far side) from the "best effort" examination. From the examinations performed, the licensee did not identify any indication. Tables 4a, 4b, and 4c of the relief request document the licensee's "best effort" percent coverage achieved for some welds. The licensee stated that the "best effort" percent coverage was not documented for some welds because reporting this coverage was not a routine practice at the time.

The licensee stated that none of the pipes, weld metal materials, and associated components are constructed with Alloy 600/82/182 materials; therefore, there are no primary stress corrosion cracking concerns.

In addition, the licensee stated that the performance of VT-2 visual examinations during system leakage testing in accordance with IWB-2500 (Examination Category B-P in Table IWB-2500-1) and IWC-2500 (Examination Category C-H in Table IWC-2500-1) provides additional assurance that a through wall flaw would be detected.

Proposed Alternative

In Tables 4a, 4b, and 4c of Attachment 1 to the RR, the licensee reported the percentage of coverage achieved by the UT in the examination performed (single-side scan).

Welds in Table 4a	48 percent
Welds in Table 4b	50 percent
Welds in Table 4c	46.3 – 50 percent

The licensee proposed this alternative coverage for the volumetric examination of the subject welds in lieu of the ASME Code required essentially 100 percent coverage.

NRC Staff Evaluation

The NRC staff has evaluated this RR pursuant to 10 CFR 50.55a(g)(6)(i). The NRC staff's evaluation focused on whether (1) a technical justification exists to support the determination that the ASME Code requirement is impractical; (2) imposition of the Code required inspections would result in a burden to the licensee; and (3) 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 welds. The NRC staff concludes that if these three criteria are met, 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") will also be met.

Impracticality of Compliance

As described and demonstrated in Attachment 1 to the RR, the predominant limitations that prevented the licensee's UT to achieve essentially 100 percent coverage of the ASME Code required volume was design and configuration of the weld and associated components (e.g., pipe-to-valve, valve-to-elbow, elbow-to-weldolet, pipe-to-branch connection, and pipe-to-flange configurations) that restricted the UT examinations to a single-sided scanning only. The NRC staff concludes that scanning from both sides of the weld, as is required to achieve the required coverage, is impractical.

Burden of Compliance

The licensee proposed that making the weld accessible for inspection from both sides would require extensive modification or replacement of the weld and associated components. The NRC staff concludes that replacing or reconfiguring the components is the only reasonable means to achieve dual-sided coverage of these welds and that replacement or reconfiguration of the components constitutes a burden on the licensee.

Structural Integrity and Leak Tightness

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 (i.e., the presence or absence of known active degradation mechanisms, the significance of a leak and/or structural failure of the subject welds, and essentially 100 percent coverage achieved for similar welds in similar environments subject to similar degradation mechanisms).

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 Attachment 1 to the RR, the NRC staff concludes that:

- The welds were examined using the appropriate equipment, ultrasonic modes of propagation, probe angles, frequencies, and scanning directions to obtain maximum coverage;
- The coverage was calculated in a reasonable manner;
- The UT procedures used were qualified as required by the regulation;
- The coverage was limited by physical access (i.e., the configuration of one side of the weld did not permit access for scanning); and
- No unacceptable indications were identified.

Therefore, the NRC staff concludes that the licensee made every effort to obtain as much coverage as reasonably 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 the welds - unachievable coverage. From review of submittal and the sketches in Attachment 1 to the RR, 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 material near the inside diameter surface of the joint) that are typically susceptible to higher stresses and, therefore, potential degradation.
- For the stainless steel weld, the NRC staff notes that the coverage obtained for axial scans was limited to the volume up to the weld centerline (near-side), because claiming coverage for the volume on the opposite side of the weld centerline (far-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. The licensee inspected the far-side volume by the "best effort" examination. The licensee did not identify any indications and did not take any credit for the coverage achieved from the "best effort" examination.

Therefore, 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.

The NRC staff concludes that in addition to the required volumetric examinations, these welds have received the required system leakage test according to the ASME Code, Section XI, IWB-2500 (Table IWB-2500-1, Examination Category B-P) for Class 1 welds and according to IWC-2500 (Table IWC-2500-1, Examination Category C-H) for Class 2 welds. Despite reduced coverage of the required examination volume, the NRC staff concludes that this inspection has provided additional assurance that any pattern of degradation, if it were to occur, would be detected, and the licensee will take appropriate corrective actions.

In its evaluation, the NRC staff noted that the licensee selected and inspected alternative and/or additional similar welds subjected to a similar environment, which will provide additional assurance that any pattern of degradation, if it were to occur, would be detected.

