



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

April 8, 2010

Chris L. Burton, Vice President
Shearon Harris Nuclear Power Plant
Carolina Power & Light Company
Post Office Box 165, Mail Zone 1
New Hill, North Carolina 27562-0165

SUBJECT: SHEARON HARRIS NUCLEAR POWER PLANT, UNIT 1 – REQUEST FOR RELIEF 2R1-018 FOR THE SECOND 10-YEAR INTERVAL INSERVICE INSPECTION PROGRAM PLAN (TAC NO. ME0608)

Dear Mr. Burton:

By letter dated February 5, 2009, as supplemented by letters dated September 24, 2009, and February 11, 2010, Carolina Power & Light Company (the licensee), now doing business as Progress Energy Carolinas, Inc., submitted Relief Request (RR) 2R1-018 for the second 10-year inservice inspection (ISI) interval at the Shearon Harris Nuclear Power Plant, Unit 1 (HNP), which was in effect from February 2, 1998, through and including May 1, 2008.

The licensee requested relief in accordance with Title 10 of the *Code of Federal Regulations* (10 CFR), 50.55a(g)(5)(iii) from applicable requirements of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code), Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components," related to inspection of welds with limited volumetric coverage in ASME Code examination Category B-F. Specifically, RR 2R1-018 pertains to the volumetric examination of three pressure retaining reactor vessel inlet nozzle dissimilar metal butt welds in the reactor coolant system.

Based on the information provided in RR 2R1-018, the U.S. Nuclear Regulatory Commission (NRC) staff concluded that it is impractical for the licensee to comply with the applicable ASME Code requirements, and that imposing these requirements would be a burden on the licensee. The NRC staff also finds that the licensee's proposed alternative continues to provide reasonable assurance of structural integrity and is, therefore, acceptable.

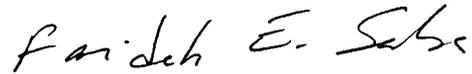
Therefore, pursuant to 10 CFR 50.55a(g)(6)(i), the NRC grants the ISI program alternative proposed in RR 2R1-018 for the second 10-year ISI interval at HNP, on the basis that it is authorized by law and will not endanger life or property or the common defense and security, and is otherwise in the public interest giving due consideration to the burden upon the licensee that could result if the requirements were imposed on the facility.

C. Burton

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The NRC staff's safety evaluation is enclosed. If you have any questions regarding this matter, please contact Marlayna Vaaler at (301) 415-3178.

Sincerely,



for

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

Docket No. 50-400

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
RELIEF REQUEST 2R1-018 ON FINAL DOCUMENTATION FOR THE SECOND 10-YEAR
INSERVICE INSPECTION PROGRAM REGARDING LIMITED COVERAGE
OF WELDS IN EXAMINATION CATEGORY B-F
SHEARON HARRIS NUCLEAR POWER PLANT, UNIT 1
CAROLINA POWER & LIGHT COMPANY
DOCKET NO. 50-400

1.0 INTRODUCTION

By letter dated February 5, 2009 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML090540055), as supplemented by letters dated September 24, 2009 (ADAMS Accession No. ML092740063), and February 11, 2010 (ADAMS Accession No. ML100490061), Carolina Power & Light Company (the licensee), now doing business as Progress Energy Carolinas, Inc., submitted Relief Request (RR) 2R1-018 for the Shearon Harris Nuclear Power Plant, Unit 1 (HNP). The proposed RR is for the second 10-year inservice inspection (ISI) interval, in which the licensee adopted the 1989 Edition of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code), Section XI, No Addenda, as the Code of Record. The second 10-year ISI interval at HNP was in effect from February 2, 1998, through and including May 1, 2008.

The proposed RR requests relief in accordance with Title 10 of the *Code of Regulations*, (10 CFR) 50.55a(g)(5)(iii) from applicable requirements of the ASME Code, Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components," related to inspection of welds with limited volumetric coverage in ASME Code examination Category B-F. The ASME Code requires that 100 percent of the examination volumes and surface areas described in ASME Code, Section XI, Table IWB-2500-1, "Examination Categories," be inspected during each ISI interval. Specifically, RR 2R1-018 pertains to the volumetric examination of three pressure retaining reactor vessel (RV) inlet nozzle dissimilar metal (DM) butt welds in the reactor coolant system (RCS).

