March 8, 2005

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

SUBJECT: SAFETY EVALUATION OF INSERVICE INSPECTION RELIEF REQUEST NO. 04-ON-005 THIRD 10-YEAR INSPECTION INTERVAL FOR OCONEE NUCLEAR STATION, UNIT 1 (TAC NO. MC4527)

Dear Mr. Jones:

The Nuclear Regulatory Commission (NRC) staff has reviewed your submittal dated September 20, 2004, requesting relief from certain volumetric examination requirements of the American Society of Mechanical Engineers (ASME) Code, Section XI, 1989 Edition (as modified by Code Case N-460) for the pressurizer sensing sample nozzle-to-shell welds and some Class 1 and 2 piping welds for Oconee, Unit 1, for the third 10-year inspection interval. The reliefs, applicable to specific circumferential nozzle-to-shell welds and the piping welds, pertain to the limited volumetric examination conducted for each of the welds due to the configuration of the weld.

The NRC staff has evaluated the relief requests against the requirements of the applicable Code, the 1989 Edition of the ASME Code, Section XI and grants relief pursuant to Title 10 of the *Code of Federal Regulations*, Section 50.55a(g)(6)(i). The details of the NRC staff's evaluation are provided in the enclosed Safety Evaluation.

Sincerely,

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

Docket No: 50-269

Enclosure: As stated

cc w/encl: See next page

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*No major changes to SB #No legal objection w/change

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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

THIRD 10-YEAR INSERVICE INSPECTION INTERVAL

REQUEST FOR RELIEF NO. 04-ON-005

DUKE ENERGY CORPORATION

OCONEE NUCLEAR STATION, UNIT 1

DOCKET NO. 50-269

1.0 INTRODUCTION

By letter dated September 20, 2004, Duke Energy Corporation (Duke) requested relief from certain volumetric examination requirements of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (Code), Section XI, 1989 Edition (as modified by Code Case N-460) for the pressurizer sensing sample nozzle-to-shell welds and some Class 1 and 2 piping welds for Oconee, Unit 1, for the third 10-year inspection interval. The examinations were conducted as part of inservice inspection (ISI) conducted during the third 10-year inspection interval of Oconee, Unit 1. The reliefs, applicable to specific circumferential nozzle-to-shell welds and the piping welds, pertain to the limited volumetric examination conducted for each of the welds due to the configuration of the weld. The NRC staff has evaluated Duke's request for relief from the ASME Code, Section XI, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) Section 50.55a(g)(6)(i).

2.0 REGULATORY EVALUATION

The ISI of ASME Code Class 1, 2, and 3 components is to be performed in accordance with Section XI of the ASME Code and applicable addenda as required by 10 CFR 50.55a(g), except where specific written relief has been granted by the Commission pursuant to 10 CFR 50.55a(g)(6)(i). 10 CFR 50.55a(a)(3) states that alternatives to the requirements of paragraph (g) may be used, when authorized by the NRC, if 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 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 applicable ISI Code of Record for the third 10-year ISI interval of Oconee, Unit 1, is the ASME Code, Section XI, 1989 Edition.

10 CFR 50.55(g)(5)(iv) states that when an examination required by the code is determined to be impractical, the basis for this determination must be demonstrated to the satisfaction of the Commission not later than 12 months after the expiration of the initial 10-year interval and each subsequent interval during which the examination is determined to be impractical. The third 10-year interval for Oconee, Unit 1, ended on January 1, 2004.

3.0 TECHNICAL EVALUATION

3.1 Systems/Component(s) for Which Relief is Requested

Pressurizer sensing sample nozzle-to-shell welds (1-PZR-WP26-3 and 7)
Examination Category B-B, Item B3.30. 32.08% volumetric coverage obtained.

Low pressure injection system elbow-to-valve weld (1LP-140-8A)
Examination Category B-J, Item B9.11. 85.07% volumetric coverage obtained.

High pressure injection system pipe-to-valve weld (1-51A-01-114AC)
Examination Category C-F-1, Item C5.21. 55.55% volumetric coverage obtained.

High pressure injection system elbow -to-valve weld (1HP-187-114)
Examination Category C-F-1, Item C5.21. 62.5% volumetric coverage obtained.

High pressure injection system pipe-to-valve weld (1-51A-02-49BA)
Examination Category C-F-1, Item C5.21. 62.5% volumetric coverage obtained.

High pressure injection system flange-to-pipe weld (1-51A-02-23BB)
Examination Category C-F-1, Item C5.21. 62.5% volumetric coverage obtained.

High pressure injection system tee-to-elbow weld (1HP-187-116)
Examination Category C-F-1, Item C5.21. 62.5% volumetric coverage obtained.

High pressure injection system pipe-to-valve weld (1HP-194-4)
Examination Category C-F-1, Item C5.21. 65.18% volumetric coverage obtained.

