August 30, 2006

Mr. Bruce H. Hamilton
Vice President, Oconee Site
Duke Power Company LLC
7800 Rochester Highway
Seneca, SC 29672

SUBJECT: THIRD 10-YEAR INSERVICE INSPECTION INTERVAL PROGRAM PLAN,REQUEST FOR RELIEF 05-ON–002, REVISION 1, OCONEE NUCLEAR STATION, UNIT 3 (TAC NO. MC7996)

Dear Mr. Hamilton:

By letter dated June 24, 2005, and additional information in a letter dated July 14, 2006, you provided Request for Relief (RR) 05-ON-002, Revision 1 for the Third 10-year Inservice Inspection Interval (ISI) Program Plan for Oconee Nuclear Station, Unit 3. With technical assistance from our contractor, the Pacific Northwest National Laboratory, we have reviewed and evaluated RR 05-ON-002, and we find it acceptable for the third 10-year ISI interval. Our safety evaluation is enclosed.

Sincerely,

/RA/

Evangelos C. Marinos, Chief
Plant Licensing Branch II-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-287

Enclosure:
Safety Evaluation

cc w/encl: See next page

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DATE	08/16/06	08/16/06	08/24/06	08/28/06

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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

THIRD 10-YEAR INSERVICE INSPECTION INTERVAL

REQUEST FOR RELIEF 05-ON-002, REVISION 1

OCONEE NUCLEAR STATION, UNIT 3

DUKE ENERGY COMPANY LLC

DOCKET NO. 50-287

1.0 INTRODUCTION

The Nuclear Regulatory Commission (NRC) staff, with technical assistance from its contractor, the Pacific Northwest National Laboratory (PNNL) has reviewed and evaluated the information provided by Duke Power Company LLC (the licensee) in its letter dated June 24, 2005 (ML051790245), which proposed its Third 10-Year Inservice Inspection Interval (ISI) Program Plan, Request for Relief (RR) 05-ON-002, Revision 1, for Oconee Nuclear Station, Unit 3 (Oconee 3). The licensee provided additional information in its letter dated July 14, 2006 (ML062060551). The staff adopts the evaluations and recommendations for granting relief contained in PNNL's Technical Letter Report (TLR) which has been incorporated into this safety evaluation and can be found in ADAMS under ML062080481. Attachment 1 to this safety evaluation lists each relief request and the status of approval.

2.0 REGULATORY REQUIREMENTS

Inservice inspection (ISI) of the American Society of Mechanical Engineers (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* (Code), and applicable addenda, as required by *Title 10 of the Code of Federal Regulations* (10 CFR), Part 50, Section 50.55a(g), except where specific relief has been granted by the Commission pursuant to 10 CFR 50.55a(g)(6)(i). The regulation at 10 CFR 50.55a(a)(3) states that alternatives to the requirements of paragraph (g) may be used, when authorized by the 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) twelve months prior to the start of the 120-month interval, subject to the limitations and modifications listed therein. The ASME Code of record for the Oconee 3 Third 10-Year Interval Inservice Inspection Program Plan, which began on December 16,1994, is the 1989 edition of Section XI of the ASME Code, with no addenda.

3.0 TECHNICAL EVALUATION

The information provided by the licensee in support of the request for relief from ASME Code requirements has been evaluated and the basis for disposition is documented below. For clarity, the request has been evaluated in several parts corresponding to ASME Code categories.

3.1 Request for Relief 05-ON-002, Examination Category B-A, Items B1.11, B1.21, and B1.30, Pressure-Retaining Welds in Reactor Vessel

ASME Code Requirement

ASME Code, Section XI, Table IWB-2500-1, Examination Category B-A, Items B1.11, B1.21, and B1.30 require essentially 100-percent volumetric examinations, as defined by Figures IWB-2500-1, -3, and -4, of the length of ASME Code Class 1 shell, head, and shell-to-flange welds in the reactor pressure vessel (RPV) to be performed during each inspection interval. ASME Code Case N-460, *Alternative Examination Coverage for Class 1 and Class 2 Welds*, as an alternative approved for use by the NRC in Regulatory Guide (RG) 1.147, Revision 14, *Inservice Inspection Code Case Acceptability* (RG 1.147), states that a reduction in examination coverage due to part geometry or interference for any ASME Code Class 1 or 2 weld is acceptable provided that the reduction is less than 10 percent, i.e., greater than 90-percent examination coverage is obtained.

