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

January 30, 2013

Vice President, Operations
Arkansas Nuclear One
Entergy Operations, Inc.
1448 S.R. 333
Russellville, AR 72802

SUBJECT: ARKANSAS NUCLEAR ONE, UNIT 2 - REQUEST FOR RELIEF NOS. ANO2-ISI-008 AND ANO2-ISI-013 FOR THIRD 10-YEAR INTERVAL INSERVICE INSPECTION (TAC NOS. ME8270 AND ME8275)

Dear Sir or Madam:

By letter dated March 26, 2012, Entergy Operations, Inc. (the licensee), proposed Request for Relief (RR) Nos. ANO2-ISI-008 and ANO2-ISI-013 (in addition to four other RRs) from certain requirements of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (ASME Code), under the provisions of Title 10 of the *Code of Federal Regulations* (10 CFR), paragraph 50.55a(g)(5)(iii), for the third 10-year inservice inspection (ISI) program for Arkansas Nuclear One (ANO), Unit 2. Additionally, in response to two U.S. Nuclear Regulatory Commission (NRC) requests for additional information dated July 18, 2012, the licensee supplemented the application by two letters, both dated September 4, 2012, for RRs ANO2-ISI-008 and ANO2-ISI-013.

The ANO, Unit 2, third 10-year ISI interval ended on March 25, 2010. The licensee extended the third 10-year ISI interval by 1 year in accordance with ASME Code, Section XI, Paragraph IWA-2430 for the 2R21 (21st) refueling outage.

RR No. ANO2-ISI-008 covers the nozzle-to-vessel welds and inner radii. In its letter dated March 26, 2012, the licensee stated that during ultrasonic examination, 100 percent coverage of the required examination volume could not be obtained and, due to the geometric configuration of the components and the close proximity of other structures which limited scan paths, the use of approved beam angles in the axial and circumferential direction were not able to achieve greater than 90 percent Code-required volume.

Similarly, RR No. ANO2-ISI-013 covers the feedwater nozzle-to-shell weld where 100 percent coverage of the required examination volumes could not be obtained. Due to the close proximity of one of the steam generator insulation brackets, 100 percent examination of the Code-required volume was not achieved.

Based on information provided by the licensee, the NRC staff concludes that it is impractical for the licensee to meet the ASME Code-required 100 percent volumetric examination coverage for the nozzle-to-vessel welds and inner radii and feedwater nozzle-to-shell weld. The licensee considered radiographic testing (RT); however, RT was not practical on these types of nozzle-to-vessel weld configurations, which prevent placement of the film and exposure source. The

licensee has examined these welds to the extent practical and will continue to perform pressure testing on the subject components as required by the ASME Code.

The NRC staff also concludes that the examinations performed to the extent practical on the subject welds provide reasonable assurance of structural integrity of the subject welds. Based on the volumetric coverage obtained for the subject welds, and considering the licensee's performance of UT techniques employed to maximize this coverage, the NRC staff also concludes that if significant service-induced degradation had occurred, evidence of it would have been detected by the examinations that were performed.

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 given due consideration to the burden upon the licensee that could result if the requirements were imposed on the facility. Accordingly, the NRC staff concludes that the licensee has adequately addressed all of the regulatory requirements set forth in 10 CFR 50.55a(g)(6)(i). Therefore, the NRC staff grants relief from the specified ASME Code, Section XI, examination coverage requirements of the subject welds contained in RRs ANO2-ISI-008 and ANO2-ISI-013 for the ANO, Unit 2, third 10-year ISI interval.

All other ASME Code, Section XI requirements for which relief was not specifically requested and approved in the subject requests for relief remain applicable, including third-party review by the Authorized Nuclear Inservice Inspector.

The NRC staff's safety evaluation is enclosed.

Sincerely,

CFolyon for

Michael T. Markley, Chief
Plant Licensing Branch IV
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-368

Enclosure:
As stated

cc w/encl: Distribution via Listserv

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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

THIRD 10-YEAR INSERVICE INSPECTION INTERVAL

REQUEST FOR RELIEF NOS. ANO2-ISI-008 AND ANO2-ISI-013

ARKANSAS NUCLEAR ONE, UNIT 2

ENTERGY OPERATIONS, INC.

