May 23, 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 01-007, REVISION 1 RE: MCGUIRE NUCLEAR STATION, UNIT 1 (TAC NO. MB5016)

Dear Mr. Barron:

By letter dated April 18, 2002, Duke Power Company (the licensee) proposed its Second 10-Year Interval Inservice (ISI) Inspection Program Plan Request for Relief 01-007 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 December 5, 2002. The NRC staff, with technical assistance from its contractor, the Pacific Northwest National Laboratory, has reviewed and evaluated the information provided by the licencee.

The NRC staff's evaluation and conclusions are contained in the enclosed Safety Evaluation. The NRC staff found the licensee's Request for Relief 01-007, Revision 1 acceptable. The NRC staff concludes that the Code examination coverage requirements are impractical for the subject components listed in Request for Relief 01-007, Examination Categories B-D, B-F, B-J, C-B, and C-F-1. Furthermore, reasonable assurance of the structural integrity of the subject components has been provided by the examinations that were performed. Therefore, relief is granted pursuant to 10 CFR 50.55a(g)(6)(i) for the second 10-year interval.

For Request for Relief 01-007 Category B-H, the pressurizer support skirt integral attachment Weld 1PZR-SKIRT, the NRC staff concludes that the licensee's modified alternative provides an acceptable level of quality and safety, as originally concluded by NRC staff in an SER dated August 23, 2001. Therefore, the licensee's proposed alternative remains authorized pursuant to 10 CFR 50.55a(a)(3)(i) for the second 10-year interval at McGuire Nuclear Station, Unit 1.

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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cc w/encl: See next page
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** See previous concurrence

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OFFICE	PDII-1/PM	PDII-1/LA	EMCB*	OGC**	PDII-1/SC
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DATE	5/23/03	5/23/03	4/15/03	5/14/03	5/23/03

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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

FOR

SECOND 10-YEAR INTERVAL INSERVICE INSPECTION

REQUEST FOR RELIEF 01-007, REVISION 1

FOR

MCGUIRE NUCLEAR STATION, UNIT 1

DUKE POWER COMPANY

DOCKET NO. 50-369

1.0 INTRODUCTION

By letter dated April 18, 2002, Duke Power Company (the licensee) proposed its Second 10-Year Interval Inservice Inspection (ISI) Program Plan Request for Relief 01-007 from 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," for McGuire Nuclear Station, Unit 1. Additional information was requested and provided by the licensee in its letter dated December 5, 2002. The NRC staff, with technical assistance from its contractor, the Pacific Northwest National Laboratory (PNNL), has reviewed and evaluated the information provided by the licencee.

2.0 REGULATORY REQUIREMENTS

ISI of nuclear power plant components is performed in accordance with the ASME B&PV Code, Section XI and applicable addenda as required by 10 CFR 50.55a(g), except where specific written relief has been granted by the Commission pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) Section 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

ENCLOSURE

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 Code of record for the second 10-year ISI for McGuire Nuclear Station, Unit 1, is the 1989 Edition of the ASME B&PV Code, Section XI.

3.0 TECHNICAL EVALUATION

For Request for Relief 01-007, Revision 1, Examination Category B-D the NRC staff determined that it is impractical to ultrasonically examine the pressurizer safety relief nozzle Weld 1PZR-14, because the component geometry restricts the scanning surface so that 100 percent of the weld cannot be examined from both sides of the weld, as required by Code. For the licensee to achieve 100 percent volumetric coverage, the subject safety relief nozzle would have to be redesigned and modified. This would place a significant burden on the licensee, thus the Code-required 100 percent volumetric examination, performed from both sides of the weld, is impractical. The NRC staff determined that the examinations performed (approximately 69 percent volumetric coverage) should have detected any significant degradation that might be present, providing reasonable assurance of the continued structural integrity of the subject weld.

For Request for Relief 01-007, Revision 1, Examination Category B-F the NRC staff determined that it is impractical to ultrasonically examine the Steam Generator Nozzle-to-Safe End Welds 1SGC-Inlet-W5SE and 1SGC-Outlet-W6SE, because nozzle geometry makes volumetric examination from two beam path directions impractical for this weld. To meet the Code coverage requirements, the nozzle safe end and associated piping would require design modifications to allow access for examination. Imposition of this requirement would place a considerable burden on the licensee. The licensee obtained a significant (approximately 75 percent aggregate) amount of volumetric coverage from the safe end side of these welds. This aggregate coverage includes 100 percent of the Code-required volumetric examination from one side. Also, 100 percent of the Code-required surface examinations was obtained for both of these steam generator safe end welds, and there are other Category B-F dissimilar welds in the reactor coolant system that receive full volumetric examinations. The combination of the completed surface examinations, full volumetric examination from one side, and the examination of other similar welds in the reactor coolant system should have detected any existing patterns of degradation that might have occurred on these welds. As a result, reasonable assurance of the structural integrity of these steam generator nozzle safe end safe end welds has been provided.

