Nuclear Operating Company

South Texas Project Electric Generating Station PO Box 289 Wadsworth, Texas 77483

October 23, 2002
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File No.: G25
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U.S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, DC 20555-0001

South Texas Project
Units 1 and 2
Docket Nos. STN 50-498, STN 50-499
Request for Relief from ASME Section XI Requirements for Repair of Control Rod Drive Mechanism (CRDM) Canopy Seal Welds in Accordance with IWA 4000, for the Second Ten-Year Inservice Inspection Interval
(Relief Request RR-ENG-2-27)

Pursuant to 10 CFR 50.55a(a)(3)(ii), STP Nuclear Operating Company (STPNOC) hereby requests NRC approval of the enclosed relief request (Relief Request RR-ENG-2-27) for the second ten-year inservice inspection interval. Relief is requested from the requirements of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel (B&PV) Code, 1989 Edition with no Addenda, IWA-4000, which would require liquid penetrant (PT) examination of a Control Rod Drive Mechanism (CRDM) canopy seal weld repair. As an alternative to the PT examination, this request will require a 5X visual examination of the repair and pressure verification testing. This request includes use of ASME Code Case N-504-2 for guidance to establish the acceptability of a repair by increasing the weld thickness by weld overlay as an alternative to IWA-4300.

During a boric acid walkdown inspection during the Unit 2 ninth refueling outage (2RE09), STPNOC identified boric acid crystal buildup on a CRDM housing. Further investigation revealed evidence of minor leakage at the intermediate CRDM canopy seal weld on three separate CRDM housings. These seal weld repairs are required to be completed prior to plant startup following completion of 2RE09.

Relief is requested from the requirements of IWA-4000 by proposing an alternative method of repair and nondestructive examination due to hardship and unusual difficulty without a compensating increase in quality or safety. In addition to the difficulty of removing the defect and conducting a PT examination of the weld repair, the high radiological dose associated with strict compliance with these requirements would be contrary to the intent of ALARA radiological controls program.

A047
A075

Similar relief requests have been granted to:

- Carolina Power and Light Company's Shearon Harris Nuclear Power Plant, by letter dated November 6, 1998,
- Northern States Power's Prairie Island Nuclear Generating Station, by letter dated January 22, 1999,
- Tennessee Valley Authority's (TVA) Watts Bar Nuclear Plant, by letter dated August 25, 1999,
- TVA's Sequoyah Nuclear Plant, by letter dated September 12, 2000, and
- Pacific Gas & Electric's Diablo Canyon Power Plant, by letter dated June 5, 2001.

The basis and justification for the relief request and an implementation schedule are attached. STPNOC requests approval of this relief request for use during repair and examinations to be performed during the 2RE09 currently in progress and any future repairs to CRDM canopy seal welds should they become necessary during the second ten-year inservice inspection interval. Approval by November 15, 2002 is requested to permit effective completion of repairs prior to restoration of the reactor coolant system during 2RE09.

If there are any questions, please contact either Mr. M. S. Lashley at (361) 972-7523 or me at (361) 972-7902.

T J Jordan
Vice President,
Engineering & Technical Services

KJT/

Attachment: Request for Relief from ASME Section XI Requirements for Repair of Control Rod Drive Mechanism (CRDM) Canopy Seal Welds in Accordance with IWA 4000 (Relief Request RR-ENG-2-27)

cc:
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SOUTH TEXAS PROJECT
UNITS 1 AND 2
REQUEST FOR RELIEF FROM ASME SECTION XI REQUIREMENTS FOR REPAIR OF CONTROL ROD DRIVE MECHANISM (CRDM) CANOPY SEAL WELDS IN ACCORDANCE WITH IWA 4000
(RELIEF REQUEST RR-ENG-2-27)

Proposed Alternative
In Accordance with 10 CFR 50.55a(a)(3)(ii)
--Hardship or Unusual Difficulty without Compensating Increase in Level of Quality or Safety--

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1. ASME Code Component Affected:

Reactor control rod drive mechanism (CRDM) canopy seal welds – Class 1 Appurtenance to the Reactor vessel.

2. Applicable Code Edition and Addenda:

American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel (B&PV) Code, Section XI, 1989 Edition with no Addenda. Designed and fabricated to the ASME BP&V Code, Section III, 1974 Edition through Summer 1974 Addenda

3. Applicable Code Requirements:

IWA-4000 of Section XI requires that repairs be performed in accordance with the owner's original construction Code of the component or system, or later editions and addenda of the Code. The canopy seal weld is a Code seal weld as described in NB-4428 of Section III and requires a liquid penetrant (PT) examination of the final weld in accordance with NB-5271. IWA-4300 of Section XI requires that a defect be removed or reduced in size such that the resultant section thickness is equal to or greater than the minimum design thickness.