Therefore, the NRC staff concludes that the volumetric examinations performed, to the extent possible, provide a reasonable assurance of structural integrity and leak tightness of the subject welds. Compliance with the ASME Code requirements is impractical for these welds and would constitute a burden on the licensee.

3.2 Relief Request LMT-R02, Category R-A, Risk Informed Piping Welds on Carbon Steel Piping

Components Affected

In this RR, the affected components are ASME Code Class 2 and non-Class welds. The licensee identified these welds in Table R02 of Attachment 2 to this RR.

- The welds listed in Table R02 are the pipe-to-valve welds in the main steam line piping and the feedwater system piping. These welds are classified as Examination Category R-A, Item Number R1.11 (elements subject to thermal fatigue) in accordance with WCAP-14572, Revision 1-NP-A (Table 4.1-1 in Supplement 2).

  In Table R02, the licensee provided the ASME Code classification, the diameter, and the nominal wall thickness for each weld. The licensee stated that the pipe, weld metal, and associated valve components are 600 pound American Standards Association (ASA) standard carbon steel. The operating temperature and pressure for these welds are provided in Attachment 2 of the June 21, 2016, letter.

Impracticality of Compliance

The licensee stated that it was not possible to obtain greater than 90 percent of the required examination volume of each weld because of the geometric configurations (i.e., pipe to valve). The welds listed in Table R02 were only scanned from one side of the weld (single-sided scan). The schematic diagram provided in Attachment 2 to the RR illustrates the geometrical difficulties

associated with dual-sided scan and impracticality of compliance with the ASME Code examination coverage requirement.

The licensee stated that compliance with the ASME Code requirements would require extensive modification or replacement of components. The option to rebuild components would create unnecessary burden.

Basis for Relief

The licensee stated that the ISI requirements for the Class 1, 2, and 3 piping welds are governed by the Surry, Unit No. 1, RI-ISI program in the fourth 10-year ISI interval. The welds in this RR were selected for volumetric examination by the RI-ISI program due to potential susceptibility to thermal fatigue. In accordance with the Surry, Unit No. 1, RI-ISI program, some welds in a segment shall be inspected (inspection is mandatory), regardless of whether limited coverage will be attained. If inspection of a weld is not mandatory, alternative welds may be selected to provide greater examination coverage. Details of the licensee's selection process for the ISI are discussed in the submittal.

The licensee stated that it performed the UT of each weld to the maximum extent possible, utilizing personnel qualified and procedures demonstrated in accordance with Appendix VIII of the ASME Code, Section XI. The ultrasonic scanning of each weld was only possible from one side of the weld (single-sided scan). In Table R02 and the figures provided in Attachment 2 to the RR, the licensee documented the insonification angles and the ultrasonic wave modes (e.g., refracted shear and longitudinal waves) utilized for scanning each weld. The licensee did not find any unacceptable indications in the subject welds during the fourth 10-year ISI interval.

The licensee stated that the surface examination has also been performed on the welds in this RR. The licensee obtained essentially 100 percent coverage. There were no unacceptable surface indications identified.

The licensee stated that the welds in Table R02 in the RR were included in the weekly visual walkdown of high energy lines outside of containment to detect through-wall leakage. This high energy line walkdown initially originated in Surry Technical Specification 4.15, "Augmented Inservice Inspection Program for High Energy Lines Outside of Containment." However, this requirement has been relocated to the Surry Technical Requirements Manual, Section 6.2.

In addition, the licensee stated that the performance of VT-2 visual examinations during system leakage testing in accordance with IWC-2500 (Examination Category C-H in Table IWC-2500-1) for the Class 2 welds provides additional assurance that a through wall flaw would be detected.

Proposed Alternative

In Table R02 of Attachment 2 to the RR, the licensee reported the percentage of coverage achieved by the UT in the examination performed (single-side scan).

Welds in Table R02 63.5 - 86.67 percent

The licensee proposed this alternative coverage for the volumetric examination of the subject welds in lieu of the ASME Code required essentially 100 percent coverage.

NRC Staff Evaluation

The NRC staff has evaluated this RR pursuant to 10 CFR 50.55a(g)(6)(i). The NRC staff's evaluation focused on whether (1) a technical justification exists to support the determination that the ASME Code requirement is impractical; (2) imposition of the Code required inspections would result in a burden to the licensee; and (3) 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 welds. The NRC staff concludes that if these three criteria are met, 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") will also be met.

