



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

September 24, 2012

Mr. Steven D. Capps
Vice President
McGuire Nuclear Station
Duke Energy Carolinas, LLC
12700 Hagers Ferry Road
Huntersville, NC 28078

SUBJECT: MCGUIRE NUCLEAR STATION, UNIT 2, PROPOSED RELIEF
REQUEST 12-MN-003 (TAC NO. ME8712)

Dear Mr. Capps:

By letter dated May 8, 2012, as supplemented by letter dated August 22, 2012, Duke Energy Carolinas, LLC (the licensee) submitted a relief request (RR) 12-MN-003, to the U.S. Nuclear Regulatory Commission (NRC) for the use of an alternative to certain requirements of the American Society of Mechanical Engineers (ASME) *Boiler and Pressure Vessel Code* (Code), Section XI, related to inservice inspection (ISI) of welds. The RR 12-MN-003 was requested for the remainder of McGuire Nuclear Station, Unit 2 (McGuire 2), third 10-year ISI interval. Pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR), Part 50, Section 50.55a(g)(5)(iii), the licensee requested to use alternatives on the basis that complying with the specified requirement is impractical.

The NRC staff has reviewed the subject request and concludes, as set forth in the enclosed safety evaluation, that the proposed alternatives for weld ISI would provide reasonable assurance of leak-tightness and structural integrity of the piping and component segments identified in RR 12-MN-003, and that complying with the specified ASME Code, Section XI, requirements is impractical. Therefore, pursuant to 10 CFR 50.55a(g)(6)(i), the NRC staff authorizes the licensee's proposed alternatives as described in RR 12-MN-003 for the duration of the McGuire 2 third 10-year ISI interval, currently scheduled to end on July 15, 2014.

All other ASME Code, Section XI, requirements for which relief was not specifically requested and authorized herein by the NRC staff remain applicable, including the third party review by the Authorized Nuclear Inservice Inspector.

S. Capps

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If you have any questions, please contact the Project Manager, Jon H. Thompson at 301-415-1119 or via e-mail at Jon.Thompson@nrc.gov.

Sincerely,



Robert J. Pascarelli, Chief
Plant Licensing Branch II-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-370

Enclosure:
Safety Evaluation

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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELIEF REQUEST NO. 12-MN-003 REGARDING PROPOSED ALTERNATIVE

REQUIREMENTS TO ASME CODE CASE N-695

DUKE ENERGY CAROLINAS, LLC

MCGUIRE NUCLEAR STATION, UNIT 2

DOCKET NO. 50-370

1.0 INTRODUCTION

By letter dated May 8, 2012, (Agencywide Documents Access and Management System (ADAMS) at Accession No. ML12138A008), as supplemented by letter dated August 22, 2012 (ADAMS Accession No. ML12250A662), Duke Energy Carolinas, LLC (Duke Energy, the licensee) submitted relief request (RR) 12-MN-003 to the U.S. Nuclear Regulatory Commission (NRC) staff for review and approval. Specifically, the licensee requested the use of an alternative to certain inservice inspection (ISI) requirements of the American Society of Mechanical Engineers (ASME) *Boiler and Pressure Vessel Code* (Code), Section XI, ASME Code Case N-695, "Qualification Requirements for Dissimilar Metal Piping Welds." ASME Code Case N-695 identifies depth sizing uncertainty qualification requirements for ultrasonic examinations conducted from the inside diameter (ID) of pipes (i.e., root mean square error (RMSE) not greater than 0.125 inches). The licensee has requested the use of an alternative to the ASME Code requirements pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR), Part 50, Section 50.55a(g)(5)(iii) on the basis that the code requirement is impractical. The proposed alternative to the ASME Code is for the remainder of the third 10-year ISI interval at McGuire Nuclear Station, Unit 2 (McGuire 2).

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 design and access provisions and preservice examination requirements, set forth in Section XI of editions and addenda of the ASME [Boiler and Pressure Vessel] B&PV Code...to the extent practical within the limitations of design, geometry, and materials of construction of the components."

Enclosure

Section 50.55a(g)(4)(ii) of 10 CFR states, in part, that "inservice examination of components...must comply with the requirements of the latest edition and addenda of the Code incorporated by reference in paragraph (b) of this section [10 CFR 55a] 12 months before the start of the 120-month inspection interval (or the optional ASME Code cases listed in NRC Regulatory Guide [RG]1.147, Revision 16, when using Section XI...)."

ASME Code Case N-695 is accepted for use in RG 1.147, Revision 16, which, is incorporated by reference in 10 CFR 50.55a(b).

The regulation at 10 CFR 50.55a(g)(5)(iii), 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."

The regulation at 10 CFR 50.55a(g)(6)(i), 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 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 NRC staff to grant the relief requested by the licensee.

