



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELIEF REQUEST FROM ASME CODE SECTION XI REQUIREMENTS

DUKE ENERGY CORPORATION

OCONEE NUCLEAR STATION, UNITS 1, 2, AND 3

DOCKET NOS. 50-269, 50-270, AND 50-287

1.0 INTRODUCTION

The Technical Specifications (TS) for Oconee Nuclear Station (Oconee), Units 1, 2, and 3, state that the inservice inspection (ISI) of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (ASME Code) Class 1, 2, and 3 components shall be performed in accordance with Section XI of the ASME Code and applicable addenda as required by Title 10 of the Code of Federal Regulations (10 CFR) Section 50.55a(g), except where specific written relief has been granted by the Commission pursuant to 10 CFR 50.55a(g)(6)(i). Section 50.55a(a)(3) states that alternatives to the requirements of paragraph (g) may be used, when authorized by the 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 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 edition of Section XI of the ASME Code for the Oconee, Units 1, 2, and 3, third 10-year ISI interval is the 1989 Edition.

2.0 EVALUATION

By letter dated March 25, 1998, Duke Energy Corporation (the licensee) submitted its third 10-year interval ISI program plan Request for Relief No. 98-01 (Parts 1 and 2) for Oconee, Units 1, 2, and 3.

The staff, with technical assistance from its contractor, the Idaho National Engineering and Environmental Laboratory, has evaluated the information provided by the licensee in support of its third 10-year ISI program Request for Relief No. 98-01. Based on the results of the review,

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the staff adopts the contractor's conclusions and recommendations presented in the Technical Letter Report (TLR) attached:

Request for Relief 98-01 (Part 1): ASME Code, Section XI, Examination Category B-D, Item B3.110, requires essentially 100 percent volumetric examination, as defined by Figure IWB-2500-7(c), of the pressurizer nozzle-to-vessel weld during each inspection interval. "Essentially 100%," as defined by ASME Code Case N-460, is greater than 90 percent coverage of the examination volume or surface area, as applicable.

In accordance with 10 CFR 50.55a(g)(5)(iii), the licensee requested relief from the Code's volumetric examination coverage requirement for pressurizer surge nozzle-to-lower head Weld Nos. 1-PZR-WP15, 2-PZR-WP15, and 3-PZR-WP15.

The Code requires 100 percent volumetric examination of these pressurizer nozzle-to-head welds during each inspection interval. The staff determined that the surface geometry caused by the taper on the nozzle side of the weld restricts ultrasonic scans of the full volume of this weld. Radiography, an alternative volumetric method, cannot be performed due to inaccessibility of the interior of the pressurizer for placement of film or positioning of a radiographic source. The staff concluded that the Code-required 100 percent volumetric examination is impractical. To gain access for 100 percent coverage, the component would have to be redesigned and modified. This would place a significant burden on the licensee.

The staff determined that from the licensee's drawings a significant amount (approximately 68 percent) of the required coverage was obtained. This weld is one of a population of Class 1 nozzle-to-vessel welds that are being examined by the licensee. The staff determined that any pattern of degradation would be detected by the examinations being performed. In addition to volumetric examinations, the licensee performs a VT-2 visual examination after each refueling outage and during the 10-year hydrostatic test. The combination of examinations performed provides reasonable assurance of the continued structural integrity of these welds. Therefore, the staff concludes that relief is granted pursuant to 10 CFR 50.55a(g)(6)(i).

Request for Relief 98-01 (Part 2): ASME Code, Section XI, Examination Category B-D, Item B3.150, requires essentially 100 percent volumetric examination, as defined by Figure IWB-2500-7(b), of nozzle-to-vessel welds in pressure vessels during each inspection interval. "Essentially 100%," as defined by ASME Code Case N-460, is greater than 90 percent coverage of the examination volume or surface area, as applicable.

In accordance with 10 CFR 50.55a(g)(5)(iii), the licensee requested relief from the Code's volumetric examination coverage requirement for letdown cooler heat exchanger nozzle-to-vessel Weld Nos. 1-LDCA-IN-V2, 1-LDCA-OUT-V6, 3-LDCA-IN-V2, and 3-LDCA-OUT-V5.

