



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

April 15, 2019

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

SUBJECT: NORTH ANNA POWER STATION, UNIT NOS. 1 AND 2 – INSERVICE
INSPECTION ALTERNATIVE REQUESTS N1-I5-NDE-001 AND N2-I5-NDE-001
(EPID L-2018-LLR-0114)

Dear Mr. Stoddard:

By letter dated August 17, 2018 (Agencywide Documents Access and Management System Accession No. ML18235A316), Virginia Electric and Power Company (the licensee) submitted a request for a proposed alternative to the requirements of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code), Section XI, to the U.S. Nuclear Regulatory Commission (NRC) for the North Anna Power Station (North Anna), Unit Nos. 1 and 2. Pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR), Part 50, Paragraph 55a(z)(2), the licensee requested the NRC to authorize the use of an alternative to allow the pressurizer surge line nozzle-to-vessel weld and nozzle inner radius to be examined as part of augmented inspections and as part of the normally scheduled Class 1 system leakage test performed during each refueling outage, on the basis that compliance with the specified requirement would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

The NRC staff has reviewed the subject request and concludes, as set forth in the enclosed safety evaluation, that complying with the ASME Code and 10 CFR 50.55a(b)(2)(xxi) requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety. Accordingly, the NRC staff concludes that the licensee has adequately addressed all of the regulatory requirements set forth in 10 CFR 50.55a(z)(2). Therefore, the NRC staff authorizes alternatives N1-I5-NDE-001 and N2-I5-NDE-001 at North Anna, Unit Nos. 1 and 2, for the fifth ten-year inservice inspection interval for each unit (from May 1, 2019 to April 30, 2029 for Unit No. 1 and from December 14, 2020 to December 13, 2030 for Unit No. 2).

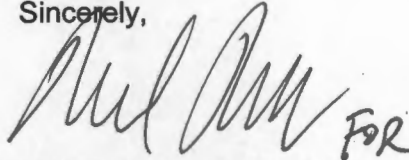
All other requirements of Section XI of the ASME Code for which an alternative was not specifically requested and approved remain applicable, including third party review by the Authorized Nuclear Inservice Inspector.

D. Stoddard

- 2 -

If you have any questions, please contact the Project Manager, Randy Hall, at 301-415-4032 or via e-mail at Randy.Hall@nrc.gov.

Sincerely,



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

Docket Nos. 50-338
50-339

Enclosure:
Safety Evaluation

cc: Listserv



UNITED STATES
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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

REQUEST FOR ALTERNATIVE NOS. N1-I5-NDE-001 AND N2-I5-NDE-001

PROPOSED ALTERNATIVE TO PRESSURIZER SURGE LINE NOZZLE-TO-VESSEL WELD

EXAMINATION REQUIREMENTS

VIRGINIA ELECTRIC AND POWER COMPANY (DOMINION ENERGY VIRGINIA)

NORTH ANNA POWER STATION, UNIT NOS. 1 AND 2

DOCKET NOS. 50-338 AND 50-339

1.0 INTRODUCTION

By letter dated August 17, 2018 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML18235A316), Virginia Electric and Power Company (Dominion Energy Virginia, the licensee), submitted to the U. S. Nuclear Regulatory Commission (NRC), a proposed alternative to the inservice inspection (ISI) requirements of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code) for the pressurizer surge line nozzle-to-vessel weld and nozzle inside radius (NIR) at the North Anna Power Station (North Anna), Unit Nos. 1 and 2.

Specifically, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR), Part 50, Paragraph 50.55a(z)(2), in lieu of performing the required ASME Code examinations for the pressurizer surge line nozzle-to-vessel welds and NIRs, the licensee proposes to examine the weld in the pressurizer surge line connected to the reactor coolant hot leg piping as part of augmented inspections and to use the normally scheduled ASME Code Class 1 system leakage test (VT-2) during each refueling outage. The licensee requested to use the proposed alternative on the basis that complying with the requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

2.0 REGULATORY EVALUATION

The pressurizer nozzle-to-vessel welds and NIR at North Anna, Unit Nos. 1 and 2, are ASME Code Class 1 components, whose ISI examinations are performed in accordance with Section XI, *Rules for Inservice Inspection of Nuclear Power Plant Components*, of the ASME Code and applicable edition and addenda, as required by 10 CFR 50.55a(g).

