

February 16, 2001

Mr. J. W. Moyer, 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 ELECTRIC PLANT, UNIT NO. 2 RE: INSERVICE
INSPECTION REQUEST (NO. 29) FOR RELIEF FROM ASME CODE,
SECTION XI REGARDING AUSTENITIC WELD EXAMINATION
REQUIREMENTS FOR PRESSURE VESSELS, PIPING, AND WELDS
(TAC NO. MA9733)

Dear Mr. Moyer:

By letter dated August 10, 2000, as supplemented November 30, 2000, Carolina Power & Light Company, the licensee for H. B. Robinson Steam Electric Plant, Unit 2 (HBRSEP2), submitted a request for two reliefs: (i) involving the implementation schedule required per American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code, Section XI, 1995 Edition, with 1996 addenda, Appendix VIII, Supplement 2 for specimen requirements for welds examined from outside surfaces after May 22, 2000, as stated in Title 10 of the *Code of Federal Regulations* (10 CFR) Section 50.55a(g)(6)(ii)(C); and (ii) to allow the use of a length sizing acceptance criteria of 0.75 inch root mean square error per ASME Code Case N-622. Also, by letter dated January 5, 2001, the licensee requested an administrative revision to relief request No. 18, which was granted by NRC letter dated October 19, 1992, regarding reclassification of examination category B-F, Item No. B5.130 welds, to examination category B-J, Item No. B9.11 welds.

The staff's evaluation and conclusions are contained in the Enclosure. Based on the information provided in the relief requests, the staff authorizes the reliefs pursuant to 10 CFR 50.55a(g)(6)(i) for item 1 (see Section 3.3 of Enclosure), because the licensee cannot achieve the Code-required coverage from the outside surface nor qualify personnel and procedures to Supplement 2 requirements for examinations from the inside surface, and that the application of the Code is impractical until November 22, 2002. As for item No. 2, the staff concludes that the alternative proposed by the licensee will provide an acceptable level of safety and quality and that there is reasonable assurance that the structural integrity will be maintained (see Section 2.3 of Enclosure). Accordingly, the staff authorizes the use of the alternative pursuant to 10 CFR 50.55a(a)(3)(i),

Both of these reliefs are authorized for the third 10-year inservice inspection interval of HBRSEP2. The administrative revision to relief request No. 18 is also approved.

Further details regarding the staff's evaluation and conclusions are contained in the enclosed Safety Evaluation.

Sincerely,

/RA by R. Laufer Acting for/
Richard P. Correia, Chief, Section 2
Project Directorate II
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket No. 50-261

Enclosure: Safety Evaluation

cc w/encl: See next page

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Further details regarding the staff's evaluation and conclusions are contained in the enclosed Safety Evaluation.

Sincerely,

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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION
THIRD 10-YEAR INTERVAL INSERVICE INSPECTION PROGRAM
REQUEST FOR RELIEF NO. 29 FROM ASME CODE, SECTION XI REQUIREMENTS
H. B. ROBINSON STEAM ELECTRIC PLANT, UNIT NO. 2
DOCKET NUMBER 50-261

1.0 INTRODUCTION

The inservice inspection (ISI) of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (Code) Class 1, Class 2, and Class 3 components is to be performed in accordance with Section XI of the ASME Code and applicable edition and addenda as required by Title 10 of the *Code of Federal Regulations* (10 CFR) Section 50.55a(g), except where specific written relief has been granted by the Commission pursuant to 10 CFR 50.55a(g)(6)(i). 10 CFR 50.55a(a)(3) states in part 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 Inservice Inspection (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) 12 months prior to the start of the 120-month interval, subject to the limitations and modifications listed therein. The Code of record for the third 10-year ISI interval at H. B. Robinson Steam Electric Plant, Unit 2 (HBRSEP2) is the 1986 Edition of Section XI of the ASME Code.

