June 22, 2005

Mr. Ronald A. Jones
Vice President, Oconee Site
Duke Energy Corporation
7800 Rochester Highway
Seneca, SC 29672

SUBJECT: REQUEST FOR RELIEF FROM CERTAIN NON-DESTRUCTIVE EXAMINATION REQUIREMENTS FOR THE THIRD 10-YEAR INSERVICE INSPECTION INTERVAL OF OCONEE NUCLEAR STATION, UNIT 3 (TAC NO. MC4453)

Dear Mr. Jones:

By letter dated September 13, 2004, Duke Energy Company submitted Request for Relief No. 04-ON-004 for the third 10-year inservice inspection (ISI) interval of Oconee, Unit 3. The request pertains to relief from the volumetric examination of essentially 100 percent (greater than 90 percent in accordance with Code Case N–460) of the volume as required by the American Society of Mechanical Engineers Code (Code), Section XI, for the Class 1 and 2 welds identified in the relief request. The Code-required examination was considered impractical due to the component configuration that allowed only single-sided access for ultrasonic examination.

The Nuclear Regulatory Commission (NRC) staff grants the requested relief pursuant to provisions of 10 CFR 50.55a(g)(6)(I) for the third 10-year ISI interval. Enclosed is the NRC staff's Safety Evaluation.

Sincerely,

/RA/

Evangelos C. Marinos, Section Chief, Section 1
Project Directorate II
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket No. 50-287

Enclosure: As stated

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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

THIRD TEN-YEAR INTERVAL INSERVICE INSPECTION PROGRAM

REQUEST FOR RELIEF NO. 04-ON-004

FOR DUKE ENERGY CORPORATION

OCONEE NUCLEAR STATION, UNIT 3

DOCKET NO. 50-287

1.0 INTRODUCTION

By letter dated September 13, 2004 (Agencywide Documents Access and Management System, Accession No. ML042660277), Duke Energy Corporation (the licensee) submitted Request for Relief No. 04-ON-004 for the third 10-year inservice inspection (ISI) interval of Oconee Nuclear Station, Unit 3. The request pertains to relief from the volumetric examination of essentially 100 percent (greater than percent) of the volume as required by the American Society of Mechanical Engineers (ASME) Code, Section XI, for the Class 1 and 2 welds identified in the relief request.

2.0 REGULATORY EVALUATION

ISI of the ASME Code Class 1, 2, and 3 components are performed in accordance with Section XI of the ASME Code and the applicable addenda as required by Title 10 of the Code of Federal Regulations (10 CFR) Section 50.55a(g), except where relief has been granted by the Commission pursuant to 10 CFR 50.55(a)(6)(I). 10 CFR 50.55a(a)(3) states that alternatives to the requirements of (g) may be used, when authorized by the Nuclear Regulatory Commission (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, “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 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 ASME Section XI Code, for Oconee Unit 3's third 10-year ISI interval is the 1989 Edition. The components (including supports) may meet the requirements set forth in subsequent editions and addenda of the ASME Code

incorporated by reference in 10 CFR 50.55a(b) subject to the limitations and modifications listed therein, and subject to Commission approval.

Pursuant to 10 CFR 50.55a(g)(5), if the licensee determines that conformance with an examination requirement of Section XI of the ASME Code is not practical for its facility, information in support of that determination and a request for relief from the ASME Code requirement shall be submitted to the Commission. After evaluation of the determination, pursuant to 10 CFR 50.55a(g)(6)(I), the Commission may grant relief and may impose alternative requirements that are determined to be authorized by law, will not endanger life, property, or the common defense and security, and are otherwise in the public interest, giving due consideration to the burden upon the licensee that could result if the requirements were imposed.

