November 9, 2000

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

SUBJECT: MCGUIRE NUCLEAR STATION, UNIT 2 - RE: REQUEST FOR RELIEF NO. 98-005 (TAC NO. MA7994)

Dear Mr. Barron:

By letter dated January 5, 2000, Duke Energy Corporation (DEC) requested the NRC staff to approve Second 10-Year Interval Inservice Inspection Program Plan Relief Request No. 98-005 (Parts A through E) for the McGuire Nuclear Station, Unit 2.

Specifically, DEC is seeking relief from the requirements of the American Society of Mechanical Engineers (ASME) Code, Section XI, to perform 100% volumetric examination for the welds addressed in Relief Request No. 98-005 (Parts A through E), because of access limitations. The applicable edition of the Code is the 1989 Edition of ASME Code, Section XI.

Based on the information provided and as discussed in the enclosed Safety Evaluation, the staff has authorized relief pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) Section 50.55a(g)(6)(i), for the second 10-year interval. This determination is based on the impracticality of performing the required inspections and the burden on the licensee if the Code requirements were imposed.

The staff considers this matter resolved and is closing out TAC No. MA7994.

Sincerely,

/RA/

Richard L. Emch Jr., 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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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

THE SECOND 10-YEAR INTERVAL INSERVICE INSPECTION

REQUESTS FOR RELIEF NO. 98-005

DUKE ENERGY CORPORATION

MCGUIRE NUCLEAR STATION, UNIT 2

DOCKET NO. 50-370

1.0 INTRODUCTION

Inservice inspection (ISI) of the American Society of Mechanical Engineers (ASME) Code Class 1, 2, and 3 components is performed in accordance with Section XI of the ASME Boiler and Pressure Vessel (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).

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, "Rules for Inservice Inspection 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 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 the McGuire Nuclear Station, Unit 2 (McGuire, Unit 2) second 10-year ISI interval is the 1989 Edition of the ASME B&PV Code.

2.0 EVALUATION

The staff, with technical assistance from Idaho National Engineering and Environmental Laboratory (INEEL), has reviewed the information concerning the ISI program Request for Relief 98-005 (Parts A through E) for the second 10-year interval for McGuire, Unit 2 in Duke Energy Corporation (the licensee) letter dated January 5, 2000.

Enclosure

For the McGuire, Unit 2 the staff determined that the Code requirement of 100 percent volumetric examination is impractical to perform for the welds discussed in Request for Relief 98-005 (Parts A through E) because of access limitations. To gain access for completeexamination of these subject welds would require design modifications. Imposition of this requirement would create an undue burden on the licensee.

The licensee has examined a significant portion of these welds, obtaining 43.7 percent through 87.7 percent coverage. Based on the coverage obtained, the staff has determined that any existing patterns of degradation would have been detected by the examinations completed, and the examinations performed provide reasonable assurance of structural integrity of the subject welds.

3.0 CONCLUSION

The McGuire, Unit 2 Request for Relief 98-005 (Parts A through E) to the Code requirements have been reviewed by the staff with the assistance of its contractor, INEEL. A summary of Request for Relief No. 98-005 (Parts A through E) determinations is presented in Attachment 1. INEEL's evaluation, Technical Letter Report (TLR) is contained in Attachment 2. The staff has reviewed the TLR and adopts the evaluations and recommendations for granting relief.

The staff concludes that certain inservice examinations cannot be performed to the extent required by the Code at McGuire, Unit 2. For the items discussed in Relief Request No. 98-005 (Parts A through E) the Code requirements are impractical to meet, and reasonable assurance of the structural integrity of the subject components has been provided by the examinations that have been completed. Therefore, relief is granted pursuant to 10 CFR 50.55a(g)(6)(i). The staff has determined 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.

Attachments: As stated

Principal Contributor: T. McLellan

Date: November 9, 2000

TECHNICAL LETTER REPORT
ON SECOND 10-YEAR INTERVAL INSERVICE INSPECTION
REQUEST FOR RELIEF NO. 98-005
FOR
DUKE ENERGY CORPORATION
MCGUIRE NUCLEAR STATION UNIT 2
DOCKET NUMBER: 50-370

1. INTRODUCTION

By letter dated January 5, 2000, the licensee, Duke Energy Corporation, submitted Request for Relief No. 98-005 from the requirements of the ASME Code, Section XI, for McGuire Nuclear Station Unit 2. This relief request is for the second 10-year inservice inspection (ISI) interval. The Idaho National Engineering and Environmental Laboratory (INEEL) staff's evaluation of the subject request for relief is in the following section.