DOCKET NO. 50-368

1.0 INTRODUCTION

By letter dated March 26, 2012 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML12086A293), Entergy Operations, Inc. (the licensee), proposed Request for Relief (RR) Nos. ANO2-ISI-008 and ANO2-ISI-013 (in addition to four other RRs) from certain requirements of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (ASME Code), under the provisions of Title 10 of the *Code of Federal Regulations* (10 CFR), paragraph 50.55a(g)(5)(iii), for the third 10-year inservice inspection (ISI) program for Arkansas Nuclear One (ANO), Unit 2. Additionally, in response to two U.S. Nuclear Regulatory Commission (NRC) requests for additional information dated July 18, 2012 (ADAMS Accession Nos. ML12201A274 and ML12201A270, respectively), the licensee supplemented the application by two letters, both dated September 4, 2012 (ADAMS Accession Nos. ML12249A252 and ML12249A254, respectively), for RR Nos. ANO2-ISI-008 and ANO2-ISI-013.

2.0 REGULATORY EVALUATION

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, 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) 12 months prior to the start of the 120-month interval, subject to the limitations and modifications listed therein.

The regulations in 10 CFR 50.55a(g)(5)(iii), state, in part, that that licensees may determine that conformance with certain ASME Code requirements is impractical and that the licensee shall notify the Commission and submit information in support of the determination. Determination of impracticality in accordance with this section must be based on the demonstrated limitations experience when attempting to comply with the code requirements during the ISI interval for

which the request is being submitted. Requests for relief made in accordance with this section must be submitted to the NRC no later than 12 months after the expiration of the initial 120-month inspection interval or subsequent 120-month inspection interval for which relief is sought.

The regulations in 10 CFR 50.55a(g)(6)(i) state that "[t]he Commission will evaluate determinations under paragraph (g)(5) of this section that code requirements are impractical. The Commission may grant such relief and may impose such alternative requirements as it determines 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."

The licensee has requested relief from ASME Code requirements pursuant to 10 CFR 50.55a(g)(6)(i). The ASME Code of record for the ANO, Unit 2, third 10-year ISI interval program is the 2001 Edition through the 2003 Addenda of Section XI of the ASME Code. ANO, Unit 2, also uses the 1995 Edition through the 1996 Addenda for ultrasonic testing (UT) examination requirements. The ANO, Unit 2, third 10-year ISI interval ended on March 25, 2010. The licensee extended the third 10-year ISI interval by 1 year in accordance with ASME Code, Section XI, Paragraph IWA-2430 for the 2R21 (21st) refueling outage.

3.0 TECHNICAL EVALUATION

3.1 RR No. ANO2-ISI-008

3.1.1 ASME Code Components

ASME Code, Section XI, Examination Category B-D, Item Numbers B1.30 and B3.140 in Steam Generator (SG) Full Penetration Welded Nozzle-to-Vessel Welds.

For a list of components, see Table 1, "Limited B-D Examinations," on pages 7-10 of this safety evaluation (SE), which was reproduced from the licensee's submittal dated March 26, 2012.

3.1.2 ASME Code Requirements

ASME Code, Section XI, Examination Category B-D, Items B3.110 and B3.140 requires 100 percent volumetric examination, as defined by ASME Code, Section XI, Figures IWB 2500-7 (a) through (d), as applicable, of full penetration ASME Code, Class 1 nozzle-to-vessel welds on the SG. ASME Code Case N-460, "Alternative Examination Coverage for Class 1 and Class 2 Welds, Section XI, Division 1," as an alternative approved for use by the NRC in Regulatory Guide (RG) 1.147, Revision 16, "Inservice Inspection Code Case Acceptability, ASME Section XI, Division 1," October 2010 (ADAMS Accession No. ML101800536), 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).

The licensee has invoked ASME Code Case N-593, "Alternative Examination Requirements for Steam Generator Nozzle to Vessel Welds, Section XI, Division 1." This ASME Code Case requires that the examination volume indicated in Figure 1 of ASME Code Case N-593 shall be

used in lieu of the examination volume specified in Table IWAB-2500-1, Examination B-D, where the contour of this head design prohibits full examination coverage of the A-B-C-D-E-F-G-H examination volume from two directions. This volume shall be examined to the extent practical. ASME Code Case N-593 has been conditionally approved as an alternative for use by the NRC in RG 1.147, Revision 16. The RG 1.147, Revision 16, condition for ASME Code Case N-593 states that:

> Essentially 100 percent (not less than 90 percent) of the examination volume A-B-C-D-E-F-G-H must be inspected.

