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

October 6, 2010

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

SUBJECT: NORTH ANNA POWER STATION (NAPS), UNIT NO. 2, FOURTH 10-YEAR INSERVICE INSPECTION INTERVAL PROGRAM, NONDESTRUCTIVE EXAMINATION (NDE), RELIEF REQUEST (RR) NDE-001 (TAC NO. ME3292)

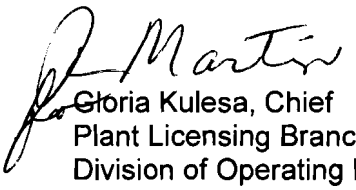
Dear Mr. Heacock:

By letter dated February 1, 2010, as supplemented by letters dated May 20, 2010, Virginia Electric and Power Company (the licensee) submitted request for relief NDE-001 from certain requirements of the American Society of Mechanical Engineers *Boiler and Pressure Vessel Code* (ASME Code) at NAPS, Unit No. 2. Specifically, in accordance with Title 10 of the *Code* of *Federal Regulations* (10 CFR), 50.55a(a)(3)(ii), the licensee proposed an alternative to requirements of ASME Code Class 1, 2, and 3 components including supports inservice inspection (ISI). The licensee requested implementation of this alternative during fourth 10-year ISI program scheduled to start on December 14, 2010, and end on December 13, 2020.

Based on the review of the information the licensee provided, the NRC staff concludes pursuant to 10 CFR, Section 50.55a(a)(3)(ii), RR No. NDE-001 is authorized on the basis that compliance with the specified requirements of the ASME Code would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety for the facility. All other ASME Code requirements for which relief was not specifically requested and approved in the subject requests for relief remain applicable, including third-party review by the Authorized Nuclear Inservice Inspector.

If you have any questions concerning this matter, please contact Dr. Sreenivas, at (301) 415-2597.

Sincerely,



Gloria Kulesa, Chief
Plant Licensing Branch II-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-339

Enclosure:
Safety Evaluation

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UNITED STATES
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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

FOURTH 10-YEAR INTERVAL INSERVICE INSPECTION (ISI)

RELIEF NDE-001

NORTH ANNA POWER STATION, UNIT NO. 2

VIRGINA ELECTRIC AND POWER COMPANY

DOCKET NO. 50-339

1.0 INTRODUCTION

By letter dated February 1, 2010, (Agencywide Documents Access and Management System (ADAMS), Accession No. ML100330125), as supplemented by letter dated May 20, 2010 (ADAMS Accession No. ML101440252), Virginia Electric and Power Company (the licensee), submitted a request for relief from certain requirements of the American Society of Mechanical Engineers (ASME), *Boiler and Pressure Vessel Code* (ASME Code), 2004 Edition, under the provisions of Title 10 of the *Code of Federal Regulations* (10 CFR), Part 50, Section 50.55a(g)(4), for the fourth 10-year ISI Program for North Anna Power Station (NAPS), Unit No. 2. The NAPS, Unit No. 2 fourth 10-year ISI interval is scheduled to start on December 14, 2010, and end on December 13, 2020.

The U.S. Nuclear Regulatory Commission (NRC) staff has concluded based on the information provided by the licensee, pursuant to 10 CFR 50.55a(a)(3)(ii), that Relief Request (RR) NDE-001 is authorized on the basis that compliance with the specified requirements of the ASME Code would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

2.0 REGULATORY EVALUATION

Inservice inspection of ASME Code Class 1, 2, and 3 components is to be performed in accordance with Section XI of the ASME Code, and applicable addenda, as required by 10 CFR 50.55a(g), except where specific relief has been granted by the Commission pursuant to 10 CFR 50.55a(g)(6)(i). The regulation at 10 CFR 50.55a(a)(3) states that alternatives to the requirements of paragraph (g) may be used, when authorized by the NRC, if the licensee demonstrates that (i) the proposed alternatives would provide an acceptable level of quality and safety or (ii) compliance with the specified requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

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 pre-service examination requirements, set forth in the ASME Code, Section XI, "Rules for ISI of Nuclear Power Plant Components," to the extent practical within the limitations of design, geometry, and materials of construction of the components.

