October 26, 2006

Mr. James J. Sheppard
President and Chief Executive Officer
STP Nuclear Operating Company
South Texas Project Electric
Generating Station
P. O. Box 289
Wadsworth, TX 77483

SUBJECT: SOUTH TEXAS PROJECT, UNIT 1 - RE: RELIEF REQUEST RR-ENG-2-42 FOR APPROVAL NON-CODE REPAIR AND DEFERRAL OF CODE REPAIR OF ESSENTIAL COOLING WATER SYSTEM PIPING (TAC NO. MC8804)

Dear Mr. Sheppard:

The Nuclear Regulatory Commission (NRC) staff has reviewed and evaluated the information provided by South Texas Project (STP) Nuclear Operating Company (the licensee) in its letter dated October 27, 2005. The licensee requested the approval of Relief Request RR-ENG-2-42 to allow a temporary non-Code repair on the Essential Cooling Water (ECW) system piping at STP Electric Generating Station, Unit 1. The ECW system piping is classified as an American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (Code) Class 3 and the licensee is proposing to defer the permanent Code repair until the next scheduled refueling outage.

Based on the information provided in the licensee's submittal, the NRC staff concludes that the licensee has provided an acceptable alternative to the requirements of ASME Code, Section XI, IWA-4310. Performing the required ASME Code repair immediately would require plant shutdown, creating a hardship for the licensee without a compensating increase in the level of quality or safety relative to the licensee's proposed alternative. Furthermore, the NRC staff concludes that the proposed alternative provides a reasonable assurance of structural integrity during the interim period prior to next refueling outage.

Therefore, pursuant to 10 CFR 50.55a(a)(3)(ii) the alternative is authorized for the STP Electric Generating Station, Unit 1, until the next scheduled refueling outage.

At that time, an ASME Code repair will be performed. 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. The NRC staff's safety evaluation is enclosed.

Sincerely,

/RA/

David Terao, Chief
Plant Licensing Branch IV
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-498

Enclosure: Safety Evaluation

cc: See next page

At that time, an ASME Code repair will be performed. 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. The NRC staff's safety evaluation is enclosed.

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Enclosure: Safety Evaluation

cc: See next page

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ACCESSION NO: ML062230309 *No significant change to SE input

OFFICE	NRR/LPL4/PM	NRR/LPL4/LA	CNPB/BC	OGC	NRR/LPL4/BC
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DATE	8/14/06	8/11/06	6/8/2006	10/24/06	10/26/06

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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

TEMPORARY NON-CODE REPAIRS OF ESSENTIAL COOLING WATER SYSTEM PIPING

STP NUCLEAR OPERATING COMPANY

SOUTH TEXAS PROJECT, UNIT 1

DOCKET NO. 50-498

1.0 INTRODUCTION

By letter dated October 27, 2005, STP Nuclear Operating Company (the licensee) requested pursuant to 10 CFR 50.55a(g)(5)(iii) approval to allow a temporary non-Code repair (RR-ENG-2-42) on the Essential Cooling Water (ECW) system piping at its STP Electric Generating Station (STPEGS), Unit 1. The ECW System is designed to supply cooling water to various safety-related systems for normal plant operation, normal shutdown, and during and after postulated design-basis accidents. The ECW system is classified as an American Society for Mechanical Engineers (ASME) Boiler and Pressure Vessel Code Class 3 system. The licensee is proposing to defer the permanent ASME Code repair of the identified flaws until the next unscheduled outage exceeding 30 days, but no later than the next scheduled refueling outage. The relief request was made because the proposed temporary non-Code repair deviates from the requirements of ASME Code, Section XI, Article IWA-4310.

The licensee has stated that it has identified through-wall indications measuring 1-inch by 1/4-inch on a 6-inch flange of the ECW return line downstream from 150-ton Essential Chiller 11B. A residue buildup near the flange weld suggests seepage through the flaw is active. The flawed area includes a potential linear indication 9/16-inch long. This indication appears to be a tight crack and any leakage is not readily measurable.

ASME Code, Section XI, 1989 Edition, is used for the Repair and Replacement Program activities at the STPEGS, Unit 1, second 10-year inservice inspection (ISI) interval.

2.0 REGULATORY EVALUATION

Paragraph 50.55a(g) of Title 10 of the *Code of Federal Regulations* (10 CFR) specifies that the ISI of nuclear power plant components shall be performed in accordance with the requirements of the ASME Code, Section XI, except where specific written relief has been granted by the Commission pursuant to 10 CFR 50.55a(g)(6)(i). The regulations in 10 CFR 50.55a(a)(3) state that alternatives to the requirements of paragraph (g) may be used, when authorized by the Nuclear Regulatory Commission (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. In 10 CFR 50.55a(g)(5)(iii), the regulations state 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 §50.4, information to support the determinations.

