



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

March 15, 2019

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

SUBJECT: SURRY POWER STATION UNIT NO. 2 - RELIEF REQUESTS REGARDING EXAMINATION COVERAGE FOR PRESSURIZER NOZZLE INNER RADIUS SECTIONS AND CERTAIN STAINLESS STEEL PIPING WELDS (S2-I5-LMT-C01 AND S2-I5-LMT-P01) (EPID NO. L-2018-LLR-0091)

Dear Mr. Stoddard:

By letter dated June 4, 2018, as supplemented by letter dated October 18, 2018, Virginia Electric and Power Company (Dominion Energy Virginia, the licensee) submitted two requests, S2-I5-LMT-C01 and S2-I5-LMT-P01, respectively, for relief from certain requirements of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code), Section XI. The relief requests pertain to examination coverage of ASME Class 1 pressurizer nozzle inner radius sections and certain stainless steel piping welds achieved during the fifth 10-year inservice inspection (ISI) interval at the Surry Power Station (Surry), Unit No. 2.

Specifically, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR), Section 50.55a(g)(5)(iii), the licensee requested relief from the required examination coverage and approval to use alternative methods for inspection of Category B-D, Item No. B3.120 (pressurizer nozzle inner radius sections of the pressurizer nozzle) and Category R-A, Item No. R1.20 (certain stainless steel welds), respectively, on the basis that the ASME Code requirements are impractical.

The U.S. Nuclear Regulatory Commission (NRC) staff has reviewed the relief requests and concludes, as set forth in the enclosed safety evaluation, that it is impractical for the licensee to comply with the ASME Code, Section XI requirements, and that the proposed inspection provides reasonable assurance of the structural integrity of the subject components. 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 requests S2-I5-LMT-C01 and S2-I5-LMT-P01 at Surry, Unit No. 2, for the fifth 10-year ISI interval, which began on May 10, 2014 and will end on May 9, 2024.

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 Karen Cotton at (301) 415-1438, or via email at Karen.Cotton@nrc.gov.

Sincerely,

A handwritten signature in black ink, appearing to read "M. Markley" with "FOR" written in a smaller font to the right.

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

Docket No. 50-281

Enclosure: Safety Evaluation

cc: Listserv



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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELIEF REQUESTS S2-I5-LMT-C01 AND S2-I5-LMT-P01

REGARDING EXAMINATION COVERAGE FOR PRESSURIZER NOZZLE INNER RADIUS

SECTIONS AND CERTAIN STAINLESS STEEL PIPING WELDS

FIFTH 10-YEAR INSERVICE INSPECTION INTERVAL

VIRGINIA ELECTRIC AND POWER COMPANY

SURRY POWER STATION, UNIT NO. 2

DOCKET NO. 50-281

1.0 INTRODUCTION

By letter dated June 4, 2018, as supplemented by letter dated October 18, 2018 (Agencywide Documents Access and Management System (ADAMS) Accession Nos. ML18159A034 and ML18303A288, respectively), Virginia Electric and Power Company (Dominion Energy Virginia, the licensee) submitted two requests, S2-I5-LMT-C01 and S2-I5-LMT-P01, respectively, for relief from certain requirements of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code), Section XI. The relief requests pertain to examination coverage of ASME Class 1 pressurizer nozzle inner radius sections and certain stainless steel piping welds achieved during the fifth 10-year inservice inspection (ISI) interval at the Surry Power Station (Surry), Unit No. 2.

Specifically, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR), Section 50.55a(g)(5)(iii), the licensee requested relief from the required examination coverage and approval to use alternative methods for inspection of Category B-D, Item No. B3.120 (pressurizer nozzle inner radius sections) and Category R-A, Item No. R1.20 (certain stainless steel piping welds) respectively, on the basis that the ASME Code requirements are impractical.

2.0 REGULATORY EVALUATION

Pursuant to 10 CFR 50.55a(g)(4), "Inservice inspection standards requirement for operating plants," states that ASME Code Class 1, 2, and 3 components (including supports) must meet the requirements, except design and access provisions and preservice examination requirements, set forth in ASME Code, Section XI, to the extent practical within the limitations of design, geometry, and materials of construction of the components.

