



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

June 12, 2009

Vice President, Operations
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 W3-ISI-006 FOR THE SECOND 10-YEAR INSERVICE
INSPECTION INTERVAL (TAC NO. MD9671)

Dear Sir or Madam:

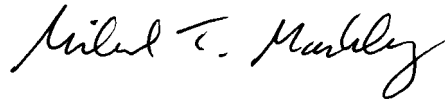
By letter dated September 18, 2008, as supplemented by letter dated March 19, 2009, Entergy Operations, Inc. (Entergy, the licensee), requested U.S. Nuclear Regulatory Commission (NRC) approval for request for alternative W3-ISI-006. The request for alternative, to the requirements of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code), Section XI, Paragraph IWB-2412, Inspection Program B, requested approval, to extend the second and third 10-year inservice inspection (ISI) interval examinations of the reactor pressure vessel (RPV) welds (Category B-A) as well as the nozzle-to-vessel welds and inner radius sections (Category B-D) until 2015 and 2035, respectively, plus or minus one refueling cycle at the Waterford Steam Electric Station, Unit 3 (Waterford 3).

The proposed alternative was requested pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) Section 50.55a(a)(3)(i). Based on the NRC staff's review, authorization of the proposed alternative is justified on the basis that it would provide an acceptable level of quality and safety to perform Waterford 3's second 10-year ISI interval examination in 2015, plus or minus one refueling cycle. The licensee will have to resubmit the requested alternative for Waterford 3's third 10-year ISI interval after the results of the facility's 2015 inspection have been evaluated.

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

The NRC staff's safety evaluation is enclosed.

Sincerely,

A handwritten signature in black ink that reads "Michael T. Markley". The signature is written in a cursive style with a large, looping initial "M".

Michael T. Markley, Chief
Plant Licensing Branch IV
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-382

Enclosure:
Safety Evaluation

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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

REQUEST FOR ALTERNATIVE W3-ISI-006 FOR THE SECOND 10-YEAR

INSERVICE INSPECTION INTERVAL FOR

REACTOR PRESSURE VESSEL WELD EXAMINATION

WATERFORD STEAM ELECTRIC STATION, UNIT 3

ENTERGY OPERATIONS, INC.

DOCKET NO. 50-382

1.0 INTRODUCTION

By letter dated September 18, 2008 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML082660040), as supplemented by letter dated March 19, 2009 (ADAMS Accession No. ML090820487), Entergy Operations, Inc. (Entergy, the licensee) requested U.S. Nuclear Regulatory Commission (NRC) approval for request for alternative W3-ISI-006 which proposes an alternative to the requirements of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code), Section XI, paragraph IWB-2412, Inspection Program B, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) Section 50.55a(a)(3)(i). The licensee requested approval for the use of the alternative, W3-ISI-006, to extend the second and third 10-year inservice inspection (ISI) interval for examinations of the reactor pressure vessel (RPV) welds (Category B-A) as well as the nozzle-to-vessel welds and inner radius sections (Category B-D) until 2015 and 2035, respectively, plus or minus one refueling cycle at the Waterford Steam Electric Station, Unit 3 (Waterford 3).

2.0 REGULATORY EVALUATION

In accordance with 10 CFR 50.55a(g)(4), the licensee is required to perform ISI of ASME Code Class 1, 2, and 3 components and system pressure tests during the first 10-year interval and subsequent 10-year intervals that comply with the requirements in the latest edition and addenda of Section XI of the ASME Code, incorporated by reference in 10 CFR 50.55a(b), subject to the limitations and modifications listed therein.

Paragraph 50.55a(a)(3) of 10 CFR states, in part, that the Director of the Office of Nuclear Reactor Regulation may authorize an alternative to the requirements of 10 CFR 50.55a(g). For an alternative to be authorized, as per 10 CFR 50.55a(a)(3)(i), the licensee must demonstrate

Enclosure

that the proposed alternative would provide an acceptable level of quality and safety; per 10 CFR 50.55a(a)(3)(ii), the licensee must show that following the ASME Code requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

2.1 Background

The ISI of Category B-A and B-D components consists of visual and ultrasonic examinations intended to discover whether flaws have initiated, whether pre-existing flaws have extended, and existence of (pre-existing) flaws that may have been missed in prior examinations. These examinations are required to be performed at regular intervals, as defined in Section XI of the ASME Code.