The Materials and Chemical Engineering Branch has reviewed the information submitted by Carolina Power & Light Company, the licensee, in a letter dated August 10, 2000, and supplements dated November 30, 2000, and January 5, 2001, requesting relief from certain Code-required inspection criteria. Specifically, the licensee requested relief from the Section XI, Appendix VIII, Supplement 4 length sizing qualification tolerance and proposed an alternative tolerance. The licensee also requested relief from Section XI, Appendix VIII, Supplement 2 for examinations conducted from the outside of the pipe based on impracticality. Instead of performing a Code-required ultrasonic testing (UT) examination of the pipe welds

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from the outside surfaces, the licensee proposed to continue examining the subject welds from the inside pipe surfaces pursuant to a relief granted on October 19, 1992, until November 22, 2002. For a list of welds covered under this relief, see the licensee's letter dated November 30, 2000.

2.0 UT LENGTH SIZING TOLERANCE FOR REACTOR PRESSURE VESSEL PERFORMANCE DEMONSTRATIONS

2.1 Code Requirements for which Relief is Requested

10 CFR 50.55a(g)(6)(ii)(C) imposes implementation of Appendix VIII to the 1995 Edition with the 1996 Addenda of Section XI of the Code. The imposed implementation schedule for Supplement 4 to Appendix VIII is November 22, 2000. Supplement 4, Subparagraph 3.2(b), length sizing qualification criterion requires that flaw lengths estimated by UT be the true length $-\frac{1}{4}$ inch $+1$ inch. However, 10 CFR 50.55a(b)(2)(xv)(C)(1) modifies the length sizing qualification criterion to a depth sizing acceptance criterion of 0.15 inch root mean square (RMS) and specifies that this be used in lieu of the requirements of Subparagraph 3.2(b).

Supplement 4, Subparagraph 3.2(c) requires that the UT performance demonstration results be plotted on a two-dimensional plot with the measured depth plotted along the ordinate axis and the true depth plotted along the abscissa axis. For qualification, the plot must satisfy the following statistical parameters: (1) slope of the linear regression line is not less than 0.7; (2) the mean deviation of flaw depth is less than 0.25 inches; and (3) correlation coefficient is not less than 0.70.

2.2 Licensee's Proposed Alternative to Code

Pursuant to 10 CFR 50.55a(a)(3)(i), the licensee proposed using a length sizing qualification criterion of 0.75 inch RMS in lieu of Appendix VIII, Supplement 4, Subparagraph 3.2(b), and the RMS value of 10 CFR 50.55a(b)(2)(xv)(C)(1), specifically 0.15 inch RMS, which modifies the depth sizing criterion of Appendix VIII, Supplement 4, Subparagraph 3.2(a), in lieu of Subparagraph 3.2(c).

2.3 Evaluation

The U.S. nuclear utilities created the Performance Demonstration Initiative (PDI) to implement performance demonstration requirements contained in Appendix VIII of Section XI of the Code. To this end, PDI has developed a performance demonstration program for qualifying UT equipment, procedures, and personnel. During the development of the performance demonstration for Supplement 4, PDI determined that the Code criteria for flaw sizing was unworkable. The length sizing tolerance of $-\frac{1}{4}$ inch $+1.0$ inch in Supplement 4, Subparagraph 3.2(b) encouraged examiners to bias their results on the plus side. To discourage testmanship (passing the test based on manipulation of results rather than skill), PDI adopted a length sizing tolerance of 0.75 inch RMS, which has been in use since 1994. As early as 1995, the staff has recognized and accepted PDI's use of 0.75 inch RMS for length sizing. PDI formalized their use of 0.75 inch RMS as the criterion for Supplement 4, Subparagraph 3.2(b), in Code Case N-622, "Ultrasonic Examination of RPV and Piping and Bolts and Stubs, Section XI, Division 1." The NRC representatives to ASME Code meetings participated in the process leading up to the publishing of Code Case N-622.

The NRC staff intended to formalize the acceptability of the 0.75 inch RMS length sizing criterion in 10 CFR 50.55a(b)(2)(xv)(C)(1), but mistakenly published the value of 0.15 inch RMS for depth sizing tolerance in place of the existing length sizing tolerance. The omission of the length sizing tolerance of

0.75 inch RMS in the rule was an oversight, and the inclusion of the depth sizing tolerance in Subparagraph 3.2(b) was an error. The NRC staff considers that the proposed alternative to use a length sizing tolerance of 0.75 inch RMS in lieu of the requirements in Supplement 4, Subparagraph 3.2(b) will provide an acceptable level of quality and safety.