Pursuant to 10 CFR 50.55a(g)(4), ASME Code Class 1, 2, and 3 components (including supports) shall meet the requirements, except the design and access provisions and the preservice examination requirements, set forth in the ASME Code, Section XI, 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 ten-year interval and subsequent intervals comply with the requirements in the latest edition and addenda of Section XI of the ASME Code incorporated by reference in 10 CFR 50.55a(a)(1)(ii) twelve months prior to the start of the 120-month interval, subject to the limitations and modifications in 10 CFR 50.55a(b)(2). Licensees may propose alternatives to the requirements in 10 CFR 50.55a(g)(4) prior to implementation of the alternative, as specified in 10 CFR 50.55a(z).

Based on the above and subject to the following technical evaluation, the NRC staff finds that the regulatory authority exists for the licensee to request the alternative, and for the NRC staff to authorize it.

3.0 TECHNICAL EVALUATION

3.1 Components Affected

Code Class: ASME Code, Section XI, Class 1
Examination Category: B-D, "Penetration Welded Nozzles in Vessels"
Item Number: B3.110 for the pressurizer nozzle-to-vessel welds
B3.120 for the NIR¹
Component Numbers: Pressurizers 1-RC-E-2 and 2-RC-E-2,
Weld 9 and nozzle inside radius 9NIR

3.2 Applicable ASME Code Edition

The ASME Code of record for North Anna, Unit Nos. 1 and 2, for the fifth ten-year ISI interval is the 2013 Edition of the ASME Code, Section XI.

3.3 ASME Code Requirements

The 2013 Edition of the ASME Code, Section XI, Table IWB-2500-1, Examination Category B-D, Item B3.110 requires a volumetric examination of pressurizer nozzle-to-vessel Weld 9 for North Anna, Unit Nos. 1 and 2. The 2013 Edition of ASME Code, Section XI does not require an examination of the pressurizer 9NIR. However, 10 CFR 50.55a(b)(2)(xxi) requires use of the 1998 Edition of Section XI for the pressurizer 9NIR. ASME Code, Section XI, IWB-2500-1, Examination Category B-D, Item B3.120 of the 1998 Edition of the ASME Code requires a volumetric examination of the pressurizer 9NIR. The regulation in 10 CFR 50.55a(b)(2)(xxi) allows examination by enhanced visual testing (EVT-1) on the inside surface in lieu of the volumetric requirement performed from the outside surface.

3.4 Reason for Proposed Alternative

In Section 4.0 of Attachment 1 of the submittal, the licensee discussed the reasons for the proposed alternative. The licensee stated that personnel would be exposed to high doses (17.751 rem to 54.320 rem) if they were to perform the required examinations on the subject

¹ The 2013 Edition of the ASME Code, Section XI is the applicable edition for the proposed alternative (see Section 3.2 of this SE), which does not list the NIR in Examination Category B-D. However, the condition in 10 CFR 50.55a(b)(2)(xxi) requires use of the 1998 Edition of Section XI of the ASME Code, which lists the NIR under Examination Category B-D, Item No. B3.120.

pressurizer surge line nozzle-to-vessel welds and NIRs. The pressurizer surge line nozzle is welded into the bottom head of the pressurizer under the pressurizer support skirt and is surrounded by 78 heater penetrations. The insulation and cables of the heater penetrations obstruct access to the nozzle for examination. The licensee stated that removal of these obstructions is time and labor intensive and is predicted to result in high occupational exposures. The licensee noted that even if all the cabling obstructions were removed, examination coverage would still be limited, due to interference from the numerous heater penetrations.

