November 26, 2002

Mr. J. W. Moyer, Vice President
Carolina Power & Light Company
H. B. Robinson Steam Electric Plant,
Unit No. 2
3581 West Entrance Road
Hartsville, South Carolina 29550

SUBJECT: H. B. ROBINSON STEAM ELECTRIC PLANT, UNIT 2 - REQUEST FOR RELIEF (RELIEF REQUEST NO. 18) REGARDING EXAMINATION OF CONTROL ROD DRIVE MECHANISM HOUSING SEAL WELD (TAC NO. MB6622)

Dear Mr. Moyer:

By letter dated October 30, 2002, as supplemented by letters dated November 5 and 6, 2002, Carolina Power & Light Company, the licensee for H. B. Robinson Steam Electric Plant, Unit 2 (HBRSEP2), pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) Section 50.55a(a)(3)(ii), requested relief from the surface examination requirements of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (the Code), 1995 Edition with 1996 Addenda, Section III, Paragraph NB-5271, "Welded Joint of Specially Designed Seals," which states that welded joints of this type shall be examined by either the magnetic particle or liquid penetrant method. Specifically, the licensee requested relief from surface examination requirements for a control rod drive mechanism (CRDM) housing-to-canopy seal weld.

During a November 5, 2002, telephone call, the licensee requested verbal approval of the subject relief request. The licensee explained that unanticipated circumstances associated with the pending refueling outage impacted their ability to submit the request in a timely manner. The subject relief was verbally granted by the staff during the November 5, 2002, telephone call.

The U.S. Nuclear Regulatory Commission (NRC) has reviewed and evaluated the subsequent information provided by the licensee. Based on this information, and pursuant to 10 CFR 50.55a(a)(3)(ii), the NRC staff has determined that the proposed alternative for HBRSEP2 was acceptable and that the Code-required surface examination of the housing-to-canopy seal welds for CRDM penetration Nos. 10, 14, and 30 CRDM would result in a hardship or unusual difficulty without a compensating increase in the level of quality and safety. The NRC staff concluded that with the use of the remote enhanced visual examination of the multiple layers of weld material over the existing seal weld, and together with the system leakage test, the licensee's proposed alternative would provide adequate assurance of structural integrity of the subject welds as required by the Code.

This alternative is authorized for the fourth 10-year inservice inspection interval for HBRSEP2, which began on February 19, 2002. The enclosed Safety Evaluation documents our review.

If you have any questions, please contact R. Subbaratnam at 301-415-1478.

Sincerely,

/RA/

Allen G. Howe, Chief, Section 2
Project Directorate II
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket No. 50-261

Enclosure: Safety Evaluation

cc w/encl: See next page

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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

FOURTH 10-YEAR INTERVAL INSERVICE INSPECTION PROGRAM

RELIEF REQUEST NO. 18 FROM THE ASME CODE, SECTION XI REQUIREMENTS

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

DOCKET NUMBER 50-261

1.0 INTRODUCTION

The inservice inspection (ISI) of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel (B&PV) Code (Code) Class 1, Class 2, and Class 3 components is to be performed in accordance with Section XI of the ASME Code and applicable edition and addenda as required by Title 10 of the *Code of Federal Regulations* (10 CFR) Section 50.55a(g), except where specific written relief has been granted by the Commission pursuant to 10 CFR 50.55a(g)(6)(i). 10 CFR 50.55a(a)(3) states in part 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 pre-service examination requirements, set forth in the ASME Code, Section XI, "Rules for Inservice Inspection (ISI) 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 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 Code of record for the HBRSEP, Unit No. 2, Fourth 10-Year ISI Interval is the ASME B&PV Code, Section XI, 1995 Edition with 1996 Addenda. The fourth 10-year ISI interval began on February 19, 2002.

The NRC staff has reviewed the information submitted by Carolina Power & Light Company, the licensee, in a letter dated October 30, 2002, as supplemented by letters dated November 5 and 6, 2002, requesting relief from certain Code-required inspection criteria. Specifically, the licensee is requesting relief from surface examination requirements for control rod drive mechanism (CRDM) housing-to-canopy seal welds. The licensee determined that surface examination of the subject welds created a hardship or unusual difficulty without a compensating increase in the level of quality and safety. The licensee proposed performing multiple seal weld passes, visually monitoring the welding, and visually examining the finished weld.

2.0 WELD SURFACE EXAMINATION

The components affected by the request for relief are the reactor pressure vessel head penetration canopy seal welds for penetration numbers 10, 14, and 30.

3.0 CODE REQUIREMENTS FOR WHICH RELIEF IS REQUESTED

The ASME B&PV Code, Section XI, 1995 Edition with 1996 Addenda, Paragraph IWA-4221, requires that repairs meet the Owner's Requirements and the applicable Construction Code to which the original item was constructed, or later editions and addenda of the Construction Code. The reactor pressure vessel head penetrations were designed and fabricated in accordance with the ASME B&PV Code, Section III, 1965 Edition, as Class A components. The licensee is requesting, pursuant to 10 CFR 50.55a(a)(3)(ii), relief from the surface examination requirements of the ASME B&PV Code, 1995 Edition with 1996 Addenda, Section III, Paragraph NB-5271, "Welded Joint of Specially Designed Seals," which states that welded joints of this type shall be examined by either the magnetic particle or liquid penetrant method. The requested relief is for the fourth 10-Year ISI Interval that began on February 19, 2002.

