

September 29, 2004

Mr. William R. McCollum
Vice President Nuclear Support
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526 South Church Street
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SUBJECT: CATAWBA NUCLEAR STATION, UNITS 1 AND 2 - REQUEST FOR RELIEF,
04-GO-006, FOR USE OF AN ALTERNATE CODE CASE TO USE
ULTRASONIC TECHNIQUES, EQUIPMENT, PROCEDURES AND
PERSONNEL QUALIFICATIONS (TAC NOS. MC0697 AND MC0698)

Dear Mr. McCollum:

By letter to the U.S. Nuclear Regulatory Commission (NRC) dated September 8, 2003, as supplemented by letter dated August 10, 2004, Duke Energy Corporation, the licensee for Catawba Nuclear Station (Catawba), Units 1 and 2, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR), Section 50.55a(a)(3)(i), requested the use of an alternative to the American Society of Mechanical Engineers (ASME) *Boiler and Pressure Vessel Code* (Code), Section XI, 1989 Edition with no Addenda, Appendix I, I-2100. Specifically, the licensee requested relief from specific requirements when ultrasonic examination is performed on circumferential and longitudinal welds in steam generators and pressurizers.

The NRC staff has completed its review of the subject request for relief. As documented in the enclosed Safety Evaluation, the NRC staff concludes that the proposed alternative provides an acceptable level of quality and safety. Therefore, the licensee's proposed alternative to the ASME Code requirements is authorized pursuant to 10 CFR 50.55a(a)(3)(i), for the second 10-year inservice inspection interval at Catawba, Units 1 and 2. All other ASME Code, Section XI, requirements for which relief was not specifically requested and approved in this relief request remain applicable, including third party review by the Authorized Nuclear Inservice Inspector.

Sincerely,

/RA/

Mary Jane Ross-Lee, Acting Chief, Section 1
Project Directorate II
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket Nos. 50-413 and 50-414

Enclosure: As stated

cc w/encl: See next page

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* No major changes to SE

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Dated: September 29, 2004

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Catawba Nuclear Station, Units 1 & 2

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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION
RELIEF ON CIRCUMFERENTIAL AND LONGITUDINAL ULTRASONIC EXAMINATION OF
WELDS FOR STEAM GENERATORS AND PRESSURIZERS,
REQUEST FOR RELIEF 03-GO-006
CATAWBA NUCLEAR STATION, UNITS 1 AND 2
DOCKET NOS. 50-413 AMD 50-414

1.0 INTRODUCTION

By letter to the U.S. Nuclear Regulatory Commission (NRC) dated September 8, 2003, as supplemented by letter dated August 10, 2004, Duke Energy Corporation, the licensee for Catawba Nuclear Station (Catawba), Units 1 and 2, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR), Section 50.55a(a)(3)(i), requested the use of an alternative to the American Society of Mechanical Engineers (ASME) *Boiler and Pressure Vessel Code* (Code), Section XI, Appendix I, I-2100, 1989 Edition with no Addenda.

Appendix I, I-2100 references ASME Code, Section V, Article 4, for the ultrasonic examination (UT) of welds in ferritic pressure vessels greater than 2 inches in thickness. The licensee proposed an alternative to perform UT in accordance with ASME Code, Section XI, Appendix VIII, Supplements 4 and 6 of the 1995 Edition through 1996 Addenda for UT of circumferential and longitudinal welds in steam generators and pressurizers for the remainder of the second 10-year inservice inspection (ISI) interval at Catawba, Units 1 and 2. Supplement 4 is entitled, "Qualification Requirements for the Clad/Base Metal Interface of Reactor Vessel," and Supplement 6 is entitled, "Qualification Requirements for Reactor Vessel Welds other than Clad/Base Metal Interface." The licensee procedure was qualified under the Performance Demonstration Initiative (PDI) program in accordance with the PDI implementation of ASME Code, Section XI, Appendix VIII, for use on steam generator and pressurizer welds.

2.0 REGULATORY EVALUATION

2.1 Applicable Requirements

The ISI of ASME Code Class 1, 2, and 3, components is to be performed in accordance with Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components," of the ASME Code and applicable addenda as required by 10 CFR 50.55a(g), except where specific relief has been granted by the Commission 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 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, 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 applicable edition of Section XI of the ASME Code for the second 10-year interval for Catawba, Units 1&2 is the 1989 Edition with no Addenda. The Catawba, Unit 1 second 10-year interval started on June 29, 1995, and ends June 29, 2005. The Catawba, Unit 2 second 10-year ISI interval started August 19, 1996, and ends August 19, 2006.

3.0 TECHNICAL EVALUATION

3.1 Systems/Components For Which Relief Is Requested

Category B-B Pressure Retaining Welds in Vessels other than Reactor Vessels

Item Numbers:

- B2.11 Pressurizer Circumferential and Shell-to-Head Welds
- B2.12 Pressurizer Longitudinal and Shell-to-Head Welds
- B2.31 Steam Generator (Primary Side) Circumferential Head Welds
- B2.40 Tubesheet-to-Head Welds

Category C-A Pressure Retaining Welds in Pressure Vessels

Item Numbers:

- C1.10 Shell Circumferential Welds
- C1.20 Head Circumferential Welds
- C1.30 Tubesheet-to-Shell Welds

3.2 Code Requirements From Which Relief is Requested

ASME Code, Section XI, Appendix I, I-2100, 1989 Edition with no Addenda requires that UT of pressure vessel welds greater than 2 inches in thickness be examined in accordance with ASME Code, Section V, Article 4, 1989 Edition with no Addenda, as supplemented by the additional requirements of Appendix I.