Impracticality of Compliance

As described and demonstrated in Attachment 2 to the RR, the predominant limitations that prevented the licensee's UT to achieve essentially 100 percent coverage of the ASME Code required volume was design and configuration of the weld and associated components (e.g., pipe to valve) that restricted the UT examinations to a single-sided scanning only. The NRC staff concludes that scanning from both sides of the weld, as is required to achieve the required coverage, is impractical.

Burden of Compliance

The licensee proposed that making the weld accessible for inspection from both sides would require extensive modification or replacement of the weld and associated components. The NRC staff concludes that replacing or reconfiguring the components is the only reasonable means to achieve dual-sided coverage of these welds and that replacement or reconfiguration of the components constitutes a burden on the licensee.

Structural Integrity and Leak Tightness

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 (i.e., the presence or absence of known active degradation mechanisms, the significance of a leak and/or structural failure of the subject welds, and essentially 100 percent coverage achieved for similar welds in similar environments subject to similar degradation mechanisms).

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 Attachment 2 to the RR, the NRC staff confirms that:

- The welds were examined using the appropriate equipment, ultrasonic modes of propagation, probe angles, frequencies, and scanning directions to obtain maximum coverage;
- The coverage was calculated in a reasonable manner;
- The UT procedures used were qualified as required by the regulation;
- The coverage was limited by geometrical configuration; and
- No unacceptable indications were identified.

Therefore, the NRC staff concludes that the licensee made every effort to obtain as much coverage as reasonably 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 the submittal and the sketches in Attachment 2 to the RR, 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 material near the inside diameter surface of the joint) that are typically susceptible to higher stresses and, therefore, potential degradation.
- The welds in this RR also received surface examinations, essentially 100 percent coverage of the required area was obtained, and no unacceptable surface indications were identified.
- The subject welds have also received visual walkdown during the weekly visual walkdown of high energy lines outside of containment to detect through wall leakage.

Therefore, 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, surface inspection, and weekly walkdown, 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 concluded that in addition to the required volumetric examinations, these welds have received the required system leakage test according to the ASME Code, Section XI, IWC-2500 (Table IWC-2500-1, Examination Category C-H) for Class 2 welds. Despite reduced coverage of the required examination volume, the NRC staff concludes that this inspection will provide additional assurance that any pattern of degradation, if it were to occur, would be detected, and the licensee will take appropriate correction actions.

In its analysis, the NRC staff notes that alternative and/or additional similar welds subjected to a similar environment were also selected and inspected, which will provide additional assurance that any pattern of degradation, if it were to occur, would be detected. Therefore, the NRC staff concludes that the volumetric examinations performed, to the extent possible, provide a reasonable assurance of structural integrity and leak tightness of the subject welds.

Compliance with the ASME Code requirements is impractical for these welds and would constitute a burden on the licensee.

3.3 Relief Request LMT-R03, Category R-A, Risk Informed Dissimilar Metal Welds on Steam Generator Nozzle to Safe-Ends

Components Affected

In this RR, the affected components are ASME Code Class 1 hot and cold legs "C" steam generator (SG) nozzle to safe end dissimilar metal (DM) welds in the reactor coolant system. These welds are classified as Examination Category R-A, Item Number R1.11 (elements subject to thermal fatigue) in accordance with WCAP-14572, Revision 1-NP-A (Table 4.1-1 in Supplement 2).

In Table R03, the licensee provided the ASME Code classification, the diameter, and the nominal wall thickness. The licensee stated that the materials of construction of the subject welds and the associated components are as follows:

Steam generator nozzle:	SA-216 Wrought Carbon Grade C (WCC)
Reactor coolant system:	SA-351
Safe end:	Cast stainless steel
Buttering:	Stainless steel
Weld metal:	Stainless steel

The licensee stated that the carbon steel nozzles were buttered with stainless steel to assist the welding process to the stainless steel pipe. The operating temperature and pressure for these welds are provided in Attachment 3 of the June 21, 2016, letter.

The licensee stated that none of the pipe or weld material is constructed with Alloy 600/82/182; therefore, there are no primary stress corrosion cracking concerns.

Impracticality of Compliance

The licensee stated that it was not possible to obtain greater than 90 percent of the required examination volume of each weld because of the geometric configurations of nozzle. The schematic diagrams provided in Attachment 3 to the RR illustrate the geometrical difficulties associated with the nozzle side scan and impracticality of compliance with the ASME Code examination coverage requirement.

