



Entergy Operations, Inc.  
Entergy Nuclear Operations, Inc.  
1340 Echelon Parkway  
Jackson, MS 39213  
Tel 601-368-5573

Mandy Halter  
Director, Nuclear Licensing

CNRO-2019-00002

10 CFR 50.55a

January 31, 2019

U.S. Nuclear Regulatory Commission  
ATTN: Document Control Desk  
Washington, DC 20555-0001

SUBJECT: Relief Request Number EN-19-RR-1, Proposed Alternative to Use ASME Code Case N-831-1, "Ultrasonic Examination in Lieu of Radiography for Welds in Ferritic or Austenitic Pipe Section XI, Division 1"

Arkansas Nuclear One, Units 1 and 2  
NRC Docket Nos. 50-313 and 50-368  
Renewed Facility Operating License Nos. DPR-51 and NPF-6

Grand Gulf Nuclear Station, Unit 1  
NRC Docket No. 50-416  
Renewed Facility Operating License No. NPF-29

Indian Point Nuclear Generating Units 2 and 3  
NRC Docket Nos. 50-247 and 50-286  
Renewed Facility Operating License Nos. DPR-26 and DPR-64

Palisades Nuclear Plant  
NRC Docket No. 50-255  
Renewed Facility Operating License No. DPR-20

River Bend Station, Unit 1  
NRC Docket No. 50-458  
Renewed Facility Operating License No. NPF-47

Waterford Steam Electric Station, Unit 3  
NRC Docket No. 50-382  
Renewed Facility Operating License No. NPF-38

In accordance with 10 CFR 50.55a(z)(1), Entergy Operations, Inc. and Entergy Nuclear Operations, Inc. (hereafter referred to collectively as Entergy) request U.S. Nuclear Regulatory Commission (NRC) approval to implement a proposed alternative to the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code, Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components."

ASME Section XI Subsection IWA-4000 requires that certain ferritic and austenitic pipe welds be examined using radiographic examination techniques to satisfy nondestructive examination requirements of the applicable construction code during repair/replacement activities. Entergy requests approval to use encoded Phased Array Ultrasonic Examination Techniques (PAUT) in accordance with ASME Section XI Code Case N-831-1, "Ultrasonic Examination in Lieu of Radiography for Welds in Ferritic or Austenitic Pipe," as an alternative to radiographic examination. Entergy considers the proposed alternative would provide an acceptable level of quality and safety. The basis for the proposed alternative is provided in the enclosure to this letter. Entergy requests NRC approval of this multi-site request by September 15, 2019 in order to support ISI activities during the 28<sup>th</sup> refueling outage at Arkansas Nuclear One (ANO), Unit 1, as well as all subsequent refueling outages. The 28<sup>th</sup> ANO Unit 1 refueling outage is scheduled to start on October 5, 2019.

This letter contains no new or revised commitments.

If you have any questions, please contact Ms. Stephenie Pyle, Senior Manager, Fleet Regulatory Assurance, at (601) 368-5516.

Respectfully,



Mandy Halter  
Director, Nuclear Licensing

MKH/jls/jgw

Enclosure: Relief Request EN-19-RR-1, Proposed Alternative to Use  
ASME Code Case N-831-1

cc: NRC Region I Administrator  
NRC Region III Administrator  
NRC Region IV Administrator  
NRC Project Manager (Arkansas Nuclear One, Units 1 and 2)  
NRC Project Manager (Grand Gulf Nuclear Station, Unit 1)  
NRC Project Manager (Indian Point Nuclear Generating Units 2 and 3)  
NRC Project Manager (Palisades Nuclear Plant)  
NRC Project Manager (River Bend Station, Unit 1)  
NRC Project Manager (Waterford Steam Electric Station, Unit 3)  
NRC Project Manager (Entergy Fleet)  
NRC Senior Resident Inspector (Arkansas Nuclear One, Units 1 and 2)  
NRC Senior Resident Inspector (Grand Gulf Nuclear Station, Unit 1)  
NRC Senior Resident Inspector (Indian Point Nuclear Generating Units 2 and 3)  
NRC Senior Resident Inspector (Palisades Nuclear Plant)  
NRC Senior Resident Inspector (River Bend Station, Unit 1)  
NRC Senior Resident Inspector (Waterford Steam Electric Station, Unit 3)

**ENCLOSURE**

**CNRO-2019-00002**

**RELIEF REQUEST EN-19-RR-1**

**PROPOSED ALTERNATIVE TO USE ASME CODE CASE N-831-1**

**RELIEF REQUEST EN-19-RR-1**

**1. ASME Code Component(s) Affected:**

All American Society of Mechanical Engineers (ASME) Boiler & Pressure Vessel (B&PV) Code, Section XI ferritic and austenitic piping welds requiring radiography during repair/replacement activities.