Pursuant to 10 CFR 50.55a(g)(4)(ii), "Applicable ISI Code: Successive 120-month intervals,"

Enclosure

inservice examination of components and system pressure tests conducted during successive 120-month inspection intervals must comply with the requirements of the latest edition and addenda of the ASME 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 U.S. Nuclear Regulatory Commission's (NRC) Regulatory Guide 1.147, "Inservice Inspection Code Case Acceptability, ASME Section XI, Division 1" Revision 18 (ADAMS Accession No. ML16321A336) incorporated by reference in paragraphs (a)(3)(ii) of 10 CFR 50.55a), subject to the conditions listed in paragraph (b) of 10 CFR 50.55a.

Pursuant to 10CFR50.55a(g)(5)(iii), "ISI program update: Notification of impractical ISI Code requirements," if a 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 ASME Code requirements during the (ISI interval for which the request is being submitted. Requests for relief made in accordance with 10 CFR 50.55a must be submitted to the NRC no later than 12 months after the expiration of the initial or subsequent 120-month inspection interval for which relief is sought.

Pursuant to 10 CFR 50.55a(g)(6)(i), "Impractical ISI requirements: Granting of relief," 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.

Regulations in 10 CFR 50.55a(b)(2)(xv)(A) requires the following examination coverage criteria when applying Appendix VIII, Supplement 2 of ASME Code, Section XI: (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; and (2) where examination from both sides is not possible on austenitic welds or dissimilar metal welds, full coverage credit from a single side may be claimed only after completing a successful single-sided Appendix VIII demonstration using flaws on the opposite side of the weld.

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 being requested.

3.0 TECHNICAL EVALUATION

3.1 Relief Request S2-I5-LMT-C01

3.1.1 Licensee's Relief Request

ASME Code Components Affected

The relief request addresses the following components for the fifth 10-year ISI interval at Surry, Unit No. 2. The examination category and item numbers identified below are from the 1998 Edition of ASME Code, Section XI.

Component Description	Weld Number	ASME Code Class	ASME Code Table	Examination Category	Item Number
Pressurizer Nozzle Inner Radius Sections	10NIR 11NIR	1	IWB-2500-1	B-D	B3.120

Applicable ASME Code, Edition and Addenda

For the fifth 10-year ISI interval at Surry, Unit No. 2, the Code of record for the inspection of ASME Code Class 1, 2, and 3 components is ASME Code, Section XI, 2004.

Applicable Code Requirements

The 2004 Edition of ASME Section XI does not require examination of Class 1 Nozzle Inner Radius (NIR) Sections. However, 10 CFR 50.55a(2)(xxi) conditions the requirements of ASME Section XI Table IWB-2500-1, Examination Category B-D. Specifically, the condition mandates that the provisions of Table IWB-2500-1, Examination Category B-D, Full Penetration Welded Nozzles in Vessels, Items B3.40 and B3.60 (Inspection Program A) and Items B3.120 and B3.140 (Inspection Program B) of the 1998 Edition be applied when using the 1999 Addenda through the latest edition and addenda incorporated by reference in 10 CFR 50.55a. Furthermore, either an ultrasonic (UT) or enhanced visual examination shall be performed.

Reason for Requested Relief

The licensee stated that the pressurizer is covered with an insulation support structure and is illustrated in Figure 1 of its letter dated June 4, 2018. The licensee explained that this insulation support frame interferes with completion of a full volumetric examination around the circumference of weld numbers 10NIR and 11NIR. In addition to the limitations caused by the insulation support structure, the licensee stated that the examinations were also limited by the rough exterior surface on the nozzles, which restricted adequate UT probe contact. The licensee provided Figures 2 and 3 in its letter dated June 4, 2018, to illustrate the areas of limitation on nozzle weld numbers 10NIR and 11NIR, respectively.

Total removal of the support structure at the mechanical connections is considered impractical due to the high dose rates in the pressurizer area. Furthermore, this is not a viable effort when considering consequential disturbance of interconnected cross supports and the welded connections to safety and power operated relief valve supports. Any removal of the mechanical connections or forced spreading apart of components would create the risk of structural misalignment and distortion of the insulation support structure. Furthermore, cutting the supports could be necessary for removal; thus, destroying the support structure.