Licensee's ASME 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 the RPV pressure boundary welds shown in Table 3.1 below.

Table 3.1 - RPV Shell Welds

Weld Number	Description	ASME Item	Coverage Obtained
3-RPV-WR34	Lower shell-to-lower head ring circumferential weld	B1.11	44.5%
3-RPV-WR35	Lower head cap-to-lower head ring circumferential weld	B1.21	50%
3-RPV-WR19	Upper shell-to-flange circumferential weld	B1.30	85.8%

Licensee's Basis for Relief Request (As Stated)

During ultrasonic examination [of weld 3-RPV-WR34], 100% coverage of the required examination volume could not be obtained. Twelve core guide lugs restrict the scanning surface, causing limitations that resulted in 44.5% coverage. The percentage of coverage reported represents the aggregate coverage from all scans parallel and perpendicular to the weld. The weld and adjacent base material were examined using 45E refracted shear waves and 45E refracted longitudinal waves. Examination volumes directly below the core guide lugs received no coverage when scanned parallel to the weld. Additionally, no scans were performed perpendicular to the weld directly below the core guide lugs. Scans parallel to the weld were restricted to 7.6 inches on either side of each core guide lug and scans perpendicular to the weld were restricted to 4.7 inches on either side of each core guide lug. In order to achieve more coverage, the core guide lugs would have to be removed to allow greater access, which is impractical. There were no recordable indications found in the areas that were examined.

54% of the weld and base material volume received coverage in two directions perpendicular to the weld.

35% of the weld and base material volume received coverage in two directions parallel to the weld.

55.50% of the weld and base material volume received no coverage.

During ultrasonic examination [of weld 3-RPV-WR35], 100% coverage of the required examination volume could not be obtained. The examination coverage was limited to 50%. The percentage of coverage reported represents the aggregate coverage from all scans parallel and perpendicular to the weld. The flow stabilizers, core guide lugs and in-core nozzles that restrict the scanning surface caused the limitations. The weld and adjacent base material were examined using 45E refracted shear waves and 45E refracted longitudinal waves. There were no recordable indications found in the areas that were examined. In order to achieve more coverage the flow stabilizers, core guide lugs and in-core nozzles would have to be removed to allow greater access for scanning, which is impractical.

53.33% of the weld and base material volume received coverage in two directions perpendicular to the weld.

46.66% of the weld and base material volume received coverage in two directions parallel to the weld.

50% of the weld and base material received no coverage.

During ultrasonic examination [of weld 3-RPV-WR19], 100% coverage of the required examination volume could not be obtained. The examination coverage was limited to 85.8%. The percentage of coverage reported represents the

aggregate coverage from all scans parallel and perpendicular to the weld. Limitations were caused by inside surface taper and the [component geometry]. The percentage of coverage reported represents the aggregate coverage from all scans. The weld and adjacent base material were examined using 45E refracted shear waves and 45E refracted longitudinal waves. There were no recordable indications found in the areas that were examined. In order to achieve more coverage, the weld would have to be redesigned which is impractical.

Licensee's Proposed Alternative Examination (As Stated)

The scheduled 10-year ASME Code examination was performed on the referenced area/weld and it resulted in the noted limited coverage. No additional examinations are planned for the area/weld during the current inspection interval.

Staff's Evaluation

The ASME Code requires essentially 100-percent volumetric examination of ASME Code Class 1 full penetration RPV circumferential shell, head and shell-to-flange welds. However, 100-percent coverage for the lower shell-to-head ring weld 3-RPV-WR34, the lower head ring-to-cap weld 3-RPV-WR35, and the shell-to-flange weld 3-RPV-WR19 was not feasible due to the design of RPV appurtenances. The vessel core guide lugs and flow stabilizers limited the scanning coverage for weld 3-RPV-WR34, the incore nozzles and flow stabilizers limited scanning coverage for weld 3-RPV-WR35, and the inner surface taper and component geometry limited scanning coverage for weld 3-RPV-WR19. For the licensee to achieve 100- percent volumetric coverage, the RPV and/or RPV internal components would need to be redesigned and modified. This would place a burden on the licensee to the extent that the ASME Code-required 100-percent volumetric examinations are impractical.