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

> During ultrasonic [(UT)] examination of the nozzle-to-vessel welds and inner radii listed in Table 1 below, 100% coverage of the required examination volume could not be obtained.
>
> Due to the geometric configuration of the components and the close proximity of other structures which limited scan paths, the use of approved beam angles in the axial and circumferential direction were not able to achieve greater than 90% code required volume. See Table 1 below for additional information.
>
> Radiography is not practical on these types of nozzle-to-vessel weld configurations, which prevent placement of the film and exposure source. To effectively perform any significant additional Code allowable ultrasonic examinations, modification and/or replacement of the component would be required. The examinations performed on the subject items in addition to the examination of other vessel welds contained in the Inservice Inspection Program would detect generic degradation, if it existed, demonstrating an acceptable level of integrity.

Additional information was provided by the licensee in its letter dated September 4, 2012, for RR No. ANO2-ISI-008 for components in Table 1 contained in the licensee's submittal dated March 26, 2012, identified as Numbers 03-005, 03-006, and 03-007 associated with Figures 5, 6, and 7[1].(as stated)

> The limitation is due to the configuration on the nozzle side of the component. These examinations were performed in 2003. During that time, the vessel weld ultrasonic examination procedure did not specifically require scanning down a nozzle taper in a best effort attempt to enhance coverage; therefore; scanning was only credited from a single side e.g., 50%.
>
> The Figures 5, 6, and 7 contained in the Request for Relief ANO2-ISI-008 are typical of the examination scans performed in the 2006 inspection and depict scans down the nozzle taper. Those scans down the nozzle taper were not performed in 2003 on components 03-005, 03-006 and 03-007.

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[1] Figures 5, 6, and 7 are not included in this SE. See the licensee's submittal dated September 4, 2012, for the subject figures.

> During the development of the response to this request it was determined that Request for Relief ANO2-ISI-008, Figures 5, 6, and 7 were incorrect. They were actually a copy of earlier figures in the same request. The correct figures [5, 6, and 7] are shown below and are typical of the examination scans performed in the 2003 time frame.

For Item Nos. 03-005, 03-006, and 03-007, additional clarifying information was provided in the licensee's e-mail dated September 19, 2012 (ADAMS Accession No. ML12263A182), which stated, in part, that

> Welds 03-005, 03-006 & 03-007 were volumetrically examined in 2003 to satisfy the 3rd ISI interval compliance requirements of IWB-2500, Table 1. The NDE [nondestructive examination] procedure was written to the ASME Section XI 1986 code. These were the Nozzle to Extension Piece welds on the then new "A" steam generator. They were scanned from the extension piece side only resulting in 50% coverage of the code required examination volume. This exam, at the time, was compliant with the procedures and the code of record.
>
> In 2006 we examined welds 04-005, 04-006 & 04-007. These 3rd ISI interval examinations were for the "B" steam generator Nozzle to Extension Piece welds (sister welds to the 03-xxx welds). They were volumetrically examined in accordance with ASME Section XI, 1995 ed [Edition] w/ [with] 96 ad [Addenda]. These welds were scanned from both sides of the weld and additional code coverage was achieved. However, since essentially 100% of these welds could not be examined either, they were included in ANO2-RR-008 also.
>
> All of the above welds were only examined once during the 3rd interval and no relief requests previous to ANO2-RR-008 were submitted for limited examination coverage.

3.1.4 Licensee's Proposed Alternative Examination

The licensee did not propose an alternative examination at this time. The licensee considered radiographic testing (RT); however, it concluded that RT was not practical on these types of nozzle-to-vessel weld configurations, which prevent placement of the film and exposure source. The licensee has examined these welds to the extent practical and will continue to perform pressure testing on the subject components as required by the ASME Code.

3.1.5 NRC Staff Evaluation

The ASME Code requires 100 percent volumetric examination of ASME Code, Class 1 Nozzle-to-Extension Pipe Welds 04-005, 04-006, and 04-007. In addition, the ASME Code requires that the volumetric examinations be conducted from both sides of these pressure retaining welds. However, the design configurations of the subject nozzle-to-extension pipe welds limit access for UT scanning primarily to the vessel side of the welds. In order to effectively increase the examination coverage, the subject welds would require design modifications or replacement. The licensee did not propose an alternative examination at this time. The licensee considered

RT; however, it concluded that RT was not practical on these types of nozzle-to-vessel weld configurations, which prevent placement of the film and exposure source. To require the licensee to perform the ASME Code-required examinations would place a burden on the licensee.

