



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

July 15, 2019

ANO Site Vice President  
Arkansas Nuclear One  
Entergy Operations, Inc.  
N-TSB-58  
1448 S.R. 333  
Russellville, AR 72802

SUBJECT: ARKANSAS NUCLEAR ONE, UNIT 1 – REQUEST FOR RELIEF ANO1-ISI-032  
FROM ASME CODE SECTION XI VISUAL EXAMINATION REQUIREMENTS  
FOR THE FOURTH 10-YEAR INSERVICE INSPECTION INTERVAL  
(EPID L-2018-LLR-0135)

Dear Sir or Madam:

By letter dated October 31, 2018 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML18304A450), as supplemented by letter dated February 28, 2019 (ADAMS Accession No. ML19059A385), Entergy Operations, Inc. (the licensee) submitted a request to the U.S. Nuclear Regulatory Commission (NRC) for relief from certain American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code), Section XI requirements at Arkansas Nuclear One, Unit 1 (ANO-1).

Specifically, this relief request, ANO1-ISI-032, pertains to an impracticality determination of the visual examination of the reactor vessel support performed during the third period of the fourth inservice inspection interval at ANO-1. Pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) paragraph 50.55a(g)(5)(iv), the licensee requested relief from the required examination coverage and to use alternative requirements, if necessary, for inspection of Category F-A, Item No. F1.40 (“Supports Other Than Piping Supports”) on the basis that the ASME Code requirement is impractical.

The NRC staff has reviewed the subject request and concludes, as set forth in the enclosed safety evaluation, that granting relief pursuant to 10 CFR 50.55a(g)(6)(i) is authorized by law, 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. Furthermore, the staff concluded that the examinations performed, to the extent practical, provide reasonable assurance of structural integrity of the subject components. Accordingly, the staff concludes that the licensee has adequately addressed all the regulatory requirements set forth in 10 CFR 50.55a(g)(6)(i). Therefore, the NRC staff grants Relief Request ANO1-ISI-032 at ANO-1 for the third period of the fourth 10-year inservice inspection interval, which commenced on May 31, 2014, and ended on May 30, 2018.

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

If you have any questions, please contact Thomas Wengert at (301) 415-4037 or by e-mail at [Thomas.Wengert@nrc.gov](mailto:Thomas.Wengert@nrc.gov).

Sincerely,

*/RA/*

Robert J. Pascarelli, Chief  
Plant Licensing Branch IV  
Division of Operating Reactor Licensing  
Office of Nuclear Reactor Regulation

Docket No. 50-313

Enclosure:  
Safety Evaluation

cc: Listserv

SUBJECT: ARKANSAS NUCLEAR ONE, UNIT 1 – REQUEST FOR RELIEF ANO1-ISI-032  
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SSheng, NRR

**ADAMS Accession No. ML19184A554**

\* by email

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UNITED STATES  
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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELIEF REQUEST ANO1-ISI-032

EXAMINATION COVERAGE FOR SUPPORTS OTHER THAN PIPING SUPPORTS

ENTERGY OPERATIONS, INC.

ARKANSAS NUCLEAR ONE, UNIT 1

DOCKET NO. 50-313

1.0 INTRODUCTION

By letter dated October 31, 2018 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML18304A450), as supplemented by letter dated February 28, 2019 (ADAMS Accession No. ML19059A385), Entergy Operations, Inc. (Entergy, the licensee) requested relief from certain requirements of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code), Section XI. This relief request, ANO1-ISI-032, pertains to an impracticality determination of the visual examination of the reactor vessel (RV) support performed during the third period of the fourth inservice inspection (ISI) interval at Arkansas Nuclear One, Unit 1 (ANO-1).

Specifically, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) paragraph 50.55a(g)(5)(iv), "ISI program update: Schedule for completing impracticality determinations," the licensee requested relief from the required examination coverage and to use alternative requirements, if necessary, for inspection of Category F-A, Item No. F1.40 ("Supports Other Than Piping Supports") on the basis that the ASME Code requirement is impractical.

2.0 REGULATORY EVALUATION

Pursuant to 10 CFR 50.55a(g)(4), "Inservice inspection standards requirement for operating plants," "[t]hroughout the service life of a boiling or pressurized water-cooled nuclear power facility, components (including supports) that are classified as ASME Code Class 1, Class 2, and Class 3 must meet the requirements, except design and access provisions and preservice examination requirements, set forth in Section XI of editions and addenda of the [ASME Code...] that become effective subsequent to editions specified in paragraphs (g)(2) and (3) [of 10 CFR 50.55a] and that are incorporated by reference in paragraph (a)(1)(ii)...[of 10 CFR 50.55a], to the extent practical within the limitations of design, geometry, and materials of construction of the components."

