January 29, 2001

Mr. W. R. McCollum, Jr.
Vice President, Oconee Site
Duke Energy Corporation
7800 Rochester Highway
Seneca, SC 29672

SUBJECT: OCONEE NUCLEAR STATION, UNIT 2 RE: THIRD 10-YEAR INTERVAL INSERVICE INSPECTION PROGRAM PLAN REQUEST FOR RELIEF NO. 00-01 (TAC NO. MA8542)

Dear Mr. McCollum:

By letter dated March 16, 2000, as supplemented by letter dated July 25, 2000, Duke Energy Corporation requested relief for Oconee Nuclear Station, Unit 2, from certain American Society of Mechanical Engineers Boiler and Pressure Vessel Code inservice inspection (ISI) requirements.

Based on the enclosed safety evaluation, the staff has concluded that Code compliance for the four pressurizer nozzle-to-vessel welds would result in hardship without a compensating increase in the level of quality and safety. Therefore, the staff authorizes the proposed alternative to the Code-required coverages in accordance with 10 CFR 50.55a(a)(3)(ii) for the third 10-year ISI interval at Oconee Nuclear Station, Unit 2.

For the steam generator (primary side) nozzle-to-vessel weld and the steam generator (primary side) nozzle inside radius section, the staff has determined that Code compliance is impractical. Therefore, the staff grants relief for the subject welds pursuant to 10 CFR 50.55a(g)(6)(i) for the third 10-year ISI interval.

Sincerely,

/RA/

Richard L. Emch, Jr., Section Chief, Section 1
Project Directorate II
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket No. 50-270

Enclosure: As stated

cc w/encl: See next page

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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

THIRD TEN-YEAR INTERVAL INSERVICE INSPECTION PROGRAM PLAN

REQUEST FOR RELIEF NO. 00-01

DUKE ENERGY CORPORATION

OCONEE NUCLEAR STATION, UNIT 2

DOCKET NO. 50-270

1.0 INTRODUCTION

The inservice inspection (ISI) of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (Code) Class 1, Class 2, and Class 3 components will be performed in accordance with Section XI of the ASME Code and applicable edition and 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). 10 CFR 50.55a(a)(3) states in part 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) will 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 ISI Code of record for Oconee Nuclear Station, Unit 2, third 10-year interval is the 1989 Edition of the ASME Code. 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.

By letter dated March 16, 2000, and supplement dated July 25, 2000, Duke Energy Corporation (the licensee) submitted Request for Relief No. 00-01 for the third 10-year ISI interval at Oconee Nuclear Station, Unit 2. The request is for relief from Code-required volumetric examinations (coverages) of the pressurizer nozzle-to-vessel welds, a steam generator (primary

side) nozzle-to-vessel weld, and a steam generator (primary side) nozzle inside radius section. The Code requires that volumetric examinations by ultrasonic testing (UT) use prescribed beam angles and scan directions. The sum of the volume examined with the different beam angles and scan directions equals examination coverage. The licensee performed an examination of the items in Table 1 of this safety evaluation (SE) and determined that the Code-required coverages were impractical due to the geometry of the nozzles and actual physical barriers. The identification of the welds, percentage of examination coverages, and obstructions to examinations are listed in Table 1.

Table 1 - List of welds, percentage of examination coverages, and obstructions hindering examinations.

Item Identification*	**Weld Description**	**IWB-2500-1, B-D, Item No.**	**Percent** Coverage Achieved**	**Obstruction Preventing Code Coverage**
2-PZR-WP34	Nozzle-to-vessel	B3.110.002	36	Taper on nozzle side of the weld
2-PZR-WP33-3	Nozzle-to-vessel	B3.110.003	37.1	Taper on nozzle side of the weld and location of lifting lugs
2-PZR-WP33-2	Nozzle-to-vessel	B3.110.004	37.1	Taper on nozzle side of the weld and location of lifting lugs
2-PZR-WP33-1	Nozzle-to-vessel	B3.110.005	37.1	Taper on nozzle side of the weld and location of lifting lugs
2-SGB-WG25	Nozzle-to-vessel	B3.130.006	58	Taper on nozzle side of the weld
2-SGB-WG25	Inner nozzle radius	B3.140.006	70.2	Taper on nozzle side of the weld