System Component for Which Relief is Requested

SYSTEM/COMPONENT	ID NUMBER	ITEM NUMBER
Reactor Coolant System 3B2 Reactor Coolant Pump Nozzle to Safe End Weld	3-PDB2-1	B09.011.023
Low Pressure Injection System Pipe to Valve 3LP-1 Weld	3LP-131-2	B09.011.051
High Pressure Injection System Flange to Pipe Weld	3-51A-120-10	C05.021.016
High Pressure Injection System Pipe to Valve 3HP-409 Weld	3-51A-121-22	C05.021.021
High Pressure Injection System Tee to Valve 3HP-117 Weld	3-51A-52-20	C05.021.035
High Pressure Injection System Pipe to Valve 3HP-410 Weld	3-51A-119-41	C05.021.044
High Pressure Injection System Tee to Valve 3HP-140 Weld	3-51A-75-34	C05.021.056
High Pressure Injection System Tee to Valve 3HP-029 Weld	3-51A-87-8	C05.021.066

High Pressure Injection System Valve 3HP-029 to Pipe Weld	3-51A-87-9	C05.021.067
High Pressure Injection System Tee to Valve 3HP-122 Weld	3-51A-59-42	C05.021.090

Code Requirement

ASME Code, Section XI, 1989 Edition, in examination categories B-J (Pressure Retaining Welds in Piping) and C-F-1 (Pressure Retaining Welds in Austenitic Stainless Steel or High Alloy Piping) requires essentially 100 percent volumetric examination of the above welds.

ASME Section XI Code Case N–460, which has been approved for use by NRC in Regulatory Guide 1.147, Revision 13, allows credit for full volume coverage of welds if it can be shown that greater than 90 percent of the required volume has been examined.

Code Requirement from Which Relief is Requested

Relief is requested from the requirement to examine essentially 100 percent of the required volume specified in the ASME Code, Section XI, 1989 Edition. Due to existing piping/valve geometry, interferences, and existing examination technology, the ultrasonic examination coverage did not meet the 90 percent examination requirements of Code Case N–460.

Licensee's Basis for Relief

Weld 3-PDB2-1

The reactor coolant pump (RCP) nozzle material is A351-CF8 and the safe-end material is SA-376 TP316. The weld has a diameter of 33.5 inches and a wall thickness of 2.33 inches.

The licensee stated that during the ultrasonic examination of weld 3-PDB2-1 only 37.5 percent coverage of the required examination volume was obtained. The coverage reported represents the aggregate coverage of all scans performed. A 45E shear wave scan covering 50 percent of the required examination volume was performed on the wrought safe end side of the weld in two circumferential directions and a 60E shear wave and 60E longitudinal wave scan covering 50 percent of the examination volume on the wrought safe end side was performed in one axial direction from the safe end side. No scanning was performed from the cast stainless steel nozzle side of the weld. The licensee stated the scanning limitations were caused by the configuration of the RCP nozzle which prevented scanning from both sides of the weld. The licensee stated in order to scan all of the required surfaces for the inspection of this weld, the RCP nozzle would have to be redesigned to allow scanning from both sides of the weld, which is impractical. There were no recordable indications found during the inspection of this weld.

Weld 3LP-131-2

The valve and pipe material is stainless steel. The weld has a diameter of 12 inches and a wall thickness of 1.125 inches.

The licensee stated that during ultrasonic examination of weld 3LP-131-2, only 37.5 percent coverage of the required examination volume was obtained. The coverage reported represents the aggregate coverage of all the scans performed. A 45E shear wave scan was performed in two-circumferential directions covering 100 percent of the base metal portion of the pipe and 50 percent of the weld. A 60E shear wave scan covering 100 percent of the adjacent base material on the pipe side was performed in one axial direction. A 60E longitudinal wave scan covering 100 percent of the weld metal and adjacent base material on both sides of the weld was performed in one axial direction from the pipe side. No scanning was performed from the valve side of the weld. The licensee stated that scanning limitations were caused by the valve configuration that prevented scanning from both sides of the weld. The licensee stated in order to scan all of the required surfaces for the inspection of this weld, the valve would have to be redesigned to allow scanning from both sides of the weld, which is impractical. There were no recordable indications found during the inspection of this weld.

