



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

July 22, 2011

Mr. Robert J. Duncan, II
Vice President
Carolina Power and Light Company
H. B. Robinson Steam Electric Plant, Unit 2
3581 West Entrance Road
Hartsville, SC 29550

SUBJECT: H. B. ROBINSON STEAM ELECTRIC PLANT, UNIT 2 – RELIEF REQUEST
NO. RR-23 FOR THE FOURTH 10-YEAR INSERVICE INSPECTION
PROGRAM INTERVAL (TAC NO. ME5407)

Dear Mr. Duncan:

By letter dated January 27, 2011, Carolina Power & Light Company (the licensee) requested the U.S. Nuclear Regulatory Commission's (NRC) authorization for H.B. Robinson Steam Electric Plant, Unit 2 (HBRSEP) to use Relief Request No. RR-23 (RR-23), as an alternative to the requirements of the American Society of Mechanical Engineers, *Boiler and Pressure Vessel* (ASME Code), Section XI, Paragraph IWB-2412, Inspection Program B. Additional supplemental information was submitted by the licensee on March 23, 2011.

Specifically, the alternative was requested pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) 50.55a(a)(3)(i) to extend the inservice inspection (ISI) interval for examinations of the reactor pressure vessel welds (Category B-A), as well as the nozzle-to-vessel welds and inner radius sections (Category B-D) from 10 years to 20 years. The NRC staff has completed its review of the submittals for RR-23 regarding HBRSEP. The staff concludes that increasing the ISI interval for Category B-A and B-D components from 10 years to 20 years shows no appreciable increase in risk. The NRC staff finds that the information provided by the licensee supports the granting of the alternative, RR-23, pursuant to 10 CFR 50.55a(a)(3)(i), because the alternative provides an acceptable level of quality and safety. Therefore, as discussed in the enclosed safety evaluation, RR-23 provides an acceptable level of quality and safety and can be granted pursuant to 10 CFR 50.55a(a)(3)(i) until 2021, which would be the end of the fourth ISI interval for Categories B-A and B-D components at HBRSEP.

The staff has completed its review of the submittals for RR-23 regarding HBRSEP. The staff concludes that increasing the ISI interval for Category B-A and B-D components from 10 years to 20 years shows no appreciable increase in risk. The staff comes to this conclusion based on the fact that the plant-specific information provided by the licensee is bounded by the data in the WCAP-A and the request meets all the conditions and limitations described in the WCAP-A. Therefore, Relief Request RR-23 provides an acceptable level of quality and safety and the alternative can be authorized pursuant to 10 CFR 50.55a(a)(3)(i) until 2021, which would be the end of the fourth ISI interval for Categories B-A and B-D components at HBRSEP.

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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.

If you have any questions or concerns, please contact the Project Manager, Brenda Mozafari, at 301-415-2020.

Sincerely,

A handwritten signature in black ink, appearing to read "Douglas A. Broaddus".

Douglas A. Broaddus, Chief
Plant Licensing Branch II-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-261

Enclosure: Safety Evaluation

cc w/enclosure: Distribution via Listserv



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

RELATED TO RELIEF REQUEST NO. RR-23

FOR THE FOURTH 10-YEAR INSERVICE INSPECTION INTERVAL

EXTENSION OF THE INTERVAL FOR CERTAIN COMPONENTS FROM 10 TO 20 YEARS

CAROLINA POWER & LIGHT COMPANY

H. B. ROBINSON STEAM ELECTRIC PLANT, UNIT NO. 2

DOCKET NO. 50-261

1.0 INTRODUCTION

By letter dated January 27, 2011, (Reference 1) Carolina Power & Light Company (the licensee) requested Nuclear Regulatory Commission (NRC) approval for H.B. Robinson Steam Electric Plant, Unit 2 (HBRSEP) to use Relief Request No. RR-23 (RR-23), as an alternative to the requirements of the American Society of Mechanical Engineers, *Boiler and Pressure Vessel* (ASME Code), Section XI, Paragraph IWB-2412, Inspection Program B. Additional supplemental information was submitted by the licensee on March 23, 2011 (Reference 2). Specifically, the alternative was requested pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) Section 50.55a(a)(3)(i), to extend the 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) from 10 years to 20 years.

