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

January 15, 2009

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 – RELIEF REQUEST 3R-03 FOR THE THIRD 10-YEAR INSERVICE INSPECTION INTERVAL REGARDING THE SYSTEM PRESSURE TEST (TAC NO. MD8743)

Dear Mr. Burton:

By letter dated April 29, 2008, Carolina Power and Light Company (the licensee), now doing business as Progress Energy Carolinas, Inc., submitted Relief Request (RR) I3R-03, pertaining to the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code), Section XI requirement on system pressure testing for the third 10-year inservice inspection (ISI) interval at the Shearon Harris Nuclear Power Plant, Unit 1.

In RR I3R-03, the licensee requested relief from performing the system pressure test of the Reactor Vessel Head Flange Seal Leak Detection Piping at the ASME Code-required test pressure corresponding to nominal operating pressure during system operation.

Based on the information provided in RR I3R-03, the U.S. Nuclear Regulatory Commission (NRC) staff concluded that compliance with the ASME Code requirement in regard to the test pressure is impractical.

Therefore, pursuant to Title 10 of the *Code of Federal Regulations*, Part 50.55a(g)(6)(i), the NRC authorizes the ISI program alternatives proposed in RR I3R-03 for the third 10-year ISI interval at the Shearon Harris Nuclear Power Plant, Unit 1.

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,

Thomas H. Boyce, 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

THIRD 10-YEAR INSERVICE INSPECTION INTERVAL

RELIEF REQUEST I3R-03 REGARDING SYSTEM PRESSURE TESTING

SHEARON HARRIS NUCLEAR POWER PLANT, UNIT 1

CAROLINA POWER & LIGHT COMPANY

DOCKET NO. 50-400

1.0 INTRODUCTION

By letter dated April 29, 2008, Carolina Power and Light Company (the licensee), now doing business as Progress Energy Carolinas, Inc., submitted Relief Request (RR) I3R-03, pertaining to the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code), Section XI requirement on system pressure testing for the third 10-year inservice inspection (ISI) interval at the Shearon Harris Nuclear Power Plant, Unit 1.

In RR I3R-03, the licensee requested relief from performing the system pressure test of the Reactor Vessel Head Flange Seal Leak Detection Piping at the ASME Code-required test pressure corresponding to nominal operating pressure during system operation. The licensee stated that the configuration of the leak detection piping precludes implementing the ASME Code-required pressure test either with the vessel head installed or while removed.

The U.S. Nuclear Regulatory Commission (NRC) staff evaluated the licensee's proposed alternative pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50.55a(g)(6)(i), in order to determine that compliance with the ASME Code requirement in regard to the test pressure for system pressure testing of the Reactor Vessel Head Flange Seal Leak Detection Piping is impractical.

2.0 REGULATORY REQUIREMENTS

The requirements of 10 CFR 50.55a(g) specify that inservice inspection of ASME Code Class 1, 2, and 3 components be performed in accordance with Section XI of the ASME Code and applicable addenda, except where specific written relief has been granted by the NRC pursuant to 10 CFR 50.55a(g)(6)(i). 10 CFR 50.55a(g)(5)(iii) states that "if the licensee has determined that conformance with certain code requirements is impractical for its facility, the licensee shall notify the Commission and submit, as specified in 10 CFR 50.4, information to support the determination." The requirements of 10 CFR 50.55a(g)(6)(i) allow the Commission to evaluate determinations that code requirements are impractical. 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 giving due consideration to the burden upon the licensee that could result if the requirements were imposed on the facility.

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, "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 ISI of components and system pressure tests conducted during the first 10-year interval and subsequent 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 interval, subject to the limitations and modifications listed therein. The ISI Code of Record for the third 10-year inservice inspection interval at the Shearon Harris Nuclear Power Plant, Unit 1 is the 2001 Edition of the ASME Code, Section XI through the 2003 Addenda.

3.0 TECHNICAL EVALUATION

3.1 System/Component(s) for Which Relief is Requested

Reactor Vessel Head Flange Seal Leak Detection Piping

3.2 ASME Code Requirements

Table IWC-2500-1, Examination Category C-H, Item Number C7.10, requires that all Class 2 pressure retaining components be subject to a system leakage test with a VT-2 visual examination once per inspection period (40 months) in accordance with IWC-5220. The system leakage test shall be conducted at the system pressure obtained while the system, or portion of the system, is in service performing its normal operating function.

3.3 Licensee's Request for Relief

Relief is requested from performing the system leakage test at a pressure corresponding to the nominal operating pressure during system operation. The licensee proposed an alternative pressure testing requirement in lieu of the system leakage test required under IWC-5221 for the Reactor Vessel Head Flange Seal Leak Detection Piping.