Weld 3-51A-120-10

The flange and pipe material is stainless steel. The weld has a diameter of 4 inches and a wall thickness of 0.531 inches.

The licensee stated that during the ultrasonic examination of weld 3-51A-120-10, only 37.5 percent coverage of the required examination volume was obtained. The coverage reported represents the aggregate coverage of all scans performed. A 45E shear wave scan was performed in two circumferential directions covering 100 percent of the base metal portion of the pipe and 50 percent of the weld. A 60E shear wave scan covering 100 percent of the adjacent base material on the pipe side was performed in one axial direction. A 60E longitudinal wave scan covering 100 percent of the weld metal and adjacent base material on both sides of the weld was performed in one axial direction from the pipe side. No scanning was performed from the flange side of the weld. The licensee stated that scanning limitations were caused by the flange to pipe configuration that prevented scanning from both sides of the weld. The licensee stated that in order to scan all of the required surfaces for the inspection of this weld, the flange would have to be redesigned to allow scanning from both sides of the weld, which is impractical. There were no recordable indications found during the inspection of the weld.

Weld 3-51A-121-22

The valve and pipe material is stainless steel. The weld has a diameter of 4 inches and a wall thickness of 0.674 inches.

The licensee stated that during the ultrasonic examination of weld 3-51A-121-22, only 37.5 percent coverage of the required examination volume was obtained. The coverage reported represents the aggregate coverage of all scans performed. A 45E shear wave scan was performed in two circumferential directions covering 100 percent of the base metal portion of the pipe and 50 percent of the weld. A 60E shear wave scan covering 100 percent of the

adjacent base material on the pipe side was performed in one axial direction. A 60E longitudinal wave scan covering 100 percent of the weld metal and adjacent base material on both sides of the weld was performed in one axial direction from the pipe side. No scanning was performed from the valve side of the weld. The licensee stated that scanning limitations were caused by the valve configuration that prevented scanning from both sides of the weld. The licensee stated that in order to scan all of the required surfaces for the inspection of this weld, the valve would have to be redesigned to allow scanning from both sides of the weld, which is impractical. There were no recordable indications found during the inspection of this weld.

Weld 3-51A-52-20

The valve and tee material is stainless steel. The weld has a diameter of 4 inches and a wall thickness of 0.531 inches.

The licensee stated that during the ultrasonic examination of weld 3-51A-52-20, only 37.5 percent coverage of the required examination volume was obtained. The coverage reported represents the aggregate coverage of all scans performed. A 45E shear wave scan was performed in two circumferential directions covering 100 percent of the base metal portion of the tee and 50 percent of the weld. A 60E shear wave scan covering 100 percent of the adjacent base material on the tee side was performed in one axial direction. A 60E longitudinal wave scan covering 100 percent of the weld metal and adjacent base material on both sides of the weld was performed in one axial direction from the tee side. No scanning was performed from the valve side of the weld. The licensee stated that scanning limitations were caused by the tee to valve configuration that prevented scanning from both sides of the weld. The licensee stated that in order to scan all of the required surfaces for the inspection of this weld, the valve and tee would have to be redesigned to allow scanning from both sides of the weld, which is impractical. There were no recordable indications found during the inspection of this weld.

Weld 3-51A-119-41

The valve and pipe material is stainless steel. The weld has a diameter of 4 inches and a wall thickness of 0.674 inches.

The licensee stated that during the ultrasonic examination of weld 3-51A-119-41, only 62.5 percent coverage of the required examination volume was obtained. The coverage reported represents the aggregate coverage of all scans performed. A 45E shear wave scan was performed in two circumferential directions covering 100 percent of the base metal portion of the pipe and 100 percent of the weld. A 60E shear wave scan covering 100 percent of the adjacent base material on the pipe side was performed in one axial direction. A 60E longitudinal wave scan covering 100 percent of the weld metal and adjacent base material on both sides of the weld was performed in one axial direction from the weld side. No scanning was performed from the valve side of the weld. The licensee stated that scanning limitations were caused by the pipe to valve configuration that prevented scanning from both sides of the weld. The licensee stated that in order to scan all of the required surfaces for the inspection of this weld, the valve would have to be redesigned to allow scanning from both sides of the weld, which is impractical. There were no recordable indications found during the inspection of this weld.

