



UNITED STATES  
NUCLEAR REGULATORY COMMISSION

WASHINGTON, D.C. 20555-0001

October 22, 2008

Mr. Thomas D. Walt, Vice President  
H. B. Robinson Steam Electric Plant,  
Unit No. 2  
Carolina Power & Light Company  
3581 West Entrance Road  
Hartsville, South Carolina 29550-0790

SUBJECT: H. B. ROBINSON STEAM ELECTRIC PLANT, UNIT NO. 2 – REQUEST FOR RELIEF FROM ASME CODE, SECTION XI, APPENDIX VIII, SUPPLEMENT 2 AND SUPPLEMENT 10 WELD EXAMINATION REQUIREMENTS (TAC NO. MD8955)

Dear Mr. Walt:

By letter dated June 6, 2008, Carolina Power & Light Company (the licensee), submitted a request for relief (RNP-RA/08-0048) from certain requirements of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (ASME Code) at the H.B. Robinson Steam Electric Plant, Unit 2 (HBRSEP). In its letter, the licensee stated that the relief request is in accordance with Title 10 of the *Code of Federal Regulations*, Section 50.55a (a)(3)(i), on the basis that alternative methods provide an acceptable level of quality and safety. The relief request is for the fourth 10-year inservice inspection (ISI) interval that is scheduled to end February 18, 2012.

ASME Code, Section XI, Appendix VIII, Supplement 2 and Supplement 10 provide the qualification criteria for examinations performed from the outside diameter (OD) of the weld. For examinations performed from either the inside diameter (ID) or the outside (OD) of the weld, the ASME Subcommittee on Nuclear Inservice Inspection (Section XI) developed Code Case N-695, "Qualification Requirements for Dissimilar Metal Piping Welds, Section XI, Division 1," as an alternative to Supplement 10. Code Case N-696, "Qualification Requirements for Appendix VIII Piping Examination Conducted from the Inside Surface, Section XI, Division 1," in conjunction with the expansion of a qualified Supplement 10, was developed as an alternative to Supplement 2 for examination from the weld ID. Code Cases N-695 and N-696 are endorsed by Regulatory Guide 1.147, Revision 15, "Inservice Inspection Code Case Acceptability, ASME Section XI, Division 1."

Specifically, the licensee in its request dated June 6, 2008, proposed using a root mean square (RMS) error criterion for sizing flaws that is greater than that contained in the ASME Code, Section XI, Appendix VIII, Supplements 2 and 10, and the alternative Code Cases N-695 and N-696.

The U.S. Nuclear Regulatory Commission (NRC) staff reviewed the information provided in the relief request and determined that the relief request is more appropriately categorized under 10 CFR 50.55a(g)(6)(i), instead of 10 CFR 50a(a)(3)(i) as proposed in the licensee's letter dated June 6, 2008.

T. D. Walt

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Based on the review provided in the enclosed safety evaluation, the NRC staff concludes that compliance with the 0.125-inch RMS depth sizing error required by Code Case N-695 and N-696 is impractical, and that the proposed alternative to use 0.212-inch RMS error provides reasonable assurance of structural integrity of the subject welds. Therefore, pursuant to 10 CFR 50.55a(g)(6)(i), relief is granted to HBRSEP to implement RNP-RA/08-0048 for the fourth 10-year ISI interval or until such time as ultrasonic testing techniques are capable of satisfying the 0.125-inch RMS error requirement of Code Cases N-695 and N-696, whichever is less. The granting of relief 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.

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.

If you have any questions regarding this matter, please contact Marlayna Vaaler at (301) 415-3178.

Sincerely,



Thomas H. Boyce/Chief  
Plant Licensing Branch II-2  
Division of Operating Reactor Licensing  
Office of Nuclear Reactor Regulation

Docket No. 50-261

Enclosure: Safety Evaluation

cc w/enclosure: See next page

Based on the review provided in the enclosed safety evaluation, the NRC staff concludes that compliance with the 0.125-inch RMS depth sizing error required by Code Case N-695 and N-696 is impractical, and that the proposed alternative to use 0.212-inch RMS error provides reasonable assurance of structural integrity of the subject welds. Therefore, pursuant to 10 CFR 50.55a(g)(6)(i), relief is granted to HBRSEP to implement RNP-RA/08-0048 for the fourth 10-year ISI interval or until such time as ultrasonic testing techniques are capable of satisfying the 0.125-inch RMS error requirement of Code Cases N-695 and N-696, whichever is less. The granting of relief 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.