* PZR = Pressurizer, SGB = Steam Generator B

** In the submittal, the licensee itemized the percent coverage for each beam angle and scan direction.

2.0 PRESSURIZER NOZZLE-TO-VESSEL WELDS

2.1 Code Requirements

The Code requires volumetric examinations of the pressurizer nozzle-to-vessel welds according to ASME Code, Section XI, 1989 Edition, Table IWB-2500-1, Examination Category B-D, Item B3.110. The weld examination volume is defined in Figure IWB-2500-7(a). Appendix I to Section XI references ASME Code, Section V, 1989 Edition, Article 4, Subarticle T-441.3.2. Specifically, T-441.3.2.1 states that volumes shall be scanned by straight and angle beam techniques as described in detail in T-441.3.2.3(a) and (b), and T-441.3.2.5. Three angle beams, having nominal angles of 45 degrees, 60 degrees, and 70 degrees with respect to a

perpendicular to the examination surface, shall generally be used. Beam angles other than 45 degrees and 60 degrees are permitted provided the measured difference between angles is at least 10 degrees. T-441.3.2.3 states that prior to the initial angle beam examination, the base material through which the angle beams will travel shall be scanned with a straight beam search unit. T-441.3.2.5 states that the examination volume shall be scanned with angle beam search units directed both at right angles to the weld axis and along the weld axis. Wherever feasible, each examination shall be performed in two directions. These examinations shall be conducted using nominal beam angles of 45 degrees, 60 degrees, and 70 degrees from each direction. The 70-degree beam shall cover the near surface to a depth of 1 inch or 1/4 of the thickness, whichever is greater. The licensee invoked Code Case N-460, which accepts an examination coverage of 90 percent or greater.

Relief is requested from the requirement to examine 100 percent of the weld length and allow the licensee to take credit for limited UT in conjunction with hydrostatic tests and VT-2 visual examinations.

2.2 Licensee's Basis for Relief

The four pressurizer nozzle-to-vessel welds identified in Table 1 of this SE (2-PZR-WP34, 2-PZR-WP33-3, 2-PZR-WP33-2, and 2-PZR-WP33-1) were examined to the maximum extent practical using UT techniques in accordance with the requirements in the 1989 Edition of the Code. The examinations performed on the four pressurizer nozzle-to-vessel welds were hindered by the nozzle configurations. Also, three of the four examinations were hindered further by lifting lugs near the welds.

The configurations restricted UT to the vessel side of the welds. In order to achieve more coverage, the nozzles would have to be re-designed to allow scanning from both sides of the welds.

2.3 Alternative Examinations

UT of these welds will be performed to the maximum extent practical. The licensee has determined that the use of radiography as an alternative volumetric examination for these welds is not a viable option due to the inability to access the inside of the components to place film or to position a radiographic source. Therefore, the licensee has proposed the use of pressure testing and VT-2 visual examinations to complement the limited examination coverage. Per the ASME Code, the pressure test will be conducted after each outage and a system hydrostatic test will be conducted during each 10-year inspection interval.

2.4 Evaluation

The extent of the volumetric examinations of the pressurizer nozzle-to-vessel welds is listed in Table 1. The licensee stated that the examinations were restricted by the nozzle taper on four welds and by the proximity of lifting lugs near three of the four welds. These restrictions prevented complete UT scanning of the Code-required volumes. The Code requires that the weld be examined in two axial and two circumferential direction with two or three different angle beams depending upon beam selection and that the base material be examined with the same beams and directions plus a straight beam. The volumetric coverage is the sum of the volume examined with each beam and each scan direction.

In letters dated December 13, 1996, and December 18, 1997 (References 1 and 2), and prior to the third interval, the staff granted relief (pre-approved) for examination during the third interval of welds 2-PZR-WP34, 2-PZR-WP33-3, 2-PZR-WP33-2, and 2-PZR-WP33-1. The letters stipulated that if actual examination coverage for any of these welds was less than the pre-approved coverage, the licensee would have to submit another request for relief. The relief granted for examination of these welds was based on examinations performed during the second interval using prescriptive UT techniques required by Appendix I of Section XI of the 1989 Edition of the Code. Based on the information supplied by the licensee, the coverages for these welds were 70.75 percent, 66.5 percent, 66.5 percent, and 76.6 percent, respectively.

