

December 16, 2004

Mr. Jeffrey S. Forbes
Site Vice President
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Entergy Operations, Inc.
1448 S. R. 333
Russellville, AR 72801

SUBJECT: ARKANSAS NUCLEAR ONE, UNIT NO. 1 (ANO-1) - RE: REQUESTS FOR RELIEF FROM VOLUMETRIC EXAMINATION REQUIREMENTS (TAC NO. MC1490)

Dear Mr. Forbes:

By letter dated December 2, 2003, as superceded by letter dated September 21, 2004, you requested relief from the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (Code), Section XI for several Class 1 and 2 components. Specifically, in ANO1-ISI-001 and ANO1-ISI-003 you requested relief from certain examination coverage requirements for selected pressurizer and steam generator components.

The U.S. Nuclear Regulatory Commission (NRC) staff has completed its review as documented in the enclosed Safety Evaluation (SE). For relief requests ANO1-ISI-001 and ANO1-ISI-003, the NRC staff determined that compliance with the Code-required examination coverage is impractical and that the achieved coverage provides reasonable assurance of structural integrity of the selected components. Therefore, pursuant to 50.55a(g)(6)(i) of Title 10 of the *Code of Federal Regulations*, relief is granted for the third 10-year inservice inspection interval. This granting 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.

Sincerely,

/RA/

Michael K. Webb, Acting Chief, Section 1
Project Directorate IV
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket No. 50-313

Enclosure: As stated

cc w/encl: See next page

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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

INSERVICE INSPECTION PROGRAM

RELIEF REQUESTS NOS. ANO1-ISI-001 AND ANO1-ISI-003

ENTERGY OPERATIONS, INC.

ARKANSAS NUCLEAR ONE, UNIT NO. 1

DOCKET NO. 50-313

1.0 INTRODUCTION

By letter dated December 2, 2003 (ADAMS Accession No. ML033430465), as superceded by letter dated September 21, 2004 (ADAMS Accession No. ML042720452), Entergy Operations, Inc. (the licensee) requested relief under Request for Relief Nos.: ANO1-ISI-001, -002, -003, and -004 for Arkansas Nuclear One, Unit 1 (ANO-1) from certain examination coverage requirements in the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (Code), Section XI for several Class 1 and 2 components. In its September 21, 2004, letter to the U.S. Nuclear Regulatory Commission (NRC), the licensee withdrew Relief Request Nos. ANO1-ISI-002 and ANO1-ISI-004 because of Code actions in process and steam generator replacement plans. Therefore, these two relief requests will not be discussed in this safety evaluation. Relief Request Nos. ANO1-ISI-001 and ANO1-ISI-003 apply during the third 10-year in-service inspection (ISI) interval.

2.0 REGULATORY EVALUATION

The ISI of ASME Code Class 1, 2, and 3 components is to be performed in accordance with Section XI, "*Rules for Inservice Inspection of Nuclear Power Plant Components*," and applicable edition and addenda as required by 50.55a(g) of Title 10 of the *Code of Federal Regulations* (10 CFR), except when specific relief has been granted by the NRC pursuant to 10 CFR 50.55a(g)(6)(i). The regulation at 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 applicant 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, 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 ANO-1 for the third 10-year ISI interval is the ASME Code, Section XI, 1992 Edition, no Addenda.

3.0 TECHNICAL EVALUATION

3.1 ISI PROGRAM RELIEF REQUEST NO. ANO1-ISI-001, EXAMINATION COVERAGE LIMITATION FOR CODE CATEGORY B-D WELDS

3.1.1 System/Component(s) for which Relief is Requested

This relief request applies to the ASME Code, Section XI, Class 1, Examination Category B-D welds identified in Table 1.

3.1.2 Code Requirements for which Relief is Requested

The 1992 Edition, no Addenda of the ASME Code, Section XI specifies the examination coverage requirements for full penetration welded nozzles in vessels. Table IWB-2500-1, Examination Category B-D, Item Nos. B3.110, B3.130, and B3.140, and Figure No. IWB-2500-7 require volumetric examination, which includes 100 percent of the welded attachment length, once during the 10-year interval. ASME Code Case N-460, "*Alternative Examination Coverage for Class 1 and Class 2 Welds*," allows a reduction in coverage for Class 1 and 2 welds due to interference or geometry as long as the overall coverage is greater than 90 percent.

3.1.3 Licensee's Proposed Alternative to the Code

The licensee requested relief from achieving the Code-required examination coverage. The licensee states that the subject components identified in Table 1 have been examined to the extent practical, and will continue to perform pressure testing on the pressurizer as required by the Code.

The proposed alternative will be used during the third 10-year ISI interval, which started June 1, 1997, and will end May 31, 2007.