The licensee stated that inspection of 100 percent of the ASME Code-required weld volumes are impractical to obtain at HNP. The regulation in 10 CFR 50.55a(g)(5)(iii) states that if the licensee determines that conformance with ASME Code requirements is impractical at the facility, the licensee shall submit information to support this determination as specified in 10 CFR 50.4. The U.S. Nuclear Regulatory Commission (the Commission, NRC) will evaluate such requests based on impracticality, and may impose alternatives, giving due consideration to public health and safety, as well as the burden imposed on the licensee.

Enclosure

2.0 REGULATORY REQUIREMENTS

Inservice inspection of ASME Code Class 1, 2, and 3 components is to be performed in accordance with Section XI of the ASME Code, and applicable addenda, as required by 10 CFR 50.55a(g), except where specific relief has been granted by the NRC pursuant to 10 CFR 50.55a(g)(6)(i). The regulation in 10 CFR 50.55a(g)(6)(i) states that the Commission may grant such relief and may impose such alternative requirements as it determines is authorized by law and will not endanger life or property or the common defense and security and is otherwise in the public interest, given consideration of the burden upon the licensee. The regulations in 10 CFR 50.55a(a)(3) state that alternatives to the requirements of paragraph (g) may be used, when authorized by the NRC, if the licensee demonstrates that (i) the proposed alternatives would provide an acceptable level of quality and safety, or (ii) compliance with the specified requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

Pursuant to 10 CFR 50.55a(g)(4), ASME Code Class 1, 2, and 3 components (including supports) shall meet the requirements, except the design and access provisions and the 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. The regulations require that inservice examination of components and system pressure tests conducted during the first 10-year ISI interval and subsequent intervals comply with the requirements in the latest edition and addenda of Section XI of the ASME Code, which was incorporated by reference into 10 CFR 50.55a(b), 12 months prior to the start of the 120-month interval, subject to the limitations and modifications listed therein. The ASME Code of Record for the HNP second 10-year ISI interval, which ended on May 1, 2008, is the 1989 Edition of Section XI of the ASME Boiler and Pressure Vessel Code, with No Addenda.

The information provided by the licensee in support of the request for relief from the ASME Code requirements listed above has been evaluated by the NRC staff. The bases for disposition and continued compliance with the regulatory requirements are documented below.

3.0 TECHNICAL EVALUATION

3.1 Applicable ASME Code Edition and Addenda

The 1989 Edition with no Addenda of the ASME Code, Section XI, is the code of record for the second 10-year ISI program at HNP. In addition, the volumetric examinations are to be conducted in accordance with Appendix VIII, Supplement 2 of the 1989 Edition with no Addenda of the ASME Code, Section XI. Relief is requested for the second 10-year ISI interval at HNP, which began on February 2, 1998, and ended on May 1, 2008.

3.2 ASME Code Components Affected

ASME Code Class:	Class 1
Plant System:	Reactor Coolant System
Examination Category:	B-F
ASME Code Component:	Pressure Retaining Dissimilar Metal Welds
ASME Code Item No.:	B5.130

The three elbow to RV inlet nozzle DM butt welds for which relief is requested are as follows:

Weld Description	Component ID No.	Component Material
Elbow to RV Inlet Nozzle DM Butt Weld at 95°	RVNOZCI-N-05SE	Stainless Steel / Carbon Steel, Alloy 82/182
Elbow to RV Inlet Nozzle DM Butt Weld at 215°	RVNOZBI-N-03SE	Stainless Steel / Carbon Steel, Alloy 82/182
Elbow to RV Inlet Nozzle DM Butt Weld at 335°	RVNOZAI-N-01SE	Stainless Steel / Carbon Steel, Alloy 82/182

