



Duke Energy Corporation
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September 8, 2003

U. S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001

ATTENTION: Document Control Desk

SUBJECT: Duke Energy Corporation
Oconee Units 1, 2, & 3
Docket Nos. 50-269, 50-270, 50-287
McGuire Nuclear Station, Unit 2
Docket No. 50-370
Catawba Nuclear Station, Units 1 & 2
Docket Nos. 50-413, 50-414

Relief Request for Alternative to ASME Section XI
Relief Request 03-GO-006

Pursuant to 10 CFR 50.55a (a) (3) (i), Duke Energy Corporation (Duke) requests the use of an alternative to the ASME Boiler and Pressure Vessel Code, Section XI, Appendix I, I-2100, 1989 Edition with no addenda for the remainder of the third inspection interval of Oconee Units 1, 2, and 3, and the second inspection interval of McGuire Unit 2 and Catawba Units 1 and 2.

Specifically, Duke requests relief from specific requirements when ultrasonic examination is performed on circumferential and longitudinal welds in steam generators and pressurizers. As an alternate, Duke requests approval to use the ultrasonic techniques, equipment, procedures, and personnel qualifications in accordance with ASME Section XI, Appendix VIII, Supplements 4 and 6, 1995 Edition through 1996 Addenda when examining circumferential and longitudinal welds greater than 2 inches in thickness in steam generators and pressurizers.

A detailed description of the proposed alternative and justification is included as an attachment to this letter. Duke is requesting approval of this request by September 8, 2004, to support the Catawba Unit 2 and Oconee Unit 3 outages in the fall of 2004. Questions regarding this request may be directed to R. K. Nader at 704-382-0979.

Very truly yours,

W. R. McCollum, Jr.
Senior Vice President, Nuclear Support

A047

Attachment

xc w/att: L. A. Reyes, Regional Administrator
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bxw w/ att: M. T. Cash (EC05O)
C. J. Thomas (MG01RC)
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G. D. Gilbert (CN01RC)
K. E. Nicholson (CN01RC)
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J. E. Smith (ON03RC)
R. P. Todd (MD02FE)
J. M. Ferguson - Date File (CN01SA)
R. K. Rhyne (EC07J)
J. J. McArdle (EC07J)
T. Wills (WC28H)
R. O. Sharpe (WC28H)
J. O. Barbour (EC07J)
MNS MasterFile MC-801.01 (MG01DM)
CNS MasterFile CN-801.01 (CN04DM)
ONS MasterFile ON-801.01 (ON03DM)
ELL

bxc w/ attach: North Carolina Municipal Power Agency Number 1
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DUKE ENERGY CORPORATION
McGuire Unit 2
Catawba Units 1 and 2
Oconee Units 1, 2 and 3

10-YEAR INTERVAL REQUEST FOR RELIEF NO. 03-GO-006

Pursuant to 10CFR50.55a (a) (3) (i), Duke Energy Corporation proposes an alternative to the requirements of ASME Section XI, 1989 Edition with no addenda. The following information is submitted in support of our proposed alternative.

I. **System/Components for Which the Alternative Applies:**

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

Item Number:

- 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 Number:

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

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

III. Code Requirement for Which the Alternative is Requested:

ASME Section XI, Appendix I, I-2100 references ASME Section V, Article 4 for the ultrasonic examination of welds in ferritic pressure vessels greater than 2 inches in thickness. Duke Energy Corporation proposes alternatives to the requirements of ASME Section V, Article 4 as shown below when manual ultrasonic examination is performed on circumferential and longitudinal welds in steam generators and pressurizers.

T-424.3 Scanning Sensitivity Level.

"Scanning shall be performed at a gain setting at least two times the reference level, except that the reference level shall be used when electronic distance-amplitude correction is used with automated recording. For both manual and mechanized examinations, recording of indications shall be made with respect to the reference level. During scanning only the gain or attenuator controls may be adjusted. Any adjustments to the other controls shall require recalibration."

Duke Energy Corporation Alternative

Duke Energy Corporation proposes to record indications at the scanning sensitivity levels that have been demonstrated during procedure qualification.

T-432.1.1 Calibration Check Upon Change in the Complete Ultrasonic Examination System.

"Alternate cables and search units singly and in combinations that have been included in a prior system calibration may be later substituted in the system; such substitution shall not necessitate a calibration check. When any other part of the examination system is changed, a calibration check shall be made on the basic calibration block to verify the $\frac{1}{4}$, $\frac{1}{2}$, and $\frac{3}{4}$ T points on the sweep and distance amplitude correction values recorded satisfy the requirements of T-433.1 and T-433.2."

Duke Energy Corporation Alternative

Duke Energy Corporation proposes to verify sweep using an International Institute of Welding (IIW) block, and to verify amplitude using a single reflector in the basic calibration block.

T-432.1.2 Calibration Check on Basic Calibration Block or Simulator Check.

"A calibration check on at least two of the basic reflectors in the basic calibration block (T-441.1.1) shall be made at the finish of each examination, every 12 hr during the examination, and when examination personnel (except for mechanized equipment) are changed. The sweep and distance amplitude correction values recorded shall satisfy the requirements of T-433.1 and T-433.2."

Duke Energy Corporation Alternative

Duke Energy Corporation proposes to perform calibration checks using an International Institute of Welding (IIW) block to verify sweep and a using single reflector in the basic calibration block to verify amplitude.

T-432.3.1 Angle Beam Calibration

"The calibration shall provide the following measurements (Appendix B contains a general technique):

(...)

(b) Distance-amplitude correction;"

Duke Energy Corporation Alternative

Duke Energy Corporation proposes to use a performance based calibration technique in lieu of distance-amplitude correction.