3.2 Code Requirements for which Relief is Requested

The ASME Code, Section XI, 1989 Edition, Table IWB-2500-1, Examination Categories B-B, and B-J, and Table IWC-2500-1, Examination Category C-F-1 require volumetric examination of essentially 100 percent of the weld examination volume. In accordance with ASME Section XI, Code Case –460, which has been approved by the NRC, essentially 100 percent means more than 90 percent of the examination volume of each weld where reduction in coverage is due to interference by another component or part geometry. In addition, 10 CFR 50.55a requires the ultrasonic examination to be performed using procedures, personnel, and equipment qualified to the requirement of Appendix VIII of the ASME Section XI Code, 1995

Edition with the 1996 Addenda "Performance Demonstration for Ultrasonic Examination Systems."

3.3 Licensee's Proposed Alternative

The scheduled 10-year code examination was performed on the referenced area/weld and it resulted in the noted limited coverage of the required ultrasonic volume. No additional examination are planned for the area/weld during the current inspection interval.

3.4 Licensee's Basis for Relief

Welds 1-PZR-WP26-3 and 7

During the ultrasonic examination of the above welds, 32.08 percent coverage of the required examination volume was obtained for each of the welds. The percentage of coverage reported represents the aggregate coverage from all scans performed on the weld and adjacent base metal. The coverage from each scan was as follows: straight beam, 37.42 percent; 45 degree scan, 39.06 percent; 60 degree scan, 19.77 percent. Limitations caused by the nozzle configuration prevented scanning from both sides of the weld. In order to scan all of the required surfaces for the inspection of these welds, the sampling nozzles 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 these welds.

Weld 1LP-140-8A

During the ultrasonic examination of the above weld, 85.07 percent coverage of the required examination volume was obtained. The percentage of coverage reported represents the aggregate coverage from all scans performed on the weld and adjacent base material. The 45 degree circumferential scans, both clockwise and counter-clockwise covered 100 percent of the examination volume, the 60 degree axial scan from the elbow side covered 100 percent of the examination volume and the 60 degree axial scan from the valve side covered 40.3 percent of the examination volume. Scanning limitations caused by the valve configuration prevented full scanning from both sides of the weld. 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 1-51A-01-114AC

During the ultrasonic examination of the above weld, 55.55 percent coverage of the required examination volume was obtained. The percentage of coverage reported represents the aggregate coverage from all scans performed on the weld and adjacent base material. The 45 degree circumferential scans, both clockwise and counter-clockwise covered 61.1 percent of the examination volume and the 60 degree axial scan from the pipe side covered 100 percent of the examination volume. In addition, a 70 degree shear wave angle beam was used to interrogate the weld and base material on the valve side of the weld. Scanning limitations caused by the valve configuration prevented scanning from both sides of the weld. 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 1HP-187-114

During the ultrasonic examination of the above weld, 62.5 percent coverage of the required examination volume was obtained. The percentage of coverage reported represents the aggregate coverage from all scans performed on the weld and adjacent base material. The 45 degree circumferential scans, both clockwise and counter-clockwise covered 75 percent of the examination volume and the 60 degree axial scan from the elbow side covered 100 percent of the examination volume. Scanning limitations caused by the valve configuration prevented scanning from both sides of the weld. 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 1-51A-02-49BA

During the ultrasonic examination of the above weld, 62.5 percent coverage of the required examination volume was obtained. The percentage of coverage reported represents the aggregate coverage from all scans performed on the weld and adjacent base material. The 45 degree circumferential scans, both clockwise and counter-clockwise covered 100 percent of the examination volume and the 60 degree axial scan from the pipe side covered 100 percent of the examination volume. Scanning limitations caused by the valve configuration prevented scanning from both sides of the weld. 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 1-51A-02-23BB

During the ultrasonic examination of the above weld, 62.5 percent coverage of the required examination volume was obtained. The percentage of coverage reported represents the aggregate coverage from all scans performed on the weld and adjacent base material. The 45 degree circumferential scans, both clockwise and counter-clockwise covered 100 percent of the examination volume and the 60 degree axial scan from the pipe side covered 100 percent of the examination volume. Scanning limitations caused by the flange configuration prevented scanning from both sides of the weld. 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 this weld.

Weld 1HP-187-116

During the ultrasonic examination of the above weld, 62.5 percent coverage of the required examination volume was obtained. The percentage of coverage reported represents the aggregate coverage from all scans performed on the weld and adjacent base material. The 45 degree circumferential scans, both clockwise and counter-clockwise covered 100 percent of the examination volume and the 60 degree axial scan from the elbow side covered 100 percent of the examination volume. Scanning limitations caused by the valve configuration prevented scanning from both sides of the weld. In order to scan all of the required surfaces for the inspection of this weld, the 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 1HP-194-4

During the ultrasonic examination of the above weld, 65.18 percent coverage of the required examination volume was obtained. The percentage of coverage reported represents the aggregate coverage from all scans performed on the weld and adjacent base material. The 45 degree circumferential scans, both clockwise and counter-clockwise covered 80.36 percent of the examination volume due to a sharp transition where the weld joins the valve body. The 60 degree axial scan from the pipe side covered 100 percent of the examination volume. Scanning limitations caused by the valve configuration prevented scanning from both sides of the weld. 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.