3.3 Applicable ASME Code Requirement

The ASME Code, Section XI, Examination Category B-F, Item Number B5.130, requires 100 percent coverage of examination volumes C-D-E-F as defined by ASME Code, Section XI, Figure IWB-2500-8. HNP has adopted ASME Code Case N-460, "Alternative Examination Coverage for Class 1 and Class 2 Welds," which is applicable when the entire examination volume or area cannot be inspected due to interference by another component or part geometry. Under such circumstances, ASME Code Case N-460 allows for a reduction in examination coverage on any Class 1 or Class 2 weld, provided the reduction in coverage for that weld is less than 10 percent. ASME Code Case N-460 has been approved for use by the NRC in Regulatory Guide 1.147, "Inservice Inspection Code Case Acceptability, ASME Section XI, Division 1," Revision 15.

3.4 Impracticality and/or Burden Caused by ASME Code Compliance

Relief is requested from the requirement to examine 100 percent of the required volume as specified in the ASME Code, Section XI. As stated by the licensee, the subject welds are inaccessible for inspection due to physical obstructions and geometric surface conditions (specifically, inner diameter surface counter-bore and root configuration), which restricts access to the complete examination area and results in an impracticality to have the ability to perform 100 percent volumetric examination on these welds. Design modifications to the RV or the replacement of components would be required to gain access as a means of obtaining additional coverage to meet the ASME Code, Section XI, Table IWB-2500-1, examination coverage requirements. The licensee stated that this type of change would be difficult due to the cramped operating space and the personnel exposure to residual radiation required. Therefore, based on the location inaccessibility and the potential for radiation exposure, meeting the 100 percent volumetric inspection requirement would be an undue burden.

Weld RVNOZCI-N-05SE (Elbow to RV Inlet Nozzle DM Butt Weld at 95 Degrees)

The licensee stated that during ultrasonic testing (UT) of Weld RVNOZCI-N-05SE from the inside diameter (ID) surface, 84.58 percent coverage of the ASME Code required examination volume was obtained. The coverage reported represents the aggregate coverage of all scans performed, including the 69.15 percent coverage obtained from a 70-degree refracted longitudinal (RL) wave circumferential scan of the weld in the clockwise and counterclockwise directions and the 100 percent coverage obtained from a 70-degree RL wave axial scan of the

weld from the elbow and nozzle sides. The licensee stated that limitations due to elbow to nozzle weld ID counter-bore and root configuration prevented achieving full examination coverage of the required volume. In order to scan all of the ASME Code-required volume for Weld RVNOZCI-N-05SE, modifications to the design of the RV nozzle would be needed, which is impractical. To supplement UT, the licensee circumferentially and axially scanned the weld areas with coverage limitations from the ID surface using eddy current testing (ECT), which is effective in detecting surface breaking flaws, and 100 percent coverage was achieved. In the volume and the area covered by UT and ECT, respectively, no indications were reported by the licensee in weld RVNOZCI-N-05SE.

Weld RVNOZBI-N-03SE (Elbow to RV Inlet Nozzle DM Butt Weld at 215 Degrees)

During the UT examinations of Weld RVNOZBI-N-03SE from the ID surface, the licensee obtained 88.34 percent coverage of the ASME Code required examination volume. The coverage reported represents the aggregate coverage of all scans performed, including the 76.67 percent coverage obtained from a 70-degree RL wave circumferential scan of the weld in the clockwise and counterclockwise directions and the 100 percent coverage obtained from a 70-degree RL wave axial scan of the weld from the elbow and nozzle sides. Limitations due to elbow to nozzle weld ID counter-bore and root configuration prevented achieving full examination coverage of the required volume. The licensee stated that in order to scan all of the ASME Code required volume for Weld RVNOZBI-N-03SE, modifications to the design of the RV nozzle would be needed, which is impractical. To supplement UT, the licensee circumferentially and axially scanned the weld areas with coverage limitations from the ID surface using ECT, which is effective in detecting surface breaking flaws, and 100 percent coverage was achieved. In the volume and the area covered by UT and ECT, respectively, no indications were reported by the licensee in weld RVNOZBI-N-03SE.

