

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

July 16, 2013

Mr. William R. Gideon, Vice President Carolina Power & Light Company H. B. Robinson Steam Electric Plant, Unit No. 2 3581 West Entrance Road Hartsville, South Carolina 29550

SUBJECT: H. B. ROBINSON STEAM ELECTRIC PLANT, UNIT NO. 2 – RELIEF REQUEST-08 FROM ASME CODE ROOT MEAN SQUARE ERROR VALUE FOR THE FIFTH 10-YEAR INSERVICE INSPECTION PROGRAM PLAN (TAC NO. MF1015)

Dear Mr. Gideon:

By letter to the U.S. Nuclear Regulatory Commission (NRC) dated March 13, 2013 (Agencywide Documents Access and Management System Accession No. ML13080A258) Carolina Power & Light Company (the licensee), doing business as Duke Energy, submitted Relief Request (RR)-08 for the Inservice Inspection (ISI) Program Plan for the fifth 10-year Interval for the H. B. Robinson Steam Electric Plant, Unit No. 2 (HBRSEP).

The licensee requested relief from the 0.125 inch root mean square (RMS) depth-sizing acceptance criteria the requirements of the 2007 Edition through the 2008 Addenda of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (Code), Section XI, Appendix VIII Supplement 10. Specifically, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR), Section 50.55a(g)(5)(iii), the licensee requested to use alternate depth sizing requirements for ISI items on the basis that the code requirement is impractical. RR-08 proposes to the use of alternate RMS error criteria for depth sizing for six reactor pressure vessel inlet and outlet dissimilar metal welds during the HBRSEP fall 2013 refueling outage.

As set forth above, the NRC staff determines that granting 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. Accordingly, the NRC staff concludes that the licensee has adequately addressed all of the regulatory requirements set forth in 10 CFR 50.55a(g)(5)(iii). Therefore, the NRC staff grants relief as described in RR-08 for the HBRSEP for the six specified welds for the remainder of the fifth 10-year inspection interval, which is currently scheduled to end on February 19, 2022.

All other ASME Code, Section XI requirements for which relief has not been specifically requested and approved in this relief request remain applicable, including third party review by the Authorized Nuclear Inservice Inspector.

W. Gideon

If you have any question, please contact the Project Manager, Araceli T. Billoch Colón at 301-415-3302 or via e-mail at Araceli.Billoch@nrc.gov

Sincerely,

Jessie F. Quichocho, Chief Plant Licensing Branch II-2 Division of Operating Reactor Licensing Office of Nuclear Reactor Regulation

Docket No. 50-261

Enclosure: Safety Evaluation

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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELIEF REQUEST NUMBER RR-08

FOR THE FIFTH 10-YEAR INSERVICE INSPECTION INTERVAL

CAROLINA POWER & LIGHT COMPANY

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

DOCKET NO. 50-261

1.0 INTRODUCTION

By letter to the U.S. Nuclear Regulatory Commission (NRC) dated March 13, 2013 (Agencywide Document Access and Management System (ADAMS) Accession No. ML13080A258) Carolina Power & Light Company (the licensee), doing business as Duke Energy, submitted Relief Request (RR)-08 for the Inservice Inspection (ISI) Program Plan for the fifth 10-year Interval for the H. B. Robinson Steam Electric Plant, Unit No. 2 (HBRSEP).

The licensee requested relief from the 0.125 inch root mean square (RMS) depth-sizing acceptance criteria the requirements of the 2007 Edition through the 2008 Addenda of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (Code), Section XI, Appendix VIII Supplement 10 (hereafter referred to as Supplement 10). Specifically, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR), Section 50.55a(g)(5)(iii), the licensee requested to use alternate depth sizing requirements for ISI items on the basis that the code requirement is impractical. RR-08 proposes to the use of alternate RMS error criteria for depth sizing for six reactor pressure vessel inlet and outlet dissimilar metal (DM) welds during the HBRSEP fall 2013 refueling outage.

2.0 REGULATORY EVALUATION

Pursuant to 10 CFR 50.55a(g)(4), ASME Code Class 1, 2, and 3 components (including supports) must meet the requirements, except the design and access provisions and the preservice examination requirements, set forth in the 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 examination of components and system pressure tests conducted during the first 10-year ISI 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) 12-months prior to the start of the 120-month interval, subject to the limitations and modifications listed therein.

Section 50.55a(g)(4)(ii) of 10 CFR states, in part, that "inservice examination of components conducted during 120-month intervals must comply with the latest edition and addenda of the Code incorporated by reference in 10 CFR 50.55a(b) 12 months before the start of the

120-month inspection interval or the optional ASME Code cases listed in NRC RG [Regulatory Guide] 1.147 ["Inservice Inspection Code Case Acceptability, ASME Section XI, Division 1"], Revision 16."