In the second part of the alternative, the licensee proposed eliminating the use of Supplement 4, Subparagraph 3.2(c), which imposes three statistical parameters for depth sizing. The first parameter, 3.2(c)(1), pertains to the slope of a linear regression line. The linear regression line is the difference between actual versus true value plotted along a through-wall thickness. For Supplement 4 performance demonstrations, a linear regression line of the data is not applicable because the performance demonstrations are performed on test specimens with flaws located in the inner 15% through-wall. The differences between actual versus true value produce a tight grouping of results that resemble a shot gun pattern. The slope of a regression line from such data is extremely sensitive to small variations, thus making the parameter of Subparagraph 3.2(c)(1) a poor and inappropriate acceptance criterion. The second parameter, 3.2(c)(2), pertains to the mean deviation of flaw depth. The value used in the Code is too lax with respect to evaluating flaw depths within the inner 15% of wall thickness. Therefore, the licensee proposed to use the more appropriate criterion of 0.15 inch RMS of 10 CFR 50.55a(b)(2)(xv)(C)(1), which modifies Subparagraph 3.2(a), as the acceptance criterion. The third parameter, 3.2(c)(3), pertains to a correlation coefficient. The value of the correlation coefficient in Subparagraph 3.2(c)(3) is inappropriate for this application since it is based on the linear regression from Subparagraph 3.2(c)(1).

PDI was aware of the inappropriateness of Subparagraph 3.2(c) early in the development of their program. They brought the issue before the appropriate ASME committee, which formalized eliminating the use of Supplement 4, Subparagraph 3.2(c) in Code Case N-622. The NRC staff representatives participated in the discussions and consensus process of the Code case. Based on the above, the NRC staff finds that the use of Subparagraph 3.2(c) requirements in this context is inappropriate and that the proposed alternative to use the RMS value of 10 CFR 50.55a(b)(2)(xv)(C)(1), specifically 0.15 inch RMS, which modifies the criterion of Appendix VIII, Supplement 4, Subparagraph 3.2(a), in lieu of Subparagraph 3.2(c) will provide an acceptable level of quality and safety.

2.4 Conclusion

Based on the discussion above, the staff has concluded that the proposed alternative length sizing qualification criterion of 0.75 inch RMS in lieu of Appendix VIII, Supplement 4, Subparagraph 3.2(b), and the RMS value of 10 CFR 50.55a(b)(2)(xv)(C)(1), which modifies the depth sizing criterion of Appendix VIII, Supplement 4, Subparagraph 3.2(a), in lieu of Subparagraph 3.2(c) will provide an acceptable level of quality and safety. Therefore, pursuant to 10 CFR 50.55a(a)(3)(i), the staff authorizes the proposed alternative for the third 10-year interval.

3.0 WELD VOLUMETRIC EXAMINATION FROM INSIDE THE PIPE

The system/component for which relief is requested is for Class 1, Examination Categories B-J Item B9.11, and B-F Item B5.130 pipe welds adjacent to or attaching to the reactor pressure vessel. The relief is for the third 10-year ISI interval through November 22, 2002.

3.1 Requirements for which Relief is Requested

10 CFR 50.55a(g)(6)(ii)(C) requires that Supplement 2, "Qualification Requirements for Wrought Austenitic Piping Welds," to Appendix VIII, "Performance Demonstration for Ultrasonic Examination Systems," of Section XI, Division 1, 1995 Edition with 1996 Addenda of the ASME Code be implemented by May 22, 2000. Section XI requires that austenitic welds be examined using personnel, procedures and equipment qualified to the requirements of Appendix VIII, Supplement 2. Relief is requested from implementing Supplement 2 specimen qualification from the outside surfaces of the welds through November 22, 2002.

3.2 Licensee's Proposed Alternative to Code

The licensee proposed to continue examination of the subject welds from the inside surfaces pursuant to a relief granted on October 19, 1992.