3.0 TECHNICAL EVALUATION

3.1. Component Descriptions

The licensee stated that this relief request addresses nozzle-to-safe end stainless steel (SS) to carbon steel (CS) dissimilar metal (DM) welds listed in Table 1 below.

Category and System Details:

Code Class:	Class 1
System Welds:	Reactor Coolant System (NC)
Examination Category:	Category R-A for the DM welds
Code Item Number:	R1.11 for Reactor Vessel (RV) DM nozzle-to-pipe welds

Table 1 - Dissimilar Metal Welds Covered by Code Case N-695

Description	Size	Nozzle to Pipe SS-CS DM Weld No.
Hot Leg RV Nozzle - A Loop	Nominal 29.0" ID with 2.33" min wall	2RPV-W1 5-SE / 2NC2F1-1
Hot Leg RV Nozzle - B Loop	Nominal 29.0" ID with 2.33" min wall	2RPV-W1 6-SE / 2NC2F2-1
Hot Leg RV Nozzle - C Loop	Nominal 29.0" ID with 2.33" min wall	2RPV-W1 7-SE / 2NC2F3-1
Hot Leg RV Nozzle - D Loop	Nominal 29.0" ID with 2.33" min wall	2RPV-W1 8-SE / 2NC2F4-1
Cold Leg RV Nozzle - A Loop	Nominal 27.5" ID with 2.21" min wall	2RPV-W1 1-SE / 2NC2F1-8
Cold Leg RV Nozzle - B Loop	Nominal 27.5" ID with 2.21" min wall	2RPV-W1 2-SE / 2NC2F2-8
Cold Leg RV Nozzle - C Loop	Nominal 27.5" ID with 2.21" min wall	2RPV-W1 3-SE / 2NC2F3-8
Cold Leg RV Nozzle - D Loop	Nominal 27.5" ID with 2.21" min wall	2RPV-W14-SE / 2NC2F4-8

3.2. Applicable Code and Addenda

McGuire 2 is currently in the third 10-year ISI interval. This interval began on March 1, 2004, and is scheduled to end on July 15, 2014. The ASME Code of record is the 1998 Edition of Section XI through the 2000 Addenda. Section XI, Code Case N-695, is referenced in the ISI program.

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 I-2220. These paragraphs refer to ASME Code, Section XI, Appendix VIII, including Supplement 10.

ASME Code Case N-695 provides alternative requirements to Appendix VIII, Supplement 10. It is unconditionally approved for use in RG 1.147, Revision 16. Paragraph 3.3(c) of ASME Code Case N-695 states that "Examination procedures, equipment, and personnel are qualified for depth sizing when the root mean square (RMS) error of the flaw depth measurements, as compared to the true flaw depths, do not exceed 0.125 in. (3 mm)."

3.4 Licensee's Discussion of the Impracticality of Compliance (as stated)

To date, although qualified for detection and length sizing on these welds, the examination vendors have not met the established root mean square error (RMSE) requirement for depth sizing (0.125 inch) when examining from the inside diameter (ID). Duke Energy's examination vendor has an RMSE of 0.189 inch instead of the required 0.125 inch. EPRI Policy/Procedure 03-01 describes the criteria for issuing documentation of depth sizing errors that exceed the 0.125 inch RMS Appendix VIII requirement.

3.5 Discussion of the Licensees Proposed Alternative

The licensee proposes to use an alternative through-wall depth sizing criteria for DM welds that are examined from the ID. Examinations of these components will be performed during the next scheduled refueling outage at McGuire 2 scheduled for September 2012.

The licensee proposes to use a contracted examination vendor that has demonstrated the ability to depth-size flaw indications with an RMSE of 0.189 inch instead of the 0.125 inch required for Code Case N-695. In the event an indication is detected that requires depth sizing, the difference between the required RMSE and the proposed demonstrated RMSE will be added to the measured through-wall extent for comparison with applicable acceptance criteria. If the examination vendor demonstrates an improved depth sizing RMSE prior to the examination, the excess of that improved RMSE over the 0.125 inch RMSE requirement, if any, will be added to the measured value for comparison with applicable acceptance criteria.

If reportable flaws are detected and they are determined to be connected to the piping ID surface during the inservice examination of the RV inlet and outlet DM welds that are covered by this relief, the licensee will supply the flaw evaluations performed, along with the measured flaw size as determined by ultrasonic testing (UT), for review. The licensee will perform the required evaluations to determine if the flaw(s) are ID surface breaking. In the case of the examinations planned for September 2012, the examination vendor deploys eddy current in order to make these determinations. If a flaw is detected and depth sizing is required, the inner profile of the weld, pipe, and nozzle in the region at and surrounding the flaw will be provided, along with an estimate of the percentage of potential surface areas with UT probe lift-off. The flaw degradation mechanism will be determined with aid from the initial and additional nondestructive examination data collected.

