

April 25, 2003

Mr. G. R. Peterson
Site Vice President
Catawba Nuclear Station
Duke Energy Corporation
4800 Concord Road
York, South Carolina 29745-9635

SUBJECT: CATAWBA NUCLEAR STATION, UNIT 1 RE: RELIEF REQUEST (RR)
NO. 02-003 (TAC NO. MB6113)

Dear Mr. Peterson:

By letter dated August 12, 2002, Duke Energy Corporation (the licensee) requested that the U.S. Nuclear Regulatory Commission staff grant relief from certain requirements of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code, Section XI, regarding a fitup mismatch of weld 1RN182-33 in the nuclear service water piping for Catawba, Unit 1.

The staff has reviewed the information provided for this relief request. The staff's Safety Evaluation is provided in the Enclosure. Based on the information provided in RR 02-003, the staff grants relief from the weld mismatch requirements for weld 1RN182-33, pursuant to Title 10 of the *Code of Federal Regulations*, Section 50.55a(a)(g)(6)(i), for Catawba, Unit 1.

Sincerely,

/RA by LOIshan for/

John Nakoski, Chief, Section 1
Project Directorate II
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket No. 50-413

Enclosure: As stated

cc w/encl: See next page

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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

REQUEST FOR RELIEF NUMBER 02-003, MISMATCH OF WELD 1RN182-33

CATAWBA NUCLEAR STATION, UNIT 1

DUKE ENERGY CORPORATION

DOCKET NO. 50-413

1.0 INTRODUCTION

The inservice inspection (ISI) of the American Society of Mechanical Engineers (ASME) Code Class 1, 2, and 3 components is to be performed in accordance with Section XI of the ASME Boiler and Pressure Vessel Code and applicable 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 U.S. Nuclear Regulatory Commission pursuant to 10 CFR 50.55a(g)(6)(i). The regulation of 10 CFR 50.55a(g)(6)(i) states that 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 that could result if the requirements were imposed on the facility.

By letter dated August 12, 2002, the Duke Energy Corporation (the licensee) submitted a request for a one-time relief pursuant to 10 CFR 50.55a(g)(5)(iii). The Catawba Nuclear Station (Catawba), Unit 1 applicable ISI code is the ASME Code, Section XI, 1989 Edition. ASME Code, Section XI requires that replacement activities at nuclear power plants shall meet the applicable construction code requirements to which the original items were constructed. The applicable construction code for Catawba, Unit 1 is ASME Code, Section III, 1974 Edition, including the 1974 Summer Addenda. The licensee sought relief from the requirements of the ASME Code, Section III, because weld 1RN182-33 joined two sections of piping that had an alignment mismatch in excess of the mismatch allowed by ASME Code, Section III. Weld 1RN182-33 is located in the nuclear service water system (RN) at the Catawba, Unit 1. The information provided by the licensee in support of the request has been evaluated and the basis for disposition is documented below.

2.0 REGULATORY EVALUATION

Background Information (as excerpted from the licensee's submittal):

During March, 2002, a modification to change out piping from the RN supply to the Control Room Area (YC) Chiller, fitup requirements of a welded joint from the original construction code were not satisfied. This butt welded joint joins two horizontal sections of 24" standard wall pipe. The pipe on one side of the joint was new, the other side - existing. The weld is located on a supply header, approximately 26.5" from the 8" branch line which supplies cooling water to the A train, Control Room Area Chiller

Condensers. The piping material is carbon steel (SA106 Grade B). The design pressure of the system is 150 psig and the design temperature is 150°F.

The circumferential butt weld joint 1RN182-33 was installed with a 5/32" mismatch that extended for about 18" around the top of the piping. (See Figure 1.) The internal joint surfaces at the bottom of the piping were flush, i.e. no observable mismatch. The root pass was made using the GTAW [gas tungsten arc welding] process, the fill passes made using a SMAW [shielded metal arc welding] process. A slight buildup on the outside surface was faired into the adjacent base metal using a 3:1 taper. Visual and surface examinations were performed on both the root pass and final pass. This is a Duke Class C, ASME Class 3 weld and is required to meet the requirements of ASME Section III, Subsection ND. In accordance with ND-4233, the maximum allowed mismatch at any one point around the circumference of the welded joint is 3/32".

The piping joint is located in the Unit 1, A train, RN essential header supplying the Control Room Area Chiller Condensers. The function of the supply is to remove heat in the YC Chiller condenser section. In turn, the YC system supports the cooling operation of the Control Room Area Ventilation (VC) System.

2.0 LICENSEE'S EVALUATION

The Components for Which Relief is Requested

Nuclear Service Water Piping (RN System) Weld Joint 1RN182-33, Class 3

Code Requirements (as stated):

The applicable inservice inspection code for Catawba Nuclear Station is ASME XI, 1989 Edition. The general requirements for replacement activities are specified by Article IWA-7000. Subarticle IWA-7200 states:

Any items to be used for replacement shall meet the following requirements unless the alternative of (c) below is adopted:

- (1) the applicable Construction Code to which the original item was constructed and
- (2) the existing design requirements

The applicable construction code for Catawba Nuclear Station is ASME III, 1974 Edition including the 1974 Summer Addenda. Subsubarticle ND 4230 includes the rules for fitting and aligning. In paragraph ND-4233, *Alignment Requirements When Component Inside Surfaces Are Inaccessible*, the Code specifies:

When the inside surfaces of components are inaccessible for welding or fairing in accordance with ND-4232.1, the inside diameters shall match each other within 1/16 in. When the components are aligned concentrically, a uniform mismatch of 1/32 in. all around the joint can result as shown in Fig. ND-4233-1 sketch (a). However, other variables not associated with the diameter of the component often result in alignments that are offset rather than concentric. In

these cases, the maximum misalignment at any one point around the joint shall not exceed 3/32 in., as shown in Fig ND-4233-1 sketch (b). Should component tolerances on diameter, wall thickness and out of roundness result in inside diameter variations which do not meet these limits, the inside diameters shall be counterbored, sized or ground to produce a bore within these limits.

