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

April 20, 2011

Mr. Christopher 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 – RELIEF REQUEST I3R-08, TEMPORARY NON-CODE REPAIR OF SERVICE WATER SUPPLY SYSTEM PIPING (TAC NO. ME4750)

Dear Mr. Burton:

By letter dated September 24, 2010 (Agencywide Documents Access and Management System (ADAMS) Accession Number ML102740038), as supplemented by letter dated January 27, 2011, (ADAMS Accession No. ML110340192), Carolina Power & Light Company submitted Relief Request I3R-08, "Request for Relief for Temporary Non-Code Repair of Service Water Return Piping Line in Accordance with 10 CFR [Title 10 of the *Code of Federal Regulations*] 50.55a(g)(5)(iii)," for the use of an alternative to the requirements of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code), Section XI, at Shearon Harris Nuclear Power Plant, Unit 1.

The NRC staff notes that impracticality for the purpose of Generic Letter (GL) 90-05, "Guidance For Performing Temporary Non-Code Repair Of ASME Code Class 1, 2, and 3 Piping," is defined to exist if the flaw detected during plant operation is in a section of Class 3 piping that cannot be isolated for completing ASME Code repair within the time period permitted by the limiting condition for operation of the affected system as specified in the plant's technical specifications, and performance of an ASME Code repair necessitates a plant shutdown. However, the staff's position is that shutting down the plant to perform a mid-cycle repair is not an impracticality but a hardship. Therefore, the NRC staff has evaluated the licensee's proposed alternatives per the evaluation considerations of GL 90-05 pursuant to 10 CFR 50.55a(a)(3)(ii), hardship or unusual difficulty without a compensating increase in the level of quality or safety.

The NRC staff concludes that the licensee has adequately addressed all of the regulatory requirements set forth in 10 CFR 50.55a(3)(ii). Therefore, the NRC authorizes the licensee's proposed alternative at Shearon Harris Nuclear Power Plant, Unit 1, no later than refueling outage, RFO-16, which began in October 2010.

The NRC staff's safety evaluation is enclosed. If you have any questions regarding this matter, please contact Brenda Mozafari at (301) 415-2020.

Sincerely,

Eric J. Leeds for

Douglas A. Broaddus, 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

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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

REQUEST FOR RELIEF NO. I3R-08

TEMPORARY NON-CODE REPAIR OF SERVICE WATER SUPPLY SYSTEM PIPING

SHEARON HARRIS NUCLEAR POWER PLANT, UNIT 1

CAROLINA POWER & LIGHT COMPANY

DOCKET NO. 50-400

1.0 INTRODUCTION

By letter dated September 24, 2010 (Agencywide Documents Access and Management System (ADAMS) Accession Number ML102740038), Carolina Power & Light Company (the licensee), now doing business as Progress Energy, submitted Request I3R-08, "Request for Relief for Temporary Non-Code Repair of Service Water Return Piping Line in Accordance with 10 CFR 50.55a(g)(5)(iii)," for the use of an alternative to the requirements of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code), Section XI, at Shearon Harris Nuclear Power Plant, Unit No. 1 (HNP).

Specifically, the licensee proposed to defer permanent ASME Code repair of a degraded Class 3 service water piping socket weld at HNP until adequate time is available for the repair, but no later than the next scheduled refueling outage. The licensee's letter dated January 27, 2011, confirmed that the code repair was completed on October 12, 2010. The licensee requested relief because the proposed temporary non-code repair deviates from the requirements of the ASME Code, Section XI, 2001 Edition with addenda through 2003.

2.0 REGULATORY REQUIREMENTS

Pursuant to Title 10 of the *Code of Federal Regulations* (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, "Rules for Inservice Inspection of Nuclear Power Plant Components," 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 inspection interval and subsequent 10-year inspection intervals 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), 12 months prior to the start of the 120-month inspection interval, subject to the limitations and modifications listed therein.

Paragraph (a)(3) of 10 CFR 50.55a states that alternatives to the requirements of 10 CFR 50.55a(g) may be used, when authorized by the NRC, if (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.

The Code of Record for the third 10-year inservice inspection (ISI) interval at HNP, ending May 1, 2018, is the ASME Code, Section XI, 2001 Edition through the 2003 Addenda.

3.0 TECHNICAL EVALUATION

3.1 Affected Systems and Components

Sockolet and sockolet-to-pipe weld on line 3SW1-114SA-1, a 1-inch carbon steel supply line to root valve ISW-62 and a downstream pressure transmitter connection point off the "A" train emergency service water (ESW) return piping from the "A" component cooling water heat exchanger.

3.2 Applicable ASME Code Requirements

ASME Code, Section XI, paragraph IWA-4410 states that welding, brazing, defect removal, metal removal by thermal methods, and installation shall be performed in accordance with the requirements of this Subarticle.