2.0 REGULATORY REQUIREMENTS

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.

For the fourth ISI interval at HBRSEP, which began on February 19, 2002, the code of record for the inspection of ASME Code Class 1, 2, and 3 components is the 1995 Edition through the 1996 addenda of the ASME Code, Section XI. The regulation in 10 CFR 50.55a(a)(3) states, in part, that the Director of the Office of Nuclear Reactor Regulation (NRR) 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 that the proposed alternative would provide an acceptable 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 preexisting flaws have extended, and whether preexisting flaws 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, Revision 2

In 2006, the Pressurized Water Reactor (PWR) Owners Group submitted a topical report WCAP-16168-NP, Revision 2 (Reference 3), referred to as the WCAP in the rest of this document), 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 PWR Owners Group took data associated with three different PWR plants (referred to as the pilot plants), one designed by each of the main contractors for PWR nuclear power plants in the USA, 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 used probabilistic fracture mechanics tools and inputs from the work described in the NRC's pressurized thermal shock (PTS) risk reevaluation (Reference 4 and 5). The PWR Owners Group analyses incorporated the effects of fatigue crack growth and inservice inspection. 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 probabilistic fracture mechanics codes (Reference 6). These effects were put into evaluations performed with the Fracture Analysis of Vessels-Oak Ridge (FAVOR) Code (Reference 7). All other inputs were identical to those used in the PTS risk re-evaluation.

From the results of the studies, the PWR Owners Group concluded that the ASME Code, Section XI 10-year inspection interval for Category B-A and B-D components in PWR RPVs can be extended to 20 years. Their conclusion from the results for the pilot plants was considered to apply to any plant 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) are bounded by the pilot plants.

2.3 Summary of NRC SE

The staff's conclusion in its SE (Reference 8) indicates that the methodology presented in the WCAP, in concert with the guidance provide by Regulatory Guide (RG) 1.174, Rev.1 (Reference 9), is acceptable for referencing in requests to implement alternatives to ASME Code inspection requirements for PWR plants in accordance with the limitations and conditions in the SE. 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 SE 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 provided to the NRC. Any deviations from the implementation plan (Reference 10) should be discussed in detail in the request for alternative. The maximum proposed ISI interval 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's review and approval. The amendment to the license shall be submitted at the same time as the request for alternative ISI interval.
3. The request for alternative ISI interval can use any NRC-approved method to calculate ΔT_{30} and RT_{MAX-X} (Reference 5). However, if the request uses the NUREG-1874 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 is a Babcock & Wilcox designed plant:
 - Licensees must verify that the fatigue crack growth of 12 heat-up/cool-down transients per year bound the fatigue crack growth for all of its design basis transients.
 - Licensees must identify the design basis transients that contribute to significant fatigue crack growth.
5. If the subject plant has RPV forgings that are susceptible to underclad cracking or if the RPV includes forgings with RT_{MAX-FO} (Reference 10) values exceeding 240 degrees Fahrenheit, then the WCAP 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 PROPOSED RR-23 FOR H.B. ROBINSON STEAM ELECTRIC PLANT, UNIT 2

3.1 Description of Proposed Alternative

In RR-23, the licensee proposes to defer the ASME Code required Category B-A and B-D weld ISI of HBRSEP until 2021 (approximately 20 years from the last inspection). This schedule is not consistent with the 2020 date included in the revised PWR Owners Group letter, OG-09-454 (Reference 11); six plants (including HBRSEP) had planned inspections in 2020 and only one plant was planned for 2021. With this proposed alternative, there would be five plants doing inspections in 2020 and two (including HBRSEP) scheduled in 2021; thus the alternative (RR-23) would still provide for detection of any emerging degradation mechanisms in a timely manner, meeting the goal for the overall implementation plan (Reference 9).