Pursuant to 10 CFR 50.55a(g)(4)(ii), “Applicable ISI Code: Successive 120-month intervals,” “[i]n-service examination of components and system pressure tests conducted during successive 120-month inspection intervals must comply with the requirements of the latest edition and addenda of the ASME Code incorporated by reference in paragraph (a) [of 10 CFR 50.55a] 12 months before the start of the 120-month inspection interval (or the optional ASME Code Cases listed in NRC [U.S. Nuclear Regulatory Commission] Regulatory Guide 1.147, when using [ASME Code], Section XI, ... as incorporated by reference in paragraphs (a)(3)(ii) [of 10 CFR 50.55a], subject to the conditions listed in paragraph (b) [of 10 CFR 50.55a]. However, a licensee whose in-service inspection interval commences during the 12 through 18-month period after August 17, 2017, may delay the update of their Appendix VIII program by up to 18 months after August 17, 2017. Alternatively, licensees may, at any time in their 120-month ISI interval, elect to use the Appendix VIII in the latest edition and addenda of the [ASME Code] incorporated by reference in paragraph (a) [of 10 CFR 50.55a], subject to any applicable conditions listed in paragraph (b) of that section. Licensees using this option must also use the same Edition and Addenda of Appendix I as Appendix VIII, including any applicable conditions listed in paragraph (b) [of 10 CFR 50.55a].”

Pursuant to 10 CFR 50.55a(g)(5)(iii), “ISI program update: Notification of impractical ISI Code requirements,” “[i]f the licensee has determined that conformance with a [ASME Code] requirement is impractical for its facility, the licensee must notify the NRC and submit, as specified in [10 CFR 50.4], information to support the determinations. Determinations of impracticality in accordance with [10 CFR 50.55a] must be based on the demonstrated limitations experienced when attempting to comply with the Code requirements during the in-service inspection interval for which the request is being submitted. Requests for relief made in accordance with [10 CFR 50.55a] must be submitted to the NRC no later than 12 months after the expiration of the initial or subsequent 120-month inspection interval for which relief is sought.”

Although the licensee requested ANO1-ISI-032 pursuant to 10 CFR 50.55a(g)(5)(iv), the NRC staff finds that this is equivalent to a request pursuant to 10 CFR 50.55a(g)(5)(iii) because the impracticality was based on the demonstrated limitations during the requested duration of the relief request.

Pursuant to 10 CFR 50.55a(g)(6)(i), “Impractical ISI requirements: Granting of relief,” “[t]he Commission will evaluate determinations under paragraph (g)(5) of [10 CFR 50.55a] that [ASME Code] requirements are impractical. The Commission may grant such relief and may impose such alternative requirements as it determines are authorized by law, will not endanger life or property or the common defense and security, and are 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.”

Based on the above, and subject to the following technical evaluation, the NRC staff finds that regulatory authority exists for the licensee to request and the NRC to grant the relief requested by the licensee.

### 3.0 TECHNICAL EVALUATION

#### 3.1 Licensee's Relief Request

##### 3.1.1 ASME Code Components Affected

The affected component is the ASME Code Class 1 component identified in Table 1, "Limited F-A Examinations," of ANO1-ISI-032, as shown in the licensee's letter dated October 31, 2018, and as identified below:

- Category: F-A, "Supports"
- Item No.: F1.40, "Supports Other Than Piping Supports (Class 1, 2, 3, and MC)"
- Component ID: 01-035, "Reactor Vessel Support Skirt-to-Flange Weld and Bolting" (i.e., Components 01-032, 01-033, and 01-034 in approved Relief Request ANO1-ISI-020 for the third ISI interval<sup>1</sup>).

##### 3.1.2 Applicable Code Edition and Addenda

The Code of record for the fourth 10-year ISI interval is the 2001 Edition through 2003 Addenda of the ASME Code (Table IWF-2500-1).

##### 3.1.3 Duration of Relief Request

The licensee submitted this relief request for the third period of the fourth 10-year ISI interval, which started on May 31, 2014, and ended on May 30, 2018.

##### 3.1.4 ASME Code Requirement

ASME Code, Section XI, Table IWF-2500-1, Examination Category F-A, Item F1.40, requires a 100 percent visual VT-3 examination of the support, as depicted in Figure IWF-1300-1.