**2. Applicable Code Edition and Addenda:**

The applicable Code Editions and Addenda and current Inservice Inspection (ISI) interval for each Entergy Operations, Inc. and Entergy Nuclear Operations, Inc. (Entergy) unit covered by this request are specified below.

<b>Plant</b>	<b>ISI Interval</b>	<b>ASME Section XI Code of Record</b>	<b>Interval Start</b>	<b>Interval End</b>
Arkansas Nuclear One, Unit 1	5 <sup>th</sup>	2007 Edition through 2008 Addenda	May 31, 2017	May 30, 2027
Arkansas Nuclear One, Unit 2	4 <sup>th</sup>	2001 Edition through 2003 Addenda <sup>1</sup>	March 26, 2010	March 25, 2020
Grand Gulf Nuclear Station	4 <sup>th</sup>	2007 Edition through 2008 Addenda	December 1, 2017	November 30, 2026
Indian Point Nuclear Generating, Unit 2	5 <sup>th</sup>	2007 Edition through 2008 Addenda	June 1, 2016	May 31, 2026
Indian Point Nuclear Generating, Unit 3	4 <sup>th</sup>	2001 Edition through 2003 Addenda <sup>1</sup>	July 21, 2009	July 20, 2021 <sup>2</sup>
Palisades Nuclear Plant	5 <sup>th</sup>	2007 Edition through 2008 Addenda	December 13, 2015	December 12, 2025
River Bend Station	4 <sup>th</sup>	2007 Edition through 2008 Addenda	December 1, 2017	November 30, 2027
Waterford Unit 3	4 <sup>th</sup>	2007 Edition through 2008 Addenda	December 1, 2017	November 30, 2027

<sup>1</sup> As specified in the table above, Arkansas Nuclear One, Unit 2 and Indian Point Nuclear Generating Unit 3 perform ISI in accordance with the 2001 Edition/ 2003 Addenda. However, it should be noted that both of these plants perform ISI-related activities such as nondestructive examinations, pressure testing, and repair/replacement activities in accordance with the 2007 Edition/2008 Addenda based on U.S. Nuclear Regulatory Commission (NRC) approval of Relief Request EN-ISI-16-1 (ML16337A368) dated December 1, 2016. See NRC Safety Evaluation (ML17174B144) dated July 12, 2017.

<sup>2</sup> Indian Point Nuclear Generating Unit 3 extended its 4<sup>th</sup> ISI interval based on NRC approval of Relief Request IP3-ISI-RR-13 (ML17297A455) dated October 18, 2017. See NRC Safety Evaluation (ML18193B030) dated July 18, 2018.

**3. Applicable Code Requirement:**

The 2007 Edition through the 2008 Addenda of ASME Section XI, paragraph IWA-4221 requires that items used for repair/replacement activities meet the applicable Owner's Requirements and Construction Code requirements when performing repair/replacement activities. IWA-4520 requires that welded joints made for fabrication or installation of items be examined in accordance with the Construction Code identified in the Repair/Replacement Plan.

**4. Reason for Request:**

Replacement of piping is periodically performed in support of the Flow Accelerated Corrosion (FAC) Program as well as other repair/replacement activities. The use of encoded Phased Array Ultrasonic Examination Techniques (PAUT) in lieu of radiography (RT) to perform the required examinations of fabrication, installation, or repair welds would eliminate the safety risk associated with performing RT, which includes both planned and unplanned radiation exposure to plant workers. PAUT also minimizes the impact on other outage activities normally involved with performing RT such as limited access to work locations. In addition, encoded PAUT is equivalent or superior to the code-required RT examination for ASME ferritic and austenitic piping repair/replacement welds for detecting and sizing critical (planar) flaws such as cracks and lack of fusion. PAUT provides sizing capabilities for both depth and length dimensions of the flaw, which are required to apply the acceptance criteria of the applicable code case. RT does not provide depth sizing capabilities. This proposed alternative is requested to support both planned and unplanned piping repair and replacement activities beginning in the Fall 2019 outage season.