2. EVALUATION

The information provided by Duke Energy Corporation in support of the request for relief from Code requirements has been evaluated and the bases for disposition are documented below. The Code of record for the McGuire Nuclear Station Unit 2, second 10-year ISI interval, which began March 2, 1994, is the 1989 Edition of Section XI of the ASME Boiler and Pressure Vessel Code.

2.1 Request for Relief No. 98-005 (Part A), Examination Category B-A, Item B1.40, Reactor Pressure Vessel Head-to-Flange Weld

Code Requirement: Examination Category B-A, Item B1.40, requires volumetric and surface examination of 100% of the weld length, as defined by Figure IWB-2500-5, of the reactor pressure vessel (RPV) head-to-flange weld to be performed during each inspection interval.

Licensee's Code Relief Request: In accordance with 10 CFR 50.55a(g)(5)(iii), the licensee requested relief from the Code-required volumetric examination coverage requirement for RPV head-to-flange Weld 2RPV-W08, Item Number B01.040.001.

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

"During the ultrasonic examination of the Reactor Vessel Closure Head Weld 2RPV-W08 (Item Number B01.040.001) shown in Attachment 1[1], coverage of required examination volume could not be obtained. Geometric limitations caused by the proximity of lifting lugs and the head flange resulted in

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1. Attachments, drawings and sketches provided in the licensee's submittal are not included in this report.

examination coverage of 87.78%. In order to achieve greater than 90% coverage, the weld would have to be redesigned to eliminate the interferences.

"The Reactor Vessel Closure Head Weld listed above is located on the McGuire Unit 2 Reactor Vessel. 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 was rigorously inspected by radiography and dye penetrant during construction and verified to be free from unacceptable fabrication defects. If a leak were to occur at the weld in question, the reactor coolant leakage calculation which is normally performed daily (and required by Technical Specifications to be performed every 72 hours) would provide an early indication of leakage. The unidentified leakage specification in Technical Specification 3.4.13 is 1 gpm. Several other indicators such as containment radiation monitors EMF-38, -39, and -40, the containment floor and equipment sump levels, containment humidity instruments, and the ventilation unit condensate drain tank level would provide early indication of weld leakage for prompt Operations and Engineering evaluation.

"Duke Energy Corporation will continue to examine the referenced items using ultrasonic techniques to the maximum extent practical. These examinations will provide assurance of weld/component integrity. It is the belief of Duke Energy that this limited examination is the best available.

"Pursuant to 10 CFR 50.55a(g)(6)(i), granting this relief for the welds listed under Examination Category B-A will provide reasonable assurance of weld/component integrity, and is authorized by law. In addition, the requested relief 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."

Licensee's Proposed Alternative Examination (as stated):

"The use of radiography as an alternate volumetric examination for all the above listed components is not practical due to component thickness and geometric configurations. Other restrictions making radiography impractical are the physical barriers prohibiting access for placement of source, film, image quality indicator, etc.

"Since radiography is impractical, Duke Energy Corporation will continue to use ultrasonic examination procedures to obtain maximum coverage to the extent practicable of the Item Numbers referenced in Section I of this Request for Relief. No additional ultrasonic examinations or alternate exams are planned during the current interval for the welds referenced in Section I of the request.

"For the Class 1 Components listed in Section I above, Duke Energy proposes to use the pressure test to compliment (sic) the limited examination coverage. The Code requires (reference Table IWB-2500-1, Item Number B15.[10]) that a system leakage test be performed after each refueling outage. Additionally a system hydrostatic test (reference Table IWB-2500-1, Item Number B15.[11]) is required once during each 10-

year inspection interval. These tests require a VT-2 visual examination for evidence of leakage. This testing will provide additional assurance of pressure boundary integrity."