The SG Outlet Nozzle-to-Extension Pipe Welds 04-005, 04-006, and 04-007, shown in Table 1 on pages 7-10 of this SE, are constructed of carbon steel material, with stainless steel cladding on the inside surface. This design geometry limits ASME Code-required UT angle beam examinations to be performed primarily from the vessel side of the welds. As shown on the sketches and technical descriptions included in the licensee's submittals, examinations of the subject welds have been completed to the extent practical with aggregate coverage of the ASME Code-required volumes 61.5, 61.5, and 54.69 percent, respectively, as shown in Table 1 on pages 7-10 of this SE. Manual UT examinations were conducted using ASME Code, Section V, Article 4 techniques and included 0-degree longitudinal, and 45-degree and 60-degree shear waves primarily from the vessel side. Limitations were caused by the configuration of the nozzle-to-extension pipe design, and proximity to nozzle outside diameter radius sections, or blend areas. The examination volumes included the weld and base materials near the inside surface of the weld joints, which are typically the highest regions of stress, and where one would expect degradation sources to be manifested should they occur. No unacceptable indications were recorded during these examinations. Although UT scans were primarily limited to the vessel side, recent studies have found that inspections conducted through carbon steel are equally effective whether the UT waves have only to propagate through the base metal, or have to also propagate through the carbon steel weldment[2]. Therefore, due to the fine-grained carbon steel microstructures, it is expected that the UT techniques employed would have detected structurally significant flaws that may have occurred on either side of the subject welds.

The ASME Code requires 100 percent volumetric examination of ASME Code, Class 1 SG Nozzle Inner Radius Welds 03-005IR, 03-0061IR, 03-007IR, 04-005IR, 04-006IR, and 04-007IR. In addition, the ASME Code requires that the volumetric examinations be conducted from both sides of these pressure retaining welds. However, the design configurations of the subject inter radius welds limit access for UT scanning primarily to the vessel side of the welds. In order to effectively increase the examination coverage, the subject welds would require design modifications or replacement. This would place a burden on the licensee.

The SG Nozzle Inner Radius Welds 03-005IR, 03-0061IR, 03-007IR, 04-005IR, 04-006IR, and 04-007IR shown in Table 1 below are constructed of carbon steel material, with stainless steel cladding on the inside surface. This design geometry and four integral attachments each 4.25-inch x 3.75-inch in size, located on the SG lower head limits ASME Code-required UT angle beam examinations to be performed primarily from the vessel side of the welds. As shown on the sketches and technical descriptions included in the licensee's submittals, examinations of the subject welds have been completed to the extent practical with aggregate coverage of the ASME Code-required volumes 88, 88, 90, 88, 88, and 90 percent, respectively, as shown in Table 1 below. Manual UT examinations were conducted using ASME Code, Section V, Article 4 techniques and included 25-degree shear, 90-degree skew angle, 35-degree shear at +120-degree and -120-degree skew angles, 55-degree shear at +22-degree and -22-degree

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[2] P. G. Heasler and S. R. Doctor, 1996. *Piping Inspection Round Robin*, NUREG/CR-5068, PNNL-10475, U.S. Nuclear Regulatory Commission, Washington, DC.

skew angles, and 70-degree at +81-degree and -81-degree skew angels waves primarily from the vessel side. Limitations were caused by the configuration of the nozzle configuration and four integral attachments. The examination volumes included the weld and base materials inside surface of the weld joints, which are typically the highest regions of stress, and where one would expect degradation sources to be manifested should they occur. No indications were recorded during these examinations.

The SG Outlet Nozzle-to-Extension Pipe Welds 03-005, 03-006, and 03-007 shown in Table 1 below are constructed of carbon steel material, with stainless steel cladding on the inside surface. This design geometry limits ASME Code-required UT angle beam examinations to be performed primarily from the pipe side of the welds. As shown on the sketches and technical descriptions included in the licensee's submittals, examinations of the subject welds have been completed to the extent practical with aggregate coverage of the ASME Code-required volumes 50, 50, and 50 percent, respectively, as shown in Table 1 below. Manual UT examinations were conducted using ASME Code, Section V, Article 4 techniques and included 45-degree, 0-degree, 60-degree, and 70-degree longitudinal and shear waves primarily from the extension pipe side. By letter dated September 4, 2012, in response to the NRC staff request for additional information (RAI) dated July 18, 2012 (ADAMS Accession No. ML12201A274), the licensee noted that these examinations were performed during 2003, and that the vessel weld UT examination procedure did not specifically require scanning down a nozzle taper in a best effort attempt to enhance coverage, thus the scanning was only credited from a single side (e.g., 50 percent as noted above).

