



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

June 12, 2019

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 – AUTHORIZATION OF
PROPOSED ALTERNATIVE TO ASME CODE CASE N-770-2
(EPID L-2018-LLR-0125)

Dear Sir or Madam:

By letter dated October 19, 2018 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML18292A856), as supplemented by letter dated November 19, 2018 (ADAMS Accession No. ML18323A611), Entergy Operations, Inc. (Entergy, the licensee) requested approval for an alternative to the VT-2 visual examination requirements of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code) Case N-770-2, "Alternative Examination Requirements and Acceptance Standards for Class 1 PWR [Pressurized-Water Reactor] Piping and Vessel Nozzle Butt Welds Fabricated with UNS N06082 or UNS W86182 Weld Filler Material with or without Application of Listed Mitigations Activities Section XI, Division 1," associated with the fourth inservice inspection (ISI) interval for Waterford Steam Electric Station, Unit 3.

Specifically, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) Section 50.55a(z)(2), the licensee submitted Relief Request W3-ISI-031 for the volumetric examination of dissimilar metal butt welds associated with the suction and discharge piping of the reactor coolant pumps on the basis that complying with the specified ASME Code requirements would result in hardship and/or unusual difficulty without a compensating increase in the level of quality and safety. On December 10, 2018, the U.S. Nuclear Regulatory Commission (NRC) provided verbal relief for the requested alternative (ADAMS Accession No. ML18345A016).

The NRC staff has determined, as set forth in the enclosed safety evaluation, that the proposed alternative provides reasonable assurance of structural integrity of the subject components and that complying with the ASME Code, Section XI requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety. Accordingly, the staff concludes that the licensee has adequately addressed all the regulatory requirements set forth in 10 CFR 50.55a(z)(2). Therefore, the staff authorizes the use of the proposed alternative in W3-ISI-031 at Waterford Steam Electric Station, Unit 3 for the fourth 10-year ISI interval, which began on December 1, 2017, and is scheduled to end on November 30, 2027.

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

If you have any questions, please contact April Pulvirenti at 301-415-1390 or via e-mail at April.Pulvirenti@nrc.gov.

Sincerely,

A handwritten signature in dark ink, appearing to read "R. Pascarelli". The signature is fluid and cursive, with a large initial "R" and a stylized "P".

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: Listserv



UNITED STATES
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SAFETY EVALUATION BY THE OFFICE NUCLEAR REACTOR REGULATION

REQUEST FOR ALTERNATIVE W3-ISI-031

WATERFORD STEAM ELECTRIC STATION, UNIT 3

ENTERGY OPERATIONS, INC.

DOCKET NO. 50-382

1.0 INTRODUCTION

By letter dated October 19, 2018 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML18292A856), as supplemented by letter dated November 19, 2018 (ADAMS Accession No. ML18323A611), Entergy Operations Inc. (the licensee) requested authorization of an alternative to the requirements of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code) Case N-770-2, "Alternative Examination Requirements and Acceptance Standards for Class 1 PWR [Pressurized-Water Reactor] Piping and Vessel Nozzle Butt Welds Fabricated with UNS N06082 or UNS W86182 Weld Filler Material with or without Application of Listed Mitigations Activities Section XI, Division 1," associated with the fourth inservice inspection (ISI) interval for Waterford Steam Electric Station, Unit 3 (Waterford 3).

Specifically, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) Section 50.55a(z)(2), the licensee submitted Relief Request W3-ISI-031 for the volumetric examination of dissimilar metal butt welds associated with the suction and discharge piping of the reactor coolant pumps on the basis that complying with the specified ASME Code requirements would result in hardship and/or unusual difficulty without a compensating increase in the level of quality and safety.

On December 10, 2018, as documented in an e-mail (ADAMS Accession No. ML18345A016), the U.S. Nuclear Regulatory Commission (NRC) provided verbal relief for the requested alternative.