Evaluation: The Code requires 100% volumetric examination of the subject Closure Head to Flange Weld. Sketches provided by the licensee show that complete examination is restricted due to lifting lugs. These limitations make the 100% volumetric examination impractical. To gain access for examination, the reactor head and/or lifting lugs would require design modifications. Imposition of this requirement would create an undue burden on the licensee.

The licensee has examined a significant portion of this weld, obtaining greater than 87% coverage. Based on the coverage obtained, it is concluded that any existing patterns of degradation would have been detected by the examinations completed, and reasonable assurance of the structural integrity has been provided.

Based on the impracticality of meeting the Code coverage requirements for the subject weld, and the reasonable assurance provided by the examinations completed, it is recommended that relief be granted pursuant to 10 CFR 50.55a(g)(6)(i).

2.2 Request for Relief No. 98-005 (Part B), Examination Category B-D, Full Penetration Welds of Nozzles in Vessels

Code Requirement: Examination Category B-D, Items B3.90, B3.100, B3.110 and B3.120, require 100% volumetric examination of full penetration welds of nozzles in vessels, and inside radius sections as defined in Figures IWB-2500-7 (a) through (d).

Licensee's Code Relief Request: In accordance with 10 CFR 50.55a(g)(5)(iii), the licensee requested relief from the Code-required volumetric examinations of the following nozzle to vessel welds and nozzle inside radius sections:

WELD	ITEM	DESCRIPTION	COVERAGE	LIMITATION
2RPV5-W15	B3.090.05A	Nozzle to Vessel Weld	43.7%	Nozzle Geometry
2RPV5-W16	B3.090.06A	Nozzle to Vessel Weld	43.7%	Nozzle Geometry
2RPV5-W17	B3.090.07A	Nozzle to Vessel Weld	43.7%	Nozzle Geometry
2RPV5-W18	B3.090.08A	Nozzle to Vessel Weld	43.7%	Nozzle Geometry
2RPV5-W15	B3.100.05	Nozzle Inside Radius Section	87.70%	Nozzle Geometry
2RPV5-W16	B3.100.06	Nozzle Inside Radius Section	87.70%	Nozzle Geometry
2RPV5-W17	B3.100.07	Nozzle Inside Radius Section	87.70%	Nozzle Geometry
2RPV5-W18	B3.100.08	Nozzle Inside Radius Section	87.70%	Nozzle Geometry
2PZR-10	B3.110.001	Pressurizer Nozzle to Vessel Weld	74.78%	Nozzle Geometry
2PZR-12	B3.110.003	Pressurizer Nozzle to Vessel Weld	71.50%	Nozzle Geometry
2PZR-12R	B3.120.002	Pressurizer Nozzle Inside Radius Section	62.86%	Nozzle Geometry

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

"During the ultrasonic examination of the Reactor Vessel Outlet Nozzle to Shell Welds

2RPV-W15 (Item Number B03.90.005A)
2RPV-W16 (Item Number B03.90.006A)
2RPV-W17 (Item Number B03.90.007A)
2RPV-W18 (Item Number B03.90.008A)

shown in Attachment 2, coverage of the required examination volume was limited to 43.70%. Limitations caused by the nozzle geometry, i.e. the nozzle taper prevented obtaining greater than 90% coverage. In order to achieve additional coverage, the nozzle would have to be re-designed to eliminate the taper.

"During the ultrasonic examination of the Reactor Vessel Outlet Nozzle to Shell Welds (Inner Radius Sections)

2RPV-W15 (Item Number B03.100.005)
2RPV-W16 (Item Number B03.100.006)
2RPV-W17 (Item Number B03.100.007)
2RPV-W18 (Item Number B03.100.008)

shown in Attachment 2, coverage of the required examination volume was limited to 87.70%. Limitations caused by the nozzle geometry, i.e. the nozzle taper prevented obtaining greater than 90% coverage. In order to achieve additional coverage, the nozzle would have to be re-designed to eliminate the taper.

"During the ultrasonic examination of the Pressurizer Nozzle to Lower Head Weld 2PZR-10 (Item Number B03.110.001) shown in Attachment 3, coverage of te required examination volume could not be obtained. The examination coverage was limited to 74.78%, due to single-sided access caused by the nozzle geometry. In order to achieve more coverage, the nozzle would have to be redesigned to allow access from both sides.