3.4 Licensee's Basis for Requesting Relief

According to the licensee's application, the Reactor Vessel Head Flange Seal Leak Detection Piping is separated from the reactor pressure boundary by one passive membrane that is an O-ring located on the vessel flange. A second O-ring is located on the opposite side of the tap in the vessel flange. This piping is required during plant operation in order to indicate failure of the inner flange seal O-ring. Failure of the inner O-ring would result in annunciation of a high pressure alarm in the control room. Failure of the inner O-ring is the only condition under which this line would be pressurized.

The configuration of this piping precludes system pressure testing while the vessel head is removed because the configuration of the vessel tap, coupled with the high test pressure requirement (approximately 1045 pounds per square inch gauge), prevents the tap in the flange from being temporarily plugged or connected to other piping. The opening in the flange is

smooth walled, making the effectiveness of a temporary seal very limited. Failure of this seal could possibly cause ejection of the device used for plugging or connection to the vessel.

The configuration also precludes pressure testing with the vessel head installed because the seal prevents complete filling of the piping, which has no vent available. The top head of the vessel contains two grooves that hold the O-rings. The O-rings are held in place by a series of retainer clips that are housed in recessed cavities in the flange face. If a pressure test were performed with the head on, the inner O-ring would be pressurized in a direction opposite to what it would experience in normal operation. This test pressure would result in a net inward force on the inner O-ring that would tend to push it into the recessed cavities that house the retainer clips. The thin O-ring material would very likely be damaged by this inward force.

3.5 Licensee's Proposed Alternative

A VT-2 visual examination will be performed on the Reactor Vessel Head Flange Seal Leak Detection Piping during flood-up of the refueling pool with the vessel head off during each refueling outage. The hydrostatic head developed due to the water above the vessel flange with the leak detection line filled during flood-up will allow for the detection of any gross indications in the piping. This examination will be performed during each refueling outage to meet the ASME Code requirement on the frequency of examination as specified in Table IWC-2500-1.

4.0 STAFF EVALUATION

The ASME Code, Section XI, requires that all Class 2 pressure retaining components be subject to a system leakage test with a VT-2 visual examination once per inspection period. The test pressure for the system leakage test shall correspond to the nominal operating pressure of the system. In RR I3R-03, the licensee requested relief from performing a system leakage test of the Reactor Vessel Head Flange Seal Leak Detection Piping at the ASME Code-required test pressure corresponding to the nominal operating pressure during system operation.

The piping is located between the inner and outer O-ring seals of the vessel flange and is required during plant operation in order to detect failure of the inner flange seal O-ring. The design of this line makes the ASME Code-required system leakage test impractical either with the vessel head in place or removed. During a system leakage test, the subject piping cannot be filled completely with water since, due to its configuration, there is no vent mechanism to remove entrapped air from the line either with the vessel head in place or removed.

If a pressure test was to be performed with the head in place, the space between the inner and outer O-ring seals would be pressurized. The test pressure would exert a net inward force on the inner O-ring that would tend to push it into the recessed cavities that house the retainer with the possibility of damaging the inner O-ring seal. The configuration of this piping also precludes system leakage testing while the vessel head is removed because the odd configuration of the vessel tap, coupled with the high test pressure requirement, prevents the tap in the flange from being temporarily plugged or connected to other piping. In addition, the opening in the flange is smooth walled, making the effectiveness of a temporary seal very limited. Failure of this seal could cause ejection of the device used for plugging or connection to the vessel.

In order to perform the system leakage test in accordance with the ASME Code requirements, the Reactor Vessel Head Flange Seal Leak Detection Piping would have to be redesigned,

fabricated, and installed. This would represent an impractical means of complying with the ASME standard. As an alternative to the ASME Code requirements, the licensee has proposed to perform a VT-2 visual examination of the Reactor Vessel Head Flange Seal Leak Detection Piping when the reactor cavity is flooded with water during each refueling outage. The NRC staff believes that the hydrostatic head developed due to the water above the vessel flange with the leak detection line filled during flood-up will allow for detection of any gross inservice flaws present in the subject piping, and hence, the proposed alternative testing method would continue to provide a reasonable assurance of structural integrity. Therefore, the NRC authorizes the licensee's proposed alternative in RR I3R-03.

5.0 CONCLUSION

Based on the NRC staff's evaluation, a system leakage test of the Reactor Vessel Head Flange Seal Leak Detection Piping at the ASME Code-required test pressure corresponding to the nominal operating pressure during system operation is impractical and would cause a burden on the licensee if the requirement were to be imposed. In addition, the licensee's proposed alternative continues to provide reasonable assurance of structural integrity.

Therefore, pursuant to 10 CFR 50.55a(g)(6)(i), the proposed alternative in RR I3R-03 is authorized for the third 10-year ISI interval at the Shearon Harris Nuclear Power Plant, Unit 1. The relief granted 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 requirements of the ASME Code, Section XI, for which relief has not been specifically requested remain applicable, including third party review by the Authorized Nuclear Inservice Inspector.

Principal Contributor: Prakash Patnaik

Date: January 15, 2009

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/ra/
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