2.0 REGULATORY EVALUATION

Pursuant to 10 CFR 50.55a(g)(4), "Inservice inspection standards requirement for operating plants," ASME Code Class 1, 2, and 3 components (including supports) shall meet the requirements, except the design and access provisions and 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.

Paragraph 50.55a(g)(6)(ii)(F)(1) of 10 CFR requires, in part, that "[h]olders of operating licenses or combined licenses for pressurized-water reactors as of or after August 17, 2017, shall

Enclosure

implement the requirements of [ASME Code] Case N-770-2 instead of [ASME Code] Case N-770-1....”

Section 10 CFR 50.55a(z) of 10 CFR states, in part, that “[a]lternatives to the requirements of paragraphs (b) through (h) of [10 CFR 50.55a] or portions thereof may be used when authorized by the Director, Office of Nuclear Reactor Regulation.... A proposed alternative must be submitted and authorized prior to implementation.” The licensee must demonstrate that:

(1) *Acceptable level of quality and safety.* The proposed alternative would provide an acceptable level of quality and safety; or

(2) *Hardship without a compensating increase in quality and safety.* 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.

Based on the above, and subject to the following technical evaluation, the NRC staff finds that regulatory authority exists for the licensee to request the use of an alternative, and for the NRC to authorize the proposed alternative.

3.0 TECHNICAL EVALUATION

3.1 The Licensee's Proposed Alternative

ASME Code Components Affected

The affected pressure retaining dissimilar metal butt welds containing nickel-based Alloy 82/182 materials are listed below:

Component ID	Component Description
07-002	30" Reactor Coolant Pump (RCP) 1 A Inlet Elbow Carbon Steel (CS) to Safe-end (Cast Stainless Steel (CASS))
08-014	30" RCP 1 A Outlet Safe-end (CASS) to Pipe (CS)
09-016	30" RCP 1 B Inlet Elbow (CS) to Safe-end (CASS)
10-002	30" RCP 1 B Outlet Safe-end (CASS) to Pipe (CS)
11-002	30" RCP 2A Inlet Elbow (CS) to Safe-end (CASS)
13-016	30" RCP 2B Inlet Elbow (CS) to Safe-end (CASS)
14-002	30" RCP 2B Outlet Safe-end (CASS) to Pipe (CS)

Code Class: ASME Code Class 1

Examination Category: ASME Code Case N-770-2, as conditioned by 10 CFR 50.55a(g)(6)(ii)(F)

Inspection Item: B

Description: Unmitigated Butt Weld at Cold Leg Operating Temperature

Applicable Code Edition and Addenda

The Code of record for the spring 2019 outage is the ASME Code, Section XI, 2007 Edition through the 2008 Addenda.

Applicable Code Requirements

ASME Code Case N-770-2, as required by 10 CFR 50.55a(g)(6)(ii)(F), requires successive examination of all Inspection Item B welds every second inspection period not to exceed 7 years after the baseline examination is performed using Section XI, Appendix VIII requirements. Paragraph 50.55a(g)(6)(ii)(F)(4), "Examination coverage," of 10 CFR states that:

When implementing Paragraph -2500(a) of [ASME Code] Case N-770-2, essentially 100 percent of the required volumetric examination coverage shall be obtained, including greater than 90 percent of the volumetric examination coverage for circumferential flaws. Licensees are prohibited from using Paragraphs -2500(c) and -2500(d) of [ASME Code] Case N-770-2 to meet examination requirements.

ASME Code Case N-460, "Alternative Examination Coverage for Class 1 and Class 2 Welds, Section XI, Division 1," allows a reduction in coverage due to interference or geometry as long as the overall coverage is greater than 90 percent. Code Case N-460 has been unconditionally accepted by the NRC in Regulatory Guide 1.147, Revision 18, "Inservice Inspection Code Case Acceptability, ASME Section XI, Division 1."

