



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

March 22, 2017

Site Vice President  
Entergy Operations, Inc.  
Waterford Steam Electric Station, Unit 3  
17265 River Road  
Killona, LA 70057-3093

SUBJECT: WATERFORD STEAM ELECTRIC STATION, UNIT 3 – REQUEST FOR  
ALTERNATIVE TO 10 CFR 50.55a(c) ASME CODE SECTION III, CODE  
CASE 1361-1, RELIEF REQUEST W3-ISI-024 (CAC NO. MF7752)

Dear Sir:

By letter dated May 19, 2016 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML16144A218), Entergy Operations, Inc. (the licensee), submitted Relief Request (RR) W3-ISI-024, proposing an alternative to the weld requirements of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (ASME Code) at Waterford Steam Electric Station, Unit 3 (Waterford 3).

Specifically, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) 50.55a(z)(1), the licensee requested to use the alternative proposed in RR W3-ISI-024 on the basis that the proposed alternative will provide an acceptable level of quality and safety.

The U.S. Nuclear Regulatory Commission (NRC) staff has reviewed the subject request and has determined, as set forth in the enclosed safety evaluation, that for RR W3-ISI-024, the proposed alternative will provide an acceptable level of quality and safety. Accordingly, the NRC staff concludes that the licensee has adequately addressed all of the regulatory requirements set forth in 10 CFR 50.55a(z)(1) for this proposed alternative. Therefore, the NRC staff authorizes the use of the proposed alternative for the duration of the operating license for Waterford 3.

If you have any questions, please contact the Project Manager, April Pulvirenti at 301-415-1390 or via e-mail at [April.Pulvirenti@nrc.gov](mailto:April.Pulvirenti@nrc.gov).

Sincerely,

A handwritten signature in black ink, appearing to read "R. Pascarelli".

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

Docket No. 50-382

Enclosure:  
Safety Evaluation

cc w/encl: Distribution via Listserv



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

REQUEST FOR ALTERNATIVE TO 10 CFR 50.55a(c)

ASME CODE SECTION III CODE CASE 1361-1, RELIEF REQUEST W3-ISI-024

WATERFORD STEAM ELECTRIC STATION, UNIT 3

ENTERGY OPERATIONS, INC.

DOCKET NO. 50-382

1.0 INTRODUCTION

By letter dated May 19, 2016 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML16144A218), Entergy Operations Inc. (the licensee), submitted Relief Request (RR) W3-ISI-024 under the provisions of Title 10 of the *Code of Federal Regulations* (10 CFR), Section 50.55a(z)(1), from the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (ASME Code) weld requirements at the Waterford Steam Electric Station, Unit 3 (Waterford 3). Pursuant to 10 CFR 50.55a(z)(1), the licensee proposed an alternative to allow the fillet weld with a maximum diametral clearance of 0.062 inches between the pressurizer heater sheath and sleeve instead of 0.045 inches as specified in ASME Code Section III, Code Case 1361-1. The alternative is proposed for the remainder of the Waterford 3 operating license.

2.0 REGULATORY EVALUATION

Pursuant to 10 CFR 50.55a(c)(1), reactor coolant pressure boundary components must meet the requirements for Class 1 components of Section III of the ASME Code to which the licensee adheres, except as provided in paragraphs (c)(2) through (c)(4) of 10 CFR 50.55a.

Pursuant to 10 CFR 50.55a(c)(3), "Applicable Code Cases and conditions on their use," the licensee applies ASME Code Case 1361-1, "Socket Welds, Section III," dated April 27, 1967. This ASME code case is incorporated into the Waterford 3 Updated Final Safety Analysis Report (UFSAR) Section 5.2.1.2, "Applicable Code Cases," and identifies ASME Code Section III, Code Case 1361-1, as the applicable ASME Code for part of the original pressurizer assembly.

ASME Code Case 1361-1 was later replaced by ASME Code Case 1361-2, dated March 1, 1979. As stated, in part, in 10 CFR 50.55a(b)(4)(ii):

If an applicant or licensee has previously applied a Code Case and a later version of the Code Case is incorporated by reference in paragraph (a) of this section, the applicant or licensee may continue to apply the previous version of the Code Case as authorized or may apply the later version of the Code Case, including any NRC-specified conditions placed on its use, until it updates its Code of Record for the component being constructed.