The information provided by the licensee in support of the request has been evaluated by the NRC staff and the bases for disposition are documented below.

2.1 Licensee's Evaluation

2.1.1 Components for which Relief is Requested

Unit 1 Train B ECW system 6-inch flange downstream from 150-ton Essential Chiller 11B. The flawed area includes a potential linear indication 9/16-inch long. The indication appears to be a tight crack and any leakage is not readily measurable.

2.1.2 Applicable Code Edition and Addenda

ASME Boiler and Pressure Vessel Code, Section XI, 1989 Edition

2.1.3 Applicable Code Requirement

Relief from the requirements of ASME Code, Section XI, IWA-5250(a)(3) is requested so that a code repair of the through-wall flaw at this location may be deferred until the next outage, of sufficient duration, but not later than the next refueling outage provided the conditions of Generic Letter 90-05, "Guidance for Performing Temporary Non-Code Repair of ASME Code Class 1, 2 and 3 Piping," are met.

2.1.4 Flaw Detection During Plant Operation

The flaw was discovered on July 27, 2005, during periodic examination of ECW system large bore piping. Unit 1 was in Mode 1 at full 100 percent power.

2.1.5 Impracticality Determination

As stated in Generic Letter 90-05, an ASME Code repair is required for Code Class 1, 2, and 3 piping unless specific written relief is granted by the NRC. Relief is appropriate when performing the repair at the time of discovery is determined to be impractical. A repair is considered to be impractical if:

- The flaw detected during plant operation is in a section of Class 3 piping that cannot be isolated to complete a code repair within the time period permitted by the limiting condition for operation of the affected system as specified in the plant Technical Specifications, and

- Performance of code repair necessitates a plant shutdown.

Performance of code repairs within the allowed outage time for the ECW System at the STPEGS, as permitted by the limiting condition for operation, is not practical due to the amount of time required to implement the repair, and the potential for fit-up problems during repair. A

plant shutdown may be necessary to complete the repair. Therefore, the licensee requests this relief on the basis of impracticality.

2.1.6 Proposed Alternative and Basis for Use

Proposed Alternative

Repair of the defect will be deferred until adequate time is available for the repair, but no later than the next Unit 1 refueling outage, provided the condition continues to meet the acceptance criteria of Generic Letter 90-05. The next Unit 1 refueling outage is currently scheduled to begin in spring 2007. Compensatory action has been implemented to detect changes in the condition of the flaw.

Basis for Use

The 150-ton Essential Chiller unit has been abandoned in place, but the flaw location is exposed to normal ECW system operating pressure. The ECW system is a low-pressure system with normal operating pressures of approximately 50 pounds per square inch gauge (psig) and a design pressure of 120 psig. Therefore, the consequences associated with failure of high-energy lines are not applicable to this relief request.

The structural integrity is monitored by the following methods:

- Monthly monitoring for qualitative assessment of leakage (quantitative if measurable leaks are observed). Currently there is no measurable leakage.

- Continuation of Essential Cooling Water System large bore piping periodic walkdowns. These walkdowns are regularly scheduled VT-2 examinations. The inspection technique has proven to be an effective means of identifying dealloyed/cracked components prior to deterioration of structural integrity margins below ASME Code, Section XI requirements.

Structural integrity and the monitoring frequency will be re-evaluated if significant changes in the condition of the dealloyed area are found during this monitoring.

Root Cause Determination

The root cause of dealloying is a combination of corrosion and stress. The dealloying process normally initiates from a crevice such as the area behind a backing ring, a fabrication-induced flaw, or a casting flaw. Dealloying in this case is believed to be similar to dealloying seen in other susceptible aluminum-bronze components.

Flaw Evaluation

In assessing the structural integrity of partially dealloyed aluminum-bronze piping components, a conservative evaluation has been performed to assure that adequate margins remain. This was accomplished by evaluating the condition where the dealloyed region is assumed to have

lost its load carrying capacity and will behave like a crack-like flaw. Under these conditions, flaw evaluation procedures similar to Section XI of the ASME Code have been applied.

Unlike some carbon steels and low-alloy steels, aluminum-bronze is inherently ductile and tough. This stems from its crystal structure which is like that of Type 304 stainless steel. Thus, the fracture resistance of aluminum bronze is expected to be high and the affected fittings will be relatively insensitive to material flaws such as cracks.

Aluminum-bronze is not expected to behave in a non-ductile manner; however, linear elastic fracture mechanics techniques (LEFM) have established the load carrying capacity of partially dealloyed fittings when treating the dealloyed region as a crack-like flaw. When LEFM principles are applied, flaw tolerance can be quantified in terms of applied stress, flaw size and shape, and the material fracture toughness. Selection of conservative values for fracture toughness, and a conservative representation of the size and extent of dealloying as a flaw, gives a conservative determination of the structural capacity.