As shown on the sketches and technical descriptions[1] provided by the licensee, an aggregate coverage of approximately 45 percent, 50 percent and 86 percent of the required examination volumes were obtained for welds 3-RPV-WR34, 3-RPV-WR35, and 3-RPV-WR19, respectively. This aggregate coverage included examination of a portion of each weld with both shear and longitudinal waves at 45 degree beam angles. The ultrasonic examinations of welds 3-RPV-WR34, 3-RPV-WR35 and 3-RPV-WR19 were conducted using personnel, equipment and procedures qualified in accordance with ASME Code, Section XI, Appendix VIII, 1995 edition with the 1996 addenda, as administered through the Electric Power Research Institute's (EPRI's) Performance Demonstration Initiative (PDI). Ultrasonic RPV examination systems qualified through the EPRI PDI program have shown high (approximately 90 percent) probability of detection levels. This has resulted in an increased reliability of inspections for weld configurations within the scope of PDI[2].

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1. Sketches and technical descriptions provided by the licensee in its letters June 24, 2005, and July 14, 2006, are not included in this report.

2. Performance Demonstration - 25 Years of Progress; L. Becker, Electric Power Research Institute, 3nd International Conference on NDE in Relation to Structural Integrity for Nuclear and Pressurized Components, November 14-16, 2001, Seville, Spain.

In addition, other pressure-retaining shell welds in the RPV were examined to the full extent of ASME Code requirements. No service-induced flaws were detected during any of these examinations. It is concluded that, due to the design of the RPV and/or RPV internal components, it is impractical for the licensee to meet the ASME Code-required 100-percent volumetric examination coverage on welds 3-RPV-WR34, 3-RPV-WR35, and 3-RPV-WR19. Based on the limited examinations that have been completed on these welds, in conjunction with full volumetric examinations on other RPV shell welds, if significant service-induced degradation were occurring, there is reasonable assurance that evidence of it would have been detected by the examinations that were performed.

3.2 Request for Relief 05-ON-002, Examination Category B-D, Item B3.90, Full Penetration Welded Nozzles in Vessels

ASME Code Requirement

ASME Code, Section XI, Table IWB-2500-1, Examination Category B-D, Item B3.90 requires 100-percent volumetric examination, as defined by Figure IWB-2500-7, of all ASME Code Class 1 full penetration RPV nozzle-to-vessel welds. ASME Code Case N-460, *Alternative Examination Coverage for Class 1 and Class 2 Welds*, as an alternative approved for use by the NRC in Regulatory Guide 1.147, Revision 14, *Inservice Inspection Code Case Acceptability* (RG 1.147), states that a reduction in examination coverage due to part geometry or interference for any Class 1 and 2 weld is acceptable provided that the reduction is less than 10 percent, i.e., greater than 90-percent examination coverage is obtained.

Licensee's ASME Code Relief Request

In accordance with 10 CFR 50.55a(g)(5)(iii), the licensee requested relief from the ASME Code requirement to complete 100-percent coverage of the examination volume for Core Flood System nozzle-to-vessel welds 3-RPV-WR54 and 3-RPV-WR54A.

Licensee's Basis for Relief Request (As Stated)

> During ultrasonic examination [of Core Flood Nozzle welds 3-RPV-WR54 and 3-RPV-WR54A], 100% coverage of the required examination volumes could not be obtained. The examination coverage was limited to 84.2% of the required volumes. The Core Flood Nozzles of a B&W [Babcock & Wilcox] 177 plant have several obstructions which limit ultrasonic examination coverage. In order of significance these are:
>
> • The flow restrictor which is welded to the inner bore of the nozzle;
>
> • The inlet nozzles located 30° on either side of each core flood nozzle;
>
> • The taper above the core flood nozzles associated with the Core Support Ledge.
>
> The percentage of exam volume coverage reported represents the aggregate coverage as follows:
>
> Weld and adjacent base material = 87.6% scanned parallel to the weld in two

opposite directions and 72.9% scanned perpendicular to the weld centerline from the nozzle bore and the vessel inside surface.