Item #	Item ID	Description	Coverage (%)	Reason for Limitation
B3.110	05-012	Pressurizer relief valve nozzle-to-vessel weld	45	Nozzle Configuration

Table 1¹				
Limited B-D Examinations				
Item #	Item ID	Description	Coverage (%)	Reason for Limitation
B3.110	05-013	Pressurizer spray nozzle-to-head weld	38	Nozzle Configuration
B3.130	03-008	Steam generator outlet nozzle-to-head weld (Reactor Coolant Pump D cold leg)	40.4	Nozzle Configuration and Support Skirt
B3.140	03-009	Steam generator outlet nozzle-to-lower head inner radius (Reactor Coolant Pump C cold leg)	90.7	Steam Generator Support Skirt

3.1.4 Licensee's Basis for Relief (as stated by the licensee)

"During the ultrasonic examination of the pressurizer and steam generator nozzle welds (ID #s 05-012, 05-013, and 03-008) and the inner radius section (ID#03-009) listed in Table 1 above, 100% coverage of the required examination volume could not be obtained due to nozzle configuration. Specifically for the nozzle welds, effective volumetric examination can only be performed from the shell side of the welds. In addition, the steam generator support skirt limits accessibility to the steam generator outlet nozzle inner radius sections. Examination coverage calculation sheets provided in the attachment of this relief request show the nozzle configuration, limitations, and beam plots of the different examination angles used. The weld volume was scanned using 0°, 45°, 60°, and 70° beam angles; no recordable indications...were located in the volume that was examined. The heat affected zones for ID #s 03-008, 05-012, and 05-013 were captured as shown in the associated examination coverage calculation sheets.

Nozzle inner radius limitations of ID #03-009 are caused by the ratio of the nozzle outside diameter (OD) to the vessel thickness. When the nozzle OD is small in relation to vessel thickness, more coverage can be obtained when scanning from the vessel side. Conducting examinations from the nozzle boss and OD blend is not practical, due to the complex beam angles and skews that must be calculated and then maintained during manual scanning in order to achieve an effective examination. To maximize coverage, the volume was scanned using 60° and 70° beam angles. During the second inspection interval, the contractor performing the examination claimed 100% coverage. However, when performing this examination during the third interval using current techniques, Entergy was able to obtain only 90.7% coverage. No recordable indications...were identified in either exam; therefore, Entergy

¹Table1 obtained from Entergy Operations, Inc. letter to the NRC dated December 2, 2003 (Entergy letter number CNRO-2003-00063) and reproduced in this page.

has reasonable assurance that any potential degradation would have been identified in the volume examined.

Radiography is not practical because of the geometry of the components, which prevents proper placement of the film and exposure source. To perform the Code-required examination would require modifying and/or replacing the components. The examinations performed on the subject items, in addition to the examination of other nozzle-to-vessel welds and inner radius sections contained in the program, would detect generic degradation, if it existed, demonstrating an acceptable level of integrity."

3.1.5 Evaluation

The 1992 Edition, no Addenda of the ASME Code, Section XI, Table IWB-2500-1, Examination Category B-D, Item Nos. B3.110, B3.130, and B3.140, and Figure No. IWB-2500-7 require volumetric examination, which includes 100 percent of the welded attachment length, once during the 10-year interval. ASME Code Case N-460 allows a reduction in coverage due to interference or geometry as long as the overall coverage is greater than 90 percent. (Note that Code Case N-460 does not apply to Item No. 03-009 since it is not a weld.)

The NRC staff reviewed the data sheets and results of ultrasonic testing examination submitted by the licensee for the subject components in Table 1. The NRC staff review notes that there was no recordable indications of degradation during the examination period for the subject components affected by the relief request. The licensee stated that they were able to examine the heat affected zone for Item Nos. 05-012, 05-013 and 03-008. In regard to Item No. 03-009, the licensee compared the results of the ultrasonic examinations during the third ISI interval against the second ISI interval, and no indications of recordable degradation were detected in either exams. In addition to this, more than 90 percent coverage of the inspection volume was achieved during both inspection intervals. The NRC staff concludes from the information provided by the licensee that any pattern of generic degradation would have been identified with the volumetric coverage obtained and, therefore, the reduction in examination coverage is acceptable.

Based on the information provided in this request for relief, the NRC staff has determined that it is impractical to examine the subject components in Table 1 to the extent required by the Code. In order to obtain the required examination coverage, redesign and modification of the subject components would be necessary. Imposition of this requirement would result in a significant burden on the licensee. In addition, the proposed alternative provides reasonable assurance of continued structural integrity of the welds and inner radius.

3.1.6 Conclusion

Based upon review of the information provided by the licensee in support of its Request for Relief No. ANO1-ISI-001, the NRC staff concludes that compliance with the Code-required examination coverage is impractical. This conclusion is based on the fact that the requirement would impose a significant burden to the licensee, and the achieved coverage provides reasonable assurance of the structural integrity of the subject components identified in Table 1. Therefore, pursuant to 10 CFR 50.55a(g)(6)(i), relief is granted to ANO-1 during the third 10-year ISI interval. This granting 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 approved in this relief request remain applicable, including third party review by the Authorized Nuclear Inservice Inspector.

3.2 ISI PROGRAM RELIEF REQUEST NO. ANO1-ISI-003, EXAMINATION COVERAGE LIMITATION FOR CODE CATEGORY C-A WELD

3.2.1 System/Component(s) for which Relief is Requested

This relief request applies to the ASME Code, Section XI, Class 2, Examination Category C-A weld identified in Table 2.