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.

If you have any questions regarding this matter, please contact Marlayna Vaaler at (301) 415-3178.

Sincerely,

*/RA/*

Thomas H. Boyce, Chief  
Plant Licensing Branch II-2  
Division of Operating Reactor Licensing  
Office of Nuclear Reactor Regulation

Docket No. 50-261

Enclosure: Safety Evaluation

cc w/enclosure: See next page

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\* by memo dated

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Carolina Power & Light Company

**H. B. Robinson Steam Electric Plant,  
Unit No. 2**

cc:

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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

REQUEST FOR RELIEF FROM ASME CODE, SECTION XI, APPENDIX VIII,

SUPPLEMENT 2 AND SUPPLEMENT 10 WELD EXAMINATION REQUIREMENTS

CAROLINA POWER AND LIGHT COMPANY

H.B. ROBINSON STEAM ELECTRIC PLANT, UNIT NO. 2

DOCKET NO. 50-261

1.0 INTRODUCTION

By letter dated June 6, 2008, Carolina Power and Light Company (the licensee), submitted a request for relief (RNP-RA/08-0048) from certain requirements of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (ASME Code) at the H.B. Robinson Steam Electric Plant, Unit No. 2 (HBRSEP). In its letter, the licensee stated that the relief request is in accordance with Title 10 of the *Code of Federal Regulations*, Section 50.55a (a)(3)(i), on the basis that alternative methods provide an acceptable level of quality and safety. The request is for the fourth 10-year inservice inspection (ISI) interval for HBRSEP, which is scheduled to end on February 18, 2012.

ASME Code, Section XI, Appendix VIII, Supplement 2 and Supplement 10 provide the qualification criteria for examinations performed from the outside diameter (OD) of a weld. For examinations performed from either the inside diameter (ID) or the OD of the weld, the ASME Subcommittee on Nuclear Inservice Inspection (Section XI) developed Code Case N-695, "Qualification Requirements for Dissimilar Metal Piping Welds, Section XI, Division 1," as an alternative to Supplement 10. Code Case N-696, "Qualification Requirements for Appendix VIII Piping Examination Conducted from the Inside Surface, Section XI, Division 1," in conjunction with the expansion of a qualified Supplement 10, was developed as an alternative to Supplement 2 for examination from the weld ID. Code Cases N-695 and N-696 were approved by the U.S. Nuclear Regulatory Commission (NRC) and incorporated by reference in Regulatory Guide (RG) 1.147, Revision 15, "Inservice Inspection Code Case Acceptability, ASME Section XI, Division 1." Specifically, the licensee proposed using a root mean square (RMS) error criterion for sizing flaws that is greater than that contained in the ASME Code, Section XI, Appendix VIII, Supplements 2 and 10, and the alternative Code Cases N-695 and N-696.

2.0 REGULATORY REQUIREMENTS

In accordance with Title 10 of the *Code of Federal Regulations* (10 CFR) Section 50.55a(g)(4), ASME Code Class 1, 2, and 3 components must meet the requirements set forth in the ASME Code and addenda, Section XI, "Rules for Inservice Inspection of Nuclear Power Plants Components," to the extent practical within the limitations of design, geometry, and materials of

Enclosure

construction of the components. The regulations require that all inservice examinations 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 the ASME Code, Section XI, incorporated by reference into 10 CFR 50.55a(b) on the date 12 months prior to the start of the 10-year interval. For HBRSEP, the code of record for the fourth 10-year ISI interval is the 1995 Edition with 1996 Addenda of Section XI of the ASME Code.

Alternatives to requirements may be authorized or relief granted by the NRC pursuant to 10 CFR 50.55a(a)(3)(i), 10 CFR 50.55a(a)(3)(ii), or 10 CFR 50.55a(g)(6)(i). In proposing alternatives or requesting relief, the licensee must demonstrate that: (1) the proposed alternatives provide an acceptable level of quality and safety; (2) compliance would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety; or (3) conformance is impractical for the facility.