3.3 Evaluation

In 1991, licensees created the PDI to implement the performance demonstration requirements of Appendix VIII to Section XI of the Code for ultrasonic examination systems. PDI began qualifying personnel and procedures to Appendix VIII, Supplements 2 and 3 in 1994. These qualifications were applicable for UT examinations conducted from the outside surface of the pipe-to-pipe weld. By the time the proposed rule was published for comment in the *Federal Register* (62 FR 63892) on December 3, 1997, the staff and PDI believed that a sufficient number of UT personnel were qualified to Supplement 2 requirements to satisfy the licensees' needs. The staff established the accelerated implementation schedule for Supplement 2 based on this availability of qualified personnel. The final rule was published in the *Federal Register* (64 FR 51370) on September 22, 1999, which has since been reflected in the regulations.

Shortly after publishing the final rule, PDI realized that their program could not support Supplement 2 performance demonstrations conducted from the inside surface. For example, the existing test specimens were designed for performance demonstrations performed on the outside surface; the specimens contained flaws which were visible from the inside surface; and the specimens did not model geometric limitations or scanning conditions which would be encountered during inside surface examinations. To support performance demonstrations conducted from the inside pipe surface, PDI has had to design, fabricate, and acquire new test specimens; develop the appropriate protocol and test implementation procedures; "fingerprint" the specimens; develop inspection procedures; and train personnel. PDI projected that they will be able to support performance demonstrations from the pipe inside surface by November 22, 2002.

The licensee determined that Supplement 2 examinations performed on the outside surface of the primary nozzle-to-safe-end and safe-end-to-pipe welds would not satisfy Code coverage

requirements. These examinations are hindered by the limited sand plug access provided from the floor of the refueling cavity to the outside of the subject welds, which are identified in the licensee's letter dated November 30, 2000. In order to satisfy the required accelerated implementation of Supplement 2, the licensee would have to either reconstruct the access to the subject welds, which is impractical, or seek relief for incomplete coverage based on impracticality.

Instead of reconstructing the access to the subject welds or performing a partial Supplement 2 examination from the outside surface of the subject welds, the licensee proposed in their request for relief that they continue to perform examinations of the subject welds from the inside surface pursuant to the relief granted by the staff in a letter dated October 19, 1992. These examinations consisted of complete through-wall UT examination from the inside surface of the subject welds, which exceeded the Code-required volume. The Code-required volume is the inner 1/3 of the weld area.

The staff finds that requiring the licensee to conduct UT examination from the outside surface of the pipe in accordance with the qualification requirements of Supplement 2 is impractical given the access limitations, and concludes that continued examination of the subject welds from the inside surface until November 22, 2002, in accordance with the relief granted in the staff's October 19, 1992, safety evaluation, will continue to provide reasonable assurance of structural integrity.

3.4 Conclusion

Because the licensee cannot achieve the Code-required coverage from the outside surface nor qualify personnel and procedures to Supplement 2 requirements for examinations from the inside surface, the application of Supplement 2 of Appendix VIII to Section XI of the Code is impractical until November 22, 2002, the time at which the licensee will be able to meet the requirements of the Code. The staff has also concluded that examination of the subject welds in accordance with the relief granted on October 19, 1992, will continue to provide reasonable assurance of structural integrity. Therefore, the staff grants relief for the subject welds from Supplement 2 requirements, pursuant to 10 CFR 50.55a(g)(6)(i) until November 22, 2002. The grant of relief 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.

By letter dated January 5, 2001, the licensee notified the NRC staff of the results of its reclassification of reactor pressure vessel safe end-to-piping circumferential welds. The HBRSEP2 Third 10-Year Interval ISI Program Plan had classified these welds under Examination Category B-F, "Pressure-Retaining Dissimilar Metal Welds," Item No. B5.130. A reevaluation of these welds resulted in a revision to the ISI Program which reclassified these welds under Examination Category B-J, "Pressure-Retaining Welds in Piping," Item No. B9.11.

Since the relief previously granted to the licensee on October 19, 1992, was developed and approved under the premise that the affected welds were classified as Examination Category B-F, Item No. B5.130, the licensee determined that a revision to that relief request was needed to reflect the revised classification of these welds. The staff has determined that the licensee's reclassification of these welds is administrative in nature and has no impact on the staff's safety findings regarding the grant of relief.

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Date: February 16, 2001

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