The regulations require that inservice examination of components and system pressure tests conducted during the first 10-year interval and subsequent intervals comply with the requirements in the latest edition and addenda of Section XI of the ASME Code incorporated by reference in 10 CFR 50.55a(b) twelve months prior to the start of the 120-month interval, subject to the limitations and modifications listed therein.

The ASME Code of record for the NAPS, Unit No. 2 fourth 10-year ISI interval program is the 2004 Edition with no Addenda of Section XI of the ASME Code.

3.0 EVALUATION

Relief Request NDE-001

ASME Code Components

ASME Code Class:	1
System	Pressurizer
Examination Category:	B-D
Item No.:	ASME Code, Section XI, Item B3.110 (2004 Edition) ASME Code, Section XI, Item B3.120 (1998 Edition)
ISI Component ID:	Pressurizer Surge Line Nozzle Weld 9 and Pressurizer Nozzle Inside Radius Section 9NIR

ASME Code Requirements

The 2004 Edition of ASME Code, Section XI, Table IWB-2500-1, Category B-D, Item B3.110 requires a volumetric examination of pressurizer surge line nozzle-to-vessel Weld 9. The 2004 Edition of ASME Code, Section XI does not require an examination of the pressurizer nozzle inside radius section 9NIR. However, 10 CFR 50.55a(b)(2)(xxi) mandates use of the 1998 Edition of Section XI for the examination requirements of 9NIR. ASME Code, Section XI, IWB-2500-1, Category B-D, Item B3.120 of the 1998 Edition requires a volumetric examination of the nozzle inside radius section of the pressurizer surge nozzle. Section 50.55a(b)(2)(xxi) allows an enhanced visual VT-1 on the inside surface in lieu of the volumetric requirement, which is performed from the outside surface.

Licensee's Basis for Relief Request

> Access to the NAPS Unit No. 2 pressurizer surge line nozzle is obstructed by multi-layered, stainless steel mirror insulation and the cables for the pressurizer heaters. Removal of the insulation and cables would be difficult as well as labor and time intensive. It is also likely that cable or heater pin damage could occur during removal.

Some, and possibly all, heater cables would have to be disconnected so that the cables can be pulled back to allow access for removing insulation and doing the exam. Dose rates are predicted using a step approach to build the total projected exposure. The worst case option assumes that all 78 heater cables have to be disconnected and pulled back. These cables have brazed connections that will be time consuming to remove and replace following the exam. This option carries a dose estimate of 54.320 rem. If the outer ring of heaters can be left intact during the examination (disconnect/reconnect 46 heaters), then the dose estimate is 34.144 rem. If only the first ring of heaters has to be dealt with (20 heaters), then the dose estimate is 17.751 rem. Even if all the cables are removed, examination coverage would still be limited due to the weld joint design and heater penetration interferences.

Other personnel safety concerns potentially involved in this examination include the increased risk for an unplanned exposure event and prevention of contamination with personnel wedged between the surge line and the exposed portion of the pressurizer heaters. Temporary shielding is considered impractical because placement of the shielding material would obstruct and potentially preclude accessibility to the examination surface.

In conjunction with license renewal, Westinghouse, [has performed an evaluation in its report WCAP-15607 *"Evaluation of Pressurizer Insurge/Outsurge Transients for Surry and North Anna,"* dated December 2000] to address the impact of operational transients for NAPS Unit No. 2 to account for insurge/outsurge transients in addition to design transients in the pressurizer lower head. The results of the evaluation show that the Cumulative Usage Factor (CUF), after service equivalent to 60 years of operation for the lower head to nozzle weld, is 0.32 for the inside surface and 0.07 for the outside surface. The CUFs for the nozzle inner radius are 0.25 (inside surface) and 0.09 (outside surface). These CUFs are considerably less than the design limit of 1.0.