Request for Relief 01-007, Revision 1, Examination Category B-H Weld 1PZR-SKIRT is for an attachment weld that joins the pressurizer support skirt to the pressurizer lower head. As such, the weld serves no pressure boundary function and degradation, if it occurs, is expected to be related to fatigue or corrosion that would be generated from the surface of the component. The licensee originally submitted this alternative as Request for Relief 00-001 in a previous letter dated April 5, 2000. The NRC staff authorized this alternative, in accordance with 10 CFR 50.55a(a)(3)(i), in a Safety Evaluation (SE) dated August 23, 2001. The NRC staff concluded that a surface examination of the outside surface (as required by Code) and a volumetric examination (as performed from the outside) of the inside surface areas of the weld and material adjacent to the weld provides an acceptable level of quality and safety. There is no basis to challenge the NRC staff's previous finding. Therefore, the original NRC staff

evaluation that the licensee's proposed alternative provides an acceptable level of quality and safety remains valid.

For Request for Relief 01-007, Revision 1, Examination Category B-J the NRC staff determined that it is impractical to ultrasonically examine pressure retaining Class 1 Piping Welds Nos. 1NC1F-1-7, 1NC-3087-W1, 1NC1F-107, 1NC1F-3613-3092, 1NI1F-643, 1NI1F-645, and 1NI1F-280, because scanning access restrictions due to either pipe restraints or component geometry permit scanning from the pipe side of the welds only. For the licensee to achieve 100 percent volumetric coverage of these welds would require that the welds be completely redesigned and would place a significant burden on the licensee; therefore, the Code-required 100 percent volumetric examination using two beam directions from both sides of these welds is impractical. The licensee obtained 33.2 percent through 85.5 percent volumetric coverage for the subject welds, completed 100 percent of the required volumetric coverage with a 45 degree longitudinal wave technique, applied in one direction, and completed 100 percent of the surface examinations. In addition, other welds in the Code Examination Category were examined to the full extent of Code requirements. The NRC staff determined that examinations completed of the subject welds, in conjunction with complete examination of other similar piping welds, should have detected any significant patterns of degradation that might have occurred. The NRC staff concluded, based on the above, that reasonable assurance of the continued integrity of the subject welds was maintained.

For Request for Relief 01-007, Revision 1, Examination Category C-B the NRC staff determined that it is impractical to ultrasonically examine the steam generator nozzle-to-shell weld 1SGD-W259, because the component outside surface geometry restricts access for volumetric examination to only the vessel side of the weld. The subject weld would have to be redesigned and modified for the licensee to achieve 100 percent volumetric coverage and would place a significant burden on the licensee. The licensee is able to obtain a substantial (approximately 75 percent) amount of the required volumetric coverage. In addition, 100 percent of the Code-required surface examination was completed. Furthermore, the licensee used inspection procedures, personnel, and equipment that have been qualified under the auspices of the Electric Power Research Institute (EPRI) performance demonstration initiative (PDI). The NRC staff determined that examinations that were performed should have detected any significant degradation that might be present, providing reasonable assurance of the continued structural integrity of the subject weld.

For Request for Relief 01-007, Revision 1, Examination Category C-F-1 the NRC staff determined that it is impractical to ultrasonically examine pressure retaining Class 2 Stainless Steel Piping Weld Nos. 1NI1F-167, 1NIF-293, 1NIF169-4, and 1NV1FW175-29, as listed by the licensee and described in ASME Code, Section XI, Figure IWC-2500-7. The subject welds are impractical to ultrasonically examine because the configurations of the subject components limit access for examination. The subject piping welds would have to be redesigned in order for the licensee to achieve 100 percent volumetric coverage, resulting in a significant burden on the licensee. The licensee obtained 59.82 percent through 85.61 percent volumetric coverage of each weld from one side of the weld and the ultrasonic examinations included both shear and longitudinal wave techniques. In addition, 100 percent of the Code-required surface examination was completed. Furthermore, the licensee used inspection procedures, personnel, and equipment that have been qualified under the auspices of the EPRI PDI. The NRC staff determined that the level of coverage obtained for these welds, along with the enhanced ultrasonic qualification measures imposed under PDI, should have enabled the licensee to

detect any general patterns of degradation that might have occurred in the inspected regions, providing reasonable assurance of the continued structural integrity of this weld.

4.0 CONCLUSION

The NRC staff adopts the evaluations and recommendations for granting reliefs and authorizing alternatives 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 NRC staff concludes that the Code examination coverage requirements are impractical for the subject components listed in Request for Relief 01-007, Examination Categories B-D, B-F, B-J, C-B, and C-F-1. Furthermore, reasonable assurance of the structural integrity of the subject components has been provided by the examinations that were performed. Therefore, relief is granted pursuant to 10 CFR 50.55a(g)(6)(i) for the second 10-year interval.