The Code requires 100 percent volumetric examination of the subject letdown cooler heat exchanger nozzle-to-vessel welds during each inspection interval. The staff determined that the surface geometry of the branch connection interfaces near the welds that restrict ultrasonic scans of the entire volume. Radiography, an alternative volumetric method, cannot be performed due to inaccessibility of the interior of the heat exchanger for placement of film or

positioning of a radiographic source. The staff concluded that the Code-required 100 percent volumetric examination is impractical. To gain access for 100 percent coverage, the component would have to be redesigned and modified. This would place a significant burden on the licensee.

The staff determined that from the licensee's drawings and worksheets that approximately 27 percent volumetric coverage on the letdown cooler heat exchanger nozzle-to-vessel welds 1-LDCA-IN-V2 and 1-LDCA-OUT-V6 (Unit 1) was obtained. The examination performed, in combination with examinations of other Class 1 nozzle-to-vessel welds, would detect a general pattern of degradation, if it existed. In addition, the licensee performs a VT-2 visual examination after each refueling outage and during the 10-year hydrostatic test. The combination of volumetric examinations performed on these welds, in addition to VT-2 examinations each refueling outage and during each 10-year hydrostatic tests, provide reasonable assurance of the structural integrity of the welds. The staff concluded that, based on the impracticality of the Code volumetric coverage requirements and the extent of examinations performed, relief is granted pursuant to 10 CFR 50.55a(g)(6)(i).

3.0 CONCLUSION

The staff concluded that certain inservice examinations cannot be performed to the extent required by the Code at Oconee, Units 1, 2, and 3. The licensee has provided information to support a determination that the Code-required volumetric examination coverage for Weld Nos. 1-PZR-WP15, 2-PZR-WP15, 3-PZR-WP15, 1-LDCA-IN-V2, 1-LDCA-OUT-V6, 3-LDCA-IN-V2, and 3-LDCA-OUT-V5 is impractical. The staff has, therefore, concluded that, pursuant to 10 CFR 50.55a(g)(6)(i), relief is granted for Relief Request No. 98-01, Parts 1 and 2.

The licensee has submitted this request for Oconee Units 1, 2, and 3; however, only the Unit 1 examinations have been completed to-date. The licensee expects similar limitations and results to apply to the volumetric examinations performed on welds for Oconee Units 2 and 3. If the coverages achieved are the same or more conservative (greater coverage), no further action is required; if the coverage is less than reported in this request, then the licensee is required to submit a new request for relief.

Attachment: Technical Letter Report

Principal Contributor: Thomas McLellan

Date: November 17, 1998

TECHNICAL LETTER REPORT
ON THE THIRD 10-YEAR INTERVAL INSERVICE INSPECTION
REQUEST FOR RELIEF NUMBER 98-01
FOR
DUKE POWER COMPANY,
OCONEE NUCLEAR STATION, UNITS 1, 2, AND 3
DOCKET NUMBERS: 50-269, 50-270, and 50-287

1. **INTRODUCTION**

By letter dated March 25, 1998, the licensee, Duke Power Company, submitted Request for Relief No. 98-01, seeking relief from the requirements of the ASME Code, Section XI, for Oconee Nuclear Station, Units 1, 2, and 3. This relief request is for the third 10-year inservice inspection (ISI) interval. The Idaho National Engineering and Environmental Laboratory (INEEL) staff's evaluation of the subject request for relief is in the following section.

2. **EVALUATION**

The information provided by Duke Power Company in support of the request for relief from Code requirements has been evaluated and the basis for disposition is documented below. The Code of record for the Oconee Nuclear Station, Units 1, 2, and 3, third 10-year ISI interval, is the 1989 Edition of Section XI of the ASME Boiler and Pressure Vessel Code. Although this request covers Units 1, 2, and 3, only the Unit 1 volumetric examinations have been completed. The licensee expects similar limitations to apply to the examinations on Units 2 and 3.

2.1 **Request for Relief 98-01 (Part 1). Examination Category B-D, Item B3.110, Full Penetration Pressurizer Surge Nozzle-to-Lower Head Weld**

Code Requirement: Examination Category B-D, Item B3.110, requires essentially 100% volumetric examination, as defined by Figure IWB-2500-7(c), of the pressurizer nozzle-to-vessel weld during each inspection interval. "Essentially 100%", as defined by ASME Code Case N-460, is greater than 90% coverage of the examination volume or surface area, as applicable.