3.5 Staff Evaluation

The pressurizer sensing sample nozzle-to-shell welds require a 100-percent volumetric examination during each inspection interval in accordance with the applicable ASME Code, Section XI. The NRC staff notes that each of the pressurizer sensing sample welds identified in the relief request was examined in accordance with the requirements of Article 4 of the ASME Code, Section V, using personnel qualified in accordance with the requirements of the ASME Code, Section XI of the 1995 Edition with the 1996 Addenda. The volumetric examination coverage was 32 percent. The results of the examination did not identify any recordable indication. The limitation in coverage is due to the curvature of the nozzle that prevented scanning from the far side. The NRC staff has determined that it is impractical to perform the Code-required examination of the welds due to the configuration of the nozzle. In order to comply with the Code requirement, a design modification of the sampling nozzle would have to be performed, which would impose a significant burden on the licensee. The NRC staff has further evaluated the impact of limited volumetric examination coverage on the structural integrity of the welds.

In assessing the structural integrity of the nozzle-to-shell welds in the pressurizer affected by this relief request, the NRC staff focused on the issues of active degradation mechanisms, the likelihood of a flaw existing in the subject welds, and the growth of an existing flaw necessary to cause a failure during the current inspection interval. The factors considered were:

1) The welds for which relief from Code-required examination coverage is requested are composed of low-alloy carbon steel, which is not susceptible to stress corrosion cracking in the exposed environment. There is no degradation mechanism, other than thermal fatigue, active in the subject welds that would cause a failure of the weld. Further, the examination conducted for each weld provides reasonable assurance of structural integrity of the weld since any pre-existing fatigue crack in the weld that would have grown while the plant was operating would have been detected with reasonable confidence during examination of the accessible weld volume.

2) Further, the system pressure test routinely conducted at the end of the refueling outage prior to operation will likely result in detection of a leak before any gross failure occurs.

The NRC staff, therefore, has determined that there is reasonable assurance of structural integrity of these welds with the limited volumetric examination and the tests conducted during the third 10-year inspection interval.

The remaining piping welds addressed in the relief request require a 100-percent volumetric examination during each inspection interval in accordance with the applicable ASME Code, Section XI. The NRC staff notes that each of the welds identified in the relief request was examined in accordance with the Performance Demonstration Initiative (PDI) requirements of Appendix VIII to Section XI and did receive a limited volumetric examination coverage ranging from 55 percent to 85 percent. It should be noted that the volumetric examination was performed through 100 percent of the Code-required volume; however, the PDI Appendix VIII procedure used is not qualified for the detection of flaws on the far side a weld when using single-sided access examinations of austenitic piping welds. The techniques employed for the examinations of the far side provide for a best-effort examination. Each of these welds is a stainless steel weld and the sound beam is markedly attenuated on the far side to detect and size flaws.

For the subject welds, ultrasonic scanning in the circumferential direction could be performed from only one side of the weld due to the component configuration that prevented scanning from the tapered surface on the other side of the weld. Therefore, it is impractical to meet the Code requirements. In order to meet the Code requirements, the components would have to be redesigned, fabricated, and installed in the systems, which would impose a significant burden on the licensee. The results of the examinations did not identify any recordable indication. The NRC staff further concludes that, if there were any service-induced flaws existing in the welds or in the base metal adjacent to the welds, the examination of the accessible weld volume would have at least detected a portion of it with a high degree of confidence. Therefore, the NRC staff has determined that the licensee's limited examination of the welds provides reasonable assurance of structural integrity of the subject welds.

4.0 CONCLUSION

Based on the above, the NRC staff concludes that the Code-examination requirements are impractical and compliance with them would require design modifications of the welds, resulting in significant burden to the licensee. The NRC staff concludes that reasonable assurance of structural integrity of the welds has been provided based on the examinations performed. Therefore, the licensee's request for relief as stated in Relief Request No.

04-ON-005 is granted pursuant to 10 CFR 50.55a(g)(6)(i) for Oconee Nuclear Station, Unit 1 for the third 10-year ISI interval. This granting of relief is authorized by law and will not endanger life, property, or the common defense and security and is otherwise in the public interest given 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 approved in this relief request remain applicable including third party review by the Authorized Nuclear Inservice Inspector.

Principal contributor: P. Patniak

Date: March 8, 2005

Oconee Nuclear Station, Units 1, 2, and 3

cc:

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