For its March 16, 2000, request for relief, the licensee performed the examinations of welds 2-PZR-WP34, 2-PZR-WP33-3, 2-PZR-WP33-2, and 2-PZR-WP33-1 according to the prescriptive coverage requirements in Appendix I of Section XI of the 1989 Edition of the Code and the performance-based requirements of Appendix VIII of Section XI of the 1992 Edition with 1993 Addenda of the Code for vessels. The licensee stated in the submittal that the actual coverages were 36 percent, 37.1 percent, 37.1 percent, and 37.1 percent, respectively. The actual coverages were less than the coverages previously reviewed (References 1 and 2), thereby resulting in this request for relief. The reasons for the differences in examination coverages are discussed below.

In a letter dated July 25, 2000, the licensee provided cross-sectional sketches showing angle beams and scanning directions used for the second interval Code examinations and the actual angle beams and scanning directions used for the third interval examinations. The second interval examinations used more beam angles and scanning directions than the third interval examinations. For the third interval examination, the licensee used a performance-based UT procedure, personnel, and equipment that were qualified through the Electric Power Research Institute - Performance Demonstration Initiative Program to criteria that are similar to Appendix VIII of Section XI of the Code for two sided examinations of reactor pressure vessel welds.

The third interval examinations of these welds did not include straight beam coverage of the nozzle base metal, angle beam coverage of the nozzle-to-vessel outside radii, or angle beam coverage of most of the vessel base metal. The coverage in the third interval was performed from one side of each weld in one direction and with one beam angle, whereas the coverage for the second interval was performed from one side of each weld but in two directions and with two angle beams, where possible. The second interval also included straight beam coverage of the nozzle base metal.

From the two previous paragraphs, it is apparent that the licensee could have achieved greater coverage of these four welds than was reported in the submittal of March 16, 2000. The coverage would still, however, be less than Code requirements; but at least equal to the pre-approved examination coverage for these welds (Reference 1 and 2).

The Code requires straight beam examinations of the base metals to identify reflectors that would interfere with angle beam examinations. The base metal for these welds was extensively examined during construction and preservice inspections, and the accessible base metal for these welds was examined in the second interval. The kinds of reflectors detected by straight beam examinations are imperfections developed in the manufacturing process of the base metal, not as a result of inservice degradation. Any existing reflectors in the base metal of

these welds should already be documented in previous examinations. Therefore, the performance of a straight beam examination of these welds would add little new information to the baseline already recorded for these welds.

The purpose of angle beam examinations is to detect flaws that may occur during plant operation. The licensee examinations were focused on the weld root (inside diameter of the nozzle) and adjoining base metal. The weld root area with its higher stresses and exposure to reactor coolant is the most susceptible area for generating cracks during plant operation. The irregular growth patterns of cracks in the root area should provide detectable indications.

In summary, these welds received limited coverages for the third 10-year ISI interval. The staff believes that requiring additional examinations to obtain coverages required by the Code would not provide a significant increase in the confidence of weld integrity. Additional examinations would, however, result in higher radiation doses to plant personnel. Therefore, the staff believes that examination of these welds per the Code during the third 10-year interval would result in hardship without a compensating increase in the level of quality and safety.

The staff finds that the proposed alternative to UT these welds to the maximum extent practical, to use pressure testing and VT-2 visual examinations to complement the limited examination coverage, and to perform a pressure test after each outage and a system hydrostatic test during each 10-year inspection interval, provides reasonable assurance of weld integrity.

The licensee used ASME Code, Section XI, performance-based examination requirements for vessel shell welds when examining these pressurizer nozzle welds. Reactor pressure vessel welds are examined according to Appendix VIII, Supplements 4, “Qualification Requirements for the Clad/Base Metal Interface of Reactor Vessel,” and/or Supplement 6, “Qualification Requirements for Reactor Vessel Welds other than Clad/Base Metal Interface.” Supplements 4 and/or 6 are inappropriate for nozzle-to-vessel welds, the subject of this relief request. The correct Appendix VIII supplement is Supplement 7, “Qualification Requirements for Nozzle-to-Vessel Weld.” Supplement 7 requirements are specifically designed for nozzle-to-vessel weld configurations. Although the regulations do not impose the requirements of Appendix VIII on pressurizers, licensees may request to use Appendix VIII, Supplement 7 in lieu of Code requirements.