The licensee noted that other safety concerns to personnel include the risk for an unplanned exposure event and the potential for contamination if personnel were wedged between the surge line and the exposed portion of the pressurizer heaters. Temporary shielding was considered but deemed impractical because it would block access to the examination surface.

The licensee also stated that the EVT-1 alternative examination permitted by 10 CFR 50.55a(b)(2)(xxi) would entail great risk and difficulty (additional radiological exposure, obstruction by the thermal sleeves, potential foreign material intrusion) with only marginal benefit. Lastly, the licensee stated that based on the work performed for license renewal, the cumulative usage factors (CUFs) after 60 years of operation for the pressurizer surge line nozzle-to-vessel welds and NIRs for both North Anna units were well below the design limit of 1.0.

For the reasons summarized above, the licensee stated that complying with the ASME Code required examinations would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety, and the licensee is thus proposing an alternative pursuant to 10 CFR 50.55a(z)(2).

3.5 Proposed Alternative

In lieu of performing the required ASME Code examinations for the pressurizer surge line nozzle-to-vessel welds and NIRs, the licensee proposes to examine the weld in the pressurizer surge line connected to the reactor coolant hot leg piping as part of augmented inspections and, for leak detection, to use the normally scheduled ASME Code Class 1 system leakage test (VT-2) during each refueling outage.

3.6 Basis for Proposed Alternative

In Section 5.0 of Attachment 1 of the submittal, the licensee discussed the proposed alternative and its basis with respect to structural integrity of the pressurizer surge line nozzle-to-vessel welds and NIRs and leak detection.

Regarding structural integrity, the licensee stated that the weld in the pressurizer surge line connected to the reactor coolant hot leg piping will be examined as part of the augmented inspections to detect environmentally assisted fatigue (EAF). The licensee implemented these augmented inspections based on a license renewal commitment. The pressurizer surge line weld connection to the reactor coolant hot leg will serve as the leading indicator of EAF. The licensee also searched for relevant operating experience of degradation at the NIR in Westinghouse-designed pressurizers and identified no known indications.

Regarding leak detection, the licensee stated that it will examine the pressurizer surge line nozzle-to-vessel welds and NIRs as part of the normally scheduled ASME Code Class 1 system leakage test (VT-2) during each refueling outage. Additionally, the licensee stated it will satisfy

the surveillance requirements in the Technical Specifications (TS) on reactor coolant system (RCS) leak rate and containment atmosphere activity, and that the Boric Acid Corrosion (BAC) Control Program used for identifying and monitoring leakage indicative of degradation in the RCS ensures that the overall level of plant quality and safety will not be compromised.

3.7 Duration of Alternative

The licensee is proposing to apply the alternative during the fifth ten-year ISI intervals for North Anna, Unit No.1 (May 1, 2019 to April 30, 2029) and Unit No. 2 (December 14, 2020 to December 13, 2030).

3.8 NRC Staff Evaluation

The NRC staff reviewed the licensee's reasons for requesting an alternative pursuant to 10 CFR 50.55a(z)(2). The licensee stated that to access the pressurizer surge line nozzle for examination, the insulation and cabling for the 78 pressurizer heaters would have to be removed, and their removal would expose personnel to high radiation doses. The licensee stated other safety concerns such as risk of an unplanned exposure event and the potential for contamination if personnel were wedged between the surge line and the exposed portion of the pressurizer heaters. The licensee also stated there is only marginal benefit if the alternative EVT-1 examination permitted by 10 CFR 50.55a(b)(2)(xxi) were to be performed. Lastly, the licensee determined that CUFs for the pressurizer surge line nozzle-to-vessel weld and NIR for 60 years of operation were well below 1.0, based on the evaluation of insurge and outsurge transients in Westinghouse report WCAP-15607, "Evaluation of Pressurizer Insurge/Outsurge Transients for Surry and North Anna," December 2000, submitted in support of the North Anna license renewal. The NRC staff finds the above factors to be acceptable bases for claiming that compliance with the required ASME Code examinations for the pressurizer surge line nozzle-to-vessel weld and NIR presents a hardship or unusual difficulty without a compensating increase in the level of quality and safety.