"During the ultrasonic examination of the Pressurizer Nozzle to Upper Head Weld 2PZR-12 (Item Number B03.110.003) shown in Attachment 3, coverage of the required examination volume could not be obtained. The examination coverage was limited to 71.50%, due to single-sided access caused by the nozzle geometry. In order to achieve more coverage, the nozzle would have to be redesigned to allow access from both sides.

"During the ultrasonic examination of the Pressurizer Spray Nozzle to Upper Head Weld 2PZR-12R (Item Number B03.120.002) shown in Attachment 3, coverage of the required examination volume could not be obtained. The examination coverage was limited to 62.86%. Limitations are caused by the ratio of the nozzle O.D. to the vessel thickness. When the nozzle O.D. is large in

relation to the vessel thickness, less coverage can be obtained when scanning from the vessel side. Singe-sided access caused by the nozzle geometry resulted in limited coverage of the required volume. In order to achieve more coverage the nozzle would have to be redesigned to allow access from both sides.

Licensee's Proposed Alternative Examination (as stated):

"The use of radiography as an alternate volumetric examination for all the above listed components is not practical due to component thickness and geometric configurations. Other restrictions making radiography impractical are the physical barriers prohibiting access for placement of source, film, image quality indicator, etc.

"Since radiography is impractical, Duke Energy Corporation will continue to use ultrasonic examination procedures to obtain maximum coverage to the extent practicable of the Item Numbers referenced in Section I of this Request for Relief. No additional ultrasonic examinations or alternate exams are planned during the current interval for the welds referenced in Section I of the request.

"For the Class 1 Components listed in Section I above, Duke Energy proposes to use the pressure test to compliment (sic) the limited examination coverage. The Code requires (reference Table IWB-2500-1, Item Number B15.[10]) that a system leakage test be performed after each refueling outage. Additionally a system hydrostatic test (reference Table IWB-2500-1, Item Number B15.[11]) is required once during each 10-year inspection interval. These tests require a VT-2 visual examination for evidence of leakage. This testing will provide additional assurance of pressure boundary integrity."

Evaluation: The Code requires 100% volumetric examination of all Class 1 nozzle-to-vessel welds and inner radius sections. However, as demonstrated by the licensee's submittal, complete volumetric examination of the subject RPV and pressurizer nozzle-to-vessel welds and inner radius sections is limited due to the radius of curvature in the transition area between the nozzle and the vessel shell(s), and geometric design configurations limiting access to a single side. These conditions make the Code coverage requirements impractical to meet for the subject welds. In order to meet the Code requirements, the nozzles and/or subject vessels would have to be modified to facilitate access for ultrasonic search units. Imposition of these requirements would create a considerable burden on the licensee.

The licensee has completed volumetric examinations ranging from 43% to 87% coverage of the subject nozzles. Therefore, based upon the volumetric coverage obtained on the accessible portion of these components and similar examinations completed on other Class 1 nozzles, it is concluded that existing patterns of degradation, if present, would have been detected and reasonable assurance of the structural integrity of the subject welds has been provided. Therefore, it is recommended that relief be granted pursuant to 10 CFR 50.55a(g)(6)(i).

2.3 Request for Relief No. 98-005, (Part C), Examination Category B-F, Items B5.70 and B5.130, Dissimilar Metal Welds

Code Requirement: Examination Category B-F, Item B5.70 and B5.130, requires 100% volumetric and surface examination of pressure retaining dissimilar metal welds, as defined in Figure IWB-2500-8 for steam generator nozzle-to-safe end dissimilar metal welds and piping 4-inch NPS or larger.

Licensee's Code Relief Request: In accordance with 10 CFR 50.55a(g)(5)(iii), the licensee requested relief from the Code-required volumetric examinations for the dissimilar welds listed below.