3.2.2 Code Requirements for which Relief is Requested

The 1992 Edition, no Addenda of the ASME Code, Section XI specifies the examination coverage requirements for pressure retaining welds in pressure vessels. Table IWC-2500-1, Examination Category C-A, Item No. C1.10, and Figure No. IWC-2500-1 require volumetric examination, which includes essentially 100 percent of the welded attachment length, once during the 10-year interval. ASME Code Case N-460, "Alternative Examination Coverage for Class 1 and Class 2 Welds," allows a reduction in coverage for Class 1 and 2 welds due to interference or geometry as long as the overall coverage is greater than 90 percent.

3.2.3 Licensee's Proposed Alternative to the Code

The licensee requested relief from achieving the Code-required examination coverage. The licensee states that the subject weld identified in Table 2 has been examined to the extent practical, and will continue to perform pressure testing on the subject weld as required by the Code.

The proposed alternative will be used during the third 10-year ISI interval, which started June 1, 1997, and will end May 31, 2007.

Table 2² Limited C-A Examination			
Item ID	Description	Coverage (%)	Reason for Limitation
03-047	Steam generator upper nozzle belt-to-upper shell weld	75.1	Nozzle-to-vessel configuration

²Table 2 obtained from Entergy Operations, Inc. letter to the NRC dated December 2, 2003 (Entergy letter number CNRO-2003-00063) and reproduced on this page.

3.2.4 Licensee's Basis for Relief (as stated by the licensee)

"During the ultrasonic examination of Weld 03-047, 100% coverage of the required examination volume could not be obtained due to configuration of the steam generator. Specifically, effective volumetric examination was limited by the nozzle belt taper. Examination coverage calculation sheets provided in the attachment of this relief request show the shell-to-nozzle belt configuration, limitations, and the beam plots of the different examination angles used. The volume was scanned using 45°, 60°, and 70° beam angles. The heat affected zone was captured as shown in the examination coverage calculation sheets.

One mid-wall recordable indication...exists in the examined volume and is completely contained within that volume. It has been evaluated per ASME IWC-3500 and determined to be acceptable. Additionally, ultrasonic data from the most recent examination has been compared with data from the previous examination; this comparison indicates no change in the indication.

Radiography is not practical because of the geometry of the component, which prevents proper placement of the film and exposure source. To perform the Code-required examination would require modifying and/or replacing the component. The examinations performed on Weld 03-047, in addition to the examination of other steam generator welds contained in the program, would detect generic degradation, if it existed, thereby demonstrating an acceptable level of integrity."

3.2.5 Evaluation

The 1992 Edition, no Addenda of the ASME Code, Section XI, Table IWC-2500-1, Examination Category C-A, Item No. C1.10, and Figure No. IWC-2500-1 require volumetric examination, which includes 100 percent of the welded attachment length, once during the 10-year interval. ASME Code Case N-460 allows a reduction in coverage due to interference or geometry as long as the overall coverage is greater than 90 percent.

The NRC staff reviewed the data sheets and results of ultrasonic testing examination submitted by the licensee for the subject component in Table 2. The NRC staff review notes that there was no recordable indications of degradation during the examination period for the subject component affected by the relief request. The licensee stated that they were able to examine the weld and the heat affected zone for Weld 03-047. In addition, the NRC staff notes that the licensee compared the ultrasonic testing examination results obtained during the most recent examination against data from the previous examination; no indications of degradation were found. The NRC staff concludes from the information provided by the licensee that any pattern of generic degradation would have been identified with the volumetric coverage obtained and, therefore, the reduction in examination coverage is acceptable.

Based on the information provided in this request for relief, the NRC staff has determined that it is impractical to examine the subject weld in Table 2 to the extent required by the Code. In order to obtain the required examination coverage, redesign and modification of the subject components would be necessary. Imposition of this requirement would result in a significant burden on the licensee. In addition, the proposed alternative provides reasonable assurance of continued structural integrity of the weld.

3.2.6 Conclusion

Based upon review of the information provided by the licensee in support of its Request for Relief No. ANO1-ISI-003, the NRC staff concludes that compliance with the Code-required examination coverage is impractical. This conclusion is based on the fact that the requirement would impose a significant burden to the licensee, and the achieved coverage provides reasonable assurance of the structural integrity of the subject weld identified in Table 2. Therefore, pursuant to 10 CFR 50.55a(g)(6)(i), relief is granted to ANO-1 during the third 10-year ISI interval. This granting 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 approved in this relief request remain applicable, including third party review by the Authorized Nuclear Inservice Inspector.

4.0 OVERALL CONCLUSION

The NRC staff has completed its review of the relief requests as documented above. For relief requests ANO1-ISI-001 and ANO1-ISI-003, the NRC staff determined that compliance with the Code-required examination coverage is impractical and that the achieved coverage provides reasonable assurance of structural integrity of the selected components. Therefore, pursuant to 10 CFR 50.55a(g)(6)(i), relief is granted for the third 10-year ISI interval. This granting 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.

Principal Contributor: Rafael Rodriguez

Date: December 16, 2004

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July 2004