3.3 Basis for Request

The licensee states that code-compliant repair of the defect requires header depressurization, and that the section of piping containing the flaw cannot be isolated from the system and depressurized without a plant shutdown. Freeze sealing of the line is an alternative method to temporarily isolate the line. However, it is unlikely that this method can be executed to allow completion of the repair within the 72-hour technical specifications (TS) limiting condition for operation (LCO) time window associated with the ESW system. Because there is little confidence that the affected section of piping can be isolated for the completion of a code repair within the time period permitted by the above TS, impracticality exists in accordance with Generic Letter (GL) 90-05, "Guidance For Performing Temporary Non-Code Repair Of ASME Code Class 1, 2, and 3 Piping," definition.

In order to comply with ASME Code requirements and the applicable LCO, the plant would need to be shutdown to perform the repair. As noted in GL 90-05: "The rather frequent instances of small leaks in some Class 3 systems, such as service water systems, could lead to an excessive number of plant start-up and shutdown cycles with undue and unnecessary stress on facility systems and components if the facilities were to perform a code repair when the leakage is identified."

The licensee states that an evaluation performed in accordance with the GL 90-05 "Through-Wall Flaw Approach," demonstrates that the leak does not present an operability concern for the structural integrity of the 1-inch supply line 3SW1-114SA-1 for all modes of operation and that the identified pinhole leak does not prevent the ESW system from performing

its safety function to provide cooling water and remove heat from essential plant heat loads associated with reactor auxiliary components during emergency operation.

3.4 Proposed Alternative to ASME Code Requirements

In accordance with the guidelines of GL 90-05, the licensee is proposing to defer repair of the identified flaw, leaving the piping "as-is" until the next outage exceeding 30 days, which is expected to be the next refueling outage, RFO-16, scheduled to begin in October 2010.

4.0 NRC STAFF EVALUATION

The NRC staff notes that impracticality for the purpose of GL 90-05 is defined to exist if the flaw detected during plant operation is in a section of Class 3 piping that cannot be isolated for completing ASME Code repair within the time period permitted by the LCO of the affected system as specified in the plant TS, and performance of ASME Code repair necessitates a plant shutdown. However, the NRC staff position is that shutting down the plant to perform mid-cycle repair is not impractical, but is a hardship. Therefore, the NRC staff has evaluated the licensee's proposed alternatives per the evaluation considerations of GL 90-05 pursuant to 10 CFR 50.55a(a)(3)(ii), hardship or unusual difficulty without a compensating increase in the level of quality or safety.

The piping system under consideration is carbon steel, moderate energy (design pressure of 150 pounds per square inch gauge (psig) and design temperature of 140 degrees Fahrenheit) and is Code Class 3. The flaw is believed to have originated on the inner diameter of the affected piping and was identified on August, 8, 2010, during operator rounds while the plant was in Mode 1 at 100 percent power. The defect therefore fulfills the requirements for the use of the provisions of GL 90-05.

GL 90-05 provides the NRC staff evaluation guidelines for authorizing temporary non-code repairs of moderate energy Class 3 piping, as follows:

1) Flaw detection during plant operation and impracticality determination
2) Root cause determination and flaw characterization
3) Flaw evaluation
4) Augmented inspection

The licensee's relief request will be compared to each of the GL 90-05 evaluation guidelines in turn.

The licensee states that the flaw was identified on August 8, 2010, during operator rounds while the plant was in Mode 1 at 100 percent power. The licensee has evaluated the conditions that are necessary for performing a code-compliant repair and has concluded that there is little confidence that the affected section of piping can be isolated by freeze sealing for the completion of a code repair within the 72-hour time period permitted by the above TS without plant shutdown. The NRC staff concurs with the licensee that it is unlikely that a code-compliant repair can be performed within the 72-hour time period permitted by the TS and finds that the flaw detection during plant operation and finds that mid-cycle shutdown to permit a

code-compliant repair would constitute a hardship. Therefore, the NRC staff finds that the first guideline of GL 90-05 is satisfied.

The licensee states that ultrasonic thickness measurements show that the areas surrounding the pinhole are near nominal thickness and that the thickness values of the sockolet vary, but are all greater than 0.200 inches. In addition, the thickness readings for the 1-inch piping adjacent to the sockolet are near nominal thickness and no areas of generalized thinning were identified. The licensee notes that a walkdown of line 3SW1-114SA-1 with the "A" component cooling water heat exchanger in service and normal service water supplying "A" ESW revealed little to no vibration present on the line (i.e., could not be felt by touch) and concludes, based on the lack of vibration and the presence of large adjacent structural supports, that vibration induced fatigue is not a concern. The licensee concludes, on the basis of the leak location and the localized nature of the defect, that a crevice formed on the inside diameter of the weld area and that localized corrosion similar to pitting corrosion resulted in the pinhole leak. The staff concurs with the licensee's evaluation that the exact cause of the weld defect which resulted in leakage cannot be determined without a destructive examination of the weld, and finds that the licensee's reasoning and ultrasonic testing (UT) results support the conclusion that the leak resulted from a crevice corrosion mechanism that is similar to pitting. Therefore, the NRC staff finds that the licensee has satisfied the GL 90-05 requirements for root cause determination and flaw characterization.