In Regulatory Guide (RG) 1.84 "Design, Fabrication, and Materials Code Case Acceptability, ASME Section III," Revision 36, dated August 2014 (ADAMS Accession No. ML13339A515), ASME Code Case 1361-2 is endorsed by NRC staff on the condition that the Code Case is applied in connection to Section III, paragraph NB-3356, "Fillet Welds." The alternative requested by the licensee is in connection with fillet welds for pressurizer heater sleeves. Therefore, the licensee meets the conditions to apply ASME Code Case 1361-2, and pursuant to 10 CFR 50.55a(b)(4)(ii), the licensee may also continue to apply ASME Code Case 1361-1.

Pursuant to 10 CFR 50.55a(z), alternatives to the requirements of paragraph (c) of 10 CFR 50.55a may be used when authorized by the Director, Office of Nuclear Reactor Regulation. A proposed alternative must be requested and authorized prior to implementation. The licensee must demonstrate (1) the proposed alternative would provide an acceptable level of quality and safety; or (2) compliance with the specified requirements of this section would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

The U.S. Nuclear Regulatory Commission (NRC) has approved similar relief requests for the Palo Verde Nuclear Generation Station, Units 1, 2 and 3, on November 19, 2004, (ADAMS Accession No. ML043240213), and for San Onofre Nuclear Generating Station, Units 2 and 3, on February 8, 2006, (ADAMS Accession No. ML060410323).

Based on the above, and subject to the following technical evaluation, the NRC staff finds that the licensee continues to apply ASME Code Case 1361-1, and that regulatory authority exists for the licensee to propose, and NRC to authorize, an alternative to ASME Code Case 1361-1.

### 3.0 TECHNICAL EVALUATION

#### 3.1 Licensee's Request for Alternative

##### 3.1.1 Components Affected

The affected components are 30 Code Class 1 pressurizer heater sleeves, Item Number RC MPZR0001.

##### 3.1.2 Applicable Code Requirements

The applicable construction code for the Waterford 3 pressurizer vessel is ASME Code Section III, 1971 Edition through Summer 1971 Addenda. The applicable ASME Code is ASME Code Case 1361-1, dated April 27, 1967. ASME Code Case 1361-1 states, in part:

Appurtenances with outside diameter equal to that of 2-inch standard pipe size and less may be constructed using weld joints in accordance with Fig. 1, provided all the following requirements are met:

- 1) The design of the joint shall be such that stresses will not exceed the limits described in NB-3220, N417, and tabulated in Tables I-1.1 and I-1.2.
- 2) A fatigue strength reduction factor of not less than 4 shall be used in fatigue analyses of the joints.

- 3) The finished welds shall be examined by a magnetic particle method in accordance with NB-5000....
- 4) End closure connections may be made with fillet welds or partial penetration welds provided the conditions...are met.

Per Figure 1 of Code Case 1361-1, "Weld Connection for Appurtenances 2-inch Pipe Size and Smaller which are Attached to Nozzles," where cMAX = diametral clearance between connecting parts, cMAX = 0.045 inches is specified.

### 3.1.3 Licensee's Proposed Alternative

The licensee proposes an alternative to allow a fillet weld with a maximum 0.062-inch diametral clearance between the connecting pressurizer heater sleeves and pressurizer heater sheaths, instead of a diametral clearance of 0.045 inches as specified in ASME Code Case 1361-1. The alternative is proposed to apply to all applicable pressurizer heater shims and sheaths.

### 3.1.4 Licensee's Basis for Authorization of the Proposed Alternative

As described in the licensee's application dated May 19, 2016, the basis for the requirement of a 0.45-inch diametral clearance is not specified in ASME Code Case 1361-1. However, maintaining a relatively small clearance between the parts will ensure that the bending stresses that can be imparted on the fillet weld due to deflection of the parts will not exceed the limits described in NB-3220, "Stress Limits for Other Than Bolts." Therefore, the licensee states that the heater sheath to sleeve fillet weld should be evaluated on the basis of whether the weld complies with the stress and fatigue requirements of ASME Code Case 1361-1. In the application for the proposed alternative, the licensee provided an analysis of the stresses on the fillet weld using the proposed diametral clearance between the parts of 0.062 inches. According to the analysis, the proposed joint configuration complies with ASME Code NB-3220 for allowable primary membrane, primary membrane plus bending, primary plus secondary, and fatigue stresses.