Limitations were caused by the configuration of the nozzle side of the component. The examination volumes included the weld and base materials near the inside surface of the weld joints, which are typically the highest regions of stress, and where one would expect degradation sources to be manifested should they occur. No unacceptable indications were recorded during these examinations. Although UT scans were primarily limited to the extension pipe, recent studies have found that inspections conducted through carbon steel are equally effective whether the UT waves have only to propagate through the base metal, or have to also propagate through the carbon steel weldment[3]. Therefore, due to the fine-grained carbon steel microstructures, it is expected that the UT techniques employed would have detected structurally significant flaws that may have occurred on either side of the subject welds.

The licensee has shown that it is impractical to meet the ASME Code-required 100 percent volumetric examination coverage for the subject SG nozzle-to-extension and nozzle inter radius welds due to the nozzles' designs and in the case of the subject nozzle inter radius welds the nozzle configuration and four integral attachments. Based on the volumetric coverage obtained for the subject welds, and considering the licensee's performance of UT techniques employed to maximize this coverage, the NRC staff concludes that that if significant service-induced degradation had occurred, evidence of it would have been detected by the examinations that were performed. The staff also concludes that the examinations performed to the extent practical on the subject welds provide reasonable assurance of structural integrity of the subject welds.

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[3] P. G. Heasler and S. R. Doctor, 1996. *Piping Inspection Round Robin*, NUREG/CR-5068, PNNL-10475, U.S. Nuclear Regulatory Commission, and Washington, DC.

Table 1 for RR No. ANO2-ISI-008 Limited B-D Examinations									
Component Description				Additional Information					
Item Number	Comp. ID	Item Description	Estimated % Coverage of Code Required Volume	Examination Summary	Scan Plan	Exam Method and Limitations	Search Units	Surface Examination	Exam Results
B3.130	04-005	Steam Generator (SG) "B" Primary Outlet Nozzle-to-Extension Pipe Circumferential Weld	61.5	Component was scanned from both sides; however, scanning was limited from the nozzle side due to the component configuration.	See the attached sketch (Figure 1) derived from UT examination report ISI-UT-06-045 on file at AND.	Manual UT A detailed sketch (Figure 1) of the limitation is included with the scan plan	Wave modalities are longitudinal and shear. Insonification angles included 0°, 45°, and 60°.	None required.	No indications were recorded.
B3.130	04-006	SG "B" Primary Outlet Nozzle-to-Extension Pipe Circumferential Weld	61.5	Component was scanned from both sides; however, scanning was limited from the nozzle side due to the component configuration.	See the attached sketch (Figure 2) derived from UT examination report ISI-UT-06-046 on File at ANO.	Manual UT A detailed sketch (Figure 2) of the limitation is included with the scan plan.	Wave modalities are longitudinal and shear. Insonification angles included 0°, 45°, and 60°.	None required.	No indications were recorded.
B3.130	04-007	Extension Pipe-to-SG "B" Primary Inlet Nozzle Circumferential Weld	54.69	Component was scanned from both sides; however, scanning was limited from the nozzle side due to the component configuration.	See the attached sketch (Figure 3) derived from UT examination report ISI-UT-06-049 on file at ANO.	Manual UT A detailed sketch (Figure 3) of the limitation is included with the scan plan.	Wave modalities are longitudinal and shear. Insonification angles included 0°, 45°, and 60°.	None required.	No indications were recorded.
B3.140	03-005IR	SG "A" Primary Outlet Nozzle Inner Radii	88	Scanning was performed from the vessel side only due to component configuration.	See the attached sketch (Figure 4) derived from UT examination reports ISI-UT-06-059andISI-UT-06-060 and UT procedure CEP-NDE-0485 on file at ANO.	Manual UT Four integral attachments, each 4.25" x 3.75" in size, located on the SG lower head, reduced examination coverage by 12%	Wave modality and insonification angles included 25' shear at 90' skew angle; 35' shear at +120' and -120' skew angles; 55' shear at +22° and -22' skew angles and 70' shear at +81' and -81" skew angles.	None required.	No indications were recorded.