T-432.3.2 Straight Beam Calibration

"The method of calibration shall provide the following measurements (Appendix C gives a general technique):

(a) sweep range calibration;

(b) distance-amplitude correction;"

Duke Energy Corporation Alternative

Duke Energy Corporation proposes to exclude straight beam examination.

T-433.1 Sweep Range Calibration

"If any point on the DAC curve has moved on the sweep line more than 10% of the sweep division reading, correct the sweep range calibration and note the correction in the examination record."

Duke Energy Corporation Alternative

Duke Energy Corporation proposes using a single reflector in the basic calibration block as an alternative to a DAC, and will apply the same acceptance criteria stated in the Code.

T-433.2 DAC Correction

"If any point on the distance-amplitude correction (DAC) curve has decreased 20% or 2 dB of its amplitude, all data sheets since the last calibration or calibration check shall be marked void. A new calibration shall be made and recorded and the voided examination areas shall be reexamined. If any point on the distance-amplitude correction (DAC) curve has increased more than 20% or 2 dB of its amplitude, all recorded indications since the last valid calibration or calibration check shall be evaluated with the corrected calibration and their values shall be changed on the data sheets."

Duke Energy Corporation Alternative

Duke Energy Corporation proposes using a single reflector in the basic calibration block as an alternative to a DAC, and apply the same acceptance criteria stated in the Code.

T-441.3.2.1 General Scanning Requirements

"These volumes shall be scanned by straight and angle beam techniques as described in detail in T-441.3.2.3 (a) and (b), and T-441.3.2.5. Three angle beams, having nominal angles of 45 deg., 60 deg., and 70 deg. with respect to a perpendicular to the examination surface, shall generally be used. Beam angles other than 45 deg. and 60 deg. are permitted provided the measured difference between angles is at least 10 deg."

Duke Energy Corporation Alternative

Duke Energy Corporation proposes to examine the required volume with 60 deg. and 70 deg. beam angles qualified by performance demonstration. Straight beam and the 45 deg. beam angle will not be used to detect planar reflectors. Duke Energy Corporation will use a straight beam to detect laminations prior to the initial angle beam examination.

T-441.3.2.5 Angle Beam Scanning

"The examination using the 70 deg. beam shall cover the near surface to a depth of 1 in. or $\frac{1}{4}$ thickness, whichever is greater."

Duke Energy Corporation Alternative

Duke Energy Corporation proposes to use the 70 deg. beam angle to cover the near surface to a depth of 1 in. or 15% of the thickness, whichever is greater.

T-441.3.2.8 Recording Angle Beam Examination Data for Planar Reflectors

"(a) Record all reflectors that produce a response equal to or greater than 20% of the distance-amplitude correction (DAC). However, clad interface and backwall reflections need not be recorded. Record surface reflectors that produce a response equal to or exceeding the calibration amplitude established per T-432.3.1 (d)."

Duke Energy Corporation Alternative

Duke Energy Corporation proposes recording angle beam data as follows:

1. Clad Vessels

- Surface reflectors that produce a 3:1 signal to noise ratio when compared to the clad roll at the scanning gain level.
- Non-surface connected reflectors that have amplitudes greater than 20% of full screen height at the scanning gain level.

2. Non-Clad Vessels

All reflectors that have amplitudes greater than 20% of full screen height at the scanning gain level.

3. Additional factors used in determining if an indication should be recorded are:

- An indication is detected and plotted in the same location from two opposite directions;
- An indication detected from a perpendicular scan plots to the same location as an indication found in a parallel scan;
- An indication "travels" or shows target motion;
- Tip diffracted signals are present with the indication.

- IV. **Basis for the Relief:** ASME Section V, Article 4 describes the required techniques to be used for the ultrasonic examination of welds in ferritic pressure vessels greater than 2 inches in thickness. These techniques were first published in ASME 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 twenty-eight years.

In 1999 Duke Energy Corporation participated in Appendix VIII performance demonstrations using mock-ups with procedures and equipment showing that use of a DAC is irrelevant in performing ultrasonic examination of ferritic pressure vessel welds. The demonstrations also showed that fewer beam angles than required by ASME Section V, Article 4 were needed to detect flaws in ferritic pressure vessel welds. In addition it was found that the 20% DAC recording criteria was arbitrary. The performance demonstrations were conducted in accordance with ASME Section XI, Code Case N-622, Supplements 4 and 6 and monitored by the Performance Demonstration Initiative (PDI) at the EPRI NDE Center.

- V. **Alternative Method for Ultrasonic Examination:** Duke Energy Corporation proposes using ultrasonic techniques with equipment, procedures and personnel qualified in accordance with ASME 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 Duke Energy Corporation has qualified applies to Ferritic pressure vessels greater than 2 inches to 7.5 inches in thickness inclusive. The manual contact techniques use 60° and 70° refracted longitudinal wave search units.

Duke Energy Corporation 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% as permitted by 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.

VI. **Justification for the Granting of Relief:** Ultrasonic examinations performed in accordance with ASME Section V, Article 4 require the use of 0°, 45°, 60° and 70° beam angles with recording criteria that are time consuming and increase personnel radiation exposure without a compensating increase in quality or safety. Ultrasonic techniques qualified in accordance with Appendix VIII and administered by the PDI would increase the reliability of the ultrasonic examination, improve the level of quality and lessen personnel radiation exposure by reducing examination time without a decrease in quality or safety.

VII. **Implementation:** Duke Energy will perform the ultrasonic examinations described in Section V of this relief request for the remainder of the 2nd inspection interval at McGuire Unit 2, Catawba Units 1 and 2, and the 3rd inspection interval at Oconee Units 1, 2 and 3

Sponsored By

James J. McQuille III

Date

9-3-03

Reviewed By

G. B. Barlow

Date

9/3/03