The structural integrity of the flanged piping was assessed using the "through-wall flaw" evaluation approach provided in Section C.3.a of Enclosure 1 to NRC Generic Letter 90-05. This approach evaluates the flaw stability by LEFM methodology.

To summarize the results:

s = predicted bending stress at the flaw location
s = 10.1 ksi
K = stress intensity factor
K = 24 ksi-in$^{1/2}$

For flaw stability, this methodology specifies "K" should be less than the critical stress intensity factor which represents the fracture toughness of the material. The fracture toughness of the aluminum-bronze ranges from 63.5 to 95.1 ksi-in$^{1/2}$.

Stresses	Pressure + Dead Weight	Faulted	Thermal
Stress (psi)	942	3286	5349
Allowable Stress (psi)	18000	43200	27000
Safety Margin	19.1	13.14	5.04

The licensee states that the calculated safety margins are adequate for the various loading conditions.

Augmented Inspection

Augmented monthly inspections have been implemented to detect changes in the size of the discolored area or leakage. Structural integrity and the monitoring frequency will be

reevaluated if significant changes in the condition of the dealloyed area are found during this monitoring.

2.2 Staff Evaluation

The licensee stated that a through-wall flaw was discovered during the performance of routine maintenance activities on the ECW system at its STPEGS, Unit 1. Specifically, the ECW Train B flaw was discovered on July 27, 2005, during periodic examination of ECW system large bore piping. The flaw was identified as an indication of through-wall dealloying measuring 1-inch by 1/4-inch. A residue buildup at a spot near the flange suggests that seepage through the flaw is active. The root cause for the linear indications in the pipe was determined to be a combination of corrosion and stress. The dealloying most likely initiated from a crevice such as the area behind a backing ring, a fabrication-induced flaw, or a casting flaw. Dealloying in this case is believed to be similar to dealloying seen in other susceptible aluminum-bronze components. The licensee has implemented augmented monthly inspections to detect changes in the size of the discolored area or leakage. Structural integrity and the monitoring frequency will be re-evaluated if significant changes in the condition of the dealloyed area are found during this monitoring. The staff finds the licensee's temporary non-Code repair acceptable because the leakage is not readily measurable and because the licensee has implemented monthly inspections to detect changes in the size of the flaw.

To assess the structural integrity of the flawed piping the licensee evaluated the piping using the "through-wall flaw" evaluation approach included in the NRC Generic Letter 90-05. The evaluation results determined that calculated safety margins are adequate for the various loading conditions. As it can be seen from the table in Section 2.1.6 above, safety margins of 5.04 to 19.1 exist for the various loading conditions. Therefore, the flaw is not expected to grow to sizes large enough to cause a failure. Further, cracks are expected to be detected well before they reach a size sufficient to result in failure. The staff finds the evaluation approach employed by the licensee acceptable because the structural integrity analysis employs the methods specified in NRC Generic Letter 90-05 and because the results showed that the calculated safety margins are adequate for the various loading conditions.

The licensee also stated that the performance of a permanent ASME Code repair may necessitate a plant shutdown because the allowed outage time specified by the limiting condition for operation for the ECW system may not be sufficient to complete the ASME Code repair. This time limitation is projected to arise from the fact that the amount of time that is needed to implement the repair would delay the restart, there is a potential for fit-up problems during repair, and other delays may be encountered during the completion of the task. Therefore, the NRC staff finds that requiring the licensee to perform a permanent ASME Code repair would result in a hardship because the affected piping cannot be repaired within the time specified by the limiting condition for operation for the ECW system and, therefore, the plant would need to be shut down in order to perform the permanent ASME Code repair. Requiring the plant to be shut down for repair, in this case, is not warranted taking into consideration the alternative that the licensee has proposed because the shutdown and subsequent restart would unnecessarily cycle plant systems and components.

3.0 CONCLUSION

Based on the information provided in the licensee's submittal, the NRC staff concludes that the licensee has provided an acceptable alternative to the requirements of Appendix IX of ASME Code, Section XI, IWA-4310. Performing ASME Code repair immediately would result in plant shutdown, creating a hardship for the licensee, without a compensating increase in the level of quality or safety. Furthermore, the NRC staff concludes that the proposed alternative provides a reasonable assurance of structural integrity during the interim period. Therefore, pursuant to 10 CFR 50.55a(a)(3)(ii) the alternative is authorized for the STPEGS, Unit 1, until the next scheduled outage exceeding 30 days, but not beyond the next refueling outage.

At that time, an ASME Code repair will be performed. 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: G. Georgiev

Date: October 26, 2006

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