2.5 Conclusion

The staff has concluded that performing additional examinations to obtain the weld coverages beyond the coverages shown in Table 1 for the four pressurizer nozzle-to-vessel welds (2-PZR-WP34, 2-PZR-WP33-3, 2-PZR-WP33-2, and 2-PZR-WP33-1), as required by the Code, would result in hardship without a compensating increase in the level of quality and safety. Therefore, the staff authorizes use of the proposed alternative to the Code-required coverages in accordance with 10 CFR 50.55a(a)(3)(ii) for the third 10-year ISI interval at Oconee Nuclear Station, Unit 2.

3.0 STEAM GENERATOR NOZZLE-TO-VESSEL

3.1 Code Requirements

The code requires volumetric examination of the steam generator nozzle-to-vessel weld according to ASME Code, Section XI, 1989 Edition, Table IWB-2500-1, Examination Category B-D, Item B3.130. The weld examination volume is defined in Figure IWB-2500-7(a). Appendix I to Section XI references ASME Code, Section V, 1989 Edition, Article 4, Subarticle T-441.3.2. Specifically, T-441.3.2.1 states that volumes shall be scanned by straight and angle beam techniques as described in detail in T-441.3.2.3(a) and (b), and T-441.3.2.5. Three angle beams, having nominal angles of 45 degrees, 60 degrees, and 70 degrees with respect to a perpendicular to the examination surface, shall generally be used. Beam angles other than 45 degrees and 60 degrees are permitted provided the measured difference between angles is a least 10 degrees. T-441.3.2.3 states that prior to the initial angle beam examination, the base material through which the angle beams will travel shall be scanned with a straight beam search unit. T-441.3.2.5 states that the examination volume shall be scanned with angle beam search units directed both at right angles to the weld axis and along the weld axis. Wherever feasible, each examination shall be performed in two directions. These examinations shall be conducted using nominal beam angles of 45 degrees, 60 degrees, and 70 degrees from each direction. The 70-degree beam shall cover the near surface to a depth of 1 inch or 1/4 thickness, whichever is greater. The licensee invoked Code Case N-460 that accepts an examination coverage of 90 percent or greater.

Relief is requested from the requirement to examine 100 percent of the weld length and allow the licensee to take credit for limited UT in conjunction with hydrostatic tests and VT-2 visual examinations.

3.2 Licensee's Basis for Relief

The steam generator nozzle-to-vessel weld, 2-SGB-WG25, in Table 1 of this SE was examined to the maximum extent practical using UT techniques in accordance with the requirements in the 1989 Edition of the Code. The examination was hindered by the nozzle configuration. The configuration restricted UT to the vessel side of the weld. In order to achieve more coverage, the nozzles would have to be re-designed to allow scanning from both sides of the welds.

3.3 Alternative Examinations

UT of the weld will be performed to the maximum extent practical. The licensee has determined that the use of radiography as an alternative volumetric examination for these weld is not a viable option due to the inability to access the inside of the components to place film or to position a radiographic source. Therefore, the licensee has proposed the use of pressure testing and VT-2 visual examinations to complement the limited examination coverage. Per the ASME Code, the pressure test will be conducted after each outage and a system hydrostatic test will be conducted during each 10-year inspection interval.

3.4 Evaluation

The extent of the volumetric examination for the steam generator nozzle-to-vessel weld, 2-SGB-WG25, for the third interval is given in Table 1 of this SE. The licensee stated that the

examination was restricted by nozzle taper. The nozzle taper restricts the examination to one side of the weld. This restriction reduced examination coverage to 58 percent of the Code-required volume. The Code requires that the weld and adjacent material be examined in two axial and two circumferential directions with two or three angle beams depending upon beam angle selection. The volumetric coverage is the sum of the volume examined with each beam and each scan direction.