The NRC staff reviewed the licensee's bases for the proposed alternative. The first basis has to do with maintaining structural integrity of the pressurizer surge line nozzle-to-vessel weld and NIR. The NRC staff noted that insurge and outsurge transients in a pressurizer surge line occur many times during the life of the plant, and therefore, can lead to high CUFs in the pressurizer surge line nozzle-to-vessel weld and NIR. The licensee addressed potentially high CUFs in pressurizer components when it addressed EAF during the license renewal review of North Anna, Unit Nos. 1 and 2. The NRC staff's evaluation of the licensee's actions to address EAF is provided in Section 4.3.2 of NUREG-1766, "Safety Evaluation Report Related to the License Renewal of North Anna Power Station, Unit Nos. 1 and 2, and Surry Power Station, Unit Nos. 1 and 2," Volume 3 (ADAMS Accession No. ML030160848). The licensee committed to augment inspections of the pressurizer surge line weld connection to the hot leg piping to detect EAF. This license renewal commitment has been incorporated in the North Anna Updated Final Safety Analysis Report (UFSAR), as discussed in Section 18.2.1 "Augmented Inspection Activities" and Section 18.3.2.4 "Environmentally-Assisted Fatigue" of the UFSAR. The augmented inspection serves as the program to manage the effects of EAF in the pressurizer surge line. In Section 4.3.2 of NUREG-1766, the NRC staff accepted the use of the surge line weld connection to the hot leg as the bounding location to represent the effects of EAF in pressurizer components. Accordingly, the NRC staff finds that the augmented inspection implemented at North Anna, Unit Nos. 1 and 2, to detect EAF in the pressurizer surge line is acceptable.

Even if cracking were to initiate at the clad inner surface, the NRC staff concluded during the aging management review of the pressurizers, as documented in NUREG-1766, Section 3.4.4, "Pressurizers," that an aging management program for underclad cracking is not required because cracks do not grow significantly over the plant lifetime. Additionally, the licensee did not find any known indications of degradation in the previous augmented inspections of the pressurizer surge line NIR.

Based on the above, the NRC staff finds that the proposed alternative maintains reasonable assurance of structural integrity of the pressurizer surge line nozzle-to-vessel welds and NIRs of North Anna, Unit Nos. 1 and 2.

The second basis has to do with leak detection should degradation in the pressurizer surge line nozzle-to-vessel weld and NIR lead to reactor coolant leakage. Leak detection requirements and programs in a facility's current licensing basis ensure leakage is detected before it compromises component integrity. The licensee stated it will examine the pressurizer surge line nozzle-to-vessel welds and NIRs as part of the required ASME Code Class 1 VT-2 examination for leakage and satisfy the TS surveillance requirements for RCS leak rate and containment atmosphere activity. Additionally, the licensee has a BAC Control Program that ensures that the overall level of plant quality and safety are not compromised. The staff finds that the VT-2 examination, TS surveillance activities, and BAC Control Program provide acceptable means of detecting leakage in the pressurizer surge line nozzle-to-vessel welds and NIRs of North Anna, Unit Nos. 1 and 2, should it occur.

4.0 CONCLUSION

As set forth above, the NRC staff determines that complying with the ASME Code and 10 CFR 50.55a(b)(2)(xxi) requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety. Accordingly, the NRC staff concludes that the licensee has adequately addressed all of the regulatory requirements set forth in 10 CFR 50.55a(z)(2). Therefore, the NRC staff authorizes alternatives N1-I5-NDE-001 and N2-I5-NDE-001 at North Anna, Unit Nos. 1 and 2, for the fifth ten-year ISI interval at each unit (May 1, 2019 to April 30, 2029 for Unit No.1 and December 14, 2020 to December 13, 2030 for Unit No. 2).

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

Principal Contributor: D. Dijamco, NRR

Date: April 15, 2019

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INSPECTION ALTERNATIVE REQUESTS N1-I5-NDE-001 AND N2-I5-NDE-001
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