

March 28, 2006

Mr. David A. Christian  
Senior Vice President  
and Chief Nuclear Officer  
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Innsbrook Technical Center  
5000 Dominion Boulevard  
Glen Allen, VA 23060-6711

SUBJECT: SURRY POWER STATION, UNIT NO. 1 (SURRY 1) - THIRD 10-YEAR  
INSERVICE INSPECTION INTERVAL RELIEF REQUEST PRT-08 (TAC NO.  
MC6707)

Dear Mr. Christian:

By letter dated April 11, 2005, Virginia Electric and Power Company (VEPCO) submitted Relief Request PRT-08 for the third 10-year inservice inspection (ISI) interval at Surry 1. In Relief request PRT-08, the licensee requested approval for the reduced examination coverage of the reactor vessel circumferential shell weld at Surry 1. The Nuclear Regulatory Commission (NRC) staff has completed its review of this relief request, and the NRC staff's evaluation and conclusion are contained in the enclosed safety evaluation.

The NRC staff has determined that imposing certain American Society of Mechanical Engineers, *Boiler and Pressure Vessel Code* requirements is impractical. Furthermore, the NRC staff concludes that VEPCO's proposed alternative provides reasonable assurance of structural integrity of the subject component. Therefore, VEPCO's request for relief is granted pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR), Section 50.55a(g)(6)(i) for the third 10-year ISI at Surry 1. The granting of 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.

Sincerely,

/RA/

Evangelos C. Marinos, Chief  
Plant Licensing Branch II-1  
Division of Operating Reactor Licensing  
Office of Nuclear Reactor Regulation

Docket No. 50-280

Enclosure: Safety Evaluation

cc w/encl: See next page

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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELIEF REQUEST PRT-08

SURRY POWER STATION, UNIT NO. 1

VIRGINIA ELECTRIC AND POWER COMPANY

DOCKET NO. 50-280

1.0 INTRODUCTION

By letter dated April 11, 2005, Virginia Electric and Power Company (the licensee) submitted Relief Request PRT-08 for the third 10-year Inservice Inspection (ISI) interval at Surry Power Station, Unit No.1 (Surry 1). Relief Request PRT-08 pertains to a reduced examination coverage of the reactor vessel (RV) circumferential shell weld at Surry 1. The Nuclear Regulatory Commission (NRC) staff has found that the American Society of Mechanical Engineers, *Boiler and Pressure Vessel Code* (ASME Code), Section XI, Article IWB-2500, requirement for essentially 100-percent volumetric examination coverage of the RV circumferential shell weld, as specified, is impractical at Surry 1 and that the licensee's alternative examination of the subject component provides reasonable assurance of structural integrity.

2.0 REGULATORY REQUIREMENTS

Title 10 of the *Code of Federal Regulations* (10 CFR), Part 50, Section 50.55a, paragraph (g), requires that the ISI of ASME Code Class 1, 2, and 3 components be performed in accordance with the applicable edition of Section XI of the ASME Code and applicable addenda, except where specific relief has been granted by the NRC pursuant to 10 CFR 50.55a(g)(6)(i). Section 50.55a(a)(3) states that alternatives to the requirements of paragraph (g) may be used, when authorized by the Director of the Office of Nuclear Reactor Regulation, if the applicant 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 preservice examination requirements, set forth in 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 examinations 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 ASME Code, Section XI 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 Surry 1 ISI program is the 1989 edition of ASME Code, Section XI. The licensee requested relief for the third 10-year ISI interval at Surry 1, which began on May 10, 1994, and ended on May 9, 2005.

### 3.0 TECHNICAL EVALUATION

#### 3.1 ASME Code, Section XI Requirement

The 1989 edition of ASME Code, Section XI, Article IWB-2500 requires that components be examined and tested as specified in Table IWB-2500-1. Table IWB-2500-1, examination category B-A, item number B1.11 requires a volumetric examination of the RV circumferential shell welds once each 10-year ISI interval with essentially 100-percent volumetric coverage of the examination volume cross section specified in Figure IWB-2500-1 of ASME Code, Section XI, for essentially 100-percent of the weld length.