### 3.0 TECHNICAL EVALUATION

#### 3.1 Affected Components

The affected components are 6 dissimilar metal welds (DMW) and 6 austenitic-to-austenitic stainless steel welds (SST) as listed in the table below.

<b>Weld Identification</b>	<b>Weld Description</b>	<b>ISI Drawing</b>	<b>IWB-2500-1 Category</b>	<b>Item Number</b>
107/1DM	DMW, RPV Nozzle-to-Safe End	HBR2-10618 Sheet 10	B-F	B5.10
107/14DM	DMW, Safe End-to-RPV Nozzle	HBR2-10618 Sheet 10	B-F	B5.10
107A/1DM	DMW, RPV Nozzle-to-Safe End	HBR2-10618 Sheet 11	B-F	B5.10
107A/14DM	DMW, Safe End-to-RPV Nozzle	HBR2-10618 Sheet 11	B-F	B5.10
107B/1DM	DMW, RPV Nozzle-to-Safe End	HBR2-10618 Sheet 12	B-F	B5.10
107B/14DM	DMW, Safe End-to-RPV Nozzle	HBR2-10618 Sheet 12	B-F	B5.10
107/1	SST, Safe End-to-Pipe	HBR2-10618 Sheet 10	B-J	B9.11
107/14	SST, Elbow-to-Safe End	HBR2-10618 Sheet 10	B-J	B9.11
107A/1	SST, Safe End-to-Pipe	HBR2-10618 Sheet 11	B-J	B9.11
107A/14	SST, Elbow-to-Safe End	HBR2-10618 Sheet 11	B-J	B9.11
107B/1	SST, Safe End-to-Pipe	HBR2-10618 Sheet 12	B-J	B9.11
107B/14	SST, Elbow-to-Safe End	HBR2-10618 Sheet 12	B-J	B9.11

#### 3.2 Applicable Code

The fourth 10-year ISI interval Code of Record for ultrasonic testing (UT) examinations is the 1995 Edition with 1996 Addenda of the ASME Code, Section XI, Appendix VIII, Supplement 10 and Supplement 2. Supplement 10, Paragraph 3.2(b) states that the RMS error for flaw depths estimated by UT shall not exceed 0.125-inch; and Supplement 2, Paragraph 3.2(b) states that the RMS error of the flaw depths estimated by ultrasonics, as compared with the true depths, is less than 0.125-inch RMS error.

Code Case N-695 is a Supplement 10 alternative that was approved by the NRC and incorporated into RG 1.147, Revision 15. Code Case N-695, Paragraph 3.3(c), states that

“examination procedures, equipment, and personnel are qualified for depth-sizing when the RMS error of the flaw depth measurements as compared to the true flaw depths, do not exceed 0.125 in.”

Code Case N-696, in conjunction with a Supplement 10 qualification as an alternative for a Supplement 2 qualification, was approved by the NRC and incorporated into RG 1.147, Revision 15. Code Case N-696, Paragraph 3.3(d), states that, in part, “procedures equipment and personnel are qualified for depth-sizing when the flaw depths estimated by ultrasonics, as compared with the true depths, do not exceed 0.125-inch RMS.”

### 3.3 Proposed Alternative

The licensee proposed to apply the difference between the examination vendor’s (IHI Southwest) achieved RMS combined error of 0.211-inch and the required 0.125-inch RMS error of Code Cases N-695 and N-696 to actual flaw depths when depth-sizing of indications is required.

### 3.4 Licensee Basis for the Alternative

The Electric Power Research Institute (EPRI) Nondestructive Examination Center Performance Demonstration Initiative (PDI) states that currently no vendor has successfully demonstrated the ASME Code-required 0.125-inch RMS value in qualification tests for examinations conducted from the ID surface for Section XI, Appendix VIII, Supplement 2 or Supplement 10. The PDI has verified that the selected examination vendor achieved a 0.211-inch RMS error for a Supplement 2 qualification, a 0.212-inch RMS error for a Supplement 10 qualification, and a 0.211-inch RMS error for a combined Supplement 2 [Code Case N-696] and Supplement 10 [Code Case N-695] qualification.

For examination of the subject welds, the licensee proposed to apply the difference between the examination vendor’s achieved RMS combined error of 0.211-inch and the required 0.125-inch RMS error of Code Cases N-695 and N-696 to the actual flaw depths when depth-sizing of indications is required. Applying the difference between the required RMS error and the achieved RMS error to the actual flaw being sized will ensure a conservative bounding flaw depth for both similar and dissimilar metal welds.