The licensee compared the coverage achieved for the third interval with the coverage from the second interval and determined that they were the same. The examinations performed in these intervals were according to the prescriptive requirements of the Code. To meet coverage requirements using prescriptive UT techniques, the licensee would have to redesign the nozzle. This would place a burden on the licensee. Therefore, the staff has determined that the specified requirements of the1989 Edition of the Code are impractical and that the licensee's limited examination of the welds provides reasonable assurance of the structural integrity of the subject welds.

3.5 Conclusion

Based on the discussion above, the staff has concluded that the Code requirement for the steam generator nozzle-to-vessel weld is impractical and that the proposed alternatives provide adequate assurance of the structural integrity of the subject welds. Therefore, the staff relief is granted and the alternative imposed for the subject welds, pursuant to 10 CFR 50.55a(g)(6)(i), for the third 10-year ISI interval. The relief granted is authorized by law and will not endanger 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.

4.0 STEAM GENERATOR INNER NOZZLE RADIUS

4.1 Code Requirements

The code requires volumetric examination of the steam generator inner nozzle radius according to ASME Code, Section XI, 1989 Edition, Table IWB-2500-1, Examination Category , B-D, Item B3.140. The inner radius volume to be examined is defined in Figure IWB-2500-7(b). Appendix I to Section XI references ASME Code, Section V, 1989 Edition, Article 4, "Ultrasonic Examination Methods for Inservice Inspection."

Relief is requested from the requirement to examine 100 percent of the weld length and allow the licensee to take credit for limited UT in conjunction with hydrostatic tests and VT-2 visual examinations.

4.2 Licensee's Basis for Relief

The steam generator inner nozzle radius weld, 2-SGB-WG25, in Table 1 of this SE was examined to the maximum extent practical using UT techniques in accordance with the requirements in the 1989 Edition of the Code. The examination was hindered by the nozzle configuration. The configuration restricted UT of the inner nozzle radius to the vessel. In order to achieve greater coverage, the nozzle would have to be re-designed to allow scanning from the nozzle surface. The re-design and replacement would create a considerable burden on the licensee.

4.3 Alternative Examinations

UT of the weld will be performed to the maximum extent practical. The licensee has determined that the use of radiography as an alternative volumetric examination for the weld is not a viable option due to the inability to access the inside of the components to place film or to position a radiographic source. Therefore, the licensee has proposed the use of pressure testing and VT-2 visual examinations to complement the limited examination coverage. Per the ASME Code, the pressure test will be conducted after each outage and a system hydrostatic test will be conducted during each 10-year inspection interval.

4.4 Evaluation

The extent of the volumetric examinations of the steam generator inner nozzle radius, 2-SGB-WG25, is shown Table 1 of this SE. The licensee stated that the examination was restricted by the nozzle taper. The blending of the weld to the nozzle and the nozzle taper interfered with the transducer movement. This restriction prevented complete UT scanning of the Code-required volume. The volume was scanned in two circumferential directions using two beam angles in each direction, resulting in a 70.2 percent coverage. The staff believes that the different volumes examined by the angle beams and scan directions provided sufficient coverage for detecting recordable indications, if they existed.

The licensee compared the coverage achieved for the third interval with the coverage from the second interval and determined that they were the same. The examinations performed in these intervals were according to the prescriptive requirements in Code. To meet coverage requirements using prescriptive UT techniques required by the 1989 Edition of Code, the licensee would have to redesign or replace the nozzle. This would place a burden on the licensee. Therefore, the staff has concluded that the specified requirements of the 1989 Edition of Code are impractical.

4.5 Conclusion

Based on the discussion above, the staff has concluded that the Code requirement for the steam generator inner nozzle radius is impractical and that the proposed alternatives provide adequate assurance of the structural integrity of the subject welds. Therefore, relief is granted for the subject inner nozzle radius and the alternatives imposed, pursuant to 10 CFR 50.55a(g)(6)(i), for the third 10-year ISI interval. The relief granted is authorized by law and will not endanger 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.

5.0 REFERENCES

1. Letter to J. W. Hampton, Duke Power Company, from H. N. Berkow, U. S. Nuclear Regulatory Commission, dated December 13, 1996.

2. Letter to W. R. McCollum, Duke Energy Corporation, from H. N. Berkow, U. S. Nuclear Regulatory Commission dated December 18, 1997.

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Date: January 29, 2001

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