#### 3.2 Component for Which Relief is Requested

<u>Category</u>	<u>Item</u>	<u>Description</u>
B-A	B1.11	RV Circumferential Shell Welds

The licensee has specifically requested relief for Circumferential Shell Weld 1-04 at Surry 1. This weld adjoins the RV shell with the lower vessel head.

#### 3.3 Licensee's Basis for Relief Request

The ultrasonic examination of the reactor pressure vessel circumferential shell weld is conducted in accordance with techniques qualified by demonstration for Appendix VIII, Supplements 4 and 6 of the 1995-96 Addenda of ASME [Code], Section XI.

There are four core support lugs located at 0 degree, 90 degree, 180 degree, and 270 degree [azimuth] positions [at] the vessel inside surface just above the [circumferential shell] weld which restrict[s] complete coverage of the required examination volume. The ultrasonic examination of this weld was performed by scanning the accessible scan surfaces between the support lugs and below the support lugs. Figure 1 [in the licensee's submittal] shows the general configuration of the reactor vessel and location of weld 1-04. Figures 2 and 3 [in the licensee's submittal] show the ultrasonic scanning boundaries for this weld with the restrictions due to the core support lugs. The size of the ultrasonic manipulator end effector limits how close the individual transducers can be positioned to the support lugs while scanning. The proximity of the end effector to the support lugs limits the amount of coverage obtained with each of the qualified transducers. Table 1 [in the licensee's submittal] provides the breakdown of percent [of] coverage of the required examination volume by scan direction and transducer. The achieved coverage of the required examination volume applying the qualified techniques is 73.4 [percent].

### 3.4 Licensee's Proposed Alternative

As part of the requirement of Table IWB-2500-1, Category B-P, Item B15.10, a visual VT-2 inspection is conducted on the reactor vessel every refueling outage to detect evidence of through wall leakage on the vessel. This examination has been performed in conjunction with approved Relief Request RR-014, which addresses visual inspection of the bottom of the reactor vessel. The reactor vessel was visually inspected for the Third Inspection Interval and will continue to receive similar inspection in the Fourth Inspection Interval by approved Relief Request SPT-004, Revision 1. Furthermore, Technical Specifications have surveillance requirements that monitor leakage and radiation levels of the reactor coolant system.

The station leakage monitoring methods, the VT-2 visual examination of the bottom of the reactor vessel performed every refueling outage, and the limited coverage volumetric examination revealing no indications provide an acceptable level of quality and safety. The weld in question has been examined to the greatest extent achievable with greater reliability and accuracy than in previous intervals. Dominion [Virginia Electric and Power Company] proposes that the examination already performed at the reduced coverage be considered as meeting the [ASME] Code, [Section XI] requirements.

### 3.5 NRC Staff Evaluation

The 1989 edition of ASME Code, Section XI, Article IWB-2500, requires that components be examined and tested as specified in Table IWB-2500-1. Table IWB-2500-1 requires a volumetric examination of the RV circumferential shell welds at Surry 1, with essentially 100-percent volumetric coverage of the examination volume cross section specified in Figure IWB-2500-1 of ASME Code, Section XI for essentially 100-percent of the weld length. Figure IWB-2500-1 of ASME Code, Section XI, specifies that the total examination volume cross section include the weld and the RV base metal material extending to a distance of one-half the applicable thickness of the RV wall from the extremities of the weld crown at the outside surface of the RV. The volumetric examinations are required to be performed by using ultrasonic sound beams directed both perpendicular and parallel to the weld axis and in opposing directions. This translates into 4 orthogonal sound beam directions relative to the weld axis: up (perpendicular to the weld axis), down (perpendicular to the weld axis), clock-wise (parallel to the weld axis), and counter-clock-wise (parallel to the weld axis). The intent of these requirements is to increase the likelihood of flaw detection by interrogating the component with multiple sound fields in order to find potential service-induced degradation.