Licensee's Code Relief Request: In accordance with 10 CFR 50.55a(g)(5)(iii), the licensee requested relief from the Code's volumetric examination coverage requirement for pressurizer surge nozzle-to-lower head Weld Nos. 1-PZR-WP15, 2-PZR-WP15, and 3-PZR-WP15.

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

"Pressurizer Nozzle-to-Head Weld 1- PZR-WP15 (Item Number B03.110.00) was examined to the maximum extent practical using ultrasonic techniques in accordance with the requirements of ASME Section V, Article 4, and ASME Section XI, Appendix I, 1989 Edition. Reference Attachment A for drawing.

"This weld is limited to 68.39% coverage of the required volume because of the nozzle configuration.

"The Code requires 100% volumetric examination of all Pressurizer Nozzle-to-Vessel welds. However, the taper on the nozzle side of the weld restricts scanning and prevents complete volumetric coverage of Pressurizer Nozzle-to-Vessel weld PZR-WP15. Therefore, the 100% volumetric examination is impractical for this nozzle-to-vessel weld. To meet Code examination requirements, modifications to the nozzle would be necessary to allow complete volumetric coverage. Modification to this portion of the reactor coolant system would create a considerable burden on Duke Energy.

"Duke Energy obtained 68.39% coverage of Pressurizer Nozzle-to-Vessel weld 1-PZR-WP15. Based on the significant portion of the required volumetric examination that has been completed, any existing pattern of degradation would have been detected. In addition to the Code required volumetric examination; the Pressurizer will be subjected to the Code required VT-2 visual examination after each refueling outage and the 10 year hydrostatic test. Duke Energy believes this provides reasonable assurance of the continued structural integrity of the subject nozzle-to-vessel weld.

"Pursuant to 10 CFR 50.55a(g)(6)(i), granting this relief for the Pressurizer Nozzle-to-Vessel weld will provide reasonable assurance of weld/component integrity, and 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."

Licensee's Proposed Alternative Examination (as stated):

"The use of radiography as an alternate volumetric examination of the Pressurizer weld referenced in this request is not a viable option. Restrictions to performing radiography are primarily due to inability to access the inside of the Pressurizer to place film or to position a radiographic source.

"Duke Energy proposes to use the pressure test and VT-2 visual examination to compliment the limited examination coverage. The Code requires (reference Table IWB-2500-1, Item Number B15.20) that a system leakage test be performed after each refueling outage. Additionally a system hydrostatic test (reference Table IWB-2500-1, Item Number B15.20) is required once during each 10 year inspection interval. These tests require a VT-2 visual examination for evidence of leakage. This testing will provide adequate assurance of pressure boundary integrity.

"In addition to the above Code required examinations (volumetric and pressure test), there are other activities which provide a high level of confidence that, in the unlikely case that leakage did occur through this weld, it would be detected. Specifically, any leakage from this weld would be detected by monitoring of the Reactor Coolant System (RCS), which is performed once each shift under

procedure PT/1,2,3/A/0600/10, "RCS Leakage". This RCS leakage monitoring is required by Technical Specification 3.1.6, "Leakage". The leakage could be detected through several methods. The reactor building air particulate monitor is sensitive to low leak rates; the iodine monitor, gaseous monitor and area monitor are capable of detecting any fission products in the coolant and will make these monitors sensitive to coolant leakage. In addition to the radiation monitors, leakage is also monitored by a level indicator in the reactor building normal sump. Another check would be a loss of level in the Letdown Storage Tank. Duke Energy has examined the weld referenced in this request to the maximum extent possible utilizing the latest in examination techniques and equipment. Duke Energy will continue to perform ultrasonic examination of all welds identified in Section 1 of this request (for all units) to the maximum extent practical, within the limits of original design and construction, in accordance with the requirements of ASME Section V, Article 4, and ASME Section XI, Appendix I, 1989 Edition, and Code Case N-460. This will provide reasonable assurance of weld/component integrity. Thus, an acceptable level of quality and safety will have been achieved, and public health and safety will not be endangered by allowing relief from the aforementioned Code requirements."