2.2 Summary of WCAP-16168-NP

On January 26, 2006, the Pressurized Water Reactor Owners Group (PWROG) submitted topical report WCAP-16168-NP, Revision 1, "Risk-Informed Extension of Reactor Vessel In-Service Inspection Interval" (WCAP-16168), to the NRC in support of making a risk-informed assessment of extensions to the ISI intervals for Category B-A and B-D components. In the report, the PWROG took data associated with three different pressurized-water reactor (PWR) plants (referred to as the pilot plants), one designed by each of the main contractors for nuclear power plants in the U.S., and performed the necessary studies on each of the pilot plants required to justify the proposed extension for the ISI interval for Category B-A and B-D components from 10 to 20 years.

The analyses in the WCAP-16168 used probabilistic fracture mechanics (PFM) tools and inputs from the work described in the NRC's pressurized thermal shock (PTS) risk re-evaluation. The PWROG analyses incorporated the effects of fatigue crack growth and ISI. Design-basis transient data was used as input to the fatigue crack-growth evaluation. The effects of ISI were modeled consistently with the previously approved PFM codes. These effects were put into evaluations performed with the Fracture Analysis of Vessels-Oak Ridge (FAVOR) code. All other inputs were identical to those used in the PTS risk re-evaluation.

From the results of the studies, the PWROG concluded that the ASME Code, Section XI, 10-year inspection interval for Category B-A and B-D components in PWR reactor vessels can be extended to 20 years. Their conclusion from the results for the pilot plants was considered to be applicable to PWR plants designed by the three vendors (Westinghouse, Combustion Engineering, and Babcock and Wilcox) as long as the critical, plant-specific parameters (defined in Appendix A of the WCAP-16168) are bounded by the pilot plants.

2.3 Summary of NRC Safety Evaluation Report of WCAP-16168-NP

The staff's conclusion in its safety evaluation report (SER) of WCAP-16168-NP, Revision 2, dated May 8, 2008 (ADAMS Accession No. ML081060045), indicates that the methodology presented in the WCAP-16168, along with the guidance provided by Regulatory Guide 1.174, Revision 1, "An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis," dated November 2002 (ADAMS Accession No. ML023240437), is acceptable for referencing in requests to implement alternatives to the

ASME Code inspection requirements for PWR plants in accordance with the limitations and conditions in the SER. In addition to showing that the subject plant is bounded by the pilot plants' information from Appendix A in the WCAP, the key points of the SER are summarized below.

1. The dates identified in the request for alternative should be within plus or minus one refueling cycle of the dates identified in the implementation plan, PWROG letter OG-06-356, "Plan for Plant Specific Implementation of Extended Inservice Inspection Interval per WCAP-16168-NP, Revision 1, 'Risk-Informed Extension of the Reactor Vessel In-Service Inspection Interval,'" dated October 31, 2006 (ADAMS Accession No. ML082210245). Any deviations from the implementation plan should be discussed in detail in the request for alternative ISI interval. The maximum interval for proposed ISI is 20 years.
2. The requirements for reporting the results of ISIs found in the voluntary PTS rule apply in all cases. Licensees that do not implement the voluntary PTS rule must amend their licenses to require that the information and analyses requested in the voluntary PTS rule be submitted for NRC staff review and approval. The amendment to the license shall be submitted at the same time as the request for alternative ISI interval. However, as explained in Section 4.0 of this SE, this requirement has been relaxed.
3. The request for alternative ISI interval can use any NRC-approved method to calculate ΔT_{30} and RT_{MAX-X} to subsequently calculate the total through-wall-crack-frequency ($TWCF_{95-TOTAL}$) for the RPV. However, if the request uses the NUREG-1874, "Recommended Screening Limits for Pressurized Thermal Shock (PTS)," 2007 (ADAMS Accession No. ML070860156) methodology to calculate ΔT_{30} , then the request should include the analysis described in paragraph (6) of subsection (f) to the voluntary PTS rule. The analysis should be done for all of the materials in the beltline area with at least three surveillance data points.
4. If the subject plant has RPV forgings that are susceptible to underclad cracking or if the RPV includes forgings with RT_{MAX-FO} values exceeding 240 degrees Fahrenheit ($^{\circ}F$), then the WCAP-16168 analyses are not applicable. The licensee must submit a plant-specific evaluation for any extension to the 10-year inspection interval for ASME Code, Section XI, Category B-A and B-D RPV welds.

