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

December 9, 2008

Mr. Edward D. Halpin
Chief Nuclear Officer
STP Nuclear Operating Company
South Texas Project
P. O. Box 289
Wadsworth, TX 77483

SUBJECT: SOUTH TEXAS PROJECT, UNIT 1 - RELIEF REQUEST RR-ENG-2-30, REQUEST FOR RELIEF TO USE CODE CASE N-516-3, "UNDERWATER WELDING, SECTION XI, DIVISION 1" (TAC NO. MD8097)

Dear Mr. Halpin:

By letter dated February 14, 2008, STP Nuclear Operating Company (STPNOC, the licensee) submitted to the Nuclear Regulatory Commission (NRC) Relief Request RR-ENG-2-30, Revision 3, requesting relief from certain American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (Code) Section XI requirements at South Texas Project (STP), Unit 1. Relief was requested from ASME Code, Section XI, Article IWA-4000, in order to perform underwater welding on STP, Unit 1 reactor vessel core barrel and its Roto-Lock insert locking tabs that secure the inserts and prevent their rotation.

The Code of record at STP, Unit 1 is the ASME Code, Section XI, 1989 Edition with no Addenda. Article IWA-4000 of Section XI does not address underwater welding; however, ASME Code Case N-516-3, "Underwater Welding, Section XI, Division 1," includes alternative procedure, performance, and filler metal qualifications, and alternative examination requirements to those contained or referenced in Article IWA-4000, for use when the welding is performed underwater.

The U.S. Nuclear Regulatory Commission (NRC) staff reviewed the licensee's request, and on April 2, 2008, conducted a telephone conference call with STPNOC. During the call, the NRC staff verbally authorized the alternative to the ASME Code, Section XI, Code Case N-516-3 for underwater welding of the core barrel locking tab as requested by the licensee.

Although the licensee has already completed the underwater welding on locking tabs prior to the issuance of this safety evaluation (SE), this SE is being issued to document the basis for the April 2, 2008, decision, verbally granting the licensee the relief to use the Code Case N-516-3.

Based on its evaluation, the NRC staff concludes that the use of ASME Code Case N-516-3 with the additional requirements for a bend test, a qualification test for the depth of water, and a confirmation test adequately assure weld integrity and provide an acceptable level of quality and safety. Therefore, the licensee's Relief Request RR-ENG-2-30, Revision 3, to use ASME Code Case N-516-3 for underwater welding of a core barrel locking tab at STP, Unit 1 is authorized pursuant to paragraph 50.55a(a)(3)(i) of Title 10 of the *Code of Federal Regulations* (10 CFR).

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

The NRC staff's review is provided in the enclosed safety evaluation. If you have any questions concerning this matter, please contact Mr. Mohan Thadani at (301) 415-1476.

Sincerely,

Michael T. Markley, Chief
Plant Licensing Branch IV
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-498

Enclosure:
As stated

cc w/encl: Distribution via Listserv

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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELIEF REQUEST RR-ENG-2-30

STP NUCLEAR OPERATING COMPANY

SOUTH TEXAS PROJECT, UNIT 1

DOCKET NO. 50-498

1.0 INTRODUCTION

By letter dated February 14, 2008 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML080560093), STP Nuclear Operating Company (STPNOC, the licensee) submitted Relief Request Number RR-ENG-2-30, Revision 3. Relief was requested from the requirements of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code, 1989 Edition with no Addenda, Section XI, Article IWA-4000 in order to perform underwater welding on the South Texas Project (STP), Unit , reactor vessel core barrel and its Roto-Lock insert locking tabs that secure the inserts and prevent their rotation. The Code of record at STP, Unit 1, is the ASME Code, Section XI, 1989 Edition with no Addenda. Article IWA-4000 of Section XI does not address underwater welding; however, ASME Code Case N-516-3, "Underwater Welding, Section XI, Division 1," includes alternative procedure, performance, and filler metal qualifications, and alternative examination requirements to those contained or referenced in Article IWA-4000 for use when the welding is performed underwater.

Pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR), paragraph 50.55a(a)(3)(i), STPNOC requested relief from the requirements of Article IWA-4000 in order to perform underwater welding on the reactor vessel core barrel and its Roto-Lock insert locking tabs. STPNOC requested U.S. Nuclear Regulatory Commission (NRC) approval of ASME Code Case N-516-3 for use at STP, Unit 1, on the basis that it provides an acceptable level of quality and safety.

Although the licensee has already completed the underwater welding prior to the issuance of this safety evaluation (SE), this SE is being issued to document the decision made by the NRC staff on April 2, 2008, to grant the licensee's request for relief by verbal authorization. Hence, the contents of this SE reflect the NRC staff's decision which was made prior to the underwater welding and restart of STP, Unit 1, from its spring 2008 refueling outage.