Relief Requested (as stated):

In accordance with 10 CFR50.55a(g)(5)(iii), Duke Energy Corporation requests relief from the requirements of subparagraph IWA-7200 of the ASME Code Section XI, for the replacement of piping associated with weld joint 1RN182-33 in the Nuclear Service Water System.

Basis for Relief (as stated):

Nominal stresses are low at this location primarily due to low deadweight, pressure, thermal and other design loadings. (See Table 1.) Vibrational stresses from normal operation are also low. Changes in stress concentration and stress intensification factors for the mismatch are not significant considering the margin between existing design and allowable stresses. An engineering evaluation has concluded that considering a penalty for the stress raiser (in terms of increased stress indices and an increased stress intensification factor) created by the mismatch, all ASME III, ND 3600 design requirements remain satisfied.

Table 1

Tabulation of Existing Stresses at Weld 1RN182-33 Location (Based on stress intensification factor = 1.0)		
ASME III, ND 3600 Equation	Existing Stress (psi)	Allowable Stress (psi)
8	2660	15000
9	2795	18000
9E/9F	2914	27000
10	1117	22500

Consideration of repair was performed but rejected since the residual stresses from a forced fitup may counteract reduction in stresses from an elimination of stress concentration effects. Temporary welded attachments are typically used to force the circumferential shape necessary to achieve fitup. Residual stresses are developed in the joint after completion of the weld as the load is removed from these attachments. In this particular case, these residual stresses may be more detrimental than the stress concentration effects from the mismatch.

The evaluation of the existing configuration has also considered erosion/corrosion effects. The RN system at Catawba has been susceptible to wall thinning and pitting. An established plant program for corrosion monitors wall thinning of piping components to ensure the structural integrity of the piping. Sample locations within the system are

ultrasonically examined for wall thickness measurements. Each location consists of a grid where values are determined. Wall thickness values are then extrapolated to other parts of the system based on geometrical similarities and projected corrosion rates. Projected wall thicknesses have been and will continue to be considered in the evaluation of the joint mismatch.

Flow accelerated corrosion (FAC) at the localized region of mismatch is also not a concern since the RN design temperature is 150°F and FAC is not typically a significant concern at temperatures below 200°F. In addition, the flow velocity on the 24-inch RN header under normal operating conditions is less than 4 ft/sec. Low velocities and low water temperature preclude the piping from any detrimental effects of FAC.

An engineering evaluation of the existing condition was performed and has demonstrated that the current configuration is structurally acceptable. No changes to the existing joint configuration will be pursued.

Staff Evaluation

By letter dated August 12, 2002, the licensee submitted a request for relief pursuant to 10 CFR 50.55a(g)(5)(iii). The licensee sought relief from the requirements of ASME Code, Section XI, and the referenced requirements of Section III, because weld 1RN182-33 joins two sections of piping that have an alignment mismatch of 5/32-inch that is in excess of the 3/32-inch mismatch allowed by ASME Code, Section III. Weld 1RN182-33 is located in the RN at the Catawba, Unit 1. The Catawba, Unit 1 applicable ISI code is the ASME Code, Section XI, 1989 Edition. The applicable construction code for Catawba, Unit 1 is ASME Section III 1974 Edition including 1974 Summer Addenda.

The licensee has performed an engineering evaluation of the mismatched condition and determined that the current configuration is acceptable. The licensee based its conclusions on its evaluation of existing stresses at weld 1RN182-33. These stresses are very low in comparison with the allowable stresses that were used in the piping design (see Table 1 above for details). The staff finds that a remaking of the weld would be impractical because the residual stresses from a forced fitup of the two piping sections to be joined by the weld may counteract any reduction in stress concentration effects that would be achieved by remaking the weld.

In addition, the licensee has determined that the RN piping is susceptible to erosion and corrosion effects. The licensee's corrosion control program monitors wall thinning of piping components to ensure that structural integrity of the piping is maintained. Wall thicknesses have been and will continue to be considered in the evaluation of the weld joint 1RN182-33. Further, the licensee has evaluated the piping for the effects of FAC. The licensee determined that FAC at the localized region of mismatch is not a concern since the RN design temperature is 150 °F and FAC is not typically a significant concern at temperatures below 200 °F. Also, the flow velocity on the 24-inch RN header under normal operating conditions is less than 4 feet per second. Low flow velocities and low water temperature make detrimental effects from FAC unlikely.

The staff finds that the licensee has performed an acceptable engineering evaluation of the existing condition. The licensee's engineering evaluation demonstrates that the current

configuration is structurally acceptable. The licensee has thus demonstrated that its current condition of a 5/32-inch mismatch is an acceptable deviation from meeting the 3/32-inch mismatch requirements of the Code. Accordingly, the licensee has shown that compliance with the ASME Code requirements, as it applies to weld 1RN182-33, is not required for Catawba, Unit 1. Therefore, the staff concludes that weld 1RN182-33 is acceptable for service "as is" and that no further action is required on the part of the licensee.

3.0 CONCLUSION

Based on the above, the staff concludes that compliance with the Code requirements would be impractical. The licensee's engineering evaluation demonstrates that the current configuration provides reasonable assurance of structural integrity. Therefore, the requested relief is granted for weld 1RN182-33, pursuant to 10 CFR 50.55a(g)(6)(i). The relief granted 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.

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Date: April 25, 2003

Catawba Nuclear Station

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