**5. Proposed Alternative and Basis for Use:**

The use of encoded PAUT is proposed in lieu of the code-required RT examination for ASME ferritic and austenitic piping welds as a result of repair/replacement activities. Similar techniques are being used throughout the nuclear industry for examination of dissimilar metal welds and overlaid welds, as well as other applications including piping replacements covered under ASME B31.1, "Power Piping, ASME Code for Pressure Piping, B31." This proposed alternative request includes requirements that provide an acceptable level of quality and safety that satisfies the requirements of 10 CFR 50.55a(z)(1). The capability of the alternative technique is comparable to the examination methods documented in the ASME Code Sections III, VIII, and IX, and associated code cases (References 8.1, 8.3, 8.4, 8.5, 8.7, 8.8, 8.9, 8.10, 8.11, 8.12, and 8.13) using ultrasonic examination techniques for weld acceptance. The examinations will be performed using procedures, equipment, and qualified personnel as defined in ASME Code Case N-831-1.

The basis for this proposed alternative is that PAUT is equivalent or superior to RT for detecting and sizing critical (planar) flaws. In this regard, the basis for the proposed alternative was developed from numerous codes, code cases, associated industry experience, articles, and the results of RT and encoded PAUT examinations. The examination procedure and personnel performing examinations are qualified using representative piping conditions and flaws that demonstrate the ability to detect and size flaws that are both acceptable and unacceptable to the defined acceptance standards.

The demonstrated ability of the examination procedure and personnel to appropriately detect and size flaws provides an acceptable level of quality and safety alternative as allowed by 10 CFR 50.55a(z)(1). It should also be noted that Code Case N-831 (Revision 0), which provides rules for performing ultrasonic examination of welds in ferritic piping in lieu of RT, is listed in Table 2, "Conditionally Accepted Section XI Code Cases," of Draft Regulatory Guide DG-1342. As stated in the Proposed Rule published in Vol. 83, No. 159 of the Federal Register, dated Thursday, August 16, 2018, "The NRC finds the Code Case acceptable with the condition that it is prohibited for use in new reactor construction."

#### **6. Duration of Proposed Alternative:**

The duration of this proposed alternative is for the remainder of the Inservice Inspection intervals for the Entergy plants defined in Section 2 of this request.

In addition, Entergy requests NRC approve to implement this alternative for the 5<sup>th</sup> ISI interval at Arkansas Nuclear One (ANO) Unit 2, since the 4<sup>th</sup> ISI interval is scheduled to end approximately six months after the requested relief request approval date. The 5<sup>th</sup> ISI interval at ANO Unit 2 is presently scheduled to begin on March 26, 2020, at which time ANO Unit 2 plans to update to the 2007/2008 edition and addenda of ASME Section XI (ADAMS Accession No. ML 18249Z293), pending NRC Authorization.

#### **7. Precedent:**

- 7.1 Palo Verde Nuclear Generating Station Relief Request 48, dated August 1, 2012 (ML12229A046). NRC approval dated April 12, 2013 (ML13091A177).
- 7.2 Millstone Power Station Unit 2 Alternative Request RR-04-16, dated August 1, 2013 (ML13220A019). NRC approval dated April 4, 2014 (ML14091A973).
- 7.3 Millstone Power Station Unit 2 Alternative Request RR-04-21, dated October 6, 2014 (ML14283A128). NRC approval dated September 21, 2015 (ML15257A005).
- 7.4 Millstone Power Station Unit 3 Alternative Request IR-3-25, dated October 6, 2014 (ML14283A128). NRC approval dated September 21, 2015 (ML15257A005).
- 7.5 Millstone Power Station Unit 2 Alternative Request RR-04-023, dated April 11, 2016 (ML16106A105). NRC approval dated January 23, 2017 (ML16363A089).
- 7.6 Millstone Power Station Unit 3 Alternative Request IR-3-28, dated April 11, 2016 (ML16106A105). NRC approval dated January 23, 2017 (ML16363A089).
- 7.7 Millstone Power Station, Units 2 and 3; North Anna Power Station, Units 1 and 2; and Surry Power Station, Units 1 and 2; "Proposed Alternative for the Use of Encoded Phased Array Ultrasonic Examination," dated June 29, 2017 (ML17188A379). NRC approval dated January 24, 2018 (ML18019A195).

