



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

September 14, 2009

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, UNITS 1 AND 2 - CMP-24 AND CMP-25  
ALTERNATIVE TO EXAMINATION REQUIREMENTS FOR REACTOR VESSEL  
NOZZLE TO SAFE-END BUTT WELDS (TAC NOS. ME0673 AND ME0674)

Dear Mr. Heacock:

By letter dated October 7, 2008, Virginia Electric and Power Company (the licensee) requested relief from certain requirements of Section XI of the American Society of Mechanical Engineers, *Boiler and Pressure Vessel Code* (ASME Code), under the provisions of Title 10 of the *Code of Federal Regulations* (10 CFR), Part 50, Section 50.55a for North Anna Power Station (NAPS), Unit Nos. 1 and 2. This letter specifically addresses relief requests (RR) CMP-24 and CMP-25 pertaining to the volumetric examinations of reactor vessel hot-leg and cold-leg nozzle to piping dissimilar metal welds and flaw depth sizing. By letter dated August 24, 2009, the licensee withdrew CMP-24 for NAPS Unit No. 1.

The U.S. Nuclear Regulatory Commission (NRC) staff finds that the proposed alternative submitted for CMP-25 for the spring 2010, outage at NAPS 2 provides an acceptable level of quality and safety. Therefore, the NRC staff authorizes the alternative in RR NDE-005 pursuant to 10 CFR 50.55a(a)(3)(i) for the third 10-year inservice inspection (ISI) interval.

The third 10-year ISI program for components and component supports is scheduled to be completed by December 13, 2011.

D. Heacock

- 2 -

All other requirements of the ASME Code, Section XI for which relief has not been specifically requested remain applicable, including a third-party review by the Authorized Nuclear Inservice Inspector. If you have any questions concerning this matter, please contact Dr. V. Sreenivas at (301) 415-2597.

Sincerely,

A handwritten signature in black ink, appearing to read "Melanie Wong", with a stylized flourish at the end.

Melanie Wong, Branch Chief  
Plant Licensing Branch II-1  
Division of Operating Reactor Licensing  
Office of Nuclear Reactor Regulation

Docket Nos. 50-338 and 50-339

Enclosure:  
Safety Evaluation

cc w/encl: Distribution via Listserv



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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

THIRD 10-YEAR INSERVICE INSPECTION INTERVAL PROGRAM

RELIEF CMP-25 FOR

REACTOR VESSEL NOZZLE TO SAFE-END BUTT WELDS EXAMINATION

NORTH ANNA POWER STATION, UNIT NO. 2

VIRGINIA ELECTRIC AND POWER COMPANY

DOCKET NO. 50-338

1.0 INTRODUCTION

By letter dated February 18, 2009, (Agencywide Documents Access and Management System (ADAMS) Accession No. ML090490837), Virginia Electric and Power Company (the licensee), submitted Relief Requests CMP-24 and CMP-25 for its third 10-year inservice inspection (ISI) interval for reactor vessel nozzle to safe-end butt welds examination at North Anna Power Station Unit 1 and 2 (NAPS 1 and 2). The licensee requested relief from certain ISI and examination requirements of the American Society of Mechanical Engineers, *Boiler and Pressure Vessel Code* (ASME Code), Section XI, ISI program.

The relief requests, CMP-24 and CMP-25, pertain to the volumetric examinations of reactor vessel (RV) hot-leg and cold-leg nozzle to piping dissimilar metal welds and flaw depth sizing at NAPS 1 and 2, respectively, during the third 10-year ISI interval. The CMP-24 was requested for the spring 2009, outage at NAPS 1, and the CMP-25 was requested for the spring 2010, outage at NAPS 2. There were no flaws found during the volumetric examinations of reactor vessel hot-leg and cold-leg nozzle to piping dissimilar metal welds at NAPS 1, during the spring 2009, outage that needed depth sizing. By letter dated August 24, 2009, the licensee withdrew CMP-24.

The U.S. Nuclear Regulatory Commission (NRC) staff has evaluated the licensee's Relief Requests and determined that the proposed alternatives provide an acceptable level of quality and safety for CMP-25, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR), Part 50, Section 50.55a(a)(3)(i) for the third 10-year ISI interval scheduled to be completed by December 13, 2011.