Weld 3-51A-75-34

The valve and tee material is stainless steel. The weld has a diameter of 4 inches and a wall thickness of 0.531 inches.

The licensee stated that during the ultrasonic examination of weld 3-51A-75-34, only 37.5 percent coverage of the required examination volume was obtained. The coverage reported represents the aggregate coverage of all scans performed. A 45E shear wave scan was performed in two circumferential directions covering 100 percent of the base metal portion of the tee and 50 percent of the weld. A 60E shear wave scan covering 100 percent of the adjacent base material on the tee side was performed in one axial direction. A 60E longitudinal wave scan covering 100 percent of the weld metal and adjacent base material on both sides of the weld was performed in one axial direction from the tee side. No scanning was performed from the valve side of the weld. The licensee stated that scanning limitations were caused by the valve configuration that prevented scanning from both sides of the weld. The licensee stated that in order to scan all of the required surfaces for the inspection of this weld, the valve would have to be redesigned to allow scanning from both sides of the weld, which is impractical. The licensee's inspection of this weld found one recordable indication. The indication was a geometric reflector due to the Inside Diameter counter-bore. The licensee's assessment was confirmed by review of Radiographic Testing (RT) film.

Weld 3-51A-87-8

The valve and tee material is stainless steel. The weld has a diameter of 4 inches and a wall thickness of 0.531 inches.

The licensee stated that during the ultrasonic examination of weld 3-51A-87-8, only 62.5 percent coverage of the required examination volume could not be obtained. The coverage reported represents the aggregate coverage of all scans performed. A 45E shear wave scan was performed in two circumferential directions covering 100 percent of the base metal portion of the tee and 100 percent of the weld. A 60E shear wave scan covering 100 percent of the adjacent base material on the tee side was performed in one axial direction. A 60E longitudinal wave scan covering 100 percent of the weld metal and adjacent base material on both sides of the weld was performed in one axial direction from the tee side. No scanning was performed from the valve side of the weld. The licensee stated that limitations were caused by the valve to tee configuration that prevented scanning from both sides of the weld. The licensee stated that in order to scan all of the required surfaces for the inspection of this weld, the valve and tee would have to be redesigned to allow scanning from both sides of the weld, which is impractical. There were no recordable indications found during the inspection of this weld.

Weld 3-51A-87-9

The valve and pipe material is stainless steel. The weld has a diameter of 4 inches and a wall thickness of 0.531 inches.

The licensee stated that during the ultrasonic examination of weld 3-51A-87-9, only 37.5 percent coverage of the required examination volume was obtained. The coverage reported represents the aggregate coverage of all scans performed. A 45E shear wave scan was

performed in two circumferential directions covering 100 percent of the base metal portion of the pipe and 50 percent of the weld. A60E shear wave scan covering 100 percent of the adjacent base material on the pipe side was performed in one axial direction. A 60E longitudinal wave scan covering 100 percent of the weld metal and adjacent base material on both sides of the weld was performed in one axial direction from the pipe side. No scanning was performed from the valve side of the weld. The licensee stated that scanning limitations were caused by the valve configuration that prevented scanning from both sides of the weld. The licensee stated that in order to scan all of the required surfaces for the inspection of this weld, the valve would have to be redesigned to allow scanning from both sides of the weld, which is impractical. The licensee's inspection of this weld found a reportable indication. The licensee assessed the indication to be a geometric reflector from the weld root. The licensee's assessment was confirmed by review of RT film.