The licensee stated that compliance with the ASME Code requirements would require extensive modification or replacement of components. The option to rebuild components would create unnecessary burden.

Basis for Relief

The licensee stated that the ISI requirements for the Class 1, 2, and 3 piping welds are governed by the Surry, Unit No. 1, RI-ISI program in the fourth 10-year ISI interval. The two DM welds identified in this RR, Welds 1-05 and 1-06 are part of risk segments that were determined

to be low safety significant. In the RI-ISI program, the licensee has determined that the subject welds shall be inspected for the defense-in-depth in the fourth 10-year ISI interval.

The licensee stated that since the "A" and "B" SG nozzle to safe-end welds are similarly configured, these alternative welds would also have the same limited coverage. The licensee stated that the ultrasonic scanning of the welds in this RR can only be performed from the cast stainless steel side of the weld. No qualified ASME Code, Section XI, Appendix VIII, UT techniques exist to scan the welds from the cast stainless steel side. Therefore, Appendix III of the ASME Code, Section XI, was used for personnel qualification and procedures demonstration.

The licensee stated that the ultrasonic scanning of each weld was limited due to the nozzle geometry. In Figure R03 of Attachment 3 to the RR, the licensee documented the insonification angles and the ultrasonic wave modes (e.g., refracted shear and longitudinal waves) utilized for scanning each weld. The licensee did not detect any unacceptable indications in the welds under consideration in the examination performed during the fourth 10-year ISI interval.

The licensee stated that there are no known failures of the subject welds. These DM welds are not under any augmented inspection programs.

In addition, the licensee stated that the performance of VT-2 visual examinations during system leakage testing in accordance with IWB-2500 (Examination Category B-P in Table IWB-2500-1) provides additional assurance that service-induced degradation would have been detected.

Proposed Alternative

In Table R03 of Attachment 3 to the RR, the licensee reported the percentage of coverage achieved by the UT in the examination performed.

Weld No. 1-05	63 percent
Weld No. 1-06	62 percent

The licensee proposed this alternative coverage for the volumetric examination of the subject welds in lieu of the ASME Code required essentially 100 percent coverage.

NRC Staff Evaluation

The NRC staff has evaluated this RR pursuant to 10 CFR 50.55a(g)(6)(i). The NRC staff's evaluation focused on whether (1) a technical justification exists to support the determination that the ASME Code requirement is impractical; (2) imposition of the Code required inspections would result in a burden to the licensee; and (3) 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 welds. The NRC staff concludes that if these three criteria are met that 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") will also be met.

Impracticality of Compliance

As described and demonstrated in Attachment 3 to the RR, the predominant limitations that prevented the licensee's UT to achieve essentially 100 percent coverage of the ASME Code required volume was the configuration of the subject weld and the associated nozzle that limited the nozzle side scan. The NRC staff concludes that scanning from both sides of the weld, as is required to achieve the required coverage, is impractical.

Burden of Compliance

The licensee proposed that making the weld fully accessible for inspection from both sides would require extensive modification or replacement of the weld and associated components. The NRC staff concludes that replacing or reconfiguring the components is the only reasonable means to achieve the required coverage of these welds and that replacement or reconfiguration of the components constitutes a burden on the licensee.

Structural Integrity and Leak Tightness

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 (i.e., the presence or absence of known active degradation mechanisms, the significance of a leak and/or structural failure of the subject welds, and essentially 100 coverage achieved for similar welds in similar environments subject to similar degradation mechanisms).

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 Attachment 3 to the RR, the NRC staff confirms that:

- The welds were examined using the appropriate equipment, ultrasonic modes of propagation, probe angles, frequencies, and scanning directions to obtain maximum coverage;
- The coverage was calculated in a reasonable manner;
- The UT procedures used were qualified as required by the regulation;
- The coverage was limited by physical access (i.e., the configuration of one side of the weld did not permit access for scanning); and
- No unacceptable indications were identified.

Therefore, the NRC staff concludes that the licensee made every effort to obtain as much coverage as reasonably 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 the submittal and the sketches in Attachment 3 to the RR, 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 material near the inside diameter surface of the joint) that are typically susceptible to higher stresses and, therefore, potential degradation.

Therefore, 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.

The NRC staff concludes that the alternative "A" and "B" SG nozzle to safe-end welds have similar configuration and were determined by the licensee to provide limited coverage as the "C" nozzle. Furthermore, in accordance with the RI-ISI program, the DM welds in this RR were required to be inspected for the defense-in-depth in the fourth 10-year ISI interval, regardless of limited coverage.