For Request for Relief 01-007 Category B-H, the pressurizer support skirt integral attachment Weld 1PZR-SKIRT, the NRC staff concludes that the licensee's modified alternative provides an acceptable level of quality and safety, as originally concluded by NRC staff in an SE dated August 23, 2001. Therefore, the licensee's proposed alternative remains authorized pursuant to 10 CFR 50.55a(a)(3)(i) for the second 10-year interval at McGuire Nuclear Station, Unit 1.

All other requirements of the ASME Code, Section III and XI for which relief has not been specifically requested and approved remain applicable, including third party review by the Authorized Nuclear Inservice Inspector.

Attachments: Technical Letter Report
Summary of Relief Requests

Principal Contributor: T. McLellan, EMCB

Date: May 23, 2003

TECHNICAL LETTER REPORT
ON SECOND 10-YEAR INSERVICE INSPECTION INTERVAL
REQUEST FOR RELIEF 01-007
FOR
DUKE POWER COMPANY
MCGUIRE NUCLEAR STATION, UNIT 1
DOCKET NUMBER 50-369

1.0 SCOPE

By letter dated April 18, 2002, the licensee, Duke Power Company, submitted Request for Relief 01-007 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 December 5, 2002. 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). 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 01-007, Revision 1, Examination Category B-D, Item B3.110, Full Penetration Welds of Nozzles In Vessels

Code Requirement: Examination Category B-D, Item B3.110, requires essentially 100% volumetric examination, as defined by Figure IWB-2500-7, of Class 1 full penetration nozzle welds in the pressurizer. "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 10 CFR 50.55a(g)(5)(iii), the licensee requested relief from the 100% volumetric examination coverage requirement for pressurizer safety nozzle-to-vessel weld 1PZR-14.

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

During the ultrasonic examination of this weld, 100% of the required examination volume could not be achieved. As shown in Attachment 1[1], (Pages 1-9) due to single sided access the examination coverage was limited to 69.07%. In order to achieve more coverage the weld would have to be re-designed to allow scanning from both sides.

Although the examination volume as defined in ASME Section XI 1989 Edition with no addenda, Figure IWB-2500-7(b) could not be covered, the amount of coverage obtained for this examination provides an acceptable level of quality and integrity. Ultrasonic examination of this weld was conducted using personnel, equipment and procedures qualified through the Performance Demonstration Initiative (PDI) Program for ferritic pressure vessel welds. The qualifications were conducted on samples with access to both sides of the weld. Therefore, Duke Energy Corporation does not claim credit for a single sided examination. In addition, this weld was examined during installation using volumetric and surface NDE methods.

This weld is located on the NC [Reactor Coolant] system line from the pressurizer upper head to one of the NC relief valves. This weld is not exposed to significant neutron fluence and is not prone to negative material property changes (i.e., embrittlement) associated with neutron bombardment.

Licensee's Proposed Alternative Examination (as stated):

No additional examinations are planned during the current interval for 1PZR-14. Radiography is not practical because of the geometry of the component, which prevents placement of the film and exposure source. Duke Energy Corporation will continue to use the most effective ultrasonic techniques available to obtain maximum coverage for future examination of this weld.

Evaluation: The Code requires 100% volumetric coverage of pressurizer safety relief nozzle weld 1PZR-14, however, the component geometry restricts the scanning surface so that 100% of the weld cannot be examined from both sides of the weld, as required by Code. For the licensee to achieve 100% volumetric coverage, the subject safety relief nozzle would have to be redesigned and modified. This would place a significant burden on the licensee, thus the Code-required 100% volumetric examination, performed from both sides of the weld, is impractical.

Ultrasonic examination of this weld was conducted using personnel, equipment and procedures qualified through the Electric Power Research Institute (EPRI) Performance Demonstration Initiative (PDI) Program for ferritic pressure vessel welds. As shown on the sketches and technical descriptions provided by the licensee, a significant amount (approximately 69% coverage) of the required examination volume was obtained for pressurizer safety nozzle weld 1PZR-14. This aggregate coverage includes greater than 90% of the examination volume using both 60 and 70 degree ultrasonic beam angles from the vessel side of the weld. The weld is carbon steel-to-carbon steel with a "set-in" nozzle configuration which makes complete ultrasonic access from the nozzle side of the weld impractical.

Round robin tests, as reported in NUREG/CR-5068, have demonstrated that ultrasonic examinations of ferritic material from a single side provide high probabilities of detection (usually 90% or greater) for both near- and far-side cracks in blind inspection trials. While the licensee may not have achieved complete examination coverage (from both sides) as required by the ASME code, the ultrasonic examinations performed by the licensee from the vessel side of the carbon steel weld meet the inspection procedure guidelines documented in NUREG/CR-5068. Additionally, these examinations were performed with personnel, equipment and procedures that have been demonstrated to meet EPRI PDI Program qualification requirements. For these reasons, the examinations performed are expected to detect any significant degradation that might be present, providing reasonable assurance of the continued structural integrity of this weld. Therefore, pursuant to 10 CFR 50.55a(g)(6)(i), it is recommended that relief be granted.