Basis for Requested Relief

The licensee stated that components 10NIR and 11NIR were ultrasonically examined using a non-destructive examination procedure that incorporates a modeling report specific to the Surry, Unit No. 2 pressurizer safety/relief nozzles. This modeling report details the required UT scan parameters which should be applied to achieve full coverage of the examination volume and requires a combination of UT scanning both from the nozzle blend region and the pressurizer vessel head. The licensee explained that different transducer angles, skews, and wedge contours were used for the required scans of these components. The licensee stated that no alternative UT examination techniques would provide meaningful additional data for the examination volume not attained. Any effort to achieve greater coverage would be impractical creating risk of component damage or destruction and excessive personnel dose exposure.

The pressurizer receives a visual (VT-2) examination every refueling outage as required by Section XI, Table IWB-2500-1, Category B-P, for ASME Class 1 components performed at normal operating pressure and temperature. The licensee proposed that the scanning percentage coverages obtained, as summarized below for weld numbers 10NIR and 11NIR, with no recordable indications be considered as meeting the ASME Code requirements.

Weld Number	Scanning Coverage Obtained
10NIR	77.61%
11NIR	84.83%

Duration of Requested Relief

The licensee is requesting relief for the fifth 10-year ISI interval for Surry, Unit No. 2, which began on May 10, 2014 and will end on May 9, 2024.

3.1.2 NRC Staff Technical Evaluation

Pursuant to 10 CFR Part 50.55a(g)(5)(iii), the licensee submitted this request for relief from the examination requirements of the ASME Code, Section XI. The NRC staff evaluation of the licensee's request for relief focused on: (1) whether the ASME Code requirement is impractical, (2) whether the imposition of the ASME Code required inspections would result in a burden to the licensee, and (3) whether the licensee's examination coverage provides reasonable assurance of structural integrity and leak tightness of the subject components.

As previously stated, 10 CFR 50.55a(2)(xxi) conditions the requirements of ASME Section XI Table IWB-2500-1, Examination Category B-D, Item B3.120 of the 1998 Edition be applied when using the 1999 Addenda through the latest edition and addenda incorporated by reference in 10 CFR 50.55a. It is required that an UT or enhanced visual examination from the inner diameter be performed on essentially 100 percent of the examination volume.

The NRC staff reviewed the licensee's figures of the pressurizer, specifically of the pressurizer nozzles (weld numbers 10NIR and 11NIR) to pressurizer safety valves, showing the location of the components and the insulation support structure. These figures detailed the areas for which examination access to these components are limited by the insulation support structure (~130 square inches (in²) for weld number 10NIR and ~88 in² for weld number 11NIR) and the area in which surface roughness (~5 in²) did not allow for adequate probe contact. Based on its review, the NRC staff concluded that the removal of the insulation support structure at the mechanical connections: (1) is impractical due to the high dose rates in the pressurizer area and (2) has

consequential impact to interconnected cross supports and the welded connections to the relief valve supports. Thus, the NRC staff determined that weld volume identified by the licensee for components 10NIR and 11NIR is inaccessible, and therefore, it is impractical for the licensee to comply with the specified requirement.

Based on an evaluation of the licensee's schematics and calculations, the NRC concludes that the UT procedure and techniques used by the licensee for these examinations achieved the maximum coverage practical without burdensome and extensive alterations. In addition, the NRC staff noted that the required VT-2 examination in conjunction with the Class 1 system leakage test performed each refueling outage are capable of identifying leakage from these components. Thus, the NRC staff concludes that the licensee's examination coverage of these components and the VT-2 examination every refueling outage of the pressurizer provides reasonable assurance of structural integrity and leak-tightness of the subject components.

Based on the above discussion, the NRC staff determined that obtaining the ASME Code required examination volume is impractical. Significant modification would be needed for ASME Code compliance, which imposes a burden upon the licensee. The NRC staff also determined that the licensee performing volumetric examination to the maximum extent possible and the required system pressure tests and leakage monitoring inside the containment provides reasonable assurance of the structural integrity and leak-tightness of the subject component weld numbers 10NIR and 11NIR.