3.4 Relief Request LMT-P01, Category C-F-1 and C-F-2, Preservice Weld Examinations

Components Affected

In this RR, the affected components are ASME Code Class 2 piping welds. The licensee identified these welds in Table P01 of Attachment 4 to the RR.

- Weld No. 2-AW-B is a pipe-to-valve weld of the chemical and volume control system piping and classified as Examination Category C-F-1, Item Number C5.21 (Table IWC-2500-1 of Section XI).

  As documented in Table P01 of the RR, the material of construction of pipe is Type 304 stainless steel. The licensee stated that Weld No. 2-AW-B and the associated component are made of the same material as the pipe. The operating temperature and pressure for this weld are provided in Attachment 4 of the June 21, 2016, letter.

- Weld No. 0-34A is a flange-to-elbow weld and Weld No. 0-1A is flange-to-pipe weld of the feedwater system piping and classified as Examination Category C-F-2, Item Number C5.61 (Table IWC-2500-1 of Section XI).

  As documented in Table P01 of the RR, the material of construction of pipe is 600 pound ASA standard carbon steel. The licensee stated that Weld No. 0-34A, Weld No. 0-1A, and the associated components, are made of the same material as the pipe. The operating temperature and pressure for these welds are provided in Attachment 4 of the June 21, 2016, letter.

In Table P01, the licensee provided the ASME Code classification, the diameter, and the nominal wall thickness for each weld and associated components.

Impracticality of Compliance

The licensee stated that it was not possible to obtain greater than 90 percent of the required examination volume of each weld because of the geometric configurations (i.e., pipe to valve, flange to elbow, and flange to pipe). The schematic diagram provided for each weld in Attachment 4 to the RR illustrates the geometrical difficulties associated with dual-sided scan and impracticality of compliance with the ASME Code examination coverage requirement.

The licensee stated that compliance with the ASME Code requirements would require extensive modification or replacement of components. The option to rebuild components is impractical and would create unnecessary dose burden to workers.

Basis for Relief

The licensee stated that it performed the UT of each weld to the maximum extent possible utilizing the best available techniques with personnel qualified and procedures demonstrated in accordance with the ASME Code, Appendix VIII to Section XI. The ultrasonic scanning of each weld was only possible from one side of the weld (single-sided scan). In Table P01 and Figure P01 of Attachment 4 to the RR, the licensee documented the insonification angles and the ultrasonic wave modes (e.g., refracted shear and longitudinal waves) utilized for scanning each weld. From the examinations performed, the licensee did not detect any unacceptable indications in the welds under consideration.

The licensee stated that no alternative welds were considered since the examinations were performed to satisfy the PSI requirements before returning to service after reconstruction.

The licensee stated that for the austenitic stainless steel weld, it also performed the "best effort" examination to investigate the far side of the weld. To scan the far side of the weld, the refracted longitudinal (L)-waves are generally utilized for welds with wall thickness greater than 0.5 inch and the 70-degree refracted shear waves are generally used for welds with wall thickness equal or less than 0.5 inch. The licensee did not claim any coverage past the weld centerline (far side) due to requirements in 10 CFR 50.55a(b)(2)(xv)(A)(2) for the far side UT demonstration and qualification. From the examinations performed, the licensee did not identify any unacceptable indications. Table P01 of the RR documents the licensee's "best effort" percent coverage achieved.

The licensee stated that in addition to UT, all welds in this RR received the surface examination by the liquid penetrant before return to service after reconstruction, and no unacceptable surface indications were identified in any of the welds.

The licensee stated that in addition to UT, the final Weld No. 2-AW-B received the radiographic testing before return to service after reconstruction, and no unacceptable indications were identified.

The licensee stated that the performance of VT-2 visual examinations during system leakage testing in accordance with IWC-2500 (Examination Category C-H in Table IWC-2500-1) provides additional assurance that a through wall flaw would be detected.

Proposed Alternative

In Table P01 of Attachment 4 to the RR, the licensee reported the percentage of coverage achieved by the UT in the examination performed (single-side scan).

Weld No. 2-AW-B	45.5 percent
Weld No. 0-34A and Weld No. 0-1A	88.3 percent

The licensee proposed this alternative coverage for the volumetric examination of the subject welds in lieu of the ASME Code required essentially 100 percent coverage.

NRC Staff Evaluation

The NRC staff has evaluated this RR pursuant to 10 CFR 50.55a(g)(6)(i). The NRC staff's evaluation focused on whether (1) a technical justification exists to support the determination that the ASME Code requirement is impractical; (2) imposition of the Code required inspections would result in a burden to the licensee; and (3) 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 welds. The NRC staff concludes that if these three criteria are met that 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") will also be met.

