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1CAN071601

July 13, 2016

U.S. Nuclear Regulatory Commission  
Attn: Document Control Desk  
Washington, DC 20555

SUBJECT: Request for Relief from ASME Section XI  
Table IWB-2500-1 Requirements  
Arkansas Nuclear One, Unit 1  
Docket No. 50-313  
License No. DPR-51

- REFERENCES
1. Entergy Operations letter to NRC dated April 22, 2016, "Request for Relief from ASME Section XI Table IWB-2500-1 Requirements, Arkansas Nuclear One, Unit 1," 1CAN041603, (ML16116A175)
  2. NRC letter to Entergy Operations dated July 23, 2008, "Approval of Request for Relief No. ANO1-ISI-010 for the Third 10-Year Inservice Inspection Interval (TAC No. MD8017)," (ML081680317)
  3. NRC letter to Diablo Canyon dated November 4, 2015, "Diablo Canyon Power Plant, Unit No. 2, Inservice Inspection Program Relief Request NDE-RCS-SE-2R19, Associated with the Use of Alternate Sizing Qualification Criteria Through a Protective Clad Layer (TAC No. MF5348)," (ML15299A034)
  4. NRC letter to Catawba dated October 26, 2015, "Proposed Relief Request 14-CN-003, American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (ASME Code), Code Case N-695 (CAC NO. MF5447)," (ML15286A326)

Dear Sir or Madam:

On April 22, 2016, Entergy Operations, Inc. (Entergy) submitted a request (Reference 1) for approval of an alternative to the depth sizing qualification requirement cited below for the 2016 fall outage at Arkansas Nuclear One, Unit 1 (ANO-1). This letter and its attachments supersede Reference 1 in its entirety.

During the upcoming 2016 fall refueling outage at ANO-1, Entergy plans to examine the Core Flood Nozzle to Safe-End dissimilar metal welds. The examinations will be performed using

techniques that are qualified for flaw detection and sizing using procedures, personnel, and equipment qualified by demonstration in all aspects except depth sizing. Therefore, as a contingency for depth sizing of any flaws detected, Entergy hereby requests approval of the proposed alternative to the requirements of the 2001 Edition w/ 2003 Addenda of ASME Section XI for ANO-1, specifically, the requirements of Examination Category B-F, Table IWB-2500-1. This request is made pursuant to 10 CFR 50.55a(g)(5)(iii). The basis for the request is provided in Attachment 1 to this letter.

Reference 2 documents the NRC approval of a similar request for a previous Inservice Inspection Interval for ANO-1. References 3 and 4 are examples of recent NRC approvals for similar requests at other plants. The NRC Safety Evaluations of References 3 and 4 identified the need for special treatment of flaws connected to the inside surface that are measured to be more than 50 percent through the wall thickness. This new request by Entergy incorporates all of the compensatory measures determined by NRC in References 3 and 4 to be necessary.

In accordance with 10 CFR 50.55a(g)(5)(iii), Entergy requests that the proposed alternative to the referenced requirements be approved on the basis that the required flaw sizing error requirement is impractical. The available qualified examination technology is not capable of meeting the applicable flaw sizing error requirement for the subject component. Furthermore, Entergy believes the proposed alternative maintains an acceptable level of quality and safety, as discussed in Attachment 1 of this letter.

The relief request includes two new regulatory commitments as summarized in Attachment 2. Entergy hereby withdraws the previous request (Reference 1) and its associated regulatory commitment as this request fully supersedes the previous request.

Although this request is neither exigent nor emergency, your prompt review is requested. If the need for this relief changes due to the identification of flaws in the core flood nozzle dissimilar metal welds during the 2016 fall outage, this request may become an exigent or emergency request. It should be noted that the applicable welds were last inspected in 2008. No indications were identified in those inspections.

If you have any questions or require additional information, please contact me.