By letter dated August 22, 2012, the licensee stated the following:

If twice the RMS error is not added to the depth of any measured flaw depth, Duke Energy shall satisfy the following additional requirements:

- Flaw(s) detected and measured as less than 50% through-wall in depth shall be adjusted by adding the industry-proposed correction factor of the RMS Error - 0.125 inches to the depths of any flaws.

- For flaw(s) detected and measured as 50% through-wall depth or greater, and to remain in-service without mitigation or repair, Duke Energy shall submit flaw evaluations to the NRC for review and approval prior to reactor startup.

3.6. Duration of Relief

The proposed alternative to the ASME Code is applicable for the remainder of the third 10-year ISI interval at McGuire 2.

The licensee plans to use RR 12-MN-003 for the inspections at McGuire 2 scheduled for September 2012.

3.7. NRC Staff Evaluation

As described above, the licensee has requested relief from the requirements of ASME Code Case N-695. This code case requires that procedures used to inspect welds from the ID be qualified by performance demonstration. The acceptance criterion established by the code case is an RMSE 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 ASME Code Case N-695 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 Case N-695 constitutes an impracticality as described in 10 CFR 50.55a(g)(5)(iii). Use of an alternate approach, such as an outer diameter (OD) examination, represents a burden to the licensee as the welds under consideration may be inaccessible from the OD, or inspectors may be subject to significant radiation dose in performing the inspections.

To address the issue of increased potential for under sizing of flaws by inspection procedures which do not meet the ASME Code Case N-695 acceptance criterion, the NRC staff, in July 2012, in conjunction with personnel from the Performance Demonstration Initiative, examined the proprietary data set compiled from all attempts to date to qualify inspection procedures to the acceptance criterion contained in ASME Code Case N-695. Based on this examination the NRC staff concluded that:

1. For flaw depths less than 50 percent wall thickness, reasonable assurance that a flaw will be appropriately depth sized may be obtained by adding a correction factor to the flaw depth such that the adjusted flaw depth is equal to the measured flaw depth + (contractor RMSE - 0.125).
2. For flaw depths greater than 50 percent wall thickness, the variability of sizing errors was sufficiently great that no single mathematic flaw size adjustment formula was sufficient to provide reasonable assurance of appropriate flaw disposition. As a result the NRC staff finds it necessary to evaluate these flaws on a case-by-case basis.

Based on the concerted efforts by the industry to meet the acceptance criteria contained in ASME Code Case N-695 and the difficulties associated with other inspection methods, the NRC staff finds that meeting the 0.125-inch acceptance criterion in ASME Code Case N-695 is impractical and represents a burden to the licensee. Additionally the NRC staff finds that the acceptance criteria for ASME Code Case N-695 need not be met to provide reasonable assurance of structural integrity or leak tightness of the subject components and, therefore, reasonable assurance that the subject components "will not endanger life or property" provided that the following alternative requirements which are imposed by the NRC staff in accordance with 10 CFR 50.55a(g)(6)(i) are met.

1. Examine the welds under consideration using a UT technique which is qualified for flaw detection and length sizing.
2. ID connected indications with measured depths of less than 50 percent of the wall thickness will be dispositioned in accordance with an indication the depth of which is the measured depth + (Procedure RMSE-0.125).
3. For ID-connected indications with measured depths of greater than 50 percent of the wall thickness, the licensee will repair the indication or perform, and submit the results to the NRC staff, a flaw evaluation of the observed indication. In addition to information normally contained in flaw evaluations, this evaluation shall include:
 - a. Information concerning the mechanism which caused the crack
 - b. Information concerning the surface roughness/profile in the area of the pipe/weld required to perform the inspection
 - c. Information concerning areas in which the UT probe may "lift off" from the surface of the pipe/weld

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)(6)(i), and is in compliance with the ASME Code's requirements. Therefore, the NRC staff authorizes the licensee's proposed alternative as described in RR 12-MN-003 for the duration of the McGuire 2 third 10-year ISI interval, currently scheduled to end on July 15, 2014.

All other ASME Code, Section XI, requirements for which relief was not specifically requested and authorized herein by the NRC staff remain applicable, including the third party review by the Authorized Nuclear Inservice Inspector.

Principal Contributor: S. Cumblidge, NRR

Date: September 24, 2012

S. Capps

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If you have any questions, please contact the Project Manager, Jon H. Thompson at 301-415-1119 or via e-mail at Jon.Thompson@nrc.gov.

Sincerely,

/RA/

Robert J. Pascarelli, Chief
Plant Licensing Branch II-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-370

Enclosure:
Safety Evaluation

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