Section 50.55a(g)(iii) of 10 CFR states, that "If the licensee has determined that conformance with a code requirement is impractical for its facility, the licensee shall notify the NRC and submit, as specified in Section 50.4, information to support the determinations. Determinations of impracticality in accordance with this section must be based on the demonstrated limitations experienced when attempting to comply with the code requirements during the inservice inspection interval for which the request is being submitted. Requests for relief made in accordance with this section must be submitted to the NRC no later than 12 months after the expiration of the initial or subsequent 120-month inspection interval for which relief is sought."

Section 50.55a(g)(6)(i) of 10 CFR states that "The Commission will evaluate determinations under paragraph (g)(5) of this section that code requirements are impractical. 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 giving due consideration to the burden upon the licensee if the requirements were imposed upon the licensee that could result if the requirements were imposed on the facility."

Based on the above, and subject to the following technical evaluation, the NRC staff finds that regulatory authority exists for the licensee to request and the Commission to grant the relief requested by the licensee.

3.0 TECHNICAL EVALUATION

3.1 Component Description

The licensee states that the RR-08 addresses the large-bore reactor inlet and outlet dissimilar metal welds listed in Table 1 below.

Category and System Details:

Code Class:	Class 1
System Welds:	Reactor Coolant System
Examination Category:	Category B-F
Code Item Number:	B5.10 "Reactor Vessel Nozzle-to-Safe-End Butt Welds"

Table 1: Welds Covered By RR-08						
Description	Size	Weld No.				
Hot Leg Loop "A" DM Weld	29.0" Inside Diameter (ID) (Nom.)	107/01DM				
Cold Leg Loop "A" DM Weld	27.5" ID (Nom.)	107/41DM				
Hot Leg Loop "B" DM Weld	29.0" ID (Nom.)	107A/01DM				
Cold Leg Loop "B" DM Weld	27.5" ID (Nom.)	107A/41DM				
Hot Leg Loop "C" DM Weld	29.0" ID (Nom.)	107B/01DM				
Cold Leg Loop "C" DM Weld	27.5" ID (Nom.)	107B/41DM				

3.2 Applicable Code Edition and Addenda

HBRSEP entered the fifth 10-year ISI Inspection Interval effective July 21, 2012. The ASME Section XI Code applicable to the fifth 10-year interval is the 2007 Edition through the 2008 Addenda.

3.3 Applicable Code Requirement

Volumetric examinations of the components contained in Table 1 are mandated in ASME Code, Section XI, Table IWB-2500, Category B-F, Item B5.10. Requirements for ultrasonic examinations used to conduct these inspections are contained in ASME Code, Section XI, Paragraph IWA-2232, and ASME Code, Section XI, Appendix I, Paragraph 1-2220. These paragraphs refer to ASME Code, Section XI, Appendix VIII, including Supplement 10.

ASME Code, Section XI, Appendix VIII, Supplement 10, Paragraph 3.3(c) requires 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 inch (3 mm)."

The licensee is conducting the examinations to satisfy the requirements of ASME Code Case N-770-1 "Alternative Examination Requirements and Acceptance Standards for Class 1 PWR [Pressurized Water Reactor] Piping and Vessel Nozzle Butt Welds Fabricated With UNS [Unified Numbering System] N06082 or UNS W86182 Weld Filler Material With or Without Application of Listed Mitigation Activities." The use of ASME Code Case N-770-1 is mandated in 10 CFR50.55a(b).

ASME Code Case N-770-1, Table 1, Footnote (4) applies to volumetric examination of Inspection Items A-2 and B, and requires that "Ultrasonic volumetric examination shall be used and shall meet the applicable requirements of Appendix VIII."

3.4 Reason for Request (as stated)

Since 2002, the nuclear power industry has attempted to qualify personnel and procedures for depth-sizing examinations performed from the inside surface of dissimilar metal and austenitic stainless steel butt welds in PWR piping. As of March 4, 2013, no domestic or international vendor has met the applicable root mean square (RMS) error requirement of ASME Section XI Appendix VIII, Supplement 10.

The examination vendor that Progress Energy [the licensee] intends to use for performing these examinations has not been able to meet the applicable RMS error requirement identified in Appendix VIII, Supplement 10. The examination vendor the Progress Energy intends to use for performing these examinations has an RMS error of "0.212 inches."

3.5 Proposed Alternative and Basis for Use

As stated, the licensee proposes to use the following alternative for flaw depth sizing when dissimilar metal welds are examined from the inside surface:

- 1. Examinations shall be performed using ultrasonic (UT) techniques that are qualified for flaw detection and length sizing using procedures, personnel and equipment qualified by demonstration in all aspects except depth sizing.
- 2. Flaw(s) detected and measured as less than 50 percent through-wall in depth shall be adjusted by adding a correction factor of the RMS error of 0.087 inches to the depths of any measured flaws based on the vendors demonstrated RMS of 0.212 inches. Eddy Current examination shall be used to confirm whether any detected flaws are surface breaking.
- 3. If any inner diameter surface-breaking flaws are detected and measured as 50 percent through-wall or greater, Progress Energy [the licensee] shall repair the indications or shall perform flaw evaluations and shall submit the evaluations to the NRC for review and approval prior to reactor startup. These flaw evaluations shall include the following:
 - a. Information concerning the mechanism which caused the flaw.
 - b. Information concerning the surface roughness/profile in the area of the pipe/weld required to perform the examination, and an estimate of the percentage of potential surface areas with UT probe "lift-off."