Impracticality of Compliance

As described and demonstrated in Attachment 4 to the RR, the predominant limitations that prevented the licensee's UT to achieve essentially 100 percent coverage of the ASME Code required volume was design and configuration of the weld and associated components (e.g., pipe to valve, flange to elbow, and flange to pipe) that restricted the UT examinations to a single sided scanning only. The NRC staff concludes that scanning from both sides of the weld, as is required to achieve the required coverage, is impractical.

Burden of Compliance

The licensee proposed that making the weld accessible for inspection from both sides would require extensive modification or replacement of the weld and associated components. The NRC staff concludes that replacing or reconfiguring the components is the only reasonable means to achieve dual-sided coverage of these welds and that replacement or reconfiguration of the components constitutes a burden on the licensee.

Structural Integrity and Leak Tightness

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 (i.e., the presence or absence of known active degradation mechanisms, the significance of a leak and/or structural failure of the subject welds, and essentially 100 coverage achieved for similar welds in similar environments subject to similar degradation mechanisms).

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 Attachment 4 to the RR, the NRC staff confirms that:

- The welds were examined using the appropriate equipment, ultrasonic modes of propagation, probe angles, frequencies, and scanning directions to obtain maximum coverage;
- The coverage was calculated in a reasonable manner;
- The UT procedures used were qualified as required by the regulation;
- The coverage was limited by physical access (i.e., the configuration of one side of the weld did not permit access for scanning);
- No unacceptable indications were identified.

Therefore, the NRC staff concludes that the licensee made every effort to obtain as much coverage as reasonably 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 submittal and the sketches in Attachment 4 to the RR, 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 material near the inside diameter surface of the joint) that are typically susceptible to higher stresses and, therefore, potential degradation.
- For the stainless steel weld, the NRC staff notes that the coverage obtained for axial scans was limited to the volume up to the weld centerline (near-side), because claiming coverage for the volume on the opposite side of the weld centerline (far-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. The far-side volume was inspected by the "best effort" examination, no indications were identified, and no credit was taken for the coverage achieved from the "best effort" examination.
- After repair/replacement, the final Weld No. 2-AW-B, Weld No. 0-34A, and Weld No. 0-1A were inspected by the liquid penetrant before return to service, and essentially

100 percent coverage were achieved. No unacceptable surface indications were identified on the area examined.

- After repair/replacement, the final stainless steel Weld No. 2-AW-B was received the radiographic testing before return to service, and no unacceptable indications were identified.

Therefore, 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.

The NRC staff notes that no alternative similar welds were inspected since the inspections of these welds were performed to satisfy the ASME Code required preservice inspection following repair/replacement.

The NRC staff concludes that in addition to the required volumetric examinations, these welds have received the required system leakage test according to the ASME Code, Section XI, IWC-2500 (Table IWC-2500-1, Examination Category C-H) before return to service. Despite reduced coverage of the required examination volume, the NRC staff concludes that this inspection will provide additional assurance that any pattern of degradation, if it were to occur, would be detected, and the licensee will take appropriate correction actions.

Therefore, the NRC staff concludes that the volumetric examinations performed, to the extent possible, provide a reasonable assurance of structural integrity and leak tightness of the subject welds. Compliance with the ASME Code requirements is impractical for these welds and would constitute a burden on the licensee.

3.5 Relief Request LMT-C01, Category B-B, Pressurizer Shell to Head Circumferential and Longitudinal Welds

Background

In accordance with 10 CFR 50.55a(g)(5)(iii), the licensee requested relief from the ASME Code volumetric examination coverage requirements for the full penetration pressurizer shell-to-head circumferential and longitudinal welds (Welds 1-07 and 1-15, respectively) at Surry, Unit No. 1, based on its determination that compliance with the specified examination requirements is impractical.

Components Affected

RR LMT-C01 requested relief from the ISI requirements of the ASME Code, Section XI, for the following two Class 1 pressurizer welds:

- ASME Code, Section XI, Table IWB-2500-1, Examination Category B-B, Item No. B2.11, Pressurizer Shell-to-Head Circumferential Weld (Weld No. 1-07); and
- ASME Code, Section XI, Table IWB-2500-1, Examination Category B-B, Item No. B2.12, Pressurizer Shell-to-Head Longitudinal Weld (Weld No. 1-15).