3.3 Licensee's Proposed Alternative

The licensee proposes using ultrasonic techniques with equipment, procedures and personnel qualified in accordance with ASME Code, Section XI, Appendix VIII, Supplements 4 and 6, 1995 Edition through the 1996 Addenda, when examining circumferential and longitudinal welds greater than 2 inches in thickness in steam generators and pressurizers. The ultrasonic

procedure which the licensee has qualified applies to ferritic pressure vessels greater than 2 inches to 7.5 inches in thickness inclusive. The manual contact techniques use 60° to 70° refracted longitudinal wave search units.

The licensee realizes that all vessel weld configurations cannot be fully examined by the techniques qualified through PDI and, therefore, will limit the application to welds where scanning can be accomplished in four orthogonal directions and achieve coverage greater than 90 percent as permitted by ASME Code, Section XI, Code Case N-460. Configurations that will not be examined with the PDI qualified procedure are nozzle-to-vessel welds where access is restricted to one side of the weld, and head-to-shell welds where the ratio of the inside diameter to the outside diameter of the head prevents the 60° beam angle from intercepting the inside surface.

3.4 Basis for Use of Proposed Alternative

ASME Code, Section V, Article 4, 1989 Edition with no Addenda, describes the required techniques to be used for the UT of welds in ferritic pressure vessels greater than 2 inches in thickness. These techniques were first published in ASME Code, Section V, Article 4, 1974 Edition, Summer 1975 Addenda. The calibration technique and recording criteria based on the use of a distance-amplitude-correction curve (DAC) represented "good practice" at the time and have not changed materially in 28 years.

In 1999, the licensee participated in Appendix VIII performance demonstrations using mock-ups with procedures and equipment showing that use of a DAC is irrelevant in performing UT examination of ferritic pressure vessel welds. The demonstrations also showed that fewer beam angles than required by ASME Code, Section V, Article 4, were needed to detect flaws in ferritic pressure vessel welds. In addition, it was found that the 20 percent DAC recording criteria was arbitrary. The performance demonstrations were conducted in accordance with ASME Code, Section XI, Code Case N-622, Supplements 4 and 6 and monitored by the PDI at the Electric Power Research Institute Nondestructive Examination Center.

3.5 NRC Staff Evaluation

The PDI program, based on the criteria of Appendix VIII, Section XI of the ASME Code, requires that ultrasonic techniques, equipment, procedures, and examination personnel be qualified on flawed and notched materials and configurations similar to those found in actual plant conditions. Hence, performance-based UT techniques provide a higher degree of reliability for detection and characterization of flaw when compared to the conventional amplitude-based ultrasonic techniques required by the applicable ASME Code. The NRC staff has assessed the PDI program activities and in 10 CFR 50.55a requires the use of PDI techniques for UT of material and welds in specific components in accordance with ASME Code, Section XI, Appendix VIII.

This relief request pertains to a relief from ASME Code, Section XI, Appendix I, I-2100, 1989 Edition, in regard to the ASME Code-required UT of circumferential and longitudinal welds in the steam generators and pressurizers of Catawba, Units 1 and 2, for the remainder of the second 10-year ISI interval. The licensee proposes an alternative to perform UT in accordance with ASME Code, Section XI, Appendix VIII, Supplements 4 and 6 of the 1995 Edition through 1996 Addenda when examining circumferential and longitudinal welds greater than 2 Inches in

thickness. The NRC staff's evaluation focused on the suitability of the licensee's procedure, "Ultrasonic Examination of Ferritic Pressure Vessel Welds Greater Than 2 Inches in Thickness" applicable to the RPV and qualified under the PDI program in accordance with the PDI implementation of ASME Code, Section XI, Appendix VIII for use on steam generator and pressurizer welds in regard to materials, thickness, diameter and product form.

Based on the information provided by the licensee, the NRC staff has determined that the use of ultrasonic techniques, equipment, procedures, and personnel qualifications in accordance with ASME Code, Section XI, Appendix VIII, Supplements 4 and 6 of the 1995 Edition through 1996 Addenda, will provide an equivalent or better examination than that of the applicable standards for steam generator and pressurizer welds identified in the relief request. Should there be any limitation to use the ultrasonic techniques of Appendix VIII in case of any specific weld configuration in the subject components, the licensee may use the examination methods prescribed in ASME Code, Section V, Article 4. The NRC staff's evaluation concludes that the licensee's proposed alternative will, therefore, provide an acceptable level of quality and safety.

4.0 CONCLUSION

Based on the NRC staff's review, of the information provided in the request for relief, the NRC staff concludes that the licensee's proposed alternative to ASME Code, Section XI, 1989 Edition with no Addenda, Appendix I, I-2100 requirements provides an acceptable level of quality and safety. Therefore, pursuant to 10 CFR 50.55a(a)(3)(i), the proposed alternative is authorized for Catawba Units 1 and 2 for the remainder of the second 10-year ISI interval. All other ASME Code, Section XI requirements for which relief was not specifically requested and approved in this relief request remain applicable, including third party review by the Authorized Nuclear Inservice Inspector.

Principal Contributor: P. Patnaik

Date: September 29, 2004