Weld RVNOZAI-N-01SE (Elbow to RV Inlet Nozzle DM Butt Weld at 335 Degrees)

The licensee stated that during UT of Weld RVNOZAI-N-01SE from the ID surface, 85.15 percent coverage of the ASME Code required examination volume was obtained. The coverage reported represents the aggregate coverage of all scans performed, including the 70.29 percent coverage obtained from a 70-degree RL wave circumferential scan of the weld in the clockwise and counterclockwise directions and the 100 percent coverage obtained from a 70-degree RL wave axial scan of the weld from the elbow and nozzle sides. The licensee stated that limitations due to elbow to nozzle weld ID counter-bore and root configuration prevented achieving full examination coverage of the required volume. In order to scan all of the ASME Code required volume for Weld RVNOZAI-N-01SE, modifications to the design of the RV nozzle would be needed, which is impractical. To supplement UT, the licensee circumferentially and axially scanned the weld areas with coverage limitations from the ID surface using ECT, which is effective in detecting surface breaking flaws, and 100 percent coverage was achieved. In the volume and the area covered by UT and ECT, respectively, no indications were reported by the licensee in weld RVNOZAI-N-01SE.

3.5 Proposed Alternative Examinations

The licensee stated that the subject welds (i.e., RVNOZCI-N-05SE, RVNOZBI-N-03SE, and RVNOZAI-N-01SE) were examined to the maximum extent possible using UT methods, in

accordance with the HNP ISI program schedule. The UT examinations achieved between 84 percent and 88 percent coverage of the ASME Code required examination volume for each weld. To supplement UT, the areas with examination coverage limitations for each weld were fully inspected from the wetted surface using ECT surface examinations, and 100 percent coverage was obtained. The ECT results showed no evidence of any surface breaking flaws or the onset of primary water stress corrosion cracking (PWSCC). The licensee further stated that the combination of UT and ECT examinations provides assurance that the proposed alternative would have detected any existing patterns of degradation in the subject welds, thus ensuring that the proposed alternative provides an acceptable level of quality and safety.

The licensee also stated that in addition to the UT and ECT examinations, VT-2 visual examinations are performed in conjunction with the system leakage tests for the subject welds during each refueling outage. VT-2 would detect any leakage prior to gross piping failure.

3.6 Justification for Granting Relief

The licensee stated that the UT examinations of the subject welds (i.e., RVNOZCI-N-05SE, RVNOZBI-N-03SE, and RVNOZAI-N-01SE) were performed using personnel, equipment, and procedures qualified to the ASME Code, Section XI, Appendix VIII, as administered by the Electric Power Research Institute Performance Demonstration Initiative.

To supplement the UT examinations, the areas with examination coverage limitations in these welds were fully scanned by ECT, which is effective in detecting surface breaking flaws. In addition, VT-2 visual examinations were performed in conjunction with the system leakage test during each refueling outage to assure that any leakage would be detected prior to gross piping failure. Thus, the licensee stated that the combination of UT and ECT examinations further validate that the proposed alternative provides an acceptable level of quality and safety, since these completed examinations would have detected any existing patterns of degradation.

3.7 Duration of Relief

RR 2R1-018 was submitted for NRC approval for the second 10-year ISI interval at HNP, which began on February 2, 1998, and was in effect through and including May 1, 2008.

3.8 NRC Staff Evaluation

The NRC staff has evaluated the information provided by the licensee in RR 2R1-018, as supplemented by letters in response to the staff's request for additional information dated September 24, 2009, and February 11, 2010. The licensee requested relief from the 100 percent volumetric coverage requirement for weld examinations as specified in the ASME Code, Section XI, for three elbow to RV inlet nozzle DM butt welds at HNP with Alloy 82/182 weld materials susceptible to PWSCC.

ASME Code Case N-460, which has been approved for use by the NRC in Regulatory Guide 1.147, Revision 15, allows credit for full volume or surface coverage of welds if it can be shown that greater than 90 percent of the required volume or surface area has been examined.