Comp. ID	Component Description	ASME Category	Item Number	Aggregate Coverage	Limitation
B05.070.001	Steam Generator 2SGA-Inlet-SE	B-F	B5.70	75%	Volumetric examination limited due material characteristics and single side access
B05.070.002	Steam Generator 2SGA-Outlet-SE	B-F	B5.70	75%	Volumetric examination limited due material characteristics and single side access
2NC2F-1-2	B05.130.002	B-F	B5.130	75%	Volumetric examination limited due material characteristics and single side access
2NC2F-1-3	B05.130.003	B-F	B5.130	75%	Volumetric examination limited due material characteristics and single side access

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

"During the ultrasonic examination of the Steam Generator Nozzle-to-Safe End Welds:

2SGA-Inlet SE (B05.070.001) and
2SGA-Outlet SE (B05.070.002)

shown in Attachment 4, coverage of required examination volume could not be obtained. The examination coverage was limited to 75%.

"During the ultrasonic examination of the Piping Dissimilar Metal Welds (Steam Generator Safe End to Pipe):

2NCF-1-2 (B05.130.002) and
2NCF-1-3 (B05.130.003)

shown in Attachment 4, coverage of required examination volume could not be obtained. The examination coverage was limited to 75%.

"Material characteristics and single-sided access caused by the component geometry prevents two-beam path direction coverage of the examination volume.

"The most effective ultrasonic technique for the examination of dissimilar metal welds uses refracted longitudinal waves. The longitudinal wave is preferred, as the austenitic weld metal and buttering create highly attenuative barriers to shear wave ultrasound. The longitudinal wave is less affected by these difficulties. However, the longitudinal wave is affected by mode conversion when it strikes the inside surface of the safe end or pipe at any angle other than a right angle to the surface.

"The calculation below shows that a 45° refracted longitudinal wave striking the inside surface of a pipe will produce a 22.9° refracted shear wave in addition to the normally expected 45° reflected longitudinal wave.

$$\sin^{-1} = (\sin 45^\circ \times V_S) \div V_L$$

$$= (0.707 \times 0.123) \div 0.223$$

Where: $\sin^{-1}$ is the shear wave angle

V_S is the shear wave velocity of the stainless steel safe end/pipe material in inches/μsec.
V_L is the longitudinal wave velocity of the stainless steel safe/pipe end material in inches/μsec.

"As shown in the graph[2] below the mode conversion process creates two sound beams of differing intensities reflecting off of the inside surface. At incident angles greater than 30° the shear wave will predominate. However, the shear wave is attenuated and scattered by the austenitic weld metal and the layer of buttering. The examination sensitivity is degraded to such an extent that any examination using the second sound path leg is meaningless. Therefore, the two-beam path direction coverage requirement is impractical.

"In order to obtain the required two-beam path direction coverage, welds would have to be re-designed to allow scanning from both sides."

<u>Licensee's Proposed Alternative Examination</u> (as stated):

"The use of radiography as an alternate volumetric examination for all the above listed components is not practical due to component thickness and geometric configurations. Other restrictions making radiography impractical are the physical barriers prohibiting access for placement of source, film, image quality indicator, etc.

"Since radiography is impractical, Duke Energy Corporation will continue to use

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2. Drawings, sketches, graphs, and attachments are not included with this report.

ultrasonic examination procedures to obtain maximum coverage to the extent practicable of the Item Numbers referenced in Section I of this Request for Relief. No additional ultrasonic examinations or alternate exams are planned during the current interval for the welds referenced in Section I of the request.

"For the Class 1 Components listed in Section I above, Duke Energy proposes to use the pressure test to compliment (sic) the limited examination coverage. The Code requires (reference Table IWB-2500-1, Item Number B15[.30]) that a system leakage test be performed after each refueling outage. Additionally a system hydrostatic test (reference Table IWB-2500-1, Item Number B15.[31]) is required once during each 10-year inspection interval. These tests require a VT-2 visual examination for evidence of leakage. This testing will provide additional assurance of pressure boundary integrity."

Evaluation: The Code requires 100% surface and volumetric examination for dissimilar metal safe-end welds. However, complete volumetric examination of the subject welds was limited by component geometry (one-sided access) and material properties. As supported by the licensee's submittal, these restrictions limit access and make the Code volumetric coverage requirements impractical for the subject dissimilar metal welds. To meet the Code coverage requirements, design modifications would be necessary to provide access for examination. Imposition of the Code requirements would result in an undue hardship on the licensee.