3.2 Components for Which Relief is Requested

The affected components are the subject plant RPV and its interior attachments and core support structure. The following examination categories and item numbers from IWB-2500 and Table IWB-2500-1 of the ASME Code, Section XI, are addressed in this request:

Relief Request RR-23:

Examination Category	Item Number	Description
B-A	B 1.11	Circumferential Shell Welds
B-A	B 1.12	Longitudinal Shell Welds
B-A	B 1.21	Circumferential Head Welds
B-A	B 1.22	Meridional Shell Welds
B-A	B 1.30	Shell-to-Flange Weld
B-D	B 3.90	Nozzle-to-Vessel Welds
B-D	B 3.100	Nozzle Inner Radius Areas

3.3 Basis for Proposed Alternative

The basis for the first alternative is found in the NRC-approved version of the WCAP (Reference 12, referred to as WCAP-A). Plant-specific parameters for the subject plant are summarized in Enclosure 1 to the licensee's letter of January 27, 2011. The format of the information is patterned after that found in Appendix A of the WCAP-A.

All of the critical parameters listed in Tables 1, 2, and 3 of Attachment (1) to the licensee's letter of January 27, 2011, are bounded by the WCAP-A pilot plant.

3.4 Duration of Proposed Alternative

The licensee requested deferral of the next inspection of the ASME Category B-A and B-D RPV welds scheduled for 2021 (+/- one refueling outage) at Robinson 2.

4.0 STAFF TECHNICAL EVALUATION

The staff has reviewed Enclosure 1 to the licensee's letter dated January 27, 2011, to make this evaluation. In Table 1, the "Frequency and Severity of Design Transients" of HBRSEP were found to be bounded by the WCAP-A. Also, the HBRSEP RPV was single-layer clad and so was bounded by the WCAP-A.

Table 2 of the submittal includes additional information pertaining to previous RPV inspections and the schedule for future ones. The next inspection for HBRSEP would be in 2021 (+/- one refueling outage), a slight change to the plan found in OG-09-454; (Reference 11) the staff has reviewed the revised PWR Owners Group plan and agrees that the proposed alternative does not change the overall intent of the inspection plan for the PWR fleet and is therefore acceptable to the staff.

There were a total of 2 indications detected in the most recent inservice inspection of the beltline welds with only one in the high-fluence beltline region. This one indication was found in the inner 3/8th of the RPV thickness, but outside of the inner 1 inch or 1/10th thickness of the RV beltline region. The indication was acceptable per IWB-3500 of the ASME Code, Section XI and the requirements of the alternate PTS Rule (Reference 13), so therefore, there is no requirement for remedial action or further analysis.

On March 7, 2011 (Reference 14), the staff requested additional information regarding the one indication that was found in the beltline weld region. The licensee responded via electronic correspondence on March 23, 2011 with the location (circumferential weld 10-273) and dimensions of the one indication found in the third ISI; furthermore, the licensee stated that the indication was found in the second ISI performed in 1990, but not in the first ISI in 1982. The difference in the size of the indication between the second and third ISIs can be attributed to the increased sensitivity of the inspection done during the third ISI, performed in accordance with the demonstration process required by ASME Code, Section XI, Appendix VIII, which was not in effect at the time of the first two interval inspections.

This information allows the staff to conclude that the one indication in circumferential weld 10-273 found in the third ISI could have been present in the RPV before it was placed into service, but was not detected. There is no evidence that the one indication is growing due to any active aging mechanism; the size is acceptable per IWB-3500 of the ASME Code, Section XI and the flaw limits in the alternate PTS Rule. With this information, the staff concludes that the additional information for HBRSEP in Table 2 of the proposed alternative is bounded by the WCAP.

The calculation of $TWCF_{95-TOTAL}$ (Reference 10) was performed using Table 3 of the submittal as a basis. The request uses the RG1.99, Rev. 2 methodology to calculate ΔT_{30} . The calculations were independently verified via staff calculation and the difference between the licensee's and staff's calculations were found to be insignificant. The $TWCF_{95-TOTAL}$ was found to be acceptably low as calculated through the methodology prescribed in WCAP and detailed in Table 3 of the submittal.