Reason for Request

In the NRC safety evaluation dated March 26, 2014 (Accession No. ML14070A008), the NRC staff granted relief for W3-ISI-023. Waterford 3 requested relief pursuant to 10 CFR 50.55a(a)(3)(ii) (currently 10 CFR 50.55a(a)(z)(ii)), on the basis that compliance with the requirements of ASME Code Case N-770-1, as required by 10 CFR 50.55a(g)(6)(ii)(F), would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety. Additional coverage could not be obtained due to interference/geometry and obtaining additional coverage would have required modification or replacement of the components. The staff approved this relief until Refueling Outage 22 (RF22), which was scheduled for the fall of 2018, not to exceed 54 months at weld temperatures of 525 degrees Fahrenheit (°F) or greater, between completion of subject weld volumetric examinations.

The licensee stated that the Waterford 3 outage schedule has since been revised and RF22 began in early 2019. Additionally, after approval of Relief Request W3-ISI-023, ASME Code Case N-770-1 was replaced by Code Case N-770-2. The licensee's request was submitted to receive schedule relief pursuant to the more recent code case until the examinations can be performed during RF22.

Proposed Alternative and Basis for Use

In its letter dated October 19, 2019, the licensee stated, in part, that:

Entergy Operations, Inc. ... proposes to obtain relief from the Code Case N-770-2 examination coverage requirements until the examinations can be performed during [the spring 2019] RF22 with the alternative coverage

requirements being the results obtained during the examinations performed during RF19.

Baseline examinations of the seven subject welds, in accordance with 10 CFR 50.55a(g)(6)(ii)(F), were performed in 2009 during RF16. Due to geometric limitations and design configuration, 100 percent examination coverage could not be obtained; resultantly the NRC approved request for alternative W3-ISI-020 by letter dated May 31, 2013 (ADAMS Accession No. ML13128A129), determining that fulfilling the essentially 100 percent examination requirements for axial flaws was not possible using the technology and procedures that were available at the time.

ASME Code Case N-770-1 required successive examination of all inspection welds to be performed using Section XI, Appendix VIII requirements and meeting the ASME Code Case required examination volume of essentially 100 percent. Entergy Letter No. W3F1-2013-0044 dated September 26, 2013 (ADAMS Accession No. ML13270A041), was submitted to request NRC staff approval of alternative W3-ISI-023. This was submitted prior to the performance of the successive examinations of the subject welds (which were scheduled to be performed in 2014 during RF19) to allow for less than essentially 100 percent examination coverage. As documented in the NRC safety evaluation dated March 26, 2014, the use of alternative W3-ISI-023 was approved allowing the licensee to examine the subject welds to the extent that had been obtained when the baseline examinations were performed in 2009 during RF16 in lieu of the ASME Code Case N-770-1 examination coverage requirements. The examination coverage of all seven of the welds exceeded the bounding examination coverage. These coverages, in percent, are listed in Table 1, "Pressure Retaining Dissimilar Metal Butt Welds Containing Nickel-Based Alloy 82/182 Materials 2014 Examination Coverage," of the submittal dated October 19, 2019.

Subsequent to the performance of the examinations, ASME Code Case N-770-1 was replaced by Code Case N-770-2, but the volume coverage requirements of N-770-2 for the axial and circumferential scans that are noted in the table have not changed with the revision of the Code Case; therefore, the results are applicable to both revisions.

The licensee indicated that the analyses have been performed showing that, a postulated initial flaw that is 16.7 percent through-wall would grow to the ASME Code allowable flaw size of 75 percent through-wall in approximately 54 months from the inspection. The largest undetected flaw that could exist due to the examination limitations is 100 percent through-wall, providing a margin of 6.7 percent. Based on the results of the examinations performed in RF19, which obtained examination coverage equal to or better than the most limiting coverage obtained in the 2009 examinations, the crack growth analysis supports operation of Waterford 3 for 54 months at a normal operating temperature from the RF19 (spring 2014) exams.

Therefore, Entergy proposes to perform ASME Code Case N-770-2 examinations at Waterford 3 prior to the conclusion of the spring 2019 outage (RF22).