Weld 3-51A-59-42

The valve and tee material is stainless steel. The weld has a diameter of 2 inches and a wall thickness of 0.552 inches.

The licensee stated that during the ultrasonic examination of weld 3-51A-59-42, only 62.5 percent coverage of the required examination volume was obtained. The coverage reported represents the aggregate coverage of all scans performed. A 45E shear wave scan was performed in two circumferential directions covering 100 percent of the base metal portion of the tee and 100 percent of the weld. A 60E shear wave scan covering 100 percent of the adjacent base material on the tee side was performed in one axial direction. A 60E longitudinal wave scan covering 100 percent of the weld metal and adjacent base material on both sides of the weld was performed in one axial direction from the tee side. No scanning was performed from the valve side of the weld. The licensee stated that scanning limitations were caused by the valve and tee configurations that prevented scanning from both sides of the weld. The licensee stated in order to scan all of the required surfaces for the inspection of this weld, the valve and tee would have to be redesigned to allow scanning from both sides of the weld, which is impractical. There were no recordable indications found during the inspection of this weld.

Justification for Granting Relief

The licensee stated that ultrasonic examination of welds 3-PDB2-1, and 3LP-131-2 was conducted using equipment and procedures qualified in accordance with ASME Section XI, Appendix VIII, Supplement 2 of the 1995 Edition with the 1996 Addenda as administered by the Performance Demonstration Initiative (PDI). In addition to the volumetric examination with limited scan, the licensee performed a surface examination as required by the ASME Code on the welds and achieved 100 percent coverage. The results of the surface examination were acceptable.

The licensee stated that it does not claim credit for coverage of the far side of austenitic piping welds. The characteristics of austenitic weld metal attenuate and distort the sound beam when shear waves pass through the weld metal. Refracted longitudinal waves provide better penetration, but cannot be used beyond the first sound path leg. The licensee used a combination of shear waves and longitudinal waves to examine single sided austenitic piping welds.

The licensee stated that although the procedures, personnel and equipment were qualified through the PDI using longitudinal and shear waves, the PDI does not provide a qualification for single-sided examination of similar metal austenitic piping welds.

In addition, the licensee stated that it will use Class 1, Examination Category B-P, pressure testing and VT-2 visual examinations to complement the limited scan examinations. The Code requires that a pressure test be performed after each refueling outage for Class 1 components. The pressure tests require a VT-2 visual examination for evidence of leakage. This testing provides adequate assurance of pressure boundary integrity.

The licensee stated that there are other activities that would detect and isolate leakage if leakage did occur through the weld. Specifically, leakage from the weld would be detected by monitoring of the Reactor Coolant System (RCS), which is performed once each shift. The RCS leakage monitoring is a requirement of Technical Specification (TS) 3.4.13, “Reactor Coolant System Leakage”. The licensee stated that any discovered leakage is also evaluated in accordance with this TS. Other methods the licensee used to detect leakage are the RCS mass balance calculation, the Reactor Building air particulate monitor, the level indicator in the Reactor Building normal sump, and monitoring a loss of level in the Letdown Storage Tank. Based on the results of the required volumetric, surface, and VT-2 examinations performed during the outage, the licensee considers this combination of examinations provides a reasonable assurance of component integrity.

The licensee stated that the ultrasonic examination of the welds for 3-51A-120-10, 3-51A-121-22, 3-51A-52-20, 3-51A-119-41, 3-51A-75-34, 3-51A-87-8, 3-51A-87-9, and 3-51A-59-42 was conducted using personnel, equipment, and procedures qualified in accordance with ASME Section XI, Appendix VIII, Supplement 2 of the 1995 Edition with the 1996 Addenda as administered by the PDI. In addition to the volumetric examination with limited coverage, the licensee performed a surface examination as required by the ASME Code and achieved 100 percent coverage. The results of the surface examination of the welds was acceptable.