ENCLOSURE

## 2.0 REGULATORY REQUIREMENTS

Title 10 of the *Code of Federal Regulations*, (10 CFR) 50.55a(g) specifies that ISI of nuclear power plant components shall be performed in accordance with the requirements of the ASME Code, Section XI, except where specific written relief has been granted by the Commission pursuant to 10 CFR 50.55a(g)(6)(i). 10 CFR 50.55a(g)(6)(i) states that the Commission may grant such relief and may impose such alternative requirements as it determines is authorized by law and will not endanger life or property or the common defense and security and is otherwise in the public interest, given the consideration of the burden upon the licensee. 10 CFR 50.55a(a)(3) states that alternatives to the requirements of paragraph (g) may be used, when authorized by the NRC, if (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. 10 CFR 50.55a(g)(5)(iii) states that if the licensee has determined that conformance with certain code requirements is impractical for its facility, the licensee shall notify the Commission and submit, as specified in §50.4, information to support the determinations. 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 pre-service examination requirements, set forth in the ASME Code, Section XI, "Rules for In-service 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 ISI 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 5055a(b) 2-months prior to the start of the 120-month interval, subject to the limitations and modifications listed therein.

## 3.0 TECHNICAL EVALUATION

### 3.1 ASME Code Components Affected

The components for which relief are requested include Code Class 1 pressure retaining dissimilar metal welds in RV nozzle to safe-end butt welds (Table IWB-2500-1, Category B-F, Item B5.10). The components, all from the Reactor Coolant System (RCS), are listed below.

Relief Request: CMP-25

Code Category/Item No.: Category B-F, Item B5.10

Description RV Nozzle to RCS Hot Legs; RV Nozzle to RCS Cold Legs

Weld No.1, 13, 25; 12, 24, 36

The RV nozzles were fabricated from ASME SA-508 Class 2 (P3) and the piping was ASME SA-351 Gr. CF8A or CF8M (P8). Type 308 weld filler material was used for all welding applications.

### 3.2 Applicable Code Edition and Addenda

The code of record for the third 10-year ISI interval at NAPS 2, is the 1995 Edition with 1996 Addenda to the ASME Code, Section XI. The 1995 Edition with 1996 Addenda of the ASME Code, Section XI, is used for Appendix VIII, "Performance Demonstration Initiative for Ultrasonic Examination System," Supplements 10 and 2. Acceptable alternatives to Appendix VIII, Supplements 10 and 2, are ASME Code Cases N-695 and N-696. NAPS 2, is currently in the third 10-year ISI interval which began on December 14, 2001.

### 3.3 Applicable Code Requirement

Item B5.10 of the examination category B-F of Table IWB-2500-1 of the 1995 Edition through 1996 Addenda to the ASME Code, Section XI, specifies volumetric examinations. The volumetric examinations are to be conducted in accordance with Appendix VIII, "Performance Demonstration Initiative for Ultrasonic Examination System," Supplements 10 and 2 of the 1995 Edition with 1996 Addenda to the ASME Code, Section XI, per 10 CFR 50.55a(g)(6)(ii)(C) requirements.

Alternatives to Appendix VIII, Supplements 10 and 2 are ASME Code Cases N-695 and N-696, which have been approved by NRC in Regulatory Guide 1.147, Revision 15. The specific requirements of the Code Cases pertain to the depth-sizing qualification requirements for dissimilar and similar metal piping welds as listed below.

#### 3.3.1 ASME Code Case N-695

Depth-Sizing Test: Examination procedures, equipment, and personnel are qualified for depth-sizing when the root mean square error (RMSE) of the flaw depth measurements, as compared to the true flaw depths, do not exceed 0.125-inch.

#### 3.3.2 ASME Code Case N-696

Depth-Sizing Test: Supplement 2 or Supplement 3 of Appendix VIII to the ASME Code, Section XI, examination procedures, equipment, and personnel are qualified for depth-sizing when the flaw depths estimated by ultrasonic testing (UT), as compared to the true depths, do not exceed 0.125-inch RMSE when they are combined with a successful Supplement 10 qualification.

### 3.4 Licensee Proposed Alternative and Basis for Use

As stated by the licensee, a request for relief from the 0.125-inch RMSE depth-sizing requirement of Appendix VIII, Supplement 10 is needed because, to date, examination vendors have not met the established RMSE of 0.125-inch for depth-sizing when examining from the inside diameter. The licensee proposes to use a contracted examination vendor that has demonstrated ability to meet a depth-sizing qualification requirement with a RMSE of 0.224-inch instead of the 0.125-inch required for Supplement 10. The licensee states that in the event an indication is detected that requires depth-sizing, the 0.099-inch difference between the required RMSE and the demonstrated RMSE will be added to the measured through-wall extent for comparison with applicable acceptance criteria.

As stated, the proposed alternative assures that the subject welds will be fully examined by procedures, personnel, and equipment qualified by demonstration in all aspects except depth sizing. The proposed addition of the difference between the required and demonstrated sizing tolerance to any flaw that is required to be sized, compensates for the potential variation, and likewise assures an acceptable level of quality and safety.

### 3.5 Duration of Proposed Alternative

The licensee submitted the relief request CMP-25 for approval for the remainder of the third 10-year ISI interval at NAPS 2 which ends on December 13, 2011.