At the time of issuance of the WCAP-A, 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-A that the licensee would submit a license condition which required the licensee to evaluate future volumetric ISI data in accordance with the criteria in the alternative PTS Rule. However, since that time, further guidance from the NRC's Office of General Counsel has resulted in a modification of this NRC position.

Based on the current guidance, the NRC staff will grant ISI interval extensions for the subject components on an interval-by-interval basis, i.e., only a facility's current ISI interval will be extended for up to 20 years. Licensees will have to submit updated alternatives to the NRC for review and approval to extend each following ISI interval from 10 years to 20 years, as needed. Based on this new NRC position, the requirement in WCAP-A for a license condition to address the evaluation of future ISI data (see Section 2.3, item 2) is no longer necessary in conjunction with this requested alternative. However, in order to obtain NRC staff approval, a subsequent updated alternative that seeks to extend an ISI interval 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 alternative PTS Rule. For purposes of technical and regulatory consistency, the NRC SE will be revised to reflect these changes in NRC position regarding the implementation of ISI interval extensions based on WCAP-A. Therefore, the staff will only approve proposed alternative RR-23 for the fourth ISI interval that will now end on 2021 for the subject component examinations.

In summary, the licensee has demonstrated through the submittal that the RPV for HBRSEP is bounded by the WCAP-A. The submittal demonstrates that there is no significant additional risk associated with extending the ISI interval for Category B-A and B-D components from 10 years to 20 years.

5.0 CONCLUSION

The staff has completed its review of the submittals for RR-23 regarding HBRSEP. The staff concludes that increasing the ISI interval for Category B-A and B-D components from 10 years to 20 years shows no appreciable increase in risk the plant-specific information provided by the licensee is bounded by the data in the WCAP-A and the request meets all the conditions and limitations described in the WCAP-A. Therefore, Relief Request RR-23 provides an acceptable level of quality and safety and the alternative can be granted pursuant to 10 CFR 50.55a(a)(3)(i) extending the fourth ISI interval to 2021 for Categories B-A and B-D components at HBRSEP.

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

6.0 REFERENCES

1. Letter from Progress Energy to NRC, January 27, 2011, Agencywide Documents Access and Management System (ADAMS) Accession No. ML110330085.
2. Letter from Progress Energy to NRC, March 23, 2011, ADAMS Accession No. ML110880144.
3. WCAP-16168-NP, Revision 2, ADAMS Accession No. ML072920413.
4. NUREG-1806, ADAMS Accession No. ML061580318.
5. NUREG-1874, ADAMS Accession No. ML070860156.
6. WCAP-14572-NP-A, ADAMS Accession Nos. ML012630327, ML012630349, and ML012630313.
7. ONRL/NRC/LTR0418, ADAMS Accession No. ML042960391.
8. U.S. NRC SE for Reference 3, ADAMS Accession No. ML080370295.
9. Regulatory Guide 1.174, Revision 1, ADAMS Accession No. ML023240437.
10. PWR Owners Group Letter OG-06-356, ADAMS Accession No. ML082210245.
11. PWR Owners Group OG-09-454, ADAMS Accession No. ML093370133.
12. WCAP-16168-NP-A, Revision 2, ADAMS Accession No. ML082820046.
13. Title 10 of the *Code of Federal Regulations*, Part 50, Section 50.61a.

14. Letter from NRC to Progress Energy, March 7, 2011, ADAMS Accession No. ML110660469.

Principal Contributor: Patrick Purtscher

Date: July 22, 2011

R. Duncan

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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.

If you have any questions or concerns, please contact the Project Manager, Brenda Mozafari, at 301-415-2020.

Sincerely,

/RA by TOrf for/

Douglas A. Broaddus, Chief
Plant Licensing Branch II-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-261

Enclosure: Safety Evaluation

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