- 7.8 Millstone Power Station, Units 2 and 3; "Proposed Alternative Requests RR-04-27 and IR-3-38, Use of Encoded Phased Array Ultrasonic Examination Techniques in Lieu of Radiography," dated February 28, 2018 (ML18066A522). NRC approval dated September 17, 2018 (ML18252A003).
- 7.9 Surry Power Station, Units 1 and 2; Proposed Alternative Requests S1-15-ISI-04 and S2-15-ISI-04, Use of Encoded Phased Array Ultrasonic Examination Techniques in Lieu of Radiography, dated April 11, 2018 (ML18108A123). NRC approval dated September 26, 2018 (ML18236A236).
- 7.10 South Texas Project, Units 1 and 2; "Proposed Alternative for the Use of Encoded Phased Array Ultrasonic Examination Techniques in Lieu of Radiography; Relief Request RR-ENG-3-22," dated December 12, 2017 (ML17346B279). NRC approval dated July 24, 2018 (ML18187A149).
- 7.11 Exelon Generation Company, LLC, "Proposed Alternative for the Use of Encoded Phased Array Ultrasonic Examination Techniques In Lieu of Radiography," dated November 2, 2016 and amended by letter dated March 13, 2017 (ML16307A253 and ML17072A385 respectively). NRC approval dated June 5, 2017 (ML17150A091).

## **8. References:**

- 8.1 ASME Section III Code Case N-659-2, "Use of Ultrasonic Examination in Lieu of Radiography for Weld Examination Section III, Divisions 1 and 3," dated June 9, 2008.
- 8.2 Pacific Northwest National Laboratory Report PNNL-19086, "Replacement of Radiography with Ultrasonics for the Nondestructive Inspection of Welds - Evaluation of Technical Gaps - An Interim Report," dated April 2010.
- 8.3 ASME B31.1, Case 168, "Use of Ultrasonic Examination in Lieu of Radiography for B31. 1 Application," dated June 1997.
- 8.4 ASME Section III, Code Case N-818, "Use of Analytical Evaluation approach for Acceptance of Full Penetration Butt Welds in Lieu of Weld Repair," dated December 6, 2011.
- 8.5 ASME Code Case 2235-9; "Use of Ultrasonic Examination in Lieu of Radiography Section I, Section VIII, Divisions 1 and 2, and Section XII," dated October 11, 2005.
- 8.6 Journal of Pressure Vessel Technology, "Technical Basis for ASME Section VIII Code Case 2235 on Ultrasonic Examination of Welds in Lieu of Radiography;" Rana, Hedden, Cowfer and Boyce, Volume 123, dated August 2001.
- 8.7 ASME Code Case 2326, "Ultrasonic Examination in Lieu of Radiographic Examination for Welder Qualification Test Coupons Section IX," dated January 20, 2000.

- 8.8 ASME Code Case 2541, "Use of Manual Phased Array Ultrasonic Examination Section V," dated January 19, 2006.
- 8.9 ASME Code Case 2558, "Use of Manual Phased Array E-Scan Ultrasonic Examination Per Article 4 Section V", dated December 30, 2006.
- 8.10 ASME Code Case 2599, "Use of Linear Phased Array E-Scan Ultrasonic Examination Per Article 4 Section V," dated January 29, 2008.
- 8.11 ASME Code Case 2600, "Use of Linear Phased Array S-Scan Ultrasonic Examination Per Article 4 Section V," dated January 29, 2008.
- 8.12 ASME Section XI, Code Case N-713, "Ultrasonic Examination in Lieu of Radiography," dated November 10, 2008.
- 8.13 ASME Section XI, Code Case N-831, "Ultrasonic Examination in Lieu of Radiography for Welds in Ferritic Pipe," dated October 20, 2016.
- 8.14 US NRC, NUREG/CR-7204, "Applying Ultrasonic Testing in Lieu of Radiography for Volumetric Examination of Carbon Steel Piping" (ML15253A674).
- 8.15 EPRI Report 3002010297, "Technical Basis for Substituting Ultrasonic Testing for Radiographic Testing for New, Repaired, and Replacement Welds for ASME Section XI, Division 1, Stainless Steel Piping," 2017, Palo Alto, CA.