

May 1, 2003

Mr. H. B. Barron  
Vice President, McGuire Site  
Duke Energy Corporation  
12700 Hagers Ferry Road  
Huntersville, NC 28078-8985

SUBJECT: SECOND 10-YEAR INTERVAL INSERVICE INSPECTION PROGRAM PLAN  
REQUEST FOR RELIEF 01-006, REVISION 1 RE: MCGUIRE NUCLEAR  
STATION, UNIT 1 (TAC NO. MB5463)

Dear Mr. Barron:

By letter dated April 24, 2002, Duke Power Company (the licensee) proposed its second 10-Year Interval Inservice (ISI) Inspection Program Plan Request for Relief 01-006 from the American Society of Mechanical Engineers Boiler and Pressure Vessel Code, Section XI, Rules for Inservice Inspection of Nuclear Power Plant Components for McGuire Nuclear Station, Unit 1. Additional information was requested and provided by the licensee in its letter dated January 16, 2003. The NRC staff, with technical assistance from its contractor, the Pacific Northwest National Laboratory, has reviewed and evaluated the information provided by the licensee.

The NRC staff's evaluation and conclusions are contained in the enclosed Safety Evaluation. The NRC staff found the licensee's Request for Relief 01-006, Revision 1 acceptable. Therefore, the licensee's request for relief is granted pursuant to 10 CFR 50.55a(g)(6)(i), for the second 10-year ISI interval.

Sincerely,

*/RA/*

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

Docket No. 50-370

Enclosure: As stated

cc w/encl: See next page

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McGuire Nuclear Station

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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

FOR

THE SECOND 10-YEAR INTERVAL INSERVICE INSPECTION

REQUEST FOR RELIEF 01-006, REVISION 1

FOR

MCGUIRE NUCLEAR STATION, UNIT 1

DUKE POWER COMPANY

DOCKET NUMBER 50-369

1.0 INTRODUCTION

By letter dated April 24, 2002, Duke Power Company (the licensee) submitted Request for Relief 01-006 from the requirements of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel (B&PV) Code, Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components." In response to an NRC Request for Additional Information, the licensee revised the request and provided further clarification in a letter dated January 16, 2003. This request is for the second 10-year inservice inspection (ISI) interval at McGuire Nuclear Power Station, Unit 1. The Pacific Northwest National Laboratory (PNNL) has evaluated the subject request for relief.

2.0 REGULATORY REQUIREMENTS

ISI of the ASME Code Class 1, 2, and 3 components is performed in accordance with Section XI of the ASME B&PV 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 Commission pursuant to 10 CFR 50.55a(g)(6)(i). 10 CFR 50.55a(a)(3) states that alternatives to the requirements of paragraph (g) may be used, when authorized by the NRC, if: (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) twelve months prior to the start of the 120-month interval, subject to the limitations and modifications listed therein. The applicable Code of record for the second 10-year ISI for McGuire Nuclear Power Station, Unit 1, is the 1989 Edition of the ASME B&PV Code, Section XI.

### 3.0 TECHNICAL EVALUATION

The staff adopts the evaluations and recommendations for granting reliefs contained in the Technical Letter Report (TLR), included as Attachment 1, prepared by PNNL. Attachment 2 lists each relief request and the status of approval.

The Code requires essentially 100 percent volumetric examination of the accessible length of the reactor pressure vessel (RPV) welds 1-RPV10-442, 1-RPV3-442A, 1-RPV3-442B, 1-RPV3-442C, 1-RPV4-469, and 1-RPV7-442. The staff determined that complete examinations are restricted by several factors, including the position of core barrel locating lugs, incore instrumentation nozzles and the keyway specimen tube. These conditions make 100 percent volumetric examinations impractical to perform for these welds. To gain access for examination, the RPV would require design modifications. Imposition of this requirement would create a significant burden on the licensee, therefore, the Code-required 100 percent volumetric examinations are impractical.

The licensee obtained substantial volumetric coverages of approximately 49 percent to 90 percent for the subject welds. Therefore, any significant patterns of degradation should have been detected by the examinations in the areas that were completed, providing reasonable assurance of continued structural integrity of the RPV.

### 4.0 CONCLUSION

The staff concludes that the Code-examination coverage requirements are impractical for the subject components listed in Request for Relief 01-006, Revision 1, and examinations that were performed provide reasonable assurance of structural integrity of the subject components. Therefore, the licensee's request for relief is granted pursuant to 10 CFR 50.55a(g)(6)(i) for the second 10-year ISI interval. All other requirements of the ASME Code, Section III and XI, for which relief has not been specifically requested remain applicable, including third-party review by the Authorized Nuclear Inservice Inspector.