4.0 LICENSEE'S PROPOSED ALTERNATIVE TO CODE

In lieu of performing a surface examination of the seal weld, H. B. Robinson Steam Electric Plant, Unit No. 2 (HBRSEP2) will use a multiple pass weld build-up over the current seal weld and will monitor the welding process using an 8X magnification, remotely operated, video camera. The finished weld surface will also be examined with the 8X magnification, remotely operated, video camera. The resolution of the video camera is capable of resolving a 0.001-inch diameter wire.

5.0 LICENSEE'S BASIS FOR ALTERNATIVE

The licensee discovered, or suspected to have developed, through-wall leaks at the seal weld connecting the canopy-to-CRDM reactor pressure vessel head penetration canopy seal welds for penetration numbers 10, 14, and 30. HBRSEP, Unit No. 2, requests relief in accordance with 10 CFR 50.55a(a)(3)(ii) from the required surface examination on the basis that compliance with the Code would result in hardship or unusual difficulty without a compensating increase in the level of quality or safety. The leaks were identified from stains on the CRDM; however, the actual flaws were not visually discernable. The licensee stated that:

> The general dose rate averages approximately 700 millirem/hour near the canopy seal welds. Installation of temporary shielding is not feasible, as it would interfere with the required inspections. Based on an estimated total time of two hours to perform the surface examination, the occupational exposure from the required surface examination will add approximately 1.4 rem to the total repair dose for each repair, which results in a total additional dose of approximately 4.2 rem.
>
> The proposed alternative examination provides a means that can detect flaws that are similar in size to those detectable by the Code-required surface examination technique and substantially smaller than the critical flaw size. By analysis, the critical flaw size was determined to be approximately 3 inches for an axial flaw. The critical flaw size for a circumferentially oriented flaw was determined to be approximately 6 inches. Therefore,

the required surface examination does not provide a sufficient increase in quality or safety to compensate for the expected increase in radiation exposure.

The licensee stated that the canopy seal weld flaws will not be removed and one or more layers of weld overlay shall be applied to seal unacceptable indications in the area to be repaired without excavation. The thickness of these layers shall not be included in meeting weld reinforcement thickness requirements. An analysis of the repaired weldment has been performed consistent with guidance contained in paragraph (g) of Code Case N-504-2, "Alternative Rules for Repair of Class 1, 2, and 3 Austenitic Stainless Steel Pipe," to assure that any flaws in the final weldment will not propagate unacceptably.

6.0 EVALUATION

The licensee has proposed to perform a remote enhanced visual (VT-1) examination with an 8X magnification video camera during welding and on the finished weld. The proposed alternative is in lieu of the Code-required PT for the multiple pass weld repair on the canopy-to-CRDM reactor pressure vessel head penetration canopy seal welds for penetration numbers 10, 14, and 30. The ASME B&PV Code, Section XI, 1995 Edition with 1996 Addenda, Paragraph IWA-4221, requires that repairs meet the Owner's Requirements and the applicable Construction Code to which the original item was constructed, or later editions and addenda of the Construction Code. The licensee chose to use the 1995 Edition with 1996 Addenda of Section III of the ASME Code to examine the weld. Paragraph NB-5271, "Welds of Specially Designed Seals" specifies that welds be examined by either the magnetic particle testing or the dye penetrant testing (PT) method. The licensee is proposing to use an 8X magnification, remotely operated, video camera to view the welding puddle. The examinations will be performed several inches from the weld surface and will enable the welding operator to take corrective actions during the course of welding, if needed. The visual resolution of the camera system was demonstrated as being capable of resolving a 0.001-inch diameter wire segment. The proposed enhanced VT-1 is more restrictive than the 0.03125-inch resolution Code requirement for visual examinations, and is in the range that can be detected using a PT examination. The welding process consists of multiple layers of weld metal welded over the existing seal weld. The multiple layers of weld metal provide a redundant CRDM housing-to-canopy seal. Each layer is a seal by itself. The adequacy of the seal is verified with a routine system leakage test that is performed while returning the system to service. These measures provide adequate assurance that weld integrity is maintained.

The licensee's basis for performing the remote 8X enhanced visual examination (with a resolution of at least 0.001 inches) in lieu of a PT is the dose savings that are anticipated to be achieved through the use of the remote visual examination method when compared to a manual PT examination method. The licensee estimated a total dose resulting from the performance of a PT examination on the subject weld repair to be in the range of 1.4 person-rem. This dose represents the total amount that could be averted for the examination since the dose associated with setting up the remote visual examination system is included in the dose associated with installing and removing the welding equipment. Based on the determination above that adequate assurance of weld integrity is provided by the use of the remote enhanced visual examination, the multiple layers of weld material over the existing seal weld, and the system leakage test, the licensee's proposed alternative assures weld integrity. Although the dose associated with the performance of the Code-required PT is small, it represents a dose that, if incurred, would not result in a compensating increase in the level of quality and safety.

7.0 CONCLUSION

Based on the discussion above, the NRC staff concludes that the Code-required surface examination of the seal weld connecting the canopy-to-CRDM reactor pressure vessel head penetration canopy seal welds for penetration numbers 10, 14, and 30, would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety. Therefore, pursuant to 10 CFR 50.55a(a)(3)(ii), the NRC staff authorizes the proposed alternative for HBRSEP2 for the fourth 10-year ISI interval, which began on February 19, 2002.

Principal Contributor: R. Subbaratnam, NRR

Date: November 26, 2002

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