We do not believe that the alternative visual VT-1 examination on the inside of the pressurizer nozzle-to-vessel weld could be performed. The pressurizer manway at the top of the vessel would have to be removed and a boroscope threaded down the length of the pressurizer through the support plates and through a screen device located at the outlet of the surge line near the bottom of the vessel. The examination would be partially obscured by the thermal sleeves and the examination would only be of the non-structural cladding covering the welds. If performed, the examination would provide only marginal benefit as a result. The added exposure, the risk of foreign material intrusion into the reactor coolant system [(RCS)] and the unusual difficulties attempting this examination are not commensurate with the limited benefit that may be obtained.

Due to the fact that compliance with the specified requirements would result in hardship or unusual difficulties without a compensating increase in the level of quality and safety, an alternative is requested.

Licensee's Proposed Alternative Examination

The licensee is applying per 10 CFR 50.55a(a)(3)ii for the following alternative as stated:

> The pressurizer surge line nozzle-to-vessel [weld and nozzle radius] will be [VT-2 visually] examined as part of the normally scheduled [ASME Code] Class 1 system leakage test each refueling. In addition the surveillance requirements of Technical Specifications [(TS)] that determine the reactor coolant system leak rate and the containment atmosphere radioactivity will be satisfied. The pressurizer surge line weld to the reactor coolant hot leg will also be examined as part of augmented inspections to detect environmentally affected fatigue (EAF) and will be used as the leading indicator of EAF. Furthermore, Dominion has an active Boric Acid Corrosion Control Program that identifies and monitors borated water leakage to prevent boric acid related degradation of the Reactor Coolant System. These programs ensure that the overall level of plant quality and safety will not be compromised.

NRC Staff's Evaluation

The 2004 Edition of ASME Code, Section XI, Table IWB-2500-1, Category B-D, Item B3.110 requires a volumetric examination of pressurizer surge line nozzle-to-vessel Weld 9. Section 50.55a(b)(2)(xxi)(A) requires the inspection requirements of the 1998 Edition of ASME Code, Section XI be applied for Category B-D, Item B3.120, pressurizer nozzle inside radius section. Section 50.55a(b)(2)(xxi)(A) also permits the use of enhanced VT-1 visual examination of the interior surface of the nozzle inside radius section in lieu of the volumetric examination from the outside surface required by the 1998 Edition of the ASME Code. In lieu of the ASME Code and 10 CFR 50.55a(b)(2)(xxi)(A) requirements, the licensee has proposed to perform VT-2 visual examinations of pressurizer surge line nozzle-to-vessel Weld 9 and pressurizer nozzle inside radius section 9NIR as part of the normally scheduled ASME Code, Class 1 system leakage test each refueling outage. In addition, the licensee will examine the pressurizer surge line weld to the reactor coolant hot leg as part of augmented inspections to detect EAF and will be used as the leading indicator of EAF.

The pressurizer surge line nozzle is integrally cast into the bottom head of the pressurizer, is located under the pressurizer skirt, and is surrounded by 78 heater penetrations. In addition, multi-layered, stainless steel mirror insulation and cables for the pressurizer heaters obstruct access to the subject nozzle. In order for the licensee to volumetrically examine pressurizer surge line nozzle-to-vessel Weld 9 and pressurizer nozzle inside radius section 9NIR, it would have to remove the insulation and heater cables exposing the licensee's personnel to an estimated dose of 54.320 rem. The licensee considered temporary shielding; however, it was decided it would be impractical because the shielding material would obstruct and prevent accessibility of the examination surface. In addition, disconnecting the heater cables could also cause damage to both the cables and heaters.