ASME Code Requirement

The 1998 Edition with the 2000 Addenda of the ASME Code, Section XI, Table IWB-2500-1, Examination Category B-B, Item No. B2.11, requires a volumetric examination of "essentially 100 percent" of the length of the pressurizer shell-to-head circumferential welds. "Essentially 100 percent," as clarified by ASME Code Case N-460, is greater than 90 percent coverage of the weld length.

Table IWB-2500-1, Examination Category B-B, Item No. B2.12, requires a volumetric examination of 1 foot of the pressurizer shell-to-head longitudinal weld that intersects the shell-to-head circumferential weld.

Impracticality of Compliance

The licensee stated that the pressurizer is covered with an insulation support ring, which is 6 inches wide where examination interference is encountered for Weld 1-07. The licensee noted that this insulation support ring and a power operated relief valve (PORV) support prevent complete volumetric coverage of both the upper circumferential head weld, Weld 1-07, and the intersecting longitudinal weld, Weld 1-15.

The licensee stated that total removal of the support ring at the mechanical connections is impractical and would constitute a burden due to the extreme high dose rates in the pressurizer area, with an estimate of 15.13 Roentgen equivalent man (rem) dose that would result from work activities involved, including mechanical maintenance, insulators, rigging crews, and non-destructive examination of these welds. The licensee noted that partial removal of the support ring could allow some increased coverage; however, the actual increase would be very small in relation to the entire weld length. The licensee determined that this is not considered a practical option when considering consequential disturbance of interconnected cross supports and the welded connections to safety and PORV supports. The licensee also identified that removal of the mechanical connections or forced spreading apart of components would create a risk of misalignment and possibly warp the structure.

Basis for Relief

The licensee stated that limited-scope volumetric examinations of Pressurizer Welds 1-07 and 1-15 were performed to the extent practical during the fourth 10-year ISI interval. The licensee reported that the average total examination coverage for all scan directions is 46 percent for Weld 1-07 and 31 percent for Weld 1-15. The licensee documented the obstructions to the full examination coverage required, per the ASME Code, Section XI, in the submittal for RR LMT-C01.

The licensee stated that no additional ultrasonic examination techniques would provide meaningful additional data for this cladded pressurizer material, based on the examination volume that was not attained. The licensee also noted that the pressurizer receives a visual (VT-2) examination every refueling outage per the requirements of the ASME Code, Section XI, Table IWB-2500-1, Category B-P, for Class 1 components. The licensee stated that any effort

to achieve greater ultrasonic examination coverage is impractical and would create the risk of component damage or destruction and excessive personnel radiation dose.

Proposed Alternative

Based on the volumetric coverage that was obtained with acceptable results and the routinely performed visual (VT-2) examinations, the licensee determined that the limited-scope volumetric examinations provide adequate assurance that service-induced degradation would have been detected in the subject components. Therefore, the licensee concluded that the alternative limited-scope volumetric examinations provide reasonable assurance of structural integrity for the subject welds. Therefore, pursuant to 10 CFR 50.55a(g)(5)(iii), the licensee requested that relief be granted for the subject pressurizer welds.

NRC Staff Evaluation

The ASME Code, Section XI, Table IWB-2500-1, Examination Category B-B, requires volumetric examination of "essentially 100 percent" (greater than 90 percent, per ASME Code Case N-460) of the length of the Class 1 pressurizer shell-to-head circumferential weld (Surry, Unit No. 1 Pressurizer Weld 1-07), and 1 foot of the intersecting longitudinal weld (Surry, Unit No. 1 Pressurizer Weld 1-15), to be performed during each 10-year ISI interval. The NRC staff reviewed the information provided in the licensee's submittal for RR LMT-C01 to determine (1) whether the ASME Code, Section XI, volumetric examination coverage requirements are impractical for the subject pressurizer components, and (2) whether the licensee's alternative limited coverage volumetric examinations of the subject welds provide adequate assurance of structural integrity for the pressurizer.

Impracticality of Compliance

Based on its review of the drawings provided in the licensee's submittal for RR LMT-C01, the staff was able to confirm that the pressurizer insulation support ring restricts access to the pressurizer circumferential weld (Weld 1-07) and, therefore, ultrasonic scans performed from the shell side of the pressurizer are severely limited due to the interference caused by the insulation support ring. The staff also noted that other small welded pads and instrument tubes are intermittently spaced around the circumference of the pressurizer, which also limit scanning from the head side of Weld 1-07. The staff noted that access to the intersecting longitudinal weld (Weld 1-15) is restricted by a vertical box column that forms part of the PORV support structure, and access to this weld is also impacted by the insulation support ring. The insulation support structure and PORV supports could be disassembled for greater access to examine these welds. The licensee stated that removal of the interferences is impractical. Additionally, based on its review of the licensee's estimate of the 15.13 rem radiation exposure to its personnel that would be incurred in order to accomplish these tasks, the staff determined that

requiring the licensee to disassemble these structures would impose an unwarranted dose burden.