2.0 REGULATORY EVALUATION

The applicable Code of Record for STP, Unit 1 is the 1989 Edition with no addenda of the ASME Code, Section XI, Article IWA-4000. Article IWA-4000 of ASME Code, Section XI, does not address underwater welding. However, ASME Code Case N-516-3, "Underwater Welding, Section XI, Division 1," includes alternative procedure, performance, and filler metal qualifications, and alternative examination requirements to those contained or referenced in Article IWA-4000 for use when the welding is performed underwater. The licensee

proposed to follow the guidelines of ASME Code Case N-516-3, "Underwater Welding, Section XI, Division 1."

ASME Code, Section XI, Article IWA-4120(a) states that, "Repairs shall be performed in accordance with the Owner's Design Specification and the original Construction Code of the component or system. Later editions and addenda of the Construction Code or of Section III, either in their entirety or portions thereof, and Code Cases may be used."

Section 50.55a (a) of 10 CFR states, in part, that licensees can use the ASME Code cases that the NRC has already approved and which are in NRC Regulatory Guide (RG) 1.147, "Inservice Inspection Code Case Acceptability --ASME Section XI, Division 1." RG 1.147 states that "Licenses may use these Code Cases without requesting authorization from the NRC, provided that they are used with any identified limitations or modifications." ASME Code Case N-516-3 has been incorporated by reference into RG 1.147, Revision 15, with a condition. This condition states "Licensees must obtain NRC approval in accordance with 10 CFR 50.55a(a)(3) regarding the technique to be used in the weld repair or replacement of irradiated material underwater." The NRC documented its acceptance of ASME Code Case N-516-3 in RG 1.147, Revision 15, dated October 2007.

Pursuant to 10 CFR 50.55a(a)(3)(i), STPNOC requested relief from the requirements of ASME Code, Section XI, Article IWA-4000 in order to perform underwater welding on the components noted above. STPNOC requested NRC approval of ASME Section XI Code Case N-516-3 for use at STP, Unit 1, on the basis that it provides an acceptable level of quality and safety.

3.0 EVALUATION OF RELIEF REQUEST

In the STPNOC letter dated February 14, 2008, the licensee submitted the following information in support of its request for relief RR-ENG-2-30:

The Items for which Relief is Requested

Unit 1 reactor vessel core barrel and its Roto-Lock insert locking tabs that secure the inserts and prevent their rotation.

Applicable Code Edition and Addenda

American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code, Section XI, 1989 Edition with no Addenda.

Licensee's Proposed Alternative

STPNOC requests relief from the requirements of IWA-4000 in accordance with 10 CFR 50.55a(a)(3)(i) in order to perform underwater welding for repairs. IWA-4000 of the Section XI of Code of record at South Texas Project does not address underwater welding. STPNOC requests NRC approval of ASME Section XI Code Case N-516-3 for use at STP on the basis that it provides an acceptable quality and safety.

Licensee's Basis for Relief

STPNOC plans to replace an existing Roto-Lock insert with a new Roto-Lock insert with a flow blocking plate welded in the bottom of the insert. The replacement is performed by a diver underwater and requires removing the insert locking tab for which relief was approved in 2003 and welding a new tab using the same process and material types approved in 2003. The tab removal and replacement is not due to failure or deficiency in the welding in 2003.

In the description of Code Case N-516-3, Regulatory Guide (RG) 1.147, Rev. 15 states that NRC approval is required for the technique to be used in the weld repair or replacement of irradiated material underwater.

Consequently, STPNOC requests approval for the use of Code Case N-516-3 for underwater fillet welding of a Roto-Lock insert locking tab to the reactor vessel core barrel to secure the insert and prevent its rotation.

STPNOC requests approval for use of Code Case N-516-3 in order to deposit three 0.180-inch fillet welds on one locking device. This specific application is for wet welding to make three underwater fillet welds to attach one Roto-Lock insert locking tab to the core barrel to secure the Roto-Lock insert and prevent its rotation. The subject fillet welds are to prevent the Roto-Lock insert from backing out and potentially becoming a loose part. They are not structural or pressure boundary welds. The requirements imposed on the welds are conservative with respect to the safety function of the welds.

The locking tab is A-240 Tp 304L. The core barrel is SA-182 F304H. The filler metal is SFA 5.4 E316L-17. The shielded metal arc welding (SMAW) process will be used. Cutting is expected to be done with a rotary file.

These welds will be made using a weld procedure specification (WPS) qualified in accordance with Code Case N-516-3. Examination will be remote visual by a certified inspector. No on-going examination is required or planned. The WPS was qualified with tensile and bend tests in accordance with ASME Section IX, with an additional chemical, ferrite, and tensile test performed in accordance with Code Case N-516-3. ASME Section XI guided bend tests per QW-160 have been performed.