3.2 Relief Request S2-I5-LMT-P01

3.2.1 Licensee's Relief Request

ASME Code Components Affected

The subject components are stainless steel piping welds 1-20A, 1-21A, 2-24A and 2-25A, as summarized in Table 1 below. These welds are new ASME Class 1 welds that were fabricated during valve replacement. No pressure boundary degradation issue is associated with these new welds. Table 1 also describes the achieved coverage of Code-specified examination volume during the preservice UT examinations of the subject welds.

The pipes and valves associated with the subject welds are fabricated with stainless steel. In addition, the valves are fabricated with cast stainless steel. The licensee also indicated that the ISI of the subject welds is performed in accordance with risk-informed Examination Category R-A, Item Number R1.20 (i.e., high safety significant components not subject to a degradation mechanism).

Table 1. Preservice Ultrasonic Examinations of the Subject Welds

Weld Number	Achieved Coverage of Examination Volume (percent)	Component Description
1-20A	50	Pipe-to-valve weld
1-21A	50	Valve-to-pipe weld
2-24A	50	Pipe-to-valve welds
2-25A	50	Valve-to-pipe weld

Applicable ASME Code, Edition and Addenda

The current Code of Record for the fifth 10-year ISI interval of Surry, Unit No. 2 is the 2004 Edition of ASME Code, Section XI.

Applicable Code Requirements

IWA-4530 of ASME Code Section XI requires that, when portions of items requiring preservice or ISI are affected by repair /replacement activities, or for items being fabricated or installed, including welded joints made for fabrication or installation of items, preservice inspections shall be performed in accordance with IWB-2200, IWC-2200, IWD-2200, IWE-2200, IWF-2200, or IWL-2200 prior to return of the system to service.

IWB-2200 of ASME Code Section XI requires the essentially 100-percent examination coverage for the preservice volumetric examinations of the subject welds. ASME Code Case N-460, "Alternative Examination Coverage for Class 1 and Class 2 Welds, Section XI, Division 1" (as approved in RG 1.147, Revision 18) indicates that the essentially 100-percent examination coverage allows a coverage greater than 90 percent of the Code-specified examination volume.

Requested Relief

Pursuant to 10 CFR 50.55a(g)(5)(iii), the licensee requested relief from the examination coverage requirements of the ASME Code for the preservice UT examinations of the subject welds. As the alternative to the Code-required examination coverage (permitted by ASME Code Case N-460), the licensee proposed the examination coverages achieved to the extent practically possible. Table 1 summarizes the limited examination coverages for this relief request.

Basis for Requested Relief

The licensee's basis of the relief request (including the impracticality of compliance) is summarized below. The preservice UT examinations were performed using the personnel, equipment and procedures qualified in accordance with ASME Section XI, Appendix VIII. The UT examinations used 45° and 70° shear beam angles to perform axial and circumferential scanning. Due to the geometric configuration of the components, the examinations could not achieve the Code-required coverage (i.e., greater than 90 percent examination volume). These limited examinations were single-sided examinations with an examination coverage of 50 percent.

During the UT examinations, the axial scanning was extended to the far-side of each weld (i.e., valve side) to the extent practical. However, this portion of the examination was best-effort inspection and was not qualified in accordance with the performance demonstration requirements of 10 CFR 50.55a(b)(2)(xv)(A). Currently, there are no single-side examination procedures that demonstrate the performance equivalency to two-sided examination procedures for austenitic piping welds. Therefore, the far-side examination for each weld is not credited to meet the Code-required examination coverage even though it provides a supplemental best-effort coverage (i.e., 14.8 percent for each weld).

Compliance with the ASME Code examination coverage would require extensive modification or replacement of components to allow full examination from both sides of the weld. This option to rebuild components is considered impractical and would cause unnecessary radiation exposure.

Furthermore, plant equipment could be impacted in a detrimental manner if such modification is made.

In addition to the UT examinations, each subject weld received a volumetric examination by radiography and a liquid-penetrant surface examination as part of preservice inspection. No indications or unacceptable flaws were detected in these examinations. When the system reached operating pressure and temperature, each weld was also inspected visually (VT-2 examination) to detect through-wall leaks and no leakage was detected in the VT-2 examinations. The licensee indicated that therefore it is reasonable to conclude that no unacceptable flaws exist in the new welds, based on these examination results.