### 3.6 Staff Evaluation

According to the ASME Code, Section XI, Appendix VIII, Supplement 10, the examination procedures, equipment, and personnel are qualified for depth-sizing when the RMSE of the flaw depth measurements, as compared to true depths, do not exceed 0.125-inch. Supplement 2 also requires that the RMSE of the flaw depths estimated by UT, as compared with true depths, shall not exceed 0.125-inch. Code Case N-696, which combines the requirements of Supplements 10 and 2, states that Supplement 2 examination procedures, equipment, and personnel, are qualified for depth-sizing when the flaw depths estimated by UT, as compared with the true depth, do not exceed 0.125-inch RMSE, when they are combined with a successful Supplement 10 qualification. (Note: Code Cases N-695 and N-696 are identified as Acceptable Section XI Code Cases per Revision 15 of the NRC Regulatory Guide 1.147, "In-service Inspection Code Case Acceptability ASME Code, Section XI, Division 1.")

The nuclear industry is in the process of qualifying personnel to Supplement 10 as implemented by the Performance Demonstration Initiative Program. However, for demonstrations performed from the inside surface of a pipe weld, personnel have been unsuccessful at achieving the Code-required 0.125-inch RMSE flaw depth-sizing criterion. At this time, the NRC staff acknowledges that achieving the 0.125-inch RMSE appears not to be feasible as personnel have only been capable of achieving an accuracy of 0.224-inch RMSE to size any detected flaws. The vendor contracted by the licensee has proposed to use an RMSE of 0.224-inch instead of the 0.125-inch required by Supplement 10. In the event an indication is detected that requires depth sizing, the 0.099-inch difference (i.e.  $0.224\text{-inch} - 0.125\text{-inch} = 0.099\text{-inch}$ ) between the required RMSE and the demonstrated RMSE will be added to the measured through-wall extent. This total flaw size will then be assessed against the applicable acceptance criteria specified in Section IWB-3500 of the ASME Code for flaw evaluation.

The staff finds that compliance with the ASME Code-required RMSE value is not feasible at this time and that adding the difference between the Code-required RMSE and the demonstrated RMSE to the measured through-wall extent, in addition to the use of the acceptance standards specified in Section IWB-3500 of the ASME Code, provides reasonable assurance of structural integrity and an acceptable level of quality and safety.

#### 4.0 CONCLUSION

The NRC staff has reviewed the licensee request CMP-25 and has determined that requiring the licensee to qualify procedures, personnel, and equipment, to meet the maximum RMSE of 0.125-inch for crack depth-sizing is not feasible at the present time. The licensee's proposal of adding the difference between the Code-required RMSE and the demonstrated RMSE to the measured through-wall extent provides reasonable assurance of structural integrity and an acceptable level of quality and safety. Therefore, pursuant to 10 CFR 50.55a(a)(3)(i), the proposed alternative is authorized for the third 10-year ISI interval for NAPS 2, which began on December 14, 2001, and ends on December 13, 2011.

All other ASME Code, Section XI, requirements for which relief was not specifically requested and authorized herein by the NRC staff remain applicable, including third party review by the Authorized Nuclear In-service Inspector.

Principal Contributor: Ali Rezai, DCI/CPNB

Date: September 14, 2009

D. Heacock

- 2 -

All other requirements of the ASME Code, Section XI for which relief has not been specifically requested remain applicable, including a third-party review by the Authorized Nuclear Inservice Inspector. If you have any questions concerning this matter, please contact Dr. V. Sreenivas at (301) 415-2597.

Sincerely,

**/RA/**

Melanie Wong, Branch Chief  
Plant Licensing Branch II-1  
Division of Operating Reactor Licensing  
Office of Nuclear Reactor Regulation

Docket Nos. 50-338 and 50-339

Enclosure:  
Safety Evaluation

cc w/encl: Distribution via Listserv

**DISTRIBUTION:**

PUBLIC  
LPL2-1 R/F  
RidsNrrDoriLpl2-1 Resource  
RidsNrrLAMO'Brien Resource  
RidsNrrPMNorthAnna Resource  
RidsNrrDciCvib Resource  
RidsOgcRp Resource

RidsAcrsAcnw\_MailCTR Resource  
RidsRgn2MailCenter Resource (GMcCoy)  
RidsNrrOgcRp  
MCox, ED R-II  
PPurtscher, NRR  
A. Rezai, DCI/CPNB

ADAMS Accession No.: ML092530198

\* by memo dated

OFFICE	NRR/LPL2-1/PM	NRR/LPD2-1/LA	NRR/DCI/BC	NRR/LPL2-1/BC
NAME	VSreenivas	MO'Brien (THarris for)	MMitchell*	MWong
DATE	09/11/09	09/11/09	8/03/09	09/14/09

**OFFICIAL RECORD COPY**