The licensee's justification for the proposed alternative is that although the maximum diametral clearance of 0.62 inches will exceed the 0.45-inch requirement of ASME Code Case 1361-1, the reconfigured weld joint will continue to meet the stress and fatigue strength requirements specified in ASME Code Case 1361-1, and therefore remain acceptable from a stress/fatigue perspective. Thus the alternative would provide an acceptable level of quality and safety, meeting the requirements of 10 CFR 50.55a(z)(1).

## 3.2 NRC Staff's Evaluation

The licensee proposed an alternative to allow the fillet weld with a maximum 0.062-inch diametral clearance between connecting parts, instead of 0.045 inches as specified in ASME Code Case 1361-1. This code case was revised to ASME Code Case 1361-2, which was endorsed by the NRC staff in RG 1.84, Revision 36.

The NRC staff's evaluation of the licensee's proposed relief request to increase the diametral clearance between the heater sleeve and heater sheath focused on the new stresses that would be seen by the connecting joints. ASME Code Case 1361-1 contains the following requirements concerning the design of weld joints between appurtenances:

1. The design of the joint shall be such that stresses will not exceed the limits described in NB-3220, and tabulated in Tables I-1.1 and I-1.2.
2. A fatigue strength reduction factor of not less than four shall be used in the fatigue analyses of the joints.

The specific value of diametral clearance that is contained in ASME Code Case 1361-1 is intended to maintain the relatively small clearance between the parts, limiting the amount of bending stresses that can be imparted on the fillet weld due to deflection of the parts. However, the primary assurance of safety is demonstrated by satisfying the ASME Code stress limits. Therefore, the NRC staff's acceptance of the proposed increase in diametral clearance will be based on whether the stress/fatigue requirements stated above are met.

ASME Section III, NB-3220, specifies loading conditions that need to be considered and specifies the stress limits that must be satisfied for these load conditions. The specific stresses to be considered for the sleeve-to-sheath weld are general primary stress, primary membrane-plus-bending stress, and primary-plus-secondary stress. The licensee accounted for the increased diametral clearance by reducing the weld throat area used to calculate the stresses in the finite element model analysis. The NRC staff reviewed the licensee's calculation and concluded that this analysis was satisfactorily performed, and that all resultant stresses were within the acceptance criteria required by NB-3220. Therefore, the staff finds that stress requirements have been satisfied.

ASME Section III, NB-3222.4(d), "Components Not Requiring Analysis for Cyclic Operation," identifies the requirements for components not requiring fatigue analysis. The licensee has performed evaluation to demonstrate that NB-3222.4(d), conditions (1) through (6), are met and the component is exempt from a fatigue analysis.

The NRC staff reviewed the licensee's evaluation and concluded that all the requirements of NB-3222.4(d)(1) through (6) are met. Therefore, the staff finds that the fillet weld is exempted from a fatigue analysis and the fatigue requirement has been satisfied.

On the basis mentioned above, the proposed weld joint is acceptable from a stress/fatigue perspective. Therefore, the proposed weld joint meets the stress/fatigue requirements of ASME Code Case 1361-1.

#### 4.0 CONCLUSION

The NRC staff has reviewed the subject request and has concluded, on the basis that the ASME Code stress qualification for the fillet weld integrity has been demonstrated and the component is able to perform its intended function, that the alternative proposed in RR W3-ISI-024 will provide an acceptable level of quality and safety. Accordingly, the NRC staff concludes that the licensee has adequately addressed all of the regulatory requirements set forth in 10 CFR 50.55a(z)(1) for this proposed alternative. Therefore, the NRC staff authorizes the use of the proposed alternative for the duration of the operating license for Waterford 3.

Principal Contributor: K. Hsu

Date: March 22, 2017

SUBJECT: WATERFORD STEAM ELECTRIC STATION, UNIT 3 – REQUEST FOR ALTERNATIVE TO 10 CFR 50.55a(c) ASME CODE SECTION III, CODE CASE 1361-1, RELIEF REQUEST W3-ISI-024 (CAC NO. MF7752) DATED MARCH 22, 2017

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**ADAMS Accession No. ML17069A187**

**\*by memo dated July 5, 2016**

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