There were no recordable indications found in the areas that were examined for either of these welds. In order to achieve more coverage, the inlet nozzles would have to be moved, and the taper on the flange would have to be redesigned to allow greater access for scanning, which is impractical. In addition, because of the proximity of the flow restrictors limited scanning was performed from the nozzle ID [inside diameter]. In order to achieve more coverage, the flow restrictor would have to be removed to allow access for scanning, which is impractical.

Licensee's Proposed Alternative Examination (As Stated)

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

Staff's Evaluation

The ASME Code requires 100-percent volumetric examination of ASME Code Class 1 full penetration nozzle-to-vessel welds for all RPV nozzles. However, the specific design of the RPV core flood nozzles limits access for examination of these welds so that 100 percent of the required coverage cannot be obtained. For the licensee to achieve 100-percent volumetric coverage, the subject nozzles would have to be redesigned and modified. This would place a burden on the licensee to the extent that the ASME Code-required 100-percent volumetric examinations are impractical.

As shown on the sketches and technical descriptions[3] provided by the licensee, the examinations of core flood nozzle welds 3-RPV-WR54 and 3-RPV-WR54A (0 and 180 degrees, respectively) are limited by the flange taper, proximity of the inlet nozzles, and nozzle flow restrictors. However, the licensee was able to examine approximately 84 percent of the ASME Code-required volumes for these welds, as examined from the RPV vessel inner surface and nozzle bore. Further, the ultrasonic examination of welds 3-RPV-WR54 and 3-RPV-WR54A were conducted using personnel, equipment and procedures qualified in accordance with ASME Code, Section XI, Appendix VIII, 1995 edition with the 1996 addenda, as administered through the EPRI PDI. The examinations performed by the licensee did not detect any unacceptable indications and there is no history of failures for these nozzle-to-vessel welds.

The licensee has shown that it is impractical to meet the ASME Code-required 100-percent volumetric examination coverage for the subject welds due to their design and proximity of other RPV components. Based on the high level of examination coverage obtained for these nozzle-to-vessel welds, if significant service-induced degradation were occurring, there is

3. Sketches and technical descriptions provided by the licensee in its letters dated June 24, 2005, and July 14, 2006, are not included in this report.

reasonable assurance that evidence of it would have been detected by the examinations that were performed.

4.0 CONCLUSIONS

The NRC staff has reviewed the licensee's submittal and concludes that ASME Code examination coverage requirements are impractical for the subject welds listed in RR 05-ON-002, Revision 1. Further, based on the coverages obtained, if significant service-induced degradation were occurring, there is reasonable assurance that evidence of it would have been detected by the examinations that were performed. The NRC staff further concludes that the examinations performed provide reasonable assurance of the structural integrity of the subject welds. Therefore, for RR 05-ON-002, Revision 1, relief is granted pursuant to 10 CFR 50.55a(g)(6)(i) for the third 10-year ISI interval at Oconee 3.

The NRC 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. 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: T. McLellan

Date: August 30, 2006

OCONEE NUCLEAR POWER STATION, UNIT 3
Third 10-Year ISI Interval

TABLE 1
SUMMARY OF RELIEF REQUESTS

Relief Request Number	PNNL TLR RR Sec.	System or Component	Exam. Category	Item No.	Volume or Area to be Examined	Required Method	Licensee Prop Alternative
05-ON-002 Revision 1	3.1	RPV Shell, Head and Flange Welds	B-A	B1.11 B1.21 B1.30	100% of RPV lower shell-to-head Welds 3-RPV-WR34 and 3-RPV-WR35, and shell-to-flange Weld 3-RPV-WR19	Volumetric	Use achieved volumetric cove
05-ON-002 Revision 1	3.2	RPV Nozzle Welds	B-D	B3.90	100% of nozzle-to-shell welds 3-RPV-WR54, and 3-RPV-WR54A	Volumetric	Use achieved volumetric cove

Oconee Nuclear Station, Units 1, 2, and 3

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