The Procedure Qualification Records for the tensile test and the filler material weld pad were performed at a depth of 35 feet. This qualifies the welding procedure and the filler material to a depth range of from 2 to 45 feet. The replacement weld is expected to be performed at a depth of 29 feet. The tests performed meet the qualification requirements of Code Case N-516-3 for welding at a depth of 29 feet.

A confirmation weld was performed on 1/2-inch plate using the WPS and the same weld material as that to be used in the production weld. The confirmation weld will be subject to the same inspection requirement as the production weld.

STPNOC determined that the procedure qualification requirements of the code case have been met.

The total neutron fluence at the vessel flange area is expected to be no higher than 1.2E+17n/cm^2 [1.2 x 10^{17} n/cm^2] after 40 calendar years of plant operation. As discussed in the 2003 application, the mockup material will not have the same fluence level applied to it. The application is not Class 1 and is non-structural and non-pressure retaining. Additionally, the locking tab and core barrel are not ferritic materials and, therefore, not subject to neutron embitterment.

These additional requirements, combined with the alternative requirements of Code Case N-516-3, provide an acceptable level of quality and safety for underwater welding.

The licensee implemented the relief during the STP, Unit 1, spring 2008 refueling outage.

Staff Evaluation

ASME Code Case N-516-3 has been incorporated by reference into RG 1.147, Revision 15, with a condition. This condition states, "Licensees must obtain NRC approval in accordance with 10 CFR 50.55a(a)(3) regarding the technique to be used in the weld repair or replacement of irradiated material underwater." Therefore, STPNOC requested NRC approval of ASME Code Case N-516-3 for use at STP, Unit 1, for the subject underwater welding. ASME Code Case N-516-3 provides requirements for underwater welding of P-1, P-8, and P-4X materials. The materials to be welded with this relief request are American Society for Testing and Materials (ASTM) A-240 Type 304L and ASME SA-182 F304H which are P-8 base metals using an ASME SFA 5.4, E316L-17 filler metal.

The NRC has imposed this condition because, in high neutron fluence regions, weld repair is complicated by the presence of insoluble helium in the irradiated base metal. The release of the helium, when the metal melts during welding, can produce porosity and cracking in the weld. In response to this condition on ASME Code Case N-516-3, the licensee provided a neutron fluence evaluation which supported the conclusion that helium generation was not an issue for this application. Based on this evaluation, the NRC staff agrees that a mockup that has been exposed to a high neutron fluence is not necessary.

NRC has stated in ASME Code meetings that the requirements of ASME Code Case N-516-3 may not be complete since the code case has allowed testing of welders and welding procedures to be done without the performance of bend tests as required by paragraph QW-160 in ASME Code, Section IX. Bend tests are a measure of the ductility and soundness of a weld and without these tests a weld could be very hard and brittle. The NRC staff has concluded that these bend tests are very important to ensuring the integrity of welds made underwater. Therefore, NRC requires that all underwater welding procedure qualifications and welder performance qualifications shall have the bend tests required by paragraph QW-160 in ASME Code, Section IX, performed on them. STPNOC has performed these tests in addition to the other tests required by ASME Code Case N-516-3, including ASME Code, Section XI procedure qualifications, ASME Code Case N-516-3 qualifications for the depth of water at which the

welding is to be performed in production, and a confirmation test performed underwater, prior to commencement of the production work. Therefore, the NRC staff has determined that the use of ASME Code Case N-516-3, with the additional requirements for a bend test, a qualification test for the depth of water, and a confirmation test adequately assure weld integrity and provide an acceptable level of quality and safety for the subject welding. The use of ASME Code Case N-516-3 is authorized for the specific use cited in this SE during the STP, Unit 1, spring 2008 refueling outage.

4.0 CONCLUSION

The staff concludes that the use of ASME Code Case N-516-3 with the additional requirements for a bend test, a qualification test for the depth of water, and a confirmation test adequately assure weld integrity and provide an acceptable level of quality and safety. Therefore, the licensee's Relief Request RR-ENG-2-30, Revision 3, to use ASME Code Case N-516-3 for underwater welding of a core barrel locking tab at STP, Unit 1 is authorized pursuant to 10 CFR 50.55a(3)(i). The use of ASME Code Case N-516-3 is authorized for the specific use cited in this SE during the STP, Unit 1, spring 2008 refueling outage.

All other ASME Code, Section XI, requirements for which relief was not specifically requested and authorized herein by the NRC staff remain applicable, including third-party review by the Authorized Nuclear Inservice Inspector.

Principal Contributor: E. Andruszkiewicz

Date: December 9, 2008

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

The NRC staff's review is provided in the enclosed safety evaluation. If you have any questions concerning this matter, please contact Mr. Mohan Thadani at (301) 415-1476.

Sincerely,

/RA/

Michael T. Markley, Chief
Plant Licensing Branch IV
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-498

Enclosure:
As stated

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