Attachments: 1. Technical Letter Report  
2. Relief Request and Status of Approval

Principal Contributor: T. McLellan, EMCB

Date: May 1, 2003

**TECHNICAL LETTER REPORT**  
**ON SECOND 10-YEAR INSERVICE INSPECTION INTERVAL**  
**REQUEST FOR RELIEF 01-006, REVISION 1**  
**FOR**  
**DUKE POWER COMPANY**  
**MCGUIRE NUCLEAR STATION, UNIT 1**  
**DOCKET NUMBER 50-369**

**1.0 SCOPE**

By letter dated April 24, 2002, the licensee, Duke Power Company, submitted Request for Relief 01-006 from the requirements of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code, Section XI, *Rules for Inservice Inspection of Nuclear Power Plant Components*. In response to an NRC Request for Additional Information (RAI), the licensee revised the request and provided further clarification in a letter dated January 16, 2003. This request is for the second 10-year inservice inspection (ISI) interval at McGuire Nuclear Power Station, Unit 1 (McGuire 1). The Pacific Northwest National Laboratory (PNNL) has evaluated the subject request for relief below.

**2.0 REGULATORY REQUIREMENTS**

Inservice inspection of the 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 (B&PV 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). The regulation at 10 CFR 50.55a(a)(3) states that alternatives to the requirements of paragraph (g) may be used, when authorized by the U.S. Nuclear Regulatory Commission (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 preservice 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, which was 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 McGuire 1 second 10-year interval inservice inspection program, which began on December 1, 1992, is the 1989 Edition of Section XI of the ASME Boiler and Pressure Vessel Code, with no addenda.

### 3.0 TECHNICAL EVALUATION

The information provided by Duke Power Company in support of the request for relief from Code requirements has been evaluated and the basis for disposition is documented below.

#### 3.1 Request for Relief 01-006, Revision 1, Examination Category B-A, Pressure Retaining Welds in Reactor Pressure Vessel

Code Requirement: Examination Category B-A, requires essentially 100% volumetric examination, as defined in ASME Code, Section XI, Table IWB-2500-1, Figures IWB-2500 1 through 5, of Class 1 full penetration shell welds in the reactor pressure vessel (RPV). "Essentially 100%," as clarified by ASME Code Case N-460, is greater than 90% coverage of the examination volume, or surface area, as applicable. Further, ASME Section V, Article 4, Paragraph T424.1 states that the volume must be examined by moving the search unit over the surface of the component so as to scan the entire examination volume.

Licensee's Code Relief Request: In accordance with 10CFR50.55a(g)(5)(iii), the licensee requested relief from the 100% volumetric examination coverage required by the ASME Code for the following RPV shell and head welds.

Table 1 - Examination Category B-A			
Code Item	Weld ID	Weld Type	% Coverage Achieved
B1.11	1-RPV10-44242	Lower shell-to- bottom head circumferential	69%
B1.12	1-RPV3-442A	Longitudinal seam weld	70%
B1.12	1-RPV3-442B	Longitudinal seam weld	70%
B1.12	1-RPV3-442C	Longitudinal seam weld	70%
B1.21	1-RPV4-469	Bottom head circumferential weld	49%
B1.30	1-RPV7-442	Nozzle Belt Shell to Flange weld	90%

Licensee's Basis for Relief Request (as stated):

##### 1-RPV10-442, Item B1.11

During the ultrasonic examination of this circumferential weld, 100% coverage of the required examination volume could not be achieved. The examination coverage was

reported as 69.00%. This percentage represents the aggregate coverage of all scans for the weld. Due to the proximity of six Core Guide Lugs 307 inches out of the weld length of 543.5 inches received 100% coverage from 4 orthogonal directions with 45 degree and 70 degree beam angles. Because the Core Guide Lugs cover part of the examination volume, 236.5 inches received coverage from one axial direction with the 45 degree (100%) and 70 degree (89%) beam angles. Circumferential scans were unable to cover the weld and base material under the Core Guide Lugs. In order to achieve more coverage, the Core Guide Lugs would have to be moved to allow greater access for scanning, which is impractical.

1RPV3-442A, 1RPV3-442B, and 1RPV3-442C, Item B1.12

During the ultrasonic examination of these three longitudinal seam welds, 100% coverage of the required examination volume could not be achieved. The examination coverage was limited to 79.00% due to the proximity of the Core Guide Lugs. This percentage represents the aggregate coverage of all scans for these welds. Seventy-nine percent of each weld length (77 inches) was examined from 4 orthogonal directions with 45 degree and 70 degree beam angles. Twenty-one percent (20.475 inches) received no coverage. In order to achieve more coverage, the Core Guide Lugs would have to be moved to allow greater access for scanning, which is impractical.