Sincerely,

**ORIGINAL SIGNED BY STEPHENIE L. PYLE**

SLP/rwc

Attachments:

1. Request for Relief ANO1-ISI-025
2. List of Regulatory Commitments

cc: Mr. Kriss Kennedy  
Regional Administrator  
U. S. Nuclear Regulatory Commission, Region IV  
1600 East Lamar Boulevard  
Arlington, TX 76011-4511

NRC Senior Resident Inspector  
Arkansas Nuclear One  
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London, AR 72847

U. S. Nuclear Regulatory Commission  
Attn: Mr. Stephen Koenick  
MS O-8B1A  
One White Flint North  
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**Attachment 1**

**1CAN071601**

**Request for Relief**

**ANO1-ISI-025**

## REQUEST FOR RELIEF

### ANO1-ISI-025

<b>Components/Numbers:</b>	Core Flood Nozzle to Safe-End Dissimilar Metal (DM) Welds 01-025, 01-026
<b>Code Classes:</b>	American Society of Mechanical Engineers (ASME) Code Class 1
<b>References:</b>	ASME Section XI 2001 Edition w/2003 Addenda, Table IWB-2500-1  ANO Unit 1 Risk Informed In-service Inspection (ISI) Program (based in part on ASME Code Case N-716-1)  10 CFR 50.55a  ASME Code Case N-770-1, Table 1, Inspection Item B
<b>Examination Category:</b>	B-F
<b>Item Number(s):</b>	B5.10
<b>Description:</b>	Pressure Retaining Dissimilar Metal Welds in Vessel Nozzles – Inspection Program B
<b>Unit / Inspection Interval Applicability:</b>	Arkansas Nuclear One, Unit 1 / Fourth (4th) 10-year interval (May 31, 2008 to May 20, 2017)

#### I Code Requirement(s)

The current code of record governing in-service inspection for Arkansas Nuclear One, Unit 1 (ANO-1), is the 2001 Edition w/ 2003 Addenda. Table IWB-2500-1, Examination Category B-F, "Pressure Retaining Dissimilar Metal Welds in Vessel Nozzles," Item B5.10 requires a volumetric and surface examination of the weld volume as identified in Figure IWB-2500-8.

- 1) Code Item B5.10, as designated by the risk-informed process of ASME Code Case N-716-1 to R-A Item R1.11/15, requires a volumetric examination of circumferential nozzle to safe end butt welds nominal pipe size 4 inches or larger, as depicted in Figures IWB-2500-8 and Risk-Informed In-service Inspection Evaluation Procedure, EPRI Report No. TR-112657; Topical Report, Revision B-A, June 1999. Surface examination is no longer required with the implementation of ASME Code Case N-716-1.

ASME Code Case N-770-1 requires subsequent volumetric examination of all Inspection Item B welds, as defined in Table 1 of the code case, at a frequency of every second inspection period not to exceed seven years.

The volumetric examination is to be conducted in accordance with ASME Section XI, Mandatory Appendix VIII; Supplement 10.

## II. Impracticality of Compliance

ASME Code Case N-695, "Qualification Requirements for Dissimilar Metal Piping Welds, Section XI, Division 1," is shown as acceptable for use in Regulatory Guide (RG) 1.147, Revision 17, dated August 2014. This code case provides alternatives to the requirements of Appendix VIII, Supplement 10, but Paragraph 3.3(c) of this case requires that "Examination procedures, equipment, and personnel are qualified for depth-sizing when the RMS error of the flaw depth measurements, as compared to the true flaw depths, do not exceed 0.125 inches (3 mm)."

The requirement for the 0.125-inch root mean square error (RMSE) depth sizing accuracy criteria of Code Case N-695 is impractical for ANO-1 to comply with. To date, although examination vendors have qualified for detection and length sizing in accordance with the requirements for examinations from the inside diameter (ID), the vendors have not met the established RMSE of 0.125 inch for indication depth sizing. Several process enhancements including new delivery systems, new search units, and software modifications have been implemented, but did not achieve the desired improvements in performance given the challenges of weld geometry, rough surfaces, multiple materials, and microstructural anisotropies. This result shows that the Code accuracy standard is impractical for use with the ID ultrasonic examination technology employed in the qualification efforts.