The licensee noted that it considered an alternative examination by employing a remote visual technology; however, it was determined it had a limited benefit as well as a limited probability of success. The subject nozzle has a perforated basket diffuser covering the nozzle opening on

the inside of the pressurizer that would make it difficult if not impossible to place a probe into the subject nozzle opening. Therefore, the NRC staff determined that based on the description of the pressurizer access provided in the submittal it would be very difficult for the licensee to feed a boroscope through the pressurizer access manway, down through openings in the heater support baffles and perforated basket diffuser covering the surge nozzle opening. Therefore, the NRC staff determined that based on the above, the ASME Code-required volumetric examination and/or the optional visual examination discussed in 10 CFR 50.55a(b)(2)(xxi)(A) would impose a hardship on the licensee without a compensating increase in quality and safety.

For the NAPS, Unit No. 2 license renewal, Westinghouse performed an evaluation to address the impact of operational transients to account for insurge/outsurge transients in addition to design transients in the pressurizer lower head in its report WCAP-15607. The results of the evaluation showed that the CUF, after service equivalent to 60 years of operation for the lower head to nozzle weld, is 0.32 for the inside surface and 0.07 for the outside surface and the CUFs for the nozzle inner radius are 0.25 (inside surface) and 0.09 (outside surface). These CUFs are considerably less than the design limit of 1.0.

The licensee noted that the pressurizer surge line to the reactor coolant hot leg will also be examined as part of augmented inspections to detect EAF and will be used as the leading indicator of EAF. Furthermore, the licensee has an active Boric Acid Corrosion Control Program that identifies and monitors borated water leakage to prevent boric acid related degradation of the RCS. The augmented inspection results and the results of planned research by the EPRI-sponsored Materials Reliability Program will be used to address and assess EAF for the surge nozzle. In addition, the licensee is unaware of any operating experience involving degradation (i.e., indications) in pressurizer nozzle inside radius sections or for any reactor or steam generator nozzle inside radius sections at pressurized water reactor plants.

The NAPS, Unit No. 2 TS surveillance requirements regarding reactor coolant system leak rate and the containment atmosphere radioactivity will further ensure the integrity of the pressurizer surge line nozzle. The NRC staff has determined that the licensee's proposed alternative to perform a VT-2 visual examination on the outside of the pressurizer surge line nozzle (which would effectively look for leakage from either the weld or the nozzle radius), the augmented inspections of other welds, and Boric Acid Corrosion Control Program, provide reasonable assurance of the integrity of the subject components.

4.0 CONCLUSION

As set forth above, the NRC staff has determined that the compliance with the ASME Code and 10 CFR 50.55a(b)(2)(xxi)(A) requirements would result in a hardship or unusual difficulty without a compensating increase in quality or safety. Furthermore, the staff concludes that the licensee's proposed alternative to perform a VT-2 visual examination on pressurizer surge line nozzle-to-vessel Weld 9 and pressurizer nozzle inside radius section 9NIR, proposed augmented inspections of other welds, and the Boric Acid Corrosion Control Program provide reasonable assurance of the integrity of the subject pressurizer system components. Therefore, the licensee's proposed alternative to perform VT-2 visual examinations on pressurizer surge line nozzle-to-vessel Weld 9 and pressurizer nozzle inside radius section 9NIR in lieu of the ASME Code-required volumetric examination is authorized for the fourth 10-year interval, pursuant to 10 CFR 50.55a(a)(3)(ii).

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

Therefore, the NRC staff authorizes the alternatives and relief noted above, at NAPS, Unit No. 2, for the fourth 10-year ISI interval, which starts on December 14, 2010, and ends on December 13, 2020.

Principal Contributor: Thomas Mc Lellan, NRR

Date: October 6, 2010

If you have any questions concerning this matter, please contact Dr. Sreenivas, at (301) 415-2597.

Sincerely,

/RA by RMartin for/

Gloria Kulesa, Chief
Plant Licensing Branch II-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-339

Enclosure:
Safety Evaluation

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