3.2 Request for Relief 01-007, Revision 1, Examination Category B-F, Item B5.70, Pressure Retaining Dissimilar Metal Welds in Vessel Nozzles, Steam Generator Nozzle-to-Safe End Welds

Code Requirement: Examination Category B-F, Item B5.70, requires 100% volumetric and surface examination, as defined by Figure IWB-2500-8(c), of all Class 1 nozzle-to-safe end butt welds in the steam generators. In addition, Appendix III, Paragraph III-4420 states "The examination shall be performed using a sufficiently long examination beam path to provide coverage of the required examination volume in two-beam path directions. The examination shall be performed from two sides of the weld where practicable, or from one side of the weld, as a minimum."

Licensee's Code Relief Request: In accordance with 10 CFR 50.55a(g)(5)(iii), relief is being sought from the requirement to perform 100% volumetric examination, using two beam-path directions from both sides of the weld, of the examination volume shown in

IWB-2500-8(c) for steam generator primary nozzle welds 1SGC-Inlet-W5SE and 1SGC-Outlet-W6SE.

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

Due to single sided access, the scanning was limited to coverage of the examination volume from one axial and two circumferential directions. In order to achieve two beam path direction coverage, the weld would have to be re-designed to allow scanning from both sides.

Although the examination volume as defined in ASME Section XI 1989 Edition with no addenda, Figure IWB-2500-8(c), could not be covered from two beam path directions, the amount of coverage obtained for this examination provides an acceptable level of quality and integrity. This weld was examined during installation using volumetric and surface NDE methods.

The examination of Category B-F dissimilar metal welds was conducted in accordance with the requirements of ASME Section XI, Appendix III to the maximum extent practical. Refracted longitudinal wave search units were used in accordance with NRC Information Notice No. 90-30: *Ultrasonic Inspection Techniques for Dissimilar Metal Welds*, May 1, 1990.

The refracted longitudinal wave transducers have a simulated focus effect which produces high sensitivity at a specific sound path distance. However, the sound beam averages beyond this focal point and the sensitivity decreases by a factor of two at twice the focal sound path distance. The transducers used in this examination have focal distances from 3/4 to T where T is the nominal thickness of the main run of pipe. As a result, there is not enough sensitivity to calibrate the ultrasonic system for extended sound path distances beyond the pipe inside surface.

This weld is located on the safe end inlet (Hot Leg) nozzle on the 1C Steam Generator. The weld is not exposed to significant neutron fluence and is not prone to negative material property changes (i.e., embrittlement) associated with neutron bombardment.

Licensee's Proposed Alternative Examination (as stated):

No additional examinations are planned during the current interval for this weld. Because of the configuration, radiography would not provide any additional coverage. Duke Energy Corporation will use the most effective NDE methods available to obtain maximum coverage for future examinations of this weld.

Evaluation: The Code requires 100% volumetric and surface examination of the subject steam generator nozzle-to-safe end welds from two beam path directions. However, the nozzle geometry makes volumetric examination from two beam path directions impractical for this weld. To meet the Code coverage requirements, the nozzle safe end and associated piping would require design modifications to allow access for examination. Imposition of this requirement would place a considerable burden on the licensee.

The licensee obtained a significant (approximately 75% aggregate) amount of volumetric coverage from the safe end side of these welds. This aggregate coverage includes 100% of the Code-required volumetric examination from one side. Also, 100% of the Code-required surface examinations was obtained for both of these steam generator safe end welds, and there are other Category B-F dissimilar welds in the reactor coolant system that receive full volumetric examinations. The combination of the completed surface examinations, full volumetric examination from one side, and the examination of other similar welds in the reactor coolant system should have detected any existing patterns of degradation that may have occurred on these welds. As a result, reasonable assurance of the structural integrity of these steam generator nozzle safe end safe end welds has been provided. Therefore, pursuant to 10 CFR 50.55a(g)(6)(i), it is recommended that relief be granted.

3.3 Request for Relief 01-007, Revision 1, Examination Category B-H, Item B8.20 Integral Attachments for Vessels, Pressurizer Support Skirt-to-Lower Head Weld

Code Requirement: Examination Category B-H, Item B8.20, of ASME Section XI requires 100% volumetric or surface examination, as applicable, of attachment welds for integrally welded supports. For the attachment configuration of the pressurizer support skirt weld at McGuire 1, the appropriate inspection method is a surface examination of both the inside and outside surfaces of the weld and adjacent base material, for essentially 100% of the weld length. The area to be examined is specified by Figure IWB-2500-13.