Duration of Requested Relief

The licensee submitted this relief request for the fifth 10-year ISI interval that began on May 10, 2014 and is scheduled to end on May 9, 2024.

3.2.2 NRC Staff Technical Evaluation

The NRC staff has evaluated relief request S2-I5-LMT-P01 pursuant to 10 CFR 50.55a(g)(6)(i). The NRC staff's evaluation focused on: (1) whether the request provides a technical justification to demonstrate that the achievement of the Code-required examination coverage is impractical; (2) whether the imposition of the Code-required examination coverage would result in a burden to the licensee; and (3) whether the alternative examination coverage and associated technical justification in this request provide reasonable assurance of structural integrity for the subject welds.

If these three criteria are met, the requirements of 10 CFR 50.55a(g)(6)(i) will also be met (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).

With respect to the technical justification for the request, the licensee indicated that the pipe-to-valve configuration was the primary limitation for achieving an examination coverage of essentially 100 percent (i.e., greater than 90 percent examination volume coverage). As described in Table P01 and Figures 1-4 of the relief request, the licensee could not perform essentially 100 percent UT testing from the two sides of each weld because reliable scanning from the valve side was not possible.

The NRC concludes that the particular design configuration of each weld imposes limitation to the UT scanning of the welds from both sides. Therefore, the NRC staff also concludes that the licensee provided an acceptable technical justification to demonstrate that achieving the Code-required examination coverage is impractical.

With respect to the burden of compliance, the licensee indicated that: (a) extensive modification or replacement of components would be necessary to achieve a design allowing the full examination coverage from both sides of the weld; and (b) this option to rebuild components is considered impractical and would cause unnecessary radiation exposure as well as detrimental impact on the plant equipment. In its review, the NRC staff concludes that replacing or reconfiguring the subject welds and associated components is the only reasonable means to achieve the essentially 100-percent examination coverage as the ASME Code requires and, therefore, a burden on the licensee exists to achieve such compliance. In addition, the NRC

staff considered whether the licensee provided the reasonable assurance of the structural integrity for the subject welds based on the examination coverage achieved and safety significance of the unexamined volume.

The NRC staff noted that, in addition to the preservice UT examination, each subject weld was inspected in the volumetric (radiography) and surface (liquid-penetrant) examinations prior to return to service. The subject welds were further inspected visually (VT-2 examination) to confirm the absence of through-wall leakage. The licensee confirmed that these examinations did not reveal any indications or unacceptable flaws in the welds. The NRC staff concludes that the inspection results provide reasonable assurance that there is no concern regarding the structural integrity of the subject welds. In addition, the system leakage tests provide additional assurance that any significant degradation in the welds, if it were to occur, will be detected and the licensee will take appropriate actions (e.g., repair or replacement activities as the ASME Code requires).

As discussed above, the NRC staff concludes that: (1) the achievement of the Code-required examination coverage is impractical; (2) the imposition of the Code-required examination coverage would result in a burden on the licensee; and (3) the alternative examination coverage and associated technical justification in this request provide reasonable assurance of structural integrity for the welds 1-20A, 1-21A, 2-24A, and 2-25A.

4.0 CONCLUSION

As set forth above, the NRC staff concludes that it is impractical for the licensee to comply with the ASME Code, Section XI requirements, that the proposed inspection provides reasonable assurance of the structural integrity of the subject components, 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 requests S2-I5-LMT-C01 and S2-I5-LMT-P01 at Surry, Unit No. 2, for the fifth 10-year ISI interval, which began on May 10, 2014 and will end on May 9, 2024.

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

Principal Contributor: O. Yee, NRR
S. Min, NRR

Date March 15, 2019

SUBJECT: SURRY POWER STATION UNIT NO. 2 - RELIEF REQUESTS REGARDING EXAMINATION COVERAGE FOR PRESSURIZER NOZZLE INNER RADIUS SECTIONS AND CERTAIN STAINLESS STEEL PIPING WELDS (S2-I5-LMT-C01 AND S2-I5-LMT-P01) (EPID NO. L-2018-LLR-0091) DATED MARCH 15, 2019

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