Burden of Compliance

The staff reviewed the ultrasonic examination reports for the subject welds provided in the licensee's submittal for RR LMT-C01. Based on its review, the staff was able to confirm the licensee's reported volumetric examination coverage percentages of 46 percent and 31 percent for Weld 1-07 and Weld 1-15, respectively. The staff also confirmed that these volumetric examination coverages are consistent with those obtained for the subject pressurizer welds during the previous (third) ISI interval exams, for which relief from the subject ASME Code, Section XI, volumetric examination coverage requirements was also granted by the staff for the third ISI interval.

Structural Integrity and Leak Tightness

Based on its review of the ultrasonic scan data provided in the licensee's submittal for RR LMT-C01, the staff identified that the licensee was able to obtain a one-side examination coverage greater than 80 percent of the ASME Code, Section XI, required examination volume for the circumferential weld (Weld 1-07), and a one-side examination coverage of approximately 60 percent of the required volume for the intersecting longitudinal weld (Weld 1-15). It should be noted that these one-sided examination coverages cannot be formally credited toward achieving the overall examination coverage percentages to meet ASME Code, Section XI, examination requirements. As correctly reported in the licensee's submittal for RR LMT-C01, the average total examination coverage for all scan directions for Welds 1-07 and 1-15 is 46 percent and 31 percent, respectively. However, the staff noted that the pressurizer head and shell are fabricated from low alloy steel with stainless cladding on the inside diameter surface, and during previous round robin tests reported in NUREG/CR-5068, "Piping Inspection Round Robin," April 1996, it has been demonstrated that ultrasonic examinations of ferritic material from a single side provide high probabilities of detection (usually 90 percent or greater) for both near-side and far-side cracks in blind inspection trials. Therefore, based on the level of examination coverage achieved, and the lack of relevant indications, the staff determined that if significant patterns of service-induced degradation were present in the subject pressurizer welds, there is reasonable assurance that evidence of it would have been detected by the limited coverage volumetric examinations that were performed for the subject pressurizer welds.

Examination Coverage Achieved

The staff determined that taking into consideration the above access limitations, compliance with the subject ASME Code, Section XI, volumetric examination requirements for Pressurizer Welds 1-07 and 1-15 is impractical for Surry, Unit No. 1. Furthermore, the staff determined that the licensee's alternative limited coverage volumetric examinations of the subject welds provide adequate assurance of structural integrity.

Therefore, the NRC staff concludes that ASME Code, Section XI, examination coverage requirements are impractical for the subject Class 1 pressurizer welds identified in RR LMT-C01. The staff further concludes that if significant service-induced degradation were

occurring in the subject components, there is reasonable assurance that evidence of it would have been detected by the limited coverage volumetric examinations that have been performed by the licensee.

4.0 CONCLUSION

As set forth above, the NRC staff determined that it is impractical for the licensee to comply with the ASME Code, Section XI, requirements; that the proposed inspection provides reasonable assurance of structural integrity or 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 the following RRs at Surry, Unit No. 1, for the fourth 10-year ISI interval, which commenced on October 14, 2003, and ended, as extended, on October 13, 2014.

Relief Request LMT-R01	Category R-A, Risk Informed Piping Welds on Stainless Steel Piping
Relief Request LMT-R02	Category R-A, Risk Informed Piping Welds on Carbon Steel Piping
Relief Request LMT-R03	Category R-A, Risk Informed Dissimilar Metal Welds on Steam Generator Nozzle to Safe-Ends
Relief Request LMT-P01	Category C-F-1 and C-F-2, Preservice Weld Examinations
Relief Request LMT-C01	Category B-B, Pressurizer Shell to Head Circumferential and Longitudinal welds

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: Ali Rezai
Christopher Sydnor

Date: August 24, 2016

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

If you have any questions, please contact the Project Manager, Karen Cotton Gross, at 301-415-1438 or by e-mail at Karen.Cotton@nrc.gov.

Sincerely,

/RA/

Michael T. Markley, Chief
Plant Licensing Branch 2-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-280

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