## III. Burden Caused by Compliance

The numerous attempts by inservice inspection (ISI) vendors to meet the RMSE value for depth sizing required by Supplement 10 and Code Case N-695 when examining from the inside diameter have been unsuccessful. Furthermore, the configuration of the ANO-1 core flood nozzle to safe end welds is not suitable for examination from the outer surface; examination from the outside diameter (OD) would require extensive effort and result in significant and unnecessary personnel radiation exposure.

## IV. Alternative Requested

Entergy proposes to use Code Case N-695 with a RMSE of 0.189 inches instead of the 0.125 inches specified for depth sizing in the Code Case. The examination vendor contracted to perform the safe end examinations at ANO-1 has demonstrated the ability to depth size indications in dissimilar metal welds with a RMSE of 0.189 inches instead of the 0.125 inches RMSE required by Appendix VIII Supplement 10 and Code Case N-695. If the examination vendor demonstrates an improved depth sizing RMSE prior to the examination, that improved RMSE will be used in any flaw evaluations instead of the 0.189-inch RMSE.

If a reportable flaw is detected and determined to be ID surface connected during examination of the welds in accordance with this relief request, Entergy will provide a flaw evaluation including the measured flaw size as determined by ultrasonic examination for NRC review. Eddy current testing will be used to determine if flaws are surface connected. Additional data including details of the surrounding ID surface contour in the region of the flaw and percentage of the examination area where ultrasonic testing (UT) probe lift-off is evident, if any, will be included.

In the event that any flaw(s) requiring depth sizing are detected during examination of welds in accordance with this relief request, the following criteria shall be implemented:

- Flaws detected and measured as less than 50 percent through-wall in depth shall be adjusted by adding a correction factor to the flaw depth such that the adjusted flaw depth is equal to the *measured flaw depth + (applicable vendor RMSE – 0.125 in.)*, prior to comparison to the applicable acceptance criteria;
- For flaws detected and measured as 50 percent through-wall depth or greater and to remain in service without mitigation or repair, Entergy shall submit flaw evaluation(s) for review and approval prior to reactor startup. The flaw evaluation shall include:
  - Information concerning the mechanism that caused the flaw
  - Information concerning the inside surface roughness and/or profile of the region surrounding the flaw in the examined piping weld
  - Information concerning areas where UT probe lift-off is observed, if any.

Attachment 2 provides the List of Regulatory Commitments associated with this request for relief.

The activities included in the relief request are subject to third party review by the Authorized Nuclear In-service Inspector.

#### V. Basis for Alternative

During the upcoming 2016 fall refueling outage at ANO-1 (1R26), Entergy will perform ultrasonic examination of the two (2) core flood piping safe-end to nozzle dissimilar metal welds. These examinations will be performed from the ID of the weld utilizing robotics, coincident with the 10-year ISI reactor vessel examinations. Code Case N-695 will be used as the basis for performing these examinations.

To date, although examination vendors are qualified for detection and length sizing on these welds, the examination vendors have not met the RMSE requirement for depth sizing. Entergy's contracted examination vendor has demonstrated ability to meet the depth sizing qualification requirement with an RMSE of 0.189 inches instead of the 0.125 inches required by the Code Case.

For the case of flaws measured to be less than 50 percent through-wall, the addition of the difference in allowable depth sizing tolerance to the flaw depths measured as demonstrated to

that actually measured during the examination will compensate for the possible variance in the measured depth. Flaws measured to be more than 50 percent through-wall are proposed to be given special treatment because of the concern for the magnitude of depth sizing errors specific to such deep flaws.