The licensee stated that it does not claim credit for coverage of the far side of austenitic piping welds. The characteristics of austenitic weld metal attenuate and distort the sound beam when shear waves pass through the weld metal. Refracted longitudinal waves provide better penetration, but cannot be used beyond the first sound path leg. The licensee used a combination of shear waves and longitudinal waves to examine single sided austenitic piping welds.

In addition, the licensee will use Class 2, Examination Category C-H, pressure testing and VT-2 visual examination to complement the limited examination coverage. The Code requires that a pressure test be performed once each period for Class 2 items. These tests require a VT-2 visual examination for evidence of leakage. This testing provides adequate assurance of pressure boundary integrity.

The licensee stated that although the procedures, personnel and equipment were qualified through PDI using longitudinal and shear waves, the PDI does not provide a qualification for single sided examination of similar metal austenitic piping welds.

In addition to the required Code examinations, the licensee stated there are other activities at Oconee that provide confidence that if leakage did occur, it would be detected and isolated. The licensee stated that leakage from these welds would be detected by Operations personnel during their regular rounds. The Nuclear Equipment Operator has been trained to look for any unusual conditions, such as leaks. The licensee stated that the identified welds are located in an area where operations personnel will be walking through as part of their rounds and, therefore, any leak would be identified by visual observation.

The licensee stated that the referenced weld/components have been examined to the maximum extent utilizing the latest in examination techniques and equipment. The welds/components were inspected by volumetric NDE methods during construction and verified to be free from unacceptable fabrication defects. The licensee concluded that the volumetric coverage and the required surface, and VT-2 examinations and pressure testing provide reasonable assurance of component integrity.

NRC STAFF EVALUATION

The NRC staff has evaluated the information provided by the licensee in support of the volumetric examinations of the subject welds performed during the third 10-year ISI interval. For the subject welds, ultrasonic scanning in the axial direction could be performed from only one side of the weld due to component configuration and geometries that prevented scanning from the other side of the weld. The licensee's best effort examination with single-sided access achieved volumetric coverages of the welds ranging from 37.5 percent to 62.5 percent.

Code Case N-460, which was approved for use by the NRC in Regulatory Guide 1.147, Revision 13, allows credit for full volume coverage if it can be shown that more than 90 percent of the required volume has been examined.

The NRC staff has determined that the examination coverage of the subject welds was reduced due to component configuration and geometries that restricted scanning from both sides of the weld and allowed only single-sided access. In addition to the volumetric examination, the licensee performed surface examinations on all the welds. The results of the surface examinations were acceptable. The licensee stated that it will also use Class 1, Examination Category B-P, pressure testing and VT-2 visual examination and Class 2, Examination Category C-H, pressure testing and VT-2 visual examinations to complement the applicable limited examination coverage. In order to meet the Code requirements, the components would have to be redesigned, fabricated, and installed in the systems, which would impose a burden on the licensee. Therefore, the NRC staff has determined that the licensee's limited examination coverage of the welds provide reasonable assurance of structural integrity. Based on the access limitations, it is impractical for the licensee to meet the Code coverage requirements.

CONCLUSION

The NRC staff has reviewed the licensee's submittal and has concluded that compliance with the Code requirements for volumetric coverage of the subject welds is impractical due to component configuration. The NRC staff has also determined that if the Code requirements were to be imposed on the licensee, the components must be redesigned, which would impose

significant burden on the licensee. The NRC staff finds that the examination coverage of the accessible weld volume, as complemented by the additional examinations performed by the licensee, provides reasonable assurance of structural integrity of the subject welds. Therefore, relief is granted pursuant to 10 CFR 50.55a(g)(6)(I) for the third 10-year ISI interval of Oconee Nuclear Station, Unit 3. This grant of relief 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. All other ASME Code, Section XI requirements for which relief was not specifically requested and authorized herein by the NRC staff remain applicable, including third party review by the Authorized Nuclear Inservice Inspector.

Principal Contributor: E. Reichelt

Date: June 22, 2005

Oconee Nuclear Station, Units 1, 2, and 3

cc:

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