The licensee has examined a significant portion (75%) of each of these dissimilar metal welds, in addition to a complete surface examination. As a result, any existing patterns of degradation would have been detected and reasonable assurance of the continued structural integrity has been provided. Therefore, it is recommended that relief be granted pursuant to 10 CFR 50.55a(g)(6)(i).

2.4 Request for Relief No. 98-005 (Part D) Examination Category B-J, Pressure Retaining Welds in Piping

Code Requirement: Examination Category B-J, Item B9.31 requires 100% volumetric and surface examination of pressure retaining welds in piping NPS 4 or Larger, as defined in Figures IWB-2500-9, 10 and 11.

Licensee's Code Relief Request: In accordance with 10 CFR 50.55a(g)(5)(iii), the licensee requested relief from the Code-required volumetric examination of the following welds.

Comp. ID	Component Description	ASME Category	Item Number	Aggregate Coverage	Limitation
2NC16-WN8A	B09.031.001	B-J	B9.31	49.40%	branch connections allows for single sided access only
2NC22-WN4	B09.031.002	B-J	B9.31	49.81%	branch connections allows for single sided access only
2NC22-WN8	B09.031.003	B-J	B9.31	50.00%	branch connections allows for single sided access only

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

"During the ultrasonic examination of Weld Number 2NC16-WN8A (B09.031.001) shown in Attachment 5, coverage of required examination volume could not be obtained. The examination coverage was limited to 49.40%.

"During the ultrasonic examination of Weld Number 2NC22-WN4 (B09.031.002) shown in Attachment 5, coverage of required examination volume could not be obtained. The examination coverage was limited to 49.81%.

"During the ultrasonic examination of Weld Number 2NC22-WN8 (B09.031.003) shown in Attachment 5, coverage of required examination volume could not be obtained. The examination coverage was limited to 50.00%.

"Single-sided access caused by the branch connection geometry prevents scanning from both sides of the weld.

"Cast stainless steel characteristics mandate the use of refracted longitudinal waves. This type of ultrasonic wave produces mode conversion at the pipe inside surface, thus preventing the use of sound path distances beyond the first 'leg'. Therefore, coverage of the required examination volume in two-beam path directions is not practical. In order to obtain the required two-beam path direction coverage, the branch connections and the elbow to pump weld would have to be re-designed to allow scanning from both sides of the weld over the required examination volume.

Licensee's Proposed Alternative Examination (as stated):

"The use of radiography as an alternate volumetric examination for all the above listed components is not practical due to component thickness and geometric configurations. Other restrictions making radiography impractical are the physical barriers prohibiting access for placement of source, film, image quality indicator, etc.

"Since radiography is impractical, Duke Energy Corporation will continue to use ultrasonic examination procedures to obtain maximum coverage to the extent practicable of the Item Numbers referenced in Section I of this Request for Relief. No additional ultrasonic examinations or alternate exams are planned during the current interval for the welds referenced in Section I of the request.

"For the Class 1 Components listed in Section I above, Duke Energy proposes to use the pressure test to compliment (sic) the limited examination coverage. The Code requires (reference Table IWB-2500-1, Item Number B15[.50]) that a system leakage test be performed after each refueling outage. Additionally a system hydrostatic test (reference Table IWB-2500-1, Item Number B15[.51]) is required once during each 10-year inspection interval. These tests require a VT-2 visual examination for evidence of leakage. This testing will provide additional assurance of pressure boundary integrity."

Evaluation: The Code requires 100% volumetric and surface examination of the subject pressure retaining welds in piping. However, as demonstrated by the licensee's submittal, complete volumetric examination of the subject welds is limited due to single sided access caused by the branch connection geometry. Therefore, the geometric design configuration and austenitic material characteristics make complete volumetric examinations impractical to perform on the subject welds. In order to meet the Code requirements, the branch connections and elbow to pump welds would have to be modified to facilitate scanning from both sides of the weld. Imposition of these requirements would create a considerable burden on the licensee.