The licensee was able to obtain partial coverage of the ASME Code, Section XI, required-examination volume for the specified RV circumferential shell weld (Weld 1-04) by conducting ultrasonic scans of the accessible regions of the RV interior surface in the vicinity of the weld using procedures and personnel qualified in accordance with the 1995-1996 addenda of ASME Code, Section XI, Appendix VIII, Supplements 4 and 6. The licensee conducted the examinations using three qualified ultrasonic transducers, with sound beams oriented in the four required directions to the extent practical. By using the above techniques the licensee was able to obtain an overall examination volume coverage of 73.4 percent of the ASME Code,

Section XI, required-examination volume. This overall examination volume coverage represents the combined volumetric coverage of the weld and the base metal averaged over each of the required ultrasonic sound beam directions and each of the qualified ultrasonic transducers.

The volumetric examination of Weld 1-04 was limited as a result of physical restrictions to the ultrasonic scans caused by the presence of four core support lugs in the vicinity of the weld. The licensee provided drawings which illustrate Weld 1-04 and the associated ASME Code, Section XI, required-examination volume along with the orientation of the ultrasonic sound beams during the ultrasonic examination. These drawings also illustrate the restrictions imposed on the ultrasonic scans by the core support lugs. The core support lugs, located at 0 degree, 90 degree, 180 degree, and 270 degree azimuth positions around the interior surface of the RV, just above Weld 1-04, physically restrict coverage of the ASME Code, Section XI required-examination volume over four increments along the length of the weld. These increments are defined in the drawings that accompany Relief Request PRT-08. The core support lugs overlap a portion of the ASME Code, Section XI required adjacent base metal examination volume, preventing contact between the ultrasonic transducer and the interior surface of the RV at these locations adjacent to the obstructed examination volume. Coverage was further limited by the size of the ultrasonic manipulator end effector and its proximity to the core support lugs while scanning the interior surface of the RV. For those four regions around the inner circumference of the RV where the ultrasonic scans were obstructed by the core support lugs, the licensee attempted to obtain the maximum practical coverage by scanning underneath the core support lugs. The scans were conducted in such a way as to ensure overlap between the obstructed scans performed underneath the core support lugs and the unobstructed scans performed in between the core support lugs. Due to the physical presence of the four core support lugs, the licensee would have to implement significant modifications to the design of the RV in order to be able to obtain complete volumetric coverage of the entire ASME Code, Section XI required-examination volume for Weld 1-04 at Surry 1; therefore, imposition of the ASME Code requirements would result in a burden to the licensee. The licensee has demonstrated that it has maximized the examination coverage to the fullest extent practical for this weld.

In addition to the proposed reduced examination volume, a visual VT-2 examination of the RV is conducted every refueling outage to detect evidence of leakage. Furthermore, the Surry 1 Technical Specifications (TS) have surveillance requirements for monitoring leakage from the reactor coolant system.

Based on the above considerations, the NRC staff concludes that the ASME Code, Section XI requirement to perform the volumetric examination of the RV circumferential shell welds, with essentially 100-percent volumetric coverage of the examination volume cross section specified in Figure IWB-2500-1, for essentially 100 percent of the weld length, is impractical for Weld 1-04 at Surry 1. The licensee's alternative examination consists of the 73-percent volumetric coverage and the VT-2 visual examinations of the RV. In addition, the TS surveillance requires the licensee to monitor for reactor coolant boundary leakage. As a result, these examinations combined provide reasonable assurance of structural integrity for the specified RV circumferential shell weld.

#### 4.0 CONCLUSION

The NRC staff concludes that the ASME Code, Section XI, Figure IWB-2500-1 requirement to perform the volumetric examination of the RV circumferential shell welds, with essentially 100-percent volumetric coverage of the examination volume cross section for essentially 100 percent of the weld length, is impractical for Weld 1-04 at Surry 1. Furthermore, the NRC staff concludes that the licensee's alternative examination provides reasonable assurance of structural integrity of the subject component. Therefore, the licensee's request for relief is granted pursuant to 10 CFR 50.55a(g)(6)(i) for the third 10-year ISI interval. The granting of 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. All other requirements of ASME Code, Section XI, for which relief has not been specifically requested and granted, remain applicable, including third-party review by the Authorized Nuclear Inservice Inspector.

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Date: March 28, 2006



Surry Power Station, Units 1 & 2

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