##### 3.1.5 Impracticality of Compliance

The licensee stated that during the ANO-1 27th refueling outage (1R27) in the spring of 2018, Component 01-035 was examined in compliance with the requirements of ASME Code, Section XI, Table IWF-2500-1, Examination Category F-A. However, 100 percent coverage of the required examination area could not be obtained. Examination of this component was limited due to its location in an area that is congested with incore instrumentation piping and with general area radiation dose rates of 500 – 600 millirem per hour (mR/h). Access to the support is approximately 12 feet above the floor level. Limited access and high dose rates make it impractical to safely erect and work from a scaffold to remove insulation panels to allow for better access. As a result, VT-3 was performed using a fiberscope.

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<sup>[1]</sup> This relief request and its safety evaluation are dated May 29, 2009, and May 5, 2010 (ADAMS Accession Nos. ML091520610 and ML101170119, respectively).

The fiberscope was deployed from under the vessel to perform the examination of the skirt-to-flange weld and bolting (formerly Components 01-033 and 01-034) to the extent practical. The relief request implies that the examination was limited by the narrow skirt cutouts. For the skirt circumferential weld (formerly Component 01-032), the licensee stated that the examination was limited by the surrounding insulation blocks, high radiation, and congestion due to incore instrumentation piping. This was worsened by the positioning of the fiberscope through the access hole, which would not allow for a qualified VT-3 examination due to unsatisfactory distance and viewing angle. Access from the outer diameter of the vessel was not practical due to the plant configuration.

The licensee stated that to obtain significant additional examination coverage on the subject components, modification and/or replacement of the components would be required.

### 3.1.6 Proposed Alternative and Bases for Relief

No alternative examination is proposed by the licensee because a qualified VT-3 examination could be performed by fiberscope if the limitations mentioned above in Section 3.1.5 did not exist. The licensee stated that it 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, Section XI.

The licensee stated that examination of the accessible portions of the skirt-to-flange welds and bolting revealed no unacceptable indications, and that examinations performed on the subject support would detect general degradation, if it existed, demonstrating an acceptable level of integrity.

### 3.2 NRC Staff Evaluation

ASME Code, Section XI, Table IWF-2500-1, Examination Category F-A, Item F1.40, requires a 100 percent VT-3 examination of the support (Figure IWF-1300-1). The applicable component is 01-035, which includes RV support skirt circumferential weld, skirt-to-flange weld, and skirt flange bolting.

The NRC staff evaluated the affected RV support in this relief request pursuant to 10 CFR 50.55a(g)(6)(i). The NRC staff's evaluation focused on: (1) whether a technical justification exists to support the determination that the ASME Code requirement is impractical; (2) that imposition of the Code-required inspections would result in a burden to the licensee; and (3) that the licensee's proposed alternative (accepting the reduced inspection coverage in this case) provides reasonable assurance of structural integrity of the subject welds. The NRC staff finds that if these three criteria are met, the requirements of 10 CFR 50.55a(g)(6)(i) (i.e., granting the requested relief 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") will also be met.

#### Impracticality of Compliance

As described in the licensee's letter dated October 31, 2018, the coverage of the skirt-to-flange welds and skirt flange bolting (formerly component IDs 01-033 and 01-034) using the fiberscope is limited by the access restrictions and geometry of building structure, resulting in a coverage ceiling of 62.5 percent. This coverage ceiling for the inside and outside skirt-to-flange welds is further reduced by the material between intermittent skirt cutouts, which serve as passages for

the fiberscope. Given the small number of skirt cutouts along the circumference, the NRC staff considers the resulting coverage of 32 percent for the entire inside and outside circumferential skirt-to-flange welds credible. Unlike welds, skirt flange bolts are individually spaced and, therefore, passing of the fiber scope under the insulation blocks and/or through the skirt cutouts did not affect each individual bolt's coverage that much. Hence, the NRC staff concludes that the resulting coverage of 64 percent for the entire inside and outside bolts is credible, and that the average coverage of approximately 50 percent for the skirt-to-flange welds and skirt flange bolting is reasonable.

For the skirt circumferential weld, the relief request states that it was not accessible, implying that the associated coverage is 0 percent. From the figure on the last page of the supplement (ADAMS Accession No. ML093070060) supporting the prior relief request for the third ISI interval, it appears that if the fiberscope can be directed to go through the 2-inch hole adjacent to the circumferential weld and the viewing angle can be remotely adjusted, a certain amount of coverage of the skirt circumferential weld could be obtained.

The licensee's supplement dated February 28, 2019, provides a detailed explanation concerning the limited bends of the steel tube, which prevented it from reaching the skirt circumferential weld within a desirable distance. Insertion of the fiberscope beyond the end of the supporting steel tube was limited to 2 to 3 inches. As a result, the viewing angle required for a qualified VT-3 examination could not be verified from a distance. The NRC staff concludes that this additional information is credible, and that the coverage of 0 percent for the skirt circumferential weld due to impracticality is justified.