1RPV4-469, Item B1.21

During the ultrasonic examination of this circumferential weld, 100% coverage of the required examination volume could not be achieved. The examination coverage was reported as 49.00% due to the proximity of In-core Instrument Nozzles. The percent of coverage represents the aggregate coverage of all scans for the weld. One hundred percent of the required examination volume was covered for the full length of the weld (424.3 inches) with 45 degree and 70 degree beam angles from one axial and one circumferential direction. In order to achieve greater than 90% coverage in four orthogonal directions, the In-core Instrument Nozzles would have to be moved to allow greater access for scanning, which is impractical.

1RPV7-442, Item B1.30

During the ultrasonic examination of this circumferential weld, 100% coverage of the required examination volume could not be achieved. The examination coverage was reported as 90.00% due to Keyway Specimen Tube Cutouts. The percent of coverage represents the aggregate coverage of all scans for the weld. The 70 degree beam angle covered 81% of the weld length (434.8 inches) and 88% of the base material in four orthogonal directions. The 45 degree beam angle covered 81% of the weld length and 91% of the base material in four orthogonal directions. In order to achieve more coverage, the Keyway Specimen Tube Cutouts would have to be moved to allow greater access for scanning, which is impractical.

Licensee's Proposed Alternative Examination (as stated):

No additional ultrasonic examinations are planned during the current interval for this weld. However a visual examination was performed on the interior of the reactor vessel per the requirements of the ASME Section XI Code. The visual examination of the vessel interior did not identify any rejectable conditions.

Evaluation: The Code requires essentially 100% volumetric examination of the accessible length of the subject RPV welds. However, complete examinations are restricted by several factors, including the position of core barrel locating lugs, in core instrumentation nozzles and the keyway specimen tube. These conditions make 100% volumetric examinations impractical to perform for these welds. To gain access for examination, the RPV would require design modifications. Imposition of this requirement would create a significant burden on the licensee, therefore, the Code-required 100% volumetric examinations are impractical.

Drawings and descriptions<sup>1</sup> included in the licensee's submittal clearly show that examinations of the subject welds have been performed to the maximum extent practical, with the licensee obtaining substantial volumetric coverages (from approximately 49% to 90% - see Table 1) for these welds. In the case of welds 1RPV10-442, 1RPV3-442A, 1RPV3-442B and 1RPV3-442C, reactor core guide lugs that are used to help position the reactor core barrel are located physically over the weld or positioned in close proximity to the weld so that the inspection tool device can not scan the weld to achieve the code required coverage. Coverage on weld 1RPV4-469 is limited by in-core instrumentation nozzles that are located periodically around the bottom head. The coverage on weld 1RPV7-442 is limited due to the location of the radial support keyway which limits scanning and precludes achieving the code required coverage.

All the examinations were performed using EPRI PDI qualified equipment, personnel and procedures. In addition, other RPV shell welds have been examined to the extent required by the Code. Therefore, it is concluded that any significant patterns of degradation should have been detected by the examinations in the areas that were completed, providing reasonable assurance of continued structural integrity of the RPV. Based on the impracticality of examining 100% of the subject welds, and the significant examination coverages obtained, it is recommended that relief be granted pursuant to 10 CFR 50.55a(g)(6)(i).

#### 4.0 CONCLUSIONS

The PNNL staff has reviewed the licensee's submittal and concludes that the Code examination coverage requirements are impractical for the subject components listed in Request for Relief 01-006, Revision 1. Further, reasonable assurance of the structural integrity of the subject components has been provided by the examinations that were performed. Therefore, pursuant to 10 CFR 50.55a(g)(6)(i), it is recommended that relief be granted for the second 10-year ISI interval at McGuire Nuclear Station, Unit 1, which ended on October 10, 2002. All other requirements of the ASME Code, Section III and XI for which relief has not been specifically requested remain applicable, including third party review by the Authorized Nuclear Inservice Inspector.

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<sup>1</sup>Drawings, descriptions and reports of examinations have been provided to PNNL but are not part of this report

**TABLE 1**  
**SUMMARY OF RELIEF REQUESTS**

<b>Relief Request Number</b>	<b>TLR Sec.</b>	<b>System or Component</b>	<b>Exam. Category</b>	<b>Item No.</b>	<b>Volume or Area to be Examined</b>	<b>Required Method</b>	<b>Licensee Proposed Alternative</b>	<b>Relief Request Disposition</b>
01-006, Rev. 1	3.1	Reactor Pressure Vessel	B-A	B1.11 B1.12 B1.21 B1.30	100% of pressure retaining shell and head welds	Volumetric	Use limited coverage achieved.	Granted 10 CFR 50.55a(g)(6)(i)