In previous Request for Relief 00-001, submitted in a letter dated April 5, 2000, the licensee proposed an alternative to the surface examination that is required for the inside surface of this weld. The licensee proposed to continue to perform the Code-required surface examination on the accessible outside surface of the attachment weld, and to perform angle and straight-beam ultrasonic examinations on the weld and adjacent base material in lieu of the surface examination on the inside surface of this weld. The ultrasonic examinations would be applied from the outside surface of the component. The NRC staff authorized this alternative, in accordance with 10 CFR 50.55a(a)(3)(i), in a Safety Evaluation Report (SER) dated August 23, 2001.

Licensee's Proposed Alternative: The licensee performed the examinations previously authorized by the NRC staff under Request for Relief 00-001. During these examinations, it was determined that 100% of the weld and adjacent base material inside surfaces areas could not be volumetrically accessed from the outside surface of the component. In the current Request for Relief 01-007, the licensee is proposing to modify the 100% volumetric coverage originally proposed in Request for Relief 00-001 for pressurizer integrally welded support skirt weld 1PZR-SKIRT. The licensee determined that approximately 75% of the inside surfaces of the weld and base material could be obtained. The 100% surface examination on the outside surface of the weld are being completed in accordance with the Code.

Licensee's Basis for Alternative: (as stated)

During the ultrasonic examination of this weld, 100% of the required examination volume could not be achieved. The examination coverage was limited to 75.16%. The entire examination volume was covered 100% from at least one direction.

Although the examination volume as defined in ASME Section XI 1989 Edition with no addenda, Figure IWB 2500-13 could not be covered, the amount of coverage obtained for this examination provides an acceptable level of quality and integrity. This weld was examined during installation using surface NDE methods.

There is inadequate accessibility of the inside surface (surface C-D) of the Pressurizer Support Skirt weld to perform the required surface examination. Therefore, an ultrasonic examination will be used to inspect the inner examination surface from the skirt exterior surface. The ultrasonic procedure and the basic calibration block will conform to the requirements of ASME Section XI Appendix I, 1989 Edition, and ASME Section V, Article 5, 1989 Edition.

This is the weld joining the pressurizer support skirt to the pressurizer lower head. This weld is not exposed to significant neutron fluence and is not prone to negative material property changes (i.e., embrittlement) associated with neutron bombardment. This weld joins the pressurizer support skirt, a non-pressure boundary component, to the lower pressurizer head. Therefore, the weld serves no pressure boundary function.

Evaluation: Weld 1PZR-SKIRT is an attachment weld that joins the pressurizer support skirt to the pressurizer lower head. As such, the weld serves no pressure boundary function and degradation, if it occurs, is expected be related to fatigue or corrosion that would be generated from the surface of the component.

The licensee originally submitted this alternative as Request for Relief 00-001 in a previous letter dated April 5, 2000. At that time, the volumetric examinations proposed for the inside surfaces of the weld and adjacent base material had not been performed. The NRC staff authorized this alternative, in accordance with 10 CFR 50.55a(a)(3)(i), in a Safety Evaluation Report (SER) dated August 23, 2001. In it's evaluation, the NRC staff recognized that certain volumes of the weld and adjacent base material have non-ideal profiles for flaw detection when volumetric examination is applied from the outside surface, but that any existing flaws should have a depth extending into the base material, and this extension would be detected by the volumetric methods proposed. Therefore, the NRC staff concluded that a surface examination of the outside surface (as required by Code) and a volumetric examination (as performed from the outside) of the inside surface areas of the weld and material adjacent to the weld would provide an acceptable level of quality and safety.

The configuration of attachment weld 1PZR-SKIRT on the pressurizer integrally welded support skirt prevents volumetric examination of 100% of the weld and adjacent base material inside surfaces. The licensee obtained approximately 75% volumetric coverage of the inside surfaces, as applied from the outside surface, and 100% surface examination of the outside surfaces for the weld and adjacent base material. Although the licensee was unable to volumetrically examine 100% of the inside surfaces of weld

1PZR-SKIRT, a significant level of coverage was obtained. In addition, 100% of the outside surface was examined. The NRC staff believes that existing patterns of degradation should have been detected by this combination of surface and limited volumetric examinations. Therefore, the original NRC staff evaluation, that the licensee's proposed alternative provides an acceptable level of quality and safety, remains valid. For these reasons, it is recommended, pursuant to 10 CFR 50.55a(a)(3)(i), that the licensee's modified alternative in Request for Relief 01-007 remain authorized.