The proposed alternative assures that the safe end-to-nozzle welds will be fully examined by procedures, personnel, and equipment qualified by demonstration in all aspects except depth sizing. For depth sizing of flaws measured to be less than 50 percent through-wall, the proposed addition of the difference between the qualified and demonstrated sizing tolerance to any flaw required to be sized compensates for the potential variation. For depth sizing of flaws measured to be 50 percent through-wall or greater, Entergy will submit a flaw evaluation to NRC for review and approval prior to reactor startup from the refueling outage. Therefore, the proposed alternative provides an acceptable level of quality and safety by providing reasonable assurance of structural integrity of the subject welds.

Given the impracticality of the applicable depth-sizing requirement, Entergy requests that the proposed alternative of Attachment 1 be approved in accordance with 10 CFR 50.55a(g)(5)(iii).

## VI. Conclusion

10 CFR 50.55a (g)(5)(iii) states in part:

*ISI program update: Notification of impractical ISI Code requirements.* If the licensee has determined that conformance with a Code requirement is impractical for its facility the licensee must notify the NRC and submit, as specified in § 50.4, information to support the determinations. Determinations of impracticality in accordance with this section must be based on the demonstrated limitations experienced when attempting to comply with the Code requirements during the inservice inspection interval for which the request is being submitted.

The proposed alternative assures that the safe end-to-nozzle welds will be fully examined by procedures, personnel, and equipment qualified by demonstration in all aspects except depth sizing. For depth sizing of flaws measured to be less than 50 percent through-wall, the proposed addition of the difference between the qualified and demonstrated sizing tolerance to any flaw required to be sized compensates for the potential variation. For depth sizing of flaws measured to be 50 percent through-wall or greater, Entergy will submit a flaw evaluation to NRC for review and approval prior to reactor startup from the refueling outage. Therefore, as a contingency, Entergy requests authorization to perform the proposed alternative to the Code requirement pursuant to 10 CFR 50.55a(g)(5)(iii) for implementation during the ANO-1, 1R26 refueling outage scheduled for the fall of 2016.

**Attachment 2**

**1CAN071601**

**List of Regulatory Commitments**

### List of Regulatory Commitments

The following table identifies those actions committed to by Entergy in this document. Any other statements in this submittal are provided for information purposes and are not considered to be regulatory commitments.

COMMITMENT	TYPE (check one)		SCHEDULED COMPLETION DATE
	ONE-TIME ACTION	CONTINUING COMPLIANCE	
If a reportable flaw is detected and determined to be inside diameter (ID) surface connected during examination of the welds in accordance with the Relief Request ANO1-ISI-025, Entergy will provide a flaw evaluation including the measured flaw size as determined by ultrasonic examination for NRC review. Eddy current testing will be used to determine if flaws are surface connected. Additional data including details of the surrounding ID surface contour in the region of the flaw and percentage of the examination area where ultrasonic testing (UT) probe lift-off is evident, if any, will be included.	✓		Prior to startup from ANO-1 Refueling Outage 1R26

COMMITMENT	TYPE (check one)		SCHEDULED COMPLETION DATE
	ONE-TIME ACTION	CONTINUING COMPLIANCE	
<p>In the event that any flaw(s) requiring depth sizing are detected during examination of welds in accordance with the Relief Request ANO1-ISI-025, the following criteria shall be implemented:</p> <ul style="list-style-type: none"> <li>• Flaws detected and measured as less than 50 percent through-wall in depth shall be adjusted by adding a correction factor to the flaw depth such that the adjusted flaw depth is equal to the <i>measured flaw depth + (applicable vendor RMSE – 0.125 in.)</i>, prior to comparison to the applicable acceptance criteria;</li> <li>• For flaws detected and measured as 50 percent through-wall depth or greater and to remain in service without mitigation or repair, Entergy shall submit flaw evaluation(s) for review and approval prior to reactor startup. The flaw evaluation shall include:               <ul style="list-style-type: none"> <li>○ Information concerning the mechanism that caused the flaw</li> <li>○ Information concerning the inside surface roughness and/or profile of the region surrounding the flaw in the examined piping weld</li> <li>○ Information concerning areas where UT probe lift-off is observed, if any.</li> </ul> </li> </ul>	✓		Prior to startup from ANO-1 Refueling Outage 1R26