3.0 TECHNICAL EVALUATION

3.1 Description of Proposed Alternative

The licensee proposes to defer the ASME Code-required Category B-A and B-D second 10-year ISI interval weld examination at Waterford 3 until 2015 (18-year interval from the last inspection) and continuing with the third 10-year ISI interval examination in 2035. This schedule is consistent with the information in PWROG letter OG-06-356.

3.2 Components for Which Relief is Requested

The affected component is the Waterford 3 RPV; specifically, the following ASME Code, Section XI examination categories and item numbers cover examinations of the RPV. These examination categories and item numbers are from Table IWB-2500 and IWB-2500-1 of the ASME Code, Section XI.

Examination Category	Item Number	Description
B-A	B1.11	Circumferential Shell Welds
B-A	B1.12	Longitudinal Shell Welds
B-A	B1.21	Circumferential Head Welds
B-A	B1.22	Meridional Shell Welds
B-A	B1.30	Shell-to-Flange Weld
B-A	B1.40	Head-to-Flange Weld
B-A	B1.50	Repair Welds
B-A	B1.51	Beltline Region Repair Welds
B-D	B3.90	Nozzle-to-Vessel Welds
B-D	B3.100	Nozzle Inner Radius Areas

3.3 Basis for Proposed Alternative

The basis for the alternative is found in the NRC-approved version of topical report WCAP-16168 (WCAP-16168-NP-A). Plant-specific parameters for the subject plant are summarized in Enclosure 1 to the licensee's submittal dated September 18, 2008. The format of the information is patterned after that found in Appendix A of the WCAP-16168.

All of the critical parameters listed in Tables 1, 2, and 3 of Enclosure 1 to the licensee's submittal are bounded by the WCAP-16168-NP-A pilot plant evaluations.

3.4 Duration of Proposed Alternatives

The duration of the proposed alternative is until 2015 for the second 10-year ISI and until 2035 for the third 10-year ISI.

4.0 NRC STAFF EVALUATION

The staff has reviewed Enclosure 1 to the licensee's request for alternative application, dated September 18, 2008, as supplemented by letter dated March 19, 2009. The "Frequency and Severity of Design Transients" of Waterford 3 were found to be bounded by the WCAP-16168-NP-A. Also, the Waterford 3 RPV was single-layer clad and so was bounded by the WCAP-16168-NP-A.

Table 2 to Enclosure 1 of the licensee's submittal dated September 18, 2008, includes additional information pertaining to previous RPV inspections and the schedule for future ones.

The proposed second 10-year ISI interval examination and the proposed third 10-year ISI interval examination, for Waterford 3, would be in 2015 and 2035, respectively. These proposed dates for the second and third 10-year ISI interval examinations for Waterford 3 are consistent with the PWROG letter OG-06-356. According to the past inspection's data contained in Table 2 of the licensee's submittal, zero reportable indications have been found to date and any recordable indications have been acceptable per ASME Code, Section XI IWB-3500. Therefore, the information in Table 2 of the licensee's submittal meets the regulatory guidance and is, therefore, acceptable.

At the time of issuance of the WCAP-16168-NP SER, it was the NRC's intent to establish a process by which licensees could receive approval to implement 20-year ISI intervals for the subject component examinations through the end of their facility's current operating license. This objective led to the provision established in the WCAP-16168-NP SER that licensees submit a license condition which would require the licensee to evaluate future volumetric ISI data in accordance with the criteria in the draft and/or final alternative PTS Rule, 10 CFR 50.61a. However, since that time, further guidance has resulted in a modification of this position.

Based on the modified position, the NRC staff will grant ISI interval extensions for the subject components on an interval-by-interval basis (i.e., a facility's current ISI interval only will be extended for up to 20 years). Licensees will have to submit subsequent alternatives, for NRC staff review and approval, to extend from 10 years to 20 years each following ISI interval, as needed. As a result, the NRC staff cannot grant Entergy's request to also extend the third ISI interval until 2035. Based on this, the requirement for a license condition (in WCAP-16168-NP) to address the evaluation of future ISI data is no longer necessary. The license condition requested by Entergy for Waterford 3 by letter dated September 17, 2008, was withdrawn by letter dated June 3, 2009 (ADAMS Accession No. ML091560028). However, subsequent alternative requests which seek to extend additional ISI intervals from 10 to 20 years for the subject component examinations should include the evaluation of a facility's most recent ISI data in accordance with the criteria in the final alternative PTS Rule, 10 CFR 50.61a, in order to obtain NRC staff approval. In addition, for purposes of technical and regulatory consistency, the WCAP-16168-NP SER will be revised to reflect these changes in NRC position regarding the implementation of ISI interval extensions based on WCAP-16168-NP.