The licensee obtained 49-50% composite coverage of the subject welds. Additionally, the subject welds are part of a larger population of Class 1 pressure retaining welds that have been or will be examined during the interval. Therefore, any patterns of degradation would have been detected by the examinations performed and reasonable assurance of the structural integrity of the subject pressure retaining welds has been provided. Based on the impracticality of meeting the Code coverage requirements for the subject welds, and the reasonable assurance provided by the examinations that were completed, it is recommended that relief be granted pursuant to 10 CFR 50.55a(g)(6)(i).

2.5 Request for Relief No. 98-005 (Part E) Examination Category C-B, Pressure Retaining Nozzle Welds in Vessels

Code Requirement: Examination Category C-B, Item C2.22 requires 100% volumetric examination as defined by Figure IWC-2500-4(a) or (b) of nozzle inside radius sections.

Licensee's Code Relief Request: In accordance with 10 CFR 50.55a(g)(5)(iii), the licensee has requested relief from performing volumetric examinations to the extent required by the Code for inaccessible portions of the Class 2 steam generator nozzle inner radius section 2SGA-SB-02 (C02.022.002).

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

"During the ultrasonic examination of the Feedwater Nozzle Inner Radius 2SGA-SB-02 (C02.022.002) shown in Attachment 6, coverage of the required examination volume was limited to 84.30%. Limitations were caused by the ratio of the nozzle OD to the vessel thickness. When the nozzle OD is small in relation to the vessel thickness, more coverage can be obtained when scanning from the vessel side. Duke Energy Corporation is investigating the use of computer modeling to solve the limitation problem.

"Nozzle inner radius sections were examined with the ultrasonic method to the maximum extent practical from the vessel wall. Calibration blocks and procedures were in accordance with ASME Section V, Article 4.

"Although the examination volume requirements as defined in ASME Section XI 1989 Edition, Figure IWC-2500-4 (a) or (b) could not be met, the amount of coverage obtained for these examinations provided an acceptable level of quality and integrity.

“The steam generators and associated nozzles have been replaced and there is no safety significance to the past examination coverage. The current steam generators were fully inspected by BWI prior to installation and relief for inspection of currently installed equipment is not requested.

“Pursuant to 10 CFR 50.55a(g)(6)(i), granting this relief for the welds listed under Examination Category C-B will provide reasonable assurance of weld/component integrity, and is authorized by law. In addition, the requested relief 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.”

Licensee’s Proposed Alternative Examination (as stated):

“The use of radiography as an alternate volumetric examination for all the above listed components is not practical due to component thickness and geometric configurations. Other restrictions making radiography impractical are the physical barriers prohibiting access for placement of source, film, image quality indicator, etc.

“Since radiography is impractical, Duke Energy Corporation will continue to use ultrasonic examination procedures to obtain maximum coverage to the extent practicable of the Item Numbers referenced in Section I of this Request for Relief. No additional ultrasonic examinations or alternate exams are planned during the current interval for the welds referenced in Section I of the request.

“For the Class 2 Components listed in Section I above, Duke Energy proposes to use the pressure test to compliment (sic) the limited examination coverage. The Code requires (reference Table IWC-2500-1, Item Number C7.[10]) that a system pressure test be performed once each period. Additionally, a system hydrostatic test (reference Table IWC-2500, Item Number C7.[20]) is required once during each 10-year inspection interval. These tests require a VT-2 visual examination for evidence of leakage. This testing will provide adequate assurance of pressure boundary integrity.

Evaluation: The Code requires 100% volumetric examination of the subject nozzle inside radius sections. However, as demonstrated by the licensee’s submittal, complete volumetric examination of the subject area is limited due to extreme nozzle geometry caused by the ratio of the nozzle OD to the vessel thickness. Therefore, the geometric design configuration makes complete volumetric examination impractical to perform on the subject inner radius areas. In order to meet the Code requirements, the nozzles and/or steam generator would have to be modified to increase examination coverage. Imposition of these requirements would create a considerable burden on the licensee.

The licensee obtained significant coverage (approximately 84%) of the subject area. Therefore, any significant patterns of degradation if present would have been detected by the examinations performed and reasonable assurance of the structural integrity of these areas has been provided. Based on the impracticality of meeting the Code coverage requirements for the subject welds, and the reasonable assurance provided by

the examinations that were completed, it is recommended that relief be granted pursuant to 10 CFR 50.55a(g)(6)(i).