The NRC staff has verified that the licensee's best effort UT volumetric examinations achieved volumetric coverage of 84.58 percent for the RVNOZCI-N-05SE weld, 88.34 percent for the RVNOZBI-N-03SE weld, and 85.15 percent for the RVNOZAI-N-01SE weld. Each weld was scanned in the axial direction from both the elbow and nozzle sides, and in the circumferential direction from both the clockwise and counterclockwise directions. The percentage of volumetric coverage represents the aggregate coverage from both the axial directions and the circumferential directions. No indications were identified by the licensee during the volumetric examinations of these welds.

The NRC staff has determined that the UT volumetric examination coverage was reduced due to geometrical limitations from ID surface counter-bore and root configuration. The geometrical configuration causes limited accessibility to the welds, which restricts the licensee from meeting the ASME Code examination coverage requirements. In order for the licensee to achieve the ASME Code required volumetric examination coverage, the RV would require design modifications that would also necessitate personnel radiation exposure. The NRC staff finds that design modifications to the RV nozzle welds in order to achieve the ASME Code required examination coverage are impractical and would impose an undue burden on the licensee.

As a supplement to the required volumetric examinations, the licensee also performed surface examinations of the subject welds from the wetted surface using ECT. The ECT examinations were only performed on the weld areas not fully examined by UT. No surface breaking flaws or indications of PWSCC onset were reported by the licensee in the weld areas examined by ECT. The NRC staff finds the licensee's supplemental ECT examinations and the results acceptable.

The licensee performed required visual (VT-2) examinations in conjunction with the system leakage test during each refueling outage of the second 10-year ISI interval at HNP. The VT-2 examinations ensure that any leakage will be detected prior to gross piping failure. No leakage was reported by the licensee. The staff finds the results of the VT-2 examinations acceptable.

Therefore, the NRC staff has determined that the licensee's limited volumetric examinations of the subject welds, as supplemented by ECT examinations in the weld areas not examined volumetrically, in addition to completion of the required VT-2 examinations, provide reasonable assurance of structural integrity. In order to meet the ASME Code requirements for volumetric examination coverage, the components would have to be redesigned, fabricated, and installed in the systems, which would impose a burden on the licensee. In addition, based on the access limitations, it is impractical for the licensee to meet the ASME Code coverage requirements.

4.0 CONCLUSION

The staff has reviewed the licensee's submittals and concludes that ASME Code examination coverage requirements are impractical for the subject welds listed in RR 2R1-018 due to geometrical limitations. Furthermore, imposition of these ASME Code requirements would necessitate that the components be redesigned, which would impose a significant burden on the licensee. The staff determined that based on the volumetric coverage obtained during inspection of the subject welds, as supplemented by additional ECT examinations performed by the licensee, it is reasonable to conclude that if significant service induced degradation had occurred, evidence of it would have been detected by the examinations that were performed. In

addition, the staff concluded that the examinations, as performed to the extent practical, provide reasonable assurance of the structural integrity of the subject welds.

Accordingly, the NRC staff concludes that the licensee has adequately addressed all of the regulatory requirements set forth in 10 CFR 50.55a(g)(6)(i), and will remain in compliance with the requirements of 10 CFR 50.55a subsequent to the granting of this relief. Therefore, the NRC grants relief for the subject examinations of the welds contained in RR 2R1-018 for the second 10-year ISI interval at the Shearon Harris Nuclear Plant, Unit 1.

The staff has further determined that granting RR 2R1-018 pursuant to 10 CFR 50.55a(g)(6)(i) is authorized by law and will not endanger life or property, or the common defense and security, and is otherwise in the public interest given due consideration to the burden upon the licensee that could result if the requirements were imposed on the facility.

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

Principal Contributor: Ali Rezai, NRC

Date: April 8, 2010

C. Burton

- 2 -

The NRC staff's safety evaluation is enclosed. If you have any questions regarding this matter, please contact Marlayna Vaaler at (301) 415-3178.

Sincerely,

/RA by FSaba for/

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

Docket No. 50-400

Enclosure: Safety Evaluation

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* By memo

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