Table 1 for RR No. ANO2-ISI-008 Limited B-D Examinations									
Component Description				Additional Information					
Item Number	Comp. ID	Item Description	Estimated % Coverage of Code Required Volume	Examination Summary	Scan Plan	Exam Method and Limitations	Search Units	Surface Examination	Exam Results
B3.140	03-006IR	SG "A" Primary Outlet Nozzle Inner Radii	88	Scanning was performed from the vessel side only due to component configuration.	See the attached sketch (Figure 4) derived from UT examination reports ISI-UT-06- 061 and ISI-UT-06- 062 and UT procedure CEP-NDE-0485 on file at ANO.	Manual UT Four integral attachments, each 4.25" x 3.75" in size, located on the SG lower head, reduced examination coverage by 12%	Wave modality and insonification angles included 25' shear at 90' skew angle; 35' shear at +120' and -120' skew angles; 55' shear at +22° and -22' skew angles and 70' shear at +81° and -81' skew angles.	None required.	No indications were recorded.
B3.140	03- 007IR	SG "A" Primary Inlet Nozzle Inner Radii	90	Scanning was performed from the vessel side only due to component configuration.	See the attached sketch (Figure 4) derived from UT examination reports ISI-UT-06- 063 and ISI-UT-06- 064 and UT procedure CEP-NDE-0485 on file at ANO.	Manual UT Four integral attachments, each 4.25" x 3.75" in size, located on the SG lower head, reduced examination coverage by 10%	Wave modality and insonification angles included 25° shear at 90' skew angle; 35' shear at +120" and -120' skew angles; 55" shear at +22' and -22' skew angles and 70° shear at +81' and -81" skew angles.	None required.	No indications were recorded.
B3.140	04- 005IR	SG "B" Primary Outlet Nozzle Inner Radii	88	Scanning was performed from the vessel side only due to component configuration.	See the attached sketch (Figure 4) derived from UT examination reports ISI-UT-06- 050 and ISI-UT-06- 051 and UT procedure CEP-NDE-0485 on file at ANO.	Manual UT Four integral attachments, each 4.25" x 3.75" in size, located on the SG lower head, reduced examination coverage by 12%	Wave modality and insonification angles included 25' shear at 90° skew angle; 35° shear at +120° and -120° skew angles; 55° shear at +22° and -22° skew angles and 70° shear at +81' and -81° skew angles.	None required.	No indications were recorded.

Table 1 for RR No. ANO2-ISI-008
Limited B-D Examinations

Component Description				Additional Information					
Item Number	Comp. ID	Item Description	Estimated % Coverage of Code Required Volume	Examination Summary	Scan Plan	Exam Method and Limitations	Search Units	Surface Examination	Exam Results
B3.140	04- 006IR	SG "B" Primary Outlet Nozzle Inner Radii	88	Scanning was performed from the vessel side only due to component configuration.	See the attached sketch (Figure 4) derived from UT examination reports ISI-UT-06- 052 and ISI-UT-06- 053 and UT procedure CEP-NDE-0485 on file at ANO.	Manual UT Four integral attachments, each 4.25" x 3.75" in size, located on the SG lower head, reduced examination coverage by 12%	Wave modality and insonification angles included 25° shear at 90° skew angle; 35° shear at +120° and -120° skew angles; 55° shear at +22° and -22° skew angles and 70° shear at +81° and -81° skew angles.	None required.	No indications were recorded.
83.140	04-007IR	SG "B" Primary Inlet Nozzle Inner Radii	90	Scanning was performed from the vessel side only due to component configuration.	See the attached sketch (Figure 4) derived from UT examination reports ISI-UT-06- 054 and ISI-UT-06- 055 and UT procedure CEP-NDE-0485 on file at ANO.	Manual UT Four integral attachments, each 4.25" x 3.75" in size, located on the SG lower head, reduced examination coverage by 10%	Wave modality and insonification angles included 25° shear at 90° skew angle; 35° shear at +120° and -120° skew angles; 55° shear at +22° and -22° skew angles and 70° shear at +81° and -81° skew angles.	None required.	No indications were recorded.
B3.130	03-005	SG "A" Primary Outlet Nozzle-to-Extension Pipe Circumferential Weld	50	Component was scanned from extension pipe side only.	See the attached sketch (Figure 5) derived from UT examination report 203ISIUT011 and 203ISIUT012on file at AND.	Manual UT A detailed sketch (Figure 5) of the limitation is included with the scan plan	Wave modalities are longitudinal and shear. Insonification angles included 0°, 45°, 60°, and 70°.	None required.	No Relevant indications were recorded.