Entergy continues to monitor technology changes and plans to use the best available Performance Demonstration Initiative qualified techniques to examine the subject piping welds, as practical. The examination techniques utilized in the 2014 examinations are essentially unchanged and continue to be the best available technology. To improve upon these examination coverage percentages, modification and/or replacement of the component would be required.

Duration of the Proposed Alternative

The licensee requested that the proposed alternative be effective immediately upon approval by the NRC staff, with duration to be until the examinations can be performed during the spring 2019 outage (RF22).

3.2 NRC Staff Evaluation

The RF19 examinations were performed using phased array ultrasonic techniques, which are qualified in accordance with ASME Section XI, Appendix VIII, Supplement 10, for dissimilar metal welds and 10 CFR 50.55a and administered by the Performance Demonstration Initiative program. The basis for the alternative W3-ISI-023 states that flaw growth in the subject welds would not exceed the ASME Code allowable flaw size during 54 months at operating temperatures of 525 °F or higher. Given the operating history since the spring 2014 outage, 54 months at operating temperature would end on January 31, 2019. Relief was granted until RF22, which was the scheduled refueling outage in the fall of 2018, not to exceed 54 months at weld temperatures of 525 °F or greater between completion of subject weld volumetric examinations. However, the refueling outage schedule was revised and RF22 was rescheduled to commence in early 2019. Because the start date of the spring 2019 refueling outage was prior to January 31, 2019, the NRC staff agrees that the alternative to the inspection requirements will not exceed 54 operating months.

Upon review of the licensee's submittal dated October 19, 2018, the NRC staff finds that the proposed alternative has already met the requirements specified under Section -2500 of ASME Code Case N-770-2. The NRC staff noted in Table 1 of the submittal dated October 19, 2019, that 100 percent volumetric coverage of the pressurized-water stress corrosion cracking susceptible material for both axial and circumferential flaws during the 2014 inspection was obtained for each of the subject components. The NRC staff also noted that Section -2500(b) of ASME Code Case N-770-2 specifies that "[f]or cast stainless steel items for which no supplement is available in Appendix VIII, the required examination volume shall be examined by Appendix VIII procedures to the maximum extent practical including 100% of the susceptible material volume (non-stainless steel volume)," and that this section is applicable to the components in the request by the licensee. The NRC staff finds that the licensee's inspection in 2014 is in compliance with requirements of Code Case N-770-2.

Lastly, the licensee was able to obtain at least 86 percent total volumetric coverage required by ASME Code Case N-770-2. The NRC staff finds that there is reasonable assurance that the proposed alternative will still allow for pressurized-water stress corrosion cracking initiated flaws to be found prior to exceeding the critical flaw size calculated in the licensee's analysis. Based on the above evaluation, the NRC staff finds that the licensee's proposed alternative will provide an acceptable level of quality and safety and is therefore, authorized.

4.0 CONCLUSION

As set forth above, the NRC staff determines that the proposed alternative provides reasonable assurance of structural integrity of the subject piping segments. As such, the NRC staff finds that complying with the specified ASME Code requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety. Accordingly, the NRC staff concludes that the licensee has adequately addressed all the regulatory requirements set forth in 10 CFR 50.55a(z)(2). Therefore, the NRC authorizes the use of 10 CFR 50.55a Request for Alternative W3-ISI-031 at Waterford Steam Electric Station, Unit 3, for the

fourth 10-year ISI interval that began on December 1, 2017, and is scheduled to end on November 30, 2027.

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

Principal Contributor: Austin Young, NRR/DMLR/MPHB

Date: June 12, 2019

SUBJECT: WATERFORD STEAM ELECTRIC STATION, UNIT 3 – AUTHORIZATION OF
PROPOSED ALTERNATIVE TO ASME CODE CASE N-770-2
(EPID L 2018-LLR-0125) DATED JUNE 12, 2019

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***by email dated**

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