The licensee used the NUREG-1874 methodology to calculate ΔT_{30} , RT_{MAX-X} , and $TWCF_{95-TOTAL}$ values for the RPV. Table 3 to Enclosure 1 of the licensee's submittal dated September 18, 2008, summarizes the results of these calculations. Since the licensee did not include an analysis of surveillance data points as described in paragraph (6) of subsection (f) to the voluntary PTS rule, which is required if the licensee implements the NUREG-1874 methodology to calculate ΔT_{30} , RT_{MAX-X} , and $TWCF_{95-TOTAL}$ value for the RPV, the staff requested the licensee to provide analysis consistent with the requirements (paragraph (6) of subsection (f) to the voluntary PTS rule) for Waterford 3 RPV surveillance data points. In its letter dated March 19, 2009, the licensee stated that presently, Waterford 3 has only 2 points of surveillance data. Therefore, the surveillance checks of paragraphs (f)(6)(ii), (f)(6)(iii), and (f)(6)(iv) can not be performed and as stated in paragraph (f)(6)(i)(B) to the voluntary PTS rule, the embrittlement model of NUREG-1874 may be used without performing the consistency check.

The staff independently verified the licensee's calculations of ΔT_{30} and RT_{MAX-X} using the methodology described in NUREG-1874. The staff calculated the RT_{MAX-X} values for the limiting axial weld, limiting plate, and circumferential weld which were all within 5 °F of the values listed in Table 3 of the licensee's application and well below the PTS screening criteria thresholds as given in Table 1 of the voluntary PTS rule. The calculation of $TWCF_{95-TOTAL}$ value for the Waterford 3 RPV is not the critical parameter in the analysis of this request for alternative, because none of the conditions of paragraph (e)(4)(i) through (e)(4)(iv) apply to Waterford 3. However, the staff also calculated values for $TWCF_{95-xx}$ for each of the limiting beltline materials mentioned above and found them to be off by orders of magnitude compared to the licensee's calculated values. The $TWCF_{95-TOTAL}$ value for the Waterford 3 RPV was then calculated by the staff and found to be an order of magnitude smaller than the licensee calculated value, and orders of magnitude below the 1×10^{-6} per reactor year threshold stated in paragraph (e)(4).

In summary, the licensee has demonstrated through the request for alternative submittal that the RPV for Waterford 3 is bounded by the WCAP-16168-NP-A analyses and that all regulatory requirements pertaining to the voluntary PTS rule have been satisfied. The staff concluded that the licensee's submittal demonstrates that there is no significant additional risk associated with extending the ISI interval for Category B-A and B-D pressure retaining welds from 10 years to 20 years for the second 10-year ISI interval at Waterford 3 and is, therefore, acceptable.

5.0 REGULATORY COMMITMENTS

In Enclosure 2 to its letter dated September 18, 2008, the licensee made the following commitments:

Commitment	Scheduled Completion Date
Entergy will extend the second 10-year inservice inspection interval from 10 years to 20 years for the Examination Category B-A and B-D reactor vessel welds and perform the Waterford 3 inspection in the 2015 refueling outage plus or minus one refueling cycle (One Time Action).	2015 refueling outage plus or minus one refueling cycle
Entergy will perform the second 10-year inservice inspection of the Examination Category B-J welds associated with the reactor vessel during the refueling outage Waterford 3 (One Time Action).	Fall 2009 refueling outage. (RF16)

6.0 CONCLUSION

The staff has completed its review of the request for alternative W3-ISI-006, and concludes that increasing the second 10-year ISI interval for Category B-A and B-D pressure retaining weld examinations from 10 years to 20 years shows no appreciable increase in risk and thus, granting of the modified proposed alternative is justified on the basis that it would provide an acceptable level of quality and safety. Therefore, the staff authorizes the modified proposed alternative pursuant to 10 CFR 50.55a(a)(3)(i) for the second 10-year ISI interval at Waterford 3. The alternative authorizes the licensee to perform the subject Waterford 3 second 10-year ISI interval examinations in 2015, plus or minus one refueling cycle.

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

Principal Contributor: A. Shaikh

Date: June 12, 2009

The NRC staff's safety evaluation is enclosed.

Sincerely,

/RA/

Michael T. Markley, Chief
Plant Licensing Branch IV
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-382

Enclosure:
Safety Evaluation

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