3.4 Request for Relief 01-007, Revision 1, Examination Category B-J, Item B9.10, 9.11 and 9.12, Pressure Retaining Welds in Piping

Code Requirement: Examination Category B-J, Items B 9.10, 9.11 and 9.12 require essentially 100% volumetric and surface examination of the weld length, as defined by Figure IWB-2500-11, of Class 1 full penetration piping welds. "Essentially 100%," as clarified by ASME Code Case N-460, is greater than 90% coverage of the examination volume, or surface area, as applicable. In Appendix III, Paragraph III-4420, the Code further states that examinations be performed using a sufficiently long beam path to provide coverage of the required examination volume in two-beam path directions, and that the examination be performed from two sides of the weld, where practicable, or from one side of the weld, as a minimum.

Licensee's Code Relief Request: In accordance with 10 CFR 50.55a(g)(5)(iii), the licensee requested relief from the Code requirement to examine the welds in Table 1.0 below using two beam paths, and to complete 100% coverage of the examination volume shown in Figure IWB-2500-11.

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

During the ultrasonic examination of these welds 100% coverage of the required examination volume could not be achieved due to component configuration or the presence of pipe restraints. Current ultrasonic technology in not capable of consistently detecting and sizing flaws on the far side of an austenitic weld for configurations common to U.S. nuclear applications. To demonstrate that the best available technology was applied, PDI provides a best effort qualification instead of a complete single side demonstration. PDI Performance Demonstration Qualification Summary (PDQS) for austenitic piping shows that single sided examination is performed as a best effort. Therefore, the far side of the austenitic weld, which can only be accessed from one side, will be listed as an area of no coverage.

Although the examination volume as defined in ASME Section XI 1989 Edition with no addenda, Figure IWB-2500-11, could not be covered, the amount of coverage obtained for this examination provides an acceptable level of quality and integrity. This weld was examined during installation using volumetric and surface NDE methods.

Table 1.0 - Category B-J Piping Welds		
Weld I.D. Number	**Area or Weld to be Examined**	**% Volume Inspected and Limitation**
1NC1F-1-7	Pipe to "A" Reactor Coolant Pump weld	33.2% - The pump geometry restricts access to the pipe side of the weld
1NC-3087-W1	Full penetration weld on the "A" cold leg of reactor coolant system	85.5% - Examination restricted by pipe whip restraint
1NC1F-107	Elbow-to-nozzle on the "A" cold leg of reactor coolant system	60.85% - Nozzle geometry restricts examination to the pipe side of the weld
1NC1F-3613-3092	Elbow-to-nozzle on the "B" hot leg of reactor coolant system	60.11% - Nozzle geometry restricts examination to the pipe side of the weld
1NI1F-643	Pipe-to-valve weld on the outlet side the cold leg ECCS injection line	60.43% - A valve restricts the examination access to the pipe side of the weld
1NI1F-645	Pipe-to-valve weld on the inlet side of the cold leg ECCS injection line	60.34% - A valve restricts the examination access to the pipe side of the weld
1NI1F-280	Pipe to valve weld on the "1D" Safety Accumulator Tank on the cold leg ECCS injection line	60.50% - A valve restricts the examination access to the pipe side of the weld

Licensee's Proposed Alternative Examination (as stated):

No additional examinations are planned during the current interval for this weld. Because of the configuration, radiography would not provide any additional coverage. Duke Energy Corporation will use the most effective ultrasonic techniques available to obtain maximum coverage for future examinations of this weld.

Evaluation: The Code requires 100% volumetric coverage of Category B-J pressure retaining welds in piping using two beam path directions applied from both sides of the weld. The piping welds listed in Table 1.0 above have scanning access restrictions due to either pipe restraints or component geometry that permit scanning from the pipe side of the welds only. For the licensee to achieve 100% volumetric coverage of the these welds would require that the welds be completely redesigned and modified. This would place a significant burden on the licensee; therefore, the Code-required 100% volumetric examination using two beam directions from both sides of these welds is impractical.

As shown on the sketches provided by the licensee, significant amounts of aggregate coverage for the welds have been obtained (see Table 1.0). The licensee used ultrasonic inspection procedures that have been qualified under the performance demonstration protocol developed by the EPRI PDI and accepted by NRC. The examinations performed by the licensee on the welds shown in Table 1.0 obtained 100% of the required volumetric coverage with a 45 degree longitudinal wave technique,

applied in one direction oriented perpendicular to the weld axis from the pipe side of the welds, and in clockwise and counterclockwise directions parallel to the welds. Further, other welds in the Code Examination Category are examined to the full extent of Code requirements. While the licensee cannot meet the Code-required 100% volumetric examination requirement using two beam path directions from both sides of these welds, the examinations completed, which were performed in conjunction with complete examination of other similar piping welds, should have detected any significant patterns of degradation that might have occured, providing reasonable assurance of the continued integrity of the welds in Table 1.0. Therefore, pursuant to 10CFR50.55a(g)(6)(i), it is recommended that relief be granted.