3.6 Duration of Proposed Alternative

The proposed alternative to the ASME Code is applicable for the remainder of the fifth 10-year ISI Interval at HBRSEP, which began on July 21, 2012, and is currently scheduled to end on February 19, 2022.

3.7 Staff Evaluation

As described above, the licensee has requested relief from ASME Code Section XI, Appendix VIII Supplement 10 that requires procedures and personnel to be able to depth-size cracks with an RMS error of not greater than 0.125 inches.

The NRC staff has confirmed that attempts have been made to qualify ID UT inspection procedures since 2002 and that, to date, no inspection vendor has been able to meet the acceptance criteria established by the code case despite the fact that numerous individuals from several companies have attempted to do so. The NRC staff finds that this repeated inability to qualify ID UT inspection techniques in accordance with ASME Code Section XI Appendix VIII constitutes an impracticality as described in 10 CFR 50.55a(g)(5)(iii).

In July 2012, the NRC staff reviewed the proprietary Performance Demonstration Initiative (PDI) program (administered by the Electric Power Research Institute) data used in blind tests. This review of the PDI data was conducted to verify the information and analysis contained in the Materials Reliability Program (MRP)-2012-11 "Inside Surface Flaw Depth Sizing Uncertainty Root Mean Square (RMS) Error Treatment" (provided as Attachment 2 of ADAMS Accession No. ML120730196). Based on this review, the NRC staff was able to determine that the addition of the industry-proposed correction factor prior to flaw evaluation for flaws less than 50 percent through-wall satisfactorily reduces the effect of the increased sizing error associated with not meeting the 0.125 RMS error required by Supplement 10.

The licensee has agreed that if any cracks are detected and measured as 50 percent through-wall depth or greater, and to remain in-service without mitigation or repair, the licensee shall submit flaw evaluations to the NRC for review and approval prior to reactor startup. This evaluation will include the inner profile of the weld, pipe, and nozzle in the region at and surrounding the flaw, and an estimate of the percentage of potential surface areas with UT probe lift-off. Requiring NRC approval for restart when a flaw greater than 50 percent through-wall is discovered and is to be left in service without mitigation or repair addresses the staff concerns with the possibilities of large undersizing errors in deep flaws.

The NRC staff has noted that the geometry of the six subject welds shown in Figure 1 of the relief request shows that UT inspections conducted from the nozzle ID have significant advantages for the detection of possible cracks compared to inspections from the outside diameter (OD). The geometry of the OD would hinder access to the weld and would likely require site-specific mockups to be built to validate the inspections of the accessible areas. The ID geometry has been machined flat and provides a superior scanning surface than is provided by the OD.

The NRC staff finds that by adding the correction factor of 0.087 inches (the procedure RMS Error – 0.125 inch) to the depths of any flaw measured as less than 50 percent through-wall depth found by the inspections, and by obtaining NRC review and approval prior to startup for any surface-breaking flaws measured as 50 percent through-wall or greater, adequate assurance of structural integrity and leak tightness is provided.

Based on the concerted efforts by the industry to meet the acceptance criteria contained in Supplement 10 and the difficulties associated with other inspection methods, the NRC staff finds that meeting the 0.125 inch acceptance criterion in Supplement 10 is impractical and represents a burden to the licensee. On that basis, and subsequent to NRC staff review and approval of information submitted, the NRC staff finds that this alternative provides reasonable assurance of structural integrity and leak tightness of the subject component and therefore will not endanger life or property as required by 10 CFR 50.55a(g)(6)(i).

4.0 CONCLUSION

As set forth above, the NRC staff determines that granting 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. Accordingly, the NRC staff concludes that the licensee has adequately addressed all of the regulatory requirements set forth in 10 CFR 50.55a(g)(5)(iii). Therefore, the NRC staff grants relief as described in RR-08 for the HBRSEP for the six specified welds for the remainder of the fifth 10-year inspection interval, which is currently scheduled to end on February 19, 2022.

All other ASME Code, Section XI requirements for which relief has not been specifically requested and approved in this relief request remain applicable, including third party review by the Authorized Nuclear Inservice Inspector.

Principal Contributor: Steven Cumblidge

Date: July 16, 2013

W. Gideon

If you have any question, please contact the Project Manager, Araceli T. Billoch Colón at 301-415-3302 or via e-mail at Araceli.Billoch@nrc.gov

Sincerely,

/RA by JPoole for/

Jessie F. Quichocho, Chief Plant Licensing Branch II-2 Division of Operating Reactor Licensing Office of Nuclear Reactor Regulation

Docket No. 50-261

Enclosure: Safety Evaluation

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