Table 1 for RR No. ANO2-ISI-008 Limited B-D Examinations									
Component Description				Additional Information					
Item Number	Comp. ID	Item Description	Estimated % Coverage of Code Required Volume	Examination Summary	Scan Plan	Exam Method and Limitations	Search Units	Surface Examination	Exam Results
B3.130	03-006	SG "A" Primary Outlet Nozzle-to-Extension Pipe Circumferential Weld	50	Component was scanned from extension pipe side only.	See the attached sketch (Figure 6) derived from UT examination report 203ISIUT013on file at ANO.	Manual UT A detailed sketch (Figure 6) of the limitation is included with the scan plan.	Wave modalities are longitudinal and shear. Insonification angles included 0°, 45°, 60°, and 70°.	None required.	No indications were recorded.
B3.130	03-007	Extension Pipe - to- SG "A" Primary Inlet Nozzle Circumferential Weld	50	Component was scanned from extension pipe side only.	See the attached sketch (Figure 7) derived from UT examination report 203ISIUT015on file at ANO.	Manual UT A detailed sketch (Figure 7) of the limitation is included with the scan plan.	Wave modalities are longitudinal and shear. Insonification angles included 0°, 45, 60°, and 70°.	None required.	No indications were recorded.

NOTE: Figures 1-7 referenced in this table are not reproduced for this SE. See Attachment 1 of the licensee's submittal dated March 26, 2012, for the subject figures.

3.2 RR No. ANO2-ISI-013

3.2.1 ASME Code Components

ASME Code, Section XI, Examination Category C-B, Item Numbers C2.21, SG "B" Nozzle-to-Shell Weld 04-002.

For a list of components, see Table 1, "Limited C-B Examinations," on page 13 of this SE, which was reproduced from the licensee's submittal dated March 26, 2012.

3.2.2 ASME Code Requirements

ASME Code, Section XI, Examination Category C-B, Item C2.21 requires 100 percent volumetric examination, as defined by ASME Code, Section XI, Figure IWC-2500-4 (a) or (b), as applicable, of full penetration ASME Code, Class 2 nozzle-to-vessel welds on the SG. ASME Code Case N-460, "Alternative Examination Coverage for Class 1 and Class 2 Welds, Section XI, Division 1," as an alternative approved for use by the NRC in RG 1.147, Revision 16, 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).

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

> During [UT] examination of the [SG B] Feedwater Nozzle-to-Shell Weld [04-002] listed in Table 1, 100% coverage of the required examination volumes could not be obtained.
>
> Due to the close proximity of one of the steam generator insulation brackets, located around the circumference of the vessel and directly below the Feedwater nozzles, scan paths from below the nozzle were impeded and 100% examination of the [ASME Code] required volume was not achieved. See Table 1 for additional information.
>
> There are several insulation bracket rings located around the circumference of the steam generator. These brackets facilitate supporting the many insulation panels surrounding the circumference of the steam generator. Removal of the subject bracket requires removal of all insulation panels directly supported by that ring as well as removal or engineered rigging of all insulation rings and panels above the removed ring. The insulation rings are not bolted directly to the steam generator shell therefore each lower elevation ring helps support the above rings and insulation panels.
>
> Radiography [(RT)] is not practical on these types of nozzle-to-vessel weld configurations, which prevent placement of the film and exposure source. To effectively perform any significant additional Code allowable ultrasonic examinations, modification and/or removal are replacement of the insulation ring would be required. The examinations performed on the subject items in addition to the examination of other vessel welds contained in the Inservice Inspection

program would detect generic degradation, if it existed, demonstrating an acceptable level of integrity.

3.2.4 Licensee's Proposed Alternative Examination

The licensee did not propose an alternative examination at this time. The licensee considered RT; however, it concluded that RT was not practical on these types of nozzle-to-vessel weld configurations, which prevent placement of the film and exposure source. The licensee examined these welds to the extent practical and will continue to perform pressure testing on the subject components as required by the ASME Code.

3.2.5 NRC Staff Evaluation

The ASME Code requires 100 percent volumetric and surface examinations of Class 2 nozzle-to-shell (or head) welds. However, for SG B Feedwater Nozzle-to-Shell Weld 04-002 complete examinations are limited due to the configuration of the shell-to-nozzle blend area and close proximity of an insulation bracket ring below the nozzle. In order to achieve greater volumetric coverage, the nozzle and bracket would have to be redesigned and modified. The licensee did not propose an alternative examination at this time. The licensee considered RT; however, it concluded that RT was not practical on these types of nozzle-to-shell weld configurations, which prevent placement of the film and exposure source. To require the licensee to perform the ASME Code-required examinations would place a burden on the licensee, therefore, the ASME Code volumetric examination is considered impractical.