The licensee has performed a "through-wall" flaw evaluation per GL 90-05 to evaluate the structural integrity of ESW line 3SW1-114SA-1. A flaw length, 2a (the diameter of the pinhole), was conservatively estimated to be 0.100 inches. Since a flaw of this dimension would have produced a visible, steady leakage rate at the 80 psig operating pressure of the ESW line and only moisture accumulation is seen, the NRC staff finds that the assumed flaw length of 0.100 inches is conservative, thus acceptable. The assumed 2a value is less than the flaw size limits placed by GL 90-05 of 3 inches and 15 percent of the pipe circumference (which the NRC calculated and confirmed to be 4.12 in). Therefore, the "through-wall flaw" approach of GL 90-05 can be used in assessing structural integrity. The licensee stated that the "through-wall flaw" evaluation yielded a stress intensity "K" value of 3.352 $ksi(in)^{0.5}$, a value significantly less than the limiting value of 35 $ksi(in)^{0.5}$ allowed in GL 90-05. The NRC staff reviewed the licensee's analysis and finds that the GL 90-05 criterion for flaw evaluation has been fulfilled, and that the leak does not present a structural integrity concern.

Generic Letter 90-05 provides augmented inspection provisions. The licensee states that augmented UT inspections of the heat affected zone of five root valves on 1-inch carbon steel Class 3 service water piping with design temperature and pressure equal to that of the line containing the flaw under evaluation has been performed. The results of these measurements show that the no significant thinning was identified at any location. The licensee has instituted walkdown inspections of the leakage from the flaw to be completed at least weekly, and code-compliant repair is scheduled to be completed no later than the next refueling outage, RFO-16, which began in October 2010. Since the scheduled repair was completed within 90 days of the discovery of the leak, no further UT measurements need to be made. The licensee confirmed by letter dated January 27, 2011, that the code repair was completed on October 12, 2010. The staff concludes that the augmented inspection provisions of GL 90-05 have been met.

The licensee has evaluated the potential flooding, water spray on other equipment and significant loss of flow consequences of failure of the non-code repair and concludes that these conditions are not of concern. The NRC staff reviewed the licensee's discussion on these conditions provided in accordance GL 90-05 and concurs that the leak does not represent an operability concern for the structural integrity of the 1-inch supply line. Operability and functionality of the system were maintained and deferring code repair of the flaw until the outage did not affect the health and safety of the public.

5.0 REGULATORY COMMITMENTS

The licensee has committed to perform the following actions:

1) Perform weekly inspection of location to detect changes in size or leakage of weld until code repair is performed in refueling outage, RFO-16.

2) Replace temporary non-code repair of defect on line 3SW1-114SA-1 with a permanent repair in refueling outage, RFO-16.

The staff finds these commitments satisfactory.

The licensee in its letter dated January 27, 2011, confirmed that it has completed regulatory commitment items 1 and 2. The licensee completed the repair of the subject piping in accordance with the ASME Code, Section XI in RFO-16, per the guidance of GL 95-05.

6.0 CONCLUSION

As set forth above, the NRC staff finds that requiring the licensee to complete a code-compliant repair within the 72-hour TS LCO would result in hardship without a compensating increase in the level of quality or safety, and that licensee's proposed alternative meets the evaluation guidelines found in GL 90-05. Furthermore, the NRC staff concludes that the proposed alternative provides reasonable assurance of structural integrity during the interim period. Accordingly, the NRC staff concludes that the licensee has adequately addressed all of the regulatory requirements set forth in 10 CFR 50.55a(3)(ii). Therefore, the NRC staff authorizes the licensee's proposed alternative at Shearon Harris Nuclear Power Plant, Unit 1, until refueling outage, RFO-16, which began in October 2010.

All other requirements for which relief was not specifically requested and authorized remain applicable, including third-party review by the Authorized Nuclear Inservice Inspector.

Principal Contributor: Jay S. Wallace

Date: April 20, 2011

The NRC staff's safety evaluation is enclosed. If you have any questions regarding this matter, please contact Brenda Mozafari at (301) 415-2020.

Sincerely,

/RA by SLingam for/

Douglas A. Broaddus, 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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