3. CONCLUSION

The INEEL staff evaluated the licensee's submittal and determined that certain inservice examinations cannot be performed to the extent required by the Code at McGuire Nuclear Station, Unit 2. For the items discussed in Relief Request No. 98-005 (Parts A through E), it is concluded that the Code requirements are impractical to meet, and that reasonable assurance of the structural integrity of the subject components has been provided by the examinations that have been completed. Therefore, it is recommended that relief be granted pursuant to 10 CFR 50.55a(g)(6)(i).

McGuire Nuclear Station Unit 2
Second 10-Year ISI Interval

SUMMARY OF RELIEF REQUESTS

Relief Request Number	INEEL TLR Sec.	System or Component	Exam Category	Item No.	Volume or Area to be Examined	Required Method	Licensee Proposed Alternative	Relief Request Disposition
98-005 Part A	2.1	Reactor Pressure Vessel	B-A	B1.40	Head-to-Flange Weld	Volumetric	Perform volumetric examination to the extent practical.	Granted 10 CFR50.55a(g)(6)(i)
98-005 Part B	2.2	Reactor Pressure Vessel and Pressurizer	B-D	B3.90 B3.100 B3.110 B3.120	RPV Nozzle-to-Vessel Weld RPV Nozzle Inside Radius Pressurizer Nozzle-to-Vessel Weld Pressurizer Nozzle Inside Radius	Volumetric	Perform volumetric examination to the extent practical.	Granted 10 CFR50.55a(g)(6)(i)
98-005 Part C	2.3	Steam Generator	B-F	B5.70 B5.130	SG Nozzle-to-Safe End and Piping Dissimilar Metal Welds	Volumetric	Perform volumetric examination to the extent practical.	Granted 10 CFR50.55a(g)(6)(i)
98-005 Part D	2.4	Class 1 Piping	B-J	B9.31	Class 1 Piping Branch Connections	Volumetric	Perform volumetric examination to the extent practical.	Granted 10 CFR50.55a(g)(6)(i)
98-005 Part E	2.5	Class 2 Vessels	C-B	C2.22	SG Nozzle Inside Radius	Volumetric	Perform volumetric examination to the extent practical.	Granted 10 CFR50.55a(g)(6)(i)

cc:
Ms. Lisa F. Vaughn
Legal Department (PBO5E)
Duke Energy Corporation
422 South Church Street
Charlotte, North Carolina 28201-1006

County Manager of
Mecklenburg County
720 East Fourth Street
Charlotte, North Carolina 28202

Michael T. Cash
Regulatory Compliance Manager
Duke Energy Corporation
McGuire Nuclear Site
12700 Hagers Ferry Road
Huntersville, North Carolina 28078

Anne Cottingham, Esquire
Winston and Strawn
1400 L Street, NW.
Washington, DC 20005

Senior Resident Inspector
c/o U.S. Nuclear Regulatory Commission
12700 Hagers Ferry Road
Huntersville, North Carolina 28078

Dr. John M. Barry
Mecklenberg County
Department of Environmental
Protection
700 N. Tryon Street
Charlotte, North Carolina 28202

Mr. Steven P. Shaver
Senior Sales Engineer
Westinshouse Electric Company
5929 Carnegie Blvd.
Suite 500
Charlotte, North Carolina 28209

Ms. Karen E. Long
Assistant Attorney General
North Carolina Department of
Justice
P. O. Box 629
Raleigh, North Carolina 27602

Mr. C. Jeffrey Thomas
Manager - Nuclear Regulatory
Licensing
Duke Energy Corporation
526 South Church Street
Charlotte, North Carolina 28201-1006

Elaine Wathen, Lead REP Planner
Division of Emergency Management
116 West Jones Street
Raleigh, North Carolina 27603-1335

Mr. Richard M. Fry, Director
Division of Radiation Protection
North Carolina Department of
Environment, Health and Natural
Resources
3825 Barrett Drive
Raleigh, North Carolina 27609-7721

Mr. T. Richard Puryear
Owners Group (NCEMC)
Duke Energy Corporation
4800 Concord Road
York, South Carolina 29745