3.5 Request for Relief 01-007, Revision 1, Examination Category C-B, Item C2.21, Pressure Retaining Nozzle Welds in Vessels, Steam Generator Auxiliary Feedwater Nozzle to Steam Drum

Code Requirement: Examination Category C-B, Item C2.21, requires essentially 100% volumetric and surface examination, as defined in Figure IWC-2500-4, of Class 2 nozzle-to-vessel welds. "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 10 CFR 50.55a(g)(5)(iii), the licensee requested relief from the Code requirement to examine 100% of the weld volume required by Figure IWC-2500-4(a) for steam generator nozzle-to-shell weld 1SGD-W259.

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

During the ultrasonic examination of this weld, 100% coverage of the required examination volume could not be obtained. The examination coverage was limited to 75.00% of the required examination volume. This is a ferritic nozzle to shell weld where access is limited to the vessel shell side only. In order to achieve more coverage the welded component configuration would have to be re-designed to allow scanning from both sides.

Licensee's Proposed Alternative Examination (as stated):

Duke Energy Corporation will continue to use the most effective ultrasonic techniques available to obtain maximum coverage for future examination of this weld. No additional ultrasonic examination is planned during the current interval.

Evaluation: The Code requires 100% volumetric coverage of steam generator nozzle-to-shell weld 1SGD-W259. However, the component outside surface geometry restricts access for volumetric examination to only the vessel side of the weld. The subject weld would have to be redesigned and modified for the licensee to achieve 100% volumetric coverage. This would place a significant burden on the licensee; therefore, the Code-required 100% volumetric examination is impractical.

The licensee is able to obtain a substantial (approximately 75%) amount of the required volumetric coverage. This aggregate coverage includes greater than 90% of the examination volume using a 60 degree ultrasonic beam angle from the vessel side of the weld. The base metal and weldment are ferritic materials (carbon steel) which are known to exhibit favorable ultrasonic transmission qualities due to their small, isotropic grain structures. In addition, 100% of the Code-required surface examination was completed. The licensee examined this weld using procedures, equipment and personnel qualified through the EPRI PDI Program.

Round robin tests, as reported in NUREG/CR-5068, have demonstrated that ultrasonic examinations of ferritic material from a single side provide high probabilities of detection (usually 90% or greater) for both near- and far-side cracks in blind inspection trials. While the licensee may not have achieved complete examination coverage (from both sides) as required by the ASME code, the ultrasonic examinations performed by the licensee from the vessel side of the carbon steel weld meet the inspection procedure guidelines documented in NUREG/CR-5068. Additionally, these examinations were performed with personnel, equipment and procedures that have been demonstrated to meet EPRI PDI Program qualification requirements. For these reasons, the examination performed should have detected any significant degradation that might be present, providing reasonable assurance of the continued structural integrity of this weld. Therefore, pursuant to 10 CFR 50.55a(g)(6)(i), it is recommended that relief be granted.

3.6 Request for Relief 01-007, Revision 1, Examination Category C-F-1, Items C5.11 and C5.21, Pressure Retaining Welds in Austenitic Stainless Steel or High Alloy Piping, Circumferential Welds

Code Requirement: Examination Category C-F-1, Items C5.11 and C5.21, require essentially 100% volumetric and surface examination, as defined in Figure IWC-2500-7, for Class 2 austenitic pressure retaining welds in piping, based on wall thickness. “Essentially 100%,” as clarified by ASME Code Case N-460, is greater than 90% coverage of the examination volume, or surface area, as applicable.

Licensee’s Code relief Request: In accordance with 10 CFR 50.55a(g)(5)(iii), the licensee requested relief from the requirement to examine 100% of the volume shown in Figure IWC-2500-7(a) for the piping welds shown in Table 2.0.

Licensee’s Basis for Relief (as stated):

During the ultrasonic examination of these piping welds, greater than 90% of the required examination volume as allowed by Code Case N-460 could not be achieved.

Duke Energy Corporation does not claim credit for coverage of the far side of austenitic welds. The characteristics of austenitic weld metal attenuate and distort the sound beam when shear waves pass through the weld. Refracted longitudinal waves provide better penetration. Duke Energy Corporation uses a combination of shear waves and longitudinal waves to examine single-sided austenitic welds.

Table 2.0 - Category C-F-1 Piping Welds		
Weld I.D. Number	**Code Item and Weld Configuration**	**% Volume Inspected and Limitation**
1NI1F-167	C5.11 - Elbow-to-penetration weld	59.82% - Scan limited to elbow side only
1NIF-293	C5.11 - Pipe-to-valve weld	61.30% - Scan limited to pipe side only
1NI169-4	C5.11 - Pipe-to-elbow weld	88.5% - Scan restricted by ID tag and cable tray
1NV1FW175-29	C5.21 - Pipe-to-tee weld	85.61% - Scan limited to pipe side only

The procedures, personnel, and equipment have been qualified through the Performance Demonstration Initiative (PDI). However, although longitudinal wave search units were used in the qualification and cracks were detected through the weld metal, PDI does not provide a qualification for single-sided examinations of austenitic welds.