Evaluation: The Code requires 100% volumetric examination of these pressurizer nozzle-to-head welds during each inspection interval. However, the surface geometry caused by the taper on the nozzle side of the weld restricts ultrasonic scans of the full volume of this weld. Radiography, an alternative volumetric method, cannot be performed due to inaccessibility of the interior of the pressurizer for placement of film or positioning of a radiographic source. Therefore, the Code-required 100% volumetric examination is impractical. To gain access for 100% coverage, the component would have to be redesigned and modified. This would place a significant burden on the licensee.

As shown in drawings submitted by the licensee,¹ a significant amount (approximately 68%) of the required coverage was obtained. This weld is one of a population of Class 1 nozzle-to-vessel welds that are being examined by the licensee. Therefore, any pattern of degradation should be detected by the examinations being performed. In addition to volumetric examinations, the licensee performs a VT-2 visual examination after each refueling outage and during the 10-year hydrostatic test. The combination of examinations performed provides reasonable assurance of the continued structural integrity of these welds. Therefore, based on the impracticality of the Code volumetric coverage requirements and the extent of examinations performed, it is recommended that relief be granted pursuant to 10 CFR 50.55a(g)(6)(i).

2.2 Request for Relief 98-01 (Part 2), Examination Category B-D, Item B3.150, Letdown Cooler Heat Exchanger Nozzle-to-Vessel Welds

¹ Drawings submitted by the licensee are not included in this report.

Code Requirement: Examination Category B-D, Item B3.150, requires essentially 100% volumetric examination, as defined by Figure IWB-2500-7(b), of nozzle-to-vessel welds in pressure vessels during each inspection interval. "Essentially 100%", as defined by ASME Code Case N-460, is greater than 90% coverage of the examination volume or surface area, as applicable.

Licensee's Code Relief Request: In accordance with 10 CFR 50.55a(g)(5)(iii), the licensee requested relief from the Code's volumetric examination coverage requirement for letdown cooler heat exchanger nozzle-to-vessel Weld Nos. 1-LDCA-IN-V2, 1-LDCA-OUT-V6, 3-LDCA-IN-V2, and 3-LDCA-OUT-V5.

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

"Letdown Cooler Heat Exchangers (Primary Side) Nozzle-to-Vessel Welds 1-LDCA-IN-V2 and 1-LDCA-OUT-V6 were examined to the maximum extent practical using ultrasonic techniques in accordance with the requirements of ASME Section V, Article 4, and ASME Section XI Boiler and Pressure Vessel Code, Appendix I, 1989 Edition. Reference Attachment B for drawing. These welds are limited to 26.73% coverage of the required volume because of branch connection interferences.

"The Code requires 100% volumetric examination of all Heat Exchanger Nozzle-to-Vessel welds. However, the location of the Letdown Cooler Heat Exchanger Nozzle-to-Vessel welds prevents obtaining 100% volumetric examination coverage. Therefore, the 100% volumetric examination is impractical. To meet Code examination requirements, modifications to the Letdown Cooler Heat Exchanger Nozzle would be necessary to allow complete volumetric examination coverage. Modifications of this magnitude would create a considerable burden on Duke Energy Corporation.

"Duke Energy obtained 26.73% coverage on the Letdown Cooler Heat Exchanger Nozzle-to-Vessel welds, 1 LDCA-IN-V2 and 1-LDCA-OUT-V6. It is recognized that this represents a small part of the required Code examination volume. However, in conjunction with the Code required VT2 visual examination after each refueling outage and the 10 year hydrostatic test; Duke Energy believes this provides reasonable assurance of the continued structural integrity of the subject nozzle-to-vessel welds. In addition to the above code required examinations, RCS leakage monitoring and the capability of providing remote isolation of these welds from RCS pressure boundary provide assurance that in the unlikely case that a leak from these welds did occur, the welds could be promptly isolated and evaluated for corrective action.

"Pursuant to 10 CFR 50.55a(g)(6)(i), granting this relief for the Letdown Cooler Heat Exchanger Nozzle-to-Vessel weld will provide reasonable assurance of weld/component integrity, and is authorized by law and will not endanger life of property or the common defense and security and is otherwise in the public interest giving due consideration to the burden upon the licensee that could result if the requirements were imposed on the facility."