Based on the above evaluation, the NRC staff finds that a technical justification exists to support the determination that achieving essentially 100 percent coverage is impractical.

#### Burden of Compliance

The licensee stated that to effectively obtain significantly greater examination coverage on the subject components, modifications and/or replacement of the component would be necessary. Based on Figure 2 of ANO1-ISI-032, as shown in the licensee's letter dated October 31, 2018, the NRC staff found that even if the insulation around the support was removed, the coverage would be approximately the same for the bolting (64 percent) because the limitation is not due to insulation. However, coverage would be increased to approximately 46.875 percent for the skirt-to-flange welds (62.5 percent for outside weld due to insulation removal and the same 31.25 percent for the inside weld limited by skirt cutouts). The increased coverage would still not be sufficient to meet the required ASME Code coverage. Increasing coverage further would require the licensee to make major structure modification and component changes, such as making more cutouts in the skirt and redesigning and rearranging the incore instrumentation piping to allow better access for the examination. Therefore, the NRC staff finds that replacing or reconfiguring the components to achieve full coverage constitutes a burden on the licensee.

#### Structural Integrity

The NRC staff considered whether the licensee's proposed alternative provided reasonable assurance of structural integrity of the subject component welds and bolting based on: (1) the safety significance of unexamined volumes and unachievable coverage (e.g., any stress or the material condition of the welds, indicating that the uncovered areas are more susceptible to cracking or degradation), and (2) operating experience supporting structural integrity.



For the safety significance of the unexamined volumes of welds, the NRC staff noted the following based on a review of the sketches provided in the licensee's letter dated October 31, 2018 (i.e., Figures 1 and 2):

The skirt-to-flange weld and bolting: Although the coverage is 32 percent for the skirt-to-flange weld and 64 percent for the bolting, they are distributed along a continuous circumference of approximately 225 degrees. Considering the extent of this circumference and the fact that the RV support of the skirt type would distribute loads more evenly, the NRC staff concludes that the accessible areas of the welds and bolting would include the highly stressed portion. Further, the component under air environment is unlikely to have drastic degradation of fracture toughness at specific locations along the circumference. Consequently, it is reasonable to conclude that if significant service-induced degradation had occurred, evidence of it would have been detected by the examinations that the licensee had already performed for all subject components. The licensee stated that the examination of the accessible portions of the skirt-to-flange weld and bolting revealed no unacceptable indications.

For the reactor vessel skirt circumferential weld: The NRC staff noted that although this weld cannot be examined due to inaccessibility, the structural integrity is maintained due to the significant compressive stresses acting on the postulated circumferential crack tip area in the circumferential weld by the dead weight of the RV and its internals.

In addition, the licensee stated that it will continue to perform pressure testing on the subject components as required by the ASME Code, Section XI. The supplement dated February 28, 2019, further explained that pressure tests will provide additional assurance that any leakage, if it occurred, would be detected and the licensee will take appropriate corrective actions before the leakage onto the RV support has affected its structural integrity. The NRC staff finds this acceptable because although leakage is not an indication of RV support failure, any leakage in the RV area has the potential to degrade the RV support. Thus, performing pressure testing on the subject components helps assure the continued structural integrity of the RV support.

Therefore, the NRC staff finds that the visual examinations performed provide reasonable assurance of structural integrity of the subject welds and bolting.

#### 4.0 CONCLUSION

As set forth above, the NRC staff determines that it is impractical for the licensee to comply with the specific ASME Code, Section XI, requirement; that the proposed inspection provides reasonable assurance of structural integrity of the subject welds and bolting; and that granting relief pursuant to 10 CFR 50.55a(g)(6)(i) is authorized by law and will not endanger life or property or the common defense and security, and is otherwise in the public interest giving due consideration to the burden upon the licensee that could result if the requirements were imposed on the facility. Accordingly, the NRC staff concludes that the licensee has adequately addressed all the regulatory requirements set forth in 10 CFR 50.55a(g)(6)(i). Therefore, the NRC staff grants Relief Request ANO1-ISI-032 at ANO-1 for the third period of the fourth 10-year ISI interval, which commenced on May 31, 2014, and ended on May 30, 2018.

All other ASME Code, Section XI, requirements for which relief was not specifically requested and authorized herein by the NRC staff remain applicable, including the third-party review by the Authorized Nuclear Inservice Inspector.

Principal Contributor: S. Sheng, NRR

Date: July 15, 2019