Licensee's Proposed Alternative Examination (as stated):

No additional examinations are planned during the current interval. Because of the component configurations, radiography would not provide any additional coverage. Duke Energy Corporation will use the most effective ultrasonic techniques available to obtain maximum coverage for future examination of this weld.

Evaluation: The Code requires 100% volumetric and surface examination of Class 2 stainless steel piping welds, as described in Figure IWC-2500-7, based on piping diameter and wall thickness. However, the configurations of the components containing the subject welds limit access for volumetric examination as shown in Table 2.0. The subject piping welds would have to be replaced with a modified design for the licensee to achieve 100% volumetric coverage. This would place a significant burden on the licensee; therefore, the Code required 100% volumetric examination is impractical.

While complete Code coverage of the welds was not achieved during the examinations, a significant amount (see Table 2.0) of each weld was obtained from one side of the weld. The ultrasonic examinations included both shear and longitudinal wave techniques. The component design prevented any axial scan coverage from the opposite side of the weld.

The licensee used inspection procedures, personnel, and equipment that have been qualified under the auspices of the EPRI PDI. The entire examination volume, as defined in Figure IWC-2500-7, could not be completed. However, the level of coverage obtained for these welds, along with the enhanced ultrasonic qualification measures imposed under PDI, should have enabled the licensee to detect any general patterns of

degradation that might have occured in the inspected regions, providing reasonable assurance of the continued structural integrity of this weld. Therefore, pursuant to 10 CFR 50.55a(g)(6)(i), it is recommended that relief be granted.

4.0 CONCLUSIONS

The PNNL NRC 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 01-007, Sections 3.1, 3.2, 3.4, 3.5 and 3.6 of this report. 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.

In addition, for the pressurizer support skirt integral attachment weld 1PZR-SKIRT (Section 3.3 of this report), it has been determined that the licensee's modified alternative provides an acceptable level of quality and safety, as originally concluded by NRC staff in an SER dated August 23, 2001. Therefore, it is recommended that the alternative remain authorized in accordance with 10 CFR 50.55a(a)(3)(i) for the second 10-year interval at McGuire 1.

TABLE 1
SUMMARY OF RELIEF REQUESTS

Relief Request Number	TLR Sec.	System or Component	Exam. Category	Item No.	Volume or Area to be Examined	Required Method	Licensee Proposed Alternative	Relief Request Disposition
01-007, Revision 1	3.1	Pressurizer vessel-to-nozzle weld	B-D	B3.11	100% of full penetration welds in nozzles, Weld 1PZR-14	Volumetric	Use achieved 69.07% volumetric coverage	Granted 10 CFR 50.55a(g)(6)(i)
01-007, Revision 1	3.2	Steam generator inlet and outlet safe end-to-nozzle welds	B-F	B5.70	100% of full penetration welds, Welds 1SGC-Inlet-W5SE and 1SGC-Outlet-W6SE	Volumetric and Surface	Use achieved 75% volumetric and 100% surface coverage	Granted 10 CFR 50.55a(g)(6)(i)
01-007, Revision 1	3.3	Pressurizer integrally welded support skirt	B-H	B8.20	100% of Integrally welded attachment welds in vessels, Weld 1PZR-SKIRT	Surface	Use modified alternative previously authorized by SER dated August 23, 2001	Remain Authorized 10 CFR 50.55a(a)(3)(i)
01-007, Revision 1	3.4	Full penetration Class 1 piping welds, various systems	B-J	B9.10 B9.11 B9.12	100% of full penetration piping welds 1NC1F-1-7,1NC-3087-W1,1NC1F-107, 1NC1F-3613-3092,1NI1F-643, 1NI1F-645, and 1NI1F-280	Volumetric and surface	Use achieved volumetric (see Table 1.0 in report) and 100% surface coverage	Granted 10 CFR 50.55a(g)(6)(i)
01-007, Revision 1	3.5	Steam generator nozzle-to-shell weld	C-B	C2.21	100% of the nozzle-to-shell Weld 1SGD-W259	Volumetric and surface	Use achieved 75% volumetric and 100% surface coverage	Granted 10 CFR 50.55a(g)(6)(i)
01-007, Revision 1	3.6	Full penetration Class 2 piping welds, various systems	C-F-1	C5.11 C5.21	100% of full penetration piping welds 1NI1F-167, 1NIF-293, 1NI169-4 and 1NV1FW175-29	Volumetric and Surface	Use achieved volumetric (see Table 2.0 in report) and 100% surface coverage	Granted 10 CFR 50.55a(g)(6)(i)

1. Drawings and reports contained in Attachments to the licensee's submittal are not included in this report.