The SG B Feedwater Nozzle-to-Shell Weld 04-002 shown in Table 1 below are constructed of carbon steel material, with stainless steel cladding on the inside surface. As shown in the sketches and technical descriptions included in the licensee's submittal, examination of SG B Feedwater Nozzle-to-Shell Weld 04-002 was performed to the extent practical, with the licensee obtaining 71.6 percent of the required examination volume. The shell-to-nozzle blend area and close proximity of an insulation bracket ring below the nozzle limited the examination from both sides of the weld. The licensee applied both 45-degree and 60-degree shear waves from both sides of the weld. The licensee also completed the full ASME Code-required surface examinations on the subject weld. No indications were noted during the volumetric and surface examinations of the subject weld.

The licensee has shown that it is impractical to meet the ASME Code-required 100 percent volumetric examination coverage for the subject nozzle-to-shell weld due to the nozzle's configuration and of an insulation bracket ring below the nozzle. However, based on the volumetric and full surface coverage obtained, the NRC staff concludes that if significant service-induced degradation had occurred, evidence of indications would be have been detected by the examinations performed. The NRC staff concludes that the examinations performed to the extent practical on the subject welds provide reasonable assurance of structural integrity of the subject welds.

Table 1 for RR No. ANO2-ISI-013 Limited C-B Examinations									
Component Description				Additional Information					
ASME Code Item Number	Comp. ID	Item Description	Estimated Coverage of Code Required Volume Percent	Examination Summary	Scan Plan	Exam Method and Limitations	Search Units	Surface Examination	Exam Results
C2.21	04-002	Steam Generator "B" Feedwater Nozzle-to-Shell Weld	71.6	This was a dual sided exam, limited by the configuration of the shell-to-nozzle blend area and the close proximity of an insulation bracket ring below the nozzle.	See the attached sketch (Figure 1) derived from ultrasonic test (UT) examination report ISI-UT-06-067 on file at ANO.	Manual UT A detailed sketch (Figure 1) of the limitation is included with the scan plan.	Wave modality used included shear. Insonification angles included 45° shear (S) and 60°S.	A surface examination was performed and documented on examination report ISI-MT-06-039. 100% of the required surface was examined.	No indications were recorded.

NOTE: Figure 1 referenced in this table is not reproduced for this SE. See Attachment 6 of the licensee's submittal dated March 26, 2012, for the subject figure.

4.0 CONCLUSION

As set forth above, 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 given due consideration to the burden upon the licensee that could result if the requirements were imposed on the facility. Accordingly, the staff concludes that the licensee has adequately addressed all of the regulatory requirements set forth in 10 CFR 50.55a(g)(6)(i). Therefore, the NRC staff grants relief from the specified ASME Code, Section XI, examination coverage requirements of the subject welds contained in RRs ANO2-ISI-008 and ANO2-ISI-013 for the ANO, Unit 2, third 10-year ISI interval.

All other ASME Code, Section XI requirements for which relief was not specifically requested and approved in the subject requests for relief remain applicable, including third-party review by the Authorized Nuclear Inservice Inspector.

Principal Contributor: T. McLellan, NRR/DE/EPNB

Date: January 30, 2013

licensee has examined these welds to the extent practical and will continue to perform pressure testing on the subject components as required by the ASME Code.

The NRC staff also concludes that the examinations performed to the extent practical on the subject welds provide reasonable assurance of structural integrity of the subject welds. Based on the volumetric coverage obtained for the subject welds, and considering the licensee's performance of UT techniques employed to maximize this coverage, the NRC staff also concludes that if significant service-induced degradation had occurred, evidence of it would have been detected by the examinations that were performed.

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 given due consideration to the burden upon the licensee that could result if the requirements were imposed on the facility. Accordingly, the NRC staff concludes that the licensee has adequately addressed all of the regulatory requirements set forth in 10 CFR 50.55a(g)(6)(i). Therefore, the NRC staff grants relief from the specified ASME Code, Section XI, examination coverage requirements of the subject welds contained in RRs ANO2-ISI-008 and ANO2-ISI-013 for the ANO, Unit 2, third 10-year ISI interval.

All other ASME Code, Section XI requirements for which relief was not specifically requested and approved in the subject requests for relief remain applicable, including third-party review by the Authorized Nuclear Inservice Inspector.

The NRC staff's safety evaluation is enclosed.

Sincerely,
/RA by CFLyon for/

Michael T. Markley, Chief
Plant Licensing Branch IV
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-368

Enclosure:
As stated

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