Licensee's Proposed Alternative Examination (as stated):

"The use of radiography as an alternate volumetric examination of the Letdown Cooler Heat Exchanger Nozzle-to-Vessel welds is not a viable option. Restrictions to performing radiography are primarily due to inability to access the inside of the Letdown Cooler Heat Exchanger to place film or to position a radiographic source.

"Duke Energy proposes to use the pressure test and VT-2 visual examination to compliment the limited examination coverage. The Code requires (reference Table IWB-2500-1, Item Number B15.40) that a system leakage test be performed after each refueling outage. Additionally a system hydrostatic test (reference Table IWB-2500-1, Item Number B15.41) is required once during each 10 year inspection interval. These tests require a VT-2 visual examination for evidence of leakage. This testing will provide adequate assurance of pressure boundary integrity.

"In addition to the above Code required examinations (volumetric and pressure test), there are other activities which provide a high level of confidence that, in the unlikely case that leakage did occur through these welds, it would be detected and isolated. Specifically, any leakage from these welds would be detected by monitoring of the Reactor Coolant System (RCS), which is performed once each shift under procedure PT/1,2,3/A/0600/10, "RCS Leakage". This RCS leakage monitoring is required by Technical Specification 3.1.6, "Leakage". The leakage could be detected through several methods. The reactor building air particulate monitor is sensitive to low leak rates; the iodine monitor, gaseous monitor and area monitor are capable of detecting any fission products in the coolant and will make these monitors sensitive to coolant leakage. In addition to the radiation monitors, leakage is also monitored by a level indicator in the reactor building normal sump. Another check would be a loss of level in the Letdown Storage Tank. In the unlikely case that a leak did occur, these welds would be isolated from the RCS pressure boundary by remotely-operated valves."

Evaluation: The Code requires 100% volumetric examination of the subject letdown cooler heat exchanger nozzle-to-vessel welds during each inspection interval. However, the surface geometry of the branch connection interfaces near the welds restricts ultrasonic scans of the entire volume. Radiography, an alternative volumetric method, cannot be performed due to inaccessibility of the interior of the heat exchanger for placement of film or positioning of a radiographic source. Therefore, the Code-required 100% volumetric examination is impractical. To gain access for 100% coverage, the component would have to be redesigned and modified. This would place a significant burden on the licensee.

As shown in drawings and worksheets submitted by the licensee,² approximately 27% volumetric coverage on the letdown cooler heat exchanger nozzle-to-vessel welds 1 LDCA-IN-V2 and 1-LDCA-OUT-V6 (Unit 1) was obtained. The examination performed, in combination with examinations of other Class 1 nozzle-to vessel

2 Drawings submitted by the licensee are not included in this report.

welds, should detect a general pattern of degradation, if existing. In addition, the licensee performs a VT-2 visual examination after each refueling outage and during the 10-year hydrostatic test. The combination of volumetric examinations performed on these welds in addition to VT-2 examinations each refueling outage and during each 10-year hydrostatic tests provides reasonable assurance of the continued operational readiness of the welds. Therefore, based on the impracticality of the Code volumetric coverage requirements and the extent of examinations performed, it is recommended that relief be granted pursuant to 10 CFR 50.55a(g)(6)(i).

3. CONCLUSION

The INEEL staff evaluated the licensee's submittal and concludes that certain inservice examinations cannot be performed to the extent required by the Code at Oconee Nuclear Station, Units 1, 2, and 3. The licensee has provided information to support a determination that the Code-required volumetric examination coverage for Weld Nos. 1-PRZ-WP15, 2-PRZ-WP15, 3-PRZ-WP15, 1-LDCA-IN-V2, 1-LDCA-OUT-V6, 3-LDCA-IN-V2, and 3-LDCA-OUT-V5 is impractical. Therefore, pursuant to 10 CFR 50.55a(g)(6)(i), it is recommended that relief be granted for Relief Request No. 98-01, Parts 1 and 2.

The licensee has submitted this request for Units 1, 2, and 3, however, only the Unit 1 examinations have been completed to date. The licensee expects similar limitations and results to apply to the volumetric examinations performed on welds for Units 2 and 3. If the coverages achieved are the same or more conservative (greater coverage), no further action is required; if the coverage is less than reported in this request, then the licensee should submit a new request for relief.