## 4.0 STAFF EVALUATION

The licensee’s code of record for the fourth 10-year ISI interval is the 1995 Edition with 1996 Addenda. The ASME Code requires that similar metal welds (austenitic-to-austenitic) and DMW be examined using procedures, equipment, and personnel qualified to Section XI, Appendix VIII, Supplements 2 and 10, respectively. The code of record does not provide criteria for examinations performed from the ID surface. As an alternative to Supplement 2, the ASME Section XI developed Code Case N-696 by expanding an existing Supplement 10 qualification performed from the ID of DMWs, in conjunction with selected aspects of the Supplement 2 qualification requirements. As an alternative to Supplement 10, the ASME Section XI developed Code Case N-695 for qualifications performed from either the ID or OD of DMWs. Code Cases N-695 and N-696 were approved by the NRC and incorporated in RG 1.147, Revision 15, with no conditions.

Both Code Cases N-695 and N-696 require that the maximum error for flaw depth measurements, when compared to the true flaw depth, not exceed a 0.125-inch RMS error. The U.S. nuclear power industry is using the EPRI PDI program to implement Code Cases N-695 and N-696 performance demonstration requirements. The nuclear power industry has been trying to qualify personnel and procedures for ID pipe examinations of DMWs since November 2002. Since then, UT techniques have undergone incremental improvements. However, to date, personnel and procedures have been unable to satisfy the maximum 0.125-inch RMS error requirement.

The difficulties are associated with surface roughness and pipe misalignment common to field welds, which PDI replicated in mockups used for UT qualifications. Currently, the PDI program does not have sufficient mockups with less severe surface conditions to be used for UT performance demonstrations and subsequent qualifications. In the event that UT qualifications were obtained on less severe surface conditions, the licensee would have to implement a repair/replacement activity to provide these conditions in their plant. The balance between ID surface roughness and UT depth sizing qualifications is being discussed at semiannual meetings between PDI and the NRC.

The licensee proposed using the vendor's RMS error from the PDI performance demonstration to approximate the flaw depth. The licensee has stated that the vendor's PDI performance demonstration RMS error was 0.212-inch for Code Case N-695 and 0.211-inch for Code Case N-696. The licensee proposed adding the depth sizing difference between the demonstrated 0.212-inch RMS error and the ASME Code-required 0.125-inch RMS error to the measured value of any flaw detected during the examination of DMWs and similar metal welds. Although the 0.212-inch RMS error can result in under sizing a flaw by an amount greater than the ASME Code-required error, the probability of a flaw occurring precisely when surface roughness is affecting UT is considered small.

The NRC staff finds that compliance with the Code Cases N-695 and N-696 required 0.125-inch RMS error is impractical at this time, and that adding the difference between the performance demonstrated depth sizing RMS error and the ASME Code-required depth sizing RMS error to the measured flaw value in order to determine acceptability according to the standards specified in the ASME Code, Section XI, IWB-3500, provides reasonable assurance of the structural integrity of the subject welds.

The NRC staff reviewed the information provided in the licensee's application and determined that the relief request is more appropriately categorized under 10 CFR 50.55a(g)(6)(i), rather than 10 CFR 50a(a)(3)(i), as originally proposed in the licensee's letter dated June 6, 2008.

## 5.0 CONCLUSION

Based on the above review, the NRC staff concludes that compliance with the Code Cases N-695 and N-696 required 0.125-inch RMS depth sizing error is impractical, and that the proposed alternative to add the difference between the performance demonstrated depth sizing RMS error and the ASME Code-required depth sizing RMS error to the measured flaw value in order to determine acceptability continues to provide reasonable assurance of the structural integrity of the subject welds. Therefore, pursuant to 10 CFR 50.55a(g)(6)(i), relief is granted to HBRSEP to implement RNP-RA/08-0048 for the fourth 10-year ISI interval, or until such time as

UT techniques are capable of satisfying the 0.125-inch RMS error requirement of Code Cases N-695 and N-696, whichever is less. The granting of relief 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 consideration of the burden upon the licensee.

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

Principal Contributor: Donald Naujock

Date: October 22, 2008