4. Reason for the Request:

During boric acid walkdown inspection during the Unit 2 ninth refueling outage (2RE09), STP Nuclear Operating Company (STPNOC) identified boric acid crystal buildup on a CRDM housing. Further investigation revealed evidence of minor leakage at the intermediate CRDM canopy seal weld on three separate housings.

The CRDM canopy seal welds are located above the Reactor Vessel Closure Head, which is highly congested and subject to high radiation levels. The Code-required repair method would involve excavation of the defects and restoration to the original configuration. The Code repair method requires manual excavation of the defects and manual repair welding, and has a higher risk of failure due to the difficulty of making a quality weld on the canopy seal accompanied by the required back-purging and cleaning. In addition to the difficulty and time required to remove the defect and re-weld the canopy, a similar level of difficulty and resultant time is required for a PT examination of the weld repair. The high radiological dose associated with strict compliance with these requirements would be contrary to the intent of the ALARA radiological controls program.

The PT examination would result in an estimated total dose of 1.487 person-Rem per CRDM canopy seal weld. This dose estimate is comprised of the following:

Activity	Dose (person-Rem)
• Access/egress to perform the examination (three trips)	0.121
• Performance of the PT examination (estimated residence time of twenty minutes)	1.366
Total	**1.487**

5. Proposed Alternative and Basis for Use

STPNOC requests relief from the requirements of IWA-4000 in accordance with 10 CFR 50.55a(a)(3)(ii) by proposing an alternative method of repair and nondestructive examination due to hardship and unusual difficulty without a compensating increase in quality or safety. ASME Code Case N-504-2 will be used as guidance for repair by weld overlay by increasing the weld thickness to establish the acceptability of the defect in accordance with IWB-3640. In lieu of performance of PT examinations of CRDM seal weld repairs, a 5X visual (VT-1) examination and pressure verification testing will be performed after welding is completed. In addition, alloy 52 nickel-based weld repair material will be used rather than austenitic stainless steel as required by Code Case N-504-2. The affected seal weld defects are required to be repaired and examined prior to completion of 2RE09.

Industry experience with failure analyses performed on leaking canopy seal welds removed from service at other plants has attributed the majority of the cases to transgranular stress corrosion cracking (SCC). The size of the opening where the leakage occurs has been extremely small, normally a few thousandths of an inch. The crack orientations vary, but often radiate outward such that a pinhole appears on the surface, as opposed to a long crack. The SCC results from exposure of a susceptible material to residual stress, which is often concentrated by weld discontinuities, and to a corrosive environment, such as water trapped in the cavity behind the seal weld that is mixed with the air initially in the cavity, resulting in higher oxygen content than is in the bulk primary coolant.

As allowed by the guidance of Code Case N-504-2, "Alternative Rules for Repair of Class 1, 2, and 3 Austenitic Stainless Steel Piping Section XI, Division 1," the CRDM canopy seal weld flaws will not be removed, but an analysis of the repaired weldment will be performed using Paragraph (g) of the Code Case as guidance to assure that the remaining flaw will not propagate unacceptably. This analysis establishes the critical flaw size used to qualify the VT-1 examination method to ensure capability of detecting a flaw sufficiently small to assure an adequate margin of safety is maintained. The canopy seal weld is not a structural weld, nor a pressure-retaining weld, but provides a seal to prevent reactor coolant leakage if the mechanical joint leaks. The weld buildup is considered a repair in accordance with the ASME B&PV Code, Section XI, reference to the original Code of construction because the weld is performed on an appurtenance to a pressure-retaining component.

The alternative CRDM canopy seal weld repair uses a Gas Tungsten Arc Welding (GTAW) process and VT-1 examination controlled remotely. The VT-1 examination will use a video camera with approximately 5X magnification within several inches of the weld, qualified to ensure identification of a flaw significantly smaller than the analyzed critical flaw size.

Alloy 52 nickel-based weld repair material was selected rather than austenitic stainless steel as required by Code Case N-504-2, Paragraph (b), for the repair because of its resistance to stress corrosion cracking. Consequently, the ferrite requirements of Code Case N-504-2, Paragraph (e) do not apply. The repair will be documented on Form NIS-2, reviewed by the Authorized Nuclear Inspector, and maintained in accordance with the requirements for archiving permanent plant records.

The GTAW weld repair and VT-1 examination methods result in significantly lower radiation exposure because the equipment is remotely operated after setup.

6. Duration of Proposed Alternative:

This relief request will be implemented during the STPEGS Units 1 and 2 second ten-year inservice inspection intervals. STPNOC requests Nuclear Regulatory Commission review and approval of this relief request by November 15, 2002 to support repairs during 2RE09.

7. Precedents

Similar relief requests have been granted to:

- Carolina Power and Light Company's Shearon Harris Nuclear Power Plant, by letter dated November 6, 1998,
- Northern States Power's Prairie Island Nuclear Generating Station, by letter dated January 22, 1999,
- Tennessee Valley Authority's (TVA) Watts Bar Nuclear Plant, by letter dated August 25, 1999,

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