May 12, 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-2-41 FOR APPROVAL OF TEMPORARY NON-CODE REPAIR AND DEFERRAL OF CODE REPAIR OF ESSENTIAL COOLING WATER SYSTEM PIPING (TAC NO. MC8279)

Dear Mr. Sheppard:

By letter dated September 8, 2005, STP Nuclear Operating Company (the licensee) requested relief from the requirements of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (Code), Section XI. The proposed relief (RR-ENG-2-41) would allow a temporary non-Code repair on Train 1A of the Essential Cooling Water (ECW) system piping at South Texas Project Electric Generating Station (STPEGS), Unit 1. The ECW system is classified as an ASME Code Class 3 system. The licensee is proposing to defer the permanent Code repair until the next scheduled outage exceeding 30 days, but no later than the next refueling outage.

The Nuclear Regulatory Commission (NRC) staff has reviewed the licensee's request for relief. Based on the information provided in the licensee's request, the NRC staff concludes that requiring immediate compliance with the Code would result in plant shutdown, creating a hardship for the licensee, without increasing the level of quality or safety relative to the licensee's proposed alternative. Furthermore, the NRC staff concludes that the proposed alternative provides 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 STPEGS, Unit 1, until the next outage exceeding 30 days, but not beyond the next refueling outage. At

that time, a Code repair will be performed. All other ASME Code, Section XI, requirements for which relief has not been 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

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ACCESSION NO: **ML060970240** *No significant change to SE input

OFFICE	NRR/LPL4/PM	NRR/LPL4/LA	CNPB/BC	OGC	NRR/LPL4/BC
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DATE	5/4/06	4/13/06	03/01/06	5/1/06	5/12/06

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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 September 8, 2005 (Agencywide Documents Accessing Management System Accession No. ML052590158), STP Nuclear Operating Company (the licensee) requested, pursuant to 10 CFR 50.55a(g)(5)(iii), approval to allow a temporary non-Code repair on Train 1A of the Essential Cooling Water (ECW) system piping at its South Texas Project Electric Generating Station (STP), Unit 1 (RR-ENG-2-41). 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 (Code) Class 3 system.

The licensee has stated that it has identified a through-wall indication in the 30-inch ECW pipe and has noted holes/indications in the aluminum-bronze pipe; however, there is no leakage from the identified indications.

The licensee is proposing to defer permanent Code repair of identified flaws until the next scheduled outage exceeding 30 days, but no later than the next scheduled refueling outage. The licensee requested relief because the proposed temporary non-Code repair deviates from the requirements of ASME Code, Section XI, Article IWA-4310.

ASME Code, Section XI, 1989 Edition is used for the Repair and Replacement program activities at the STP, Unit 1, during the second ten-year Inservice Inspection Interval.

2.0 REGULATORY EVALUATION

As specified in 10 CFR 50.55a(g), inservice inspection of nuclear power plant components shall be performed in accordance with the requirements of ASME Code, Section XI, except where specific written relief has been granted by the Commission pursuant to 10 CFR 50.55a(g)(6)(i). Pursuant to 10 CFR 50.55a(a)(3), 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. As stated in 10 CFR 50.55a(g)(5)(iii), 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

Relief is requested for STP, Unit 1, Train A ECW system 30-inch piping (Line Number 30" EW 1105-WT3) immediately downstream of throttle valve EW-0027 from Component Cooling Water (CCW) heat exchanger 1A. Damage consists of pitting located immediately downstream of throttle valve EW-0027, on the inside wall of the pipe, in an area covered outside the pipe by a slip-on flange. Some pitting extends through the 1/4-inch thick wall into the flange material for an approximate total depth of 1.145 inches. While there is some damage to the slip-on flange, the slip-on flange and the attended welds continue to prevent leakage from the ECW system. The root cause of the pitting is apparent cavitation resulting from required throttling of the EW-0027.

In addition, a linear flaw indication was found in the pipe end-to-flange fillet weld. The flaw is approximately 11.25 inches long along the pipe circumference and extends through the pipe wall but not through the flange. There was no active leak because of the carbon steel slip-on flange. The lower fillet weld acts as a pressure-retaining boundary. The linear indication is the result of high residual stress initiated during assembly, combined with stresses due to high cycle fatigue.

2.1.2 Applicable Code Edition and Addenda

ASME Code, Section XI, 1989 Edition.

2.1.3 Applicable Code Requirement

ASME Section XI IWA-4310 states:

> Defects shall be removed or reduced in size in accordance with this Article. The component shall be acceptable for continued service if the resultant section thickness created by the cavity is equal to or greater than the minimum design thickness. If the resulting section thickness is reduced below the minimum design thickness, the component shall be repaired in accordance with this Article. Alternatively, the component may be evaluated and accepted in accordance with the design rules of either the Construction Code, or Section III, when the Construction Code was not Section III.

2.1.4 Flaw Detection During Plant Operation

The Unit 1 ECW Train A flaw was discovered on July 5, 2005, while performing maintenance, and the through-wall flaw involved aluminum-bronze piping material.

2.1.5 Licensee's Impracticality Determination

As stated in Generic Letter 90-05, the staff has determined that an ASME Code repair is required for Code Class 1, 2, and 3 piping unless specific written relief has been granted by the NRC. However, the staff has determined that temporary non-code repair of Class 3 piping that cannot be isolated without a plant shutdown is justified in some instances.

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 STP, as permitted by the Limiting Condition for Operation, is not practical due to the amount of time required to implement the repair, the potential for fit-up problems during repair, and other uncertainties associated with completing the task. Therefore, STP requests approval of the subject relief request on the basis of impracticality. However, as described below, the staff is granting relief on an alternative basis, pursuant to 10 CFR 50.55a(a)(3)(ii).

2.1.6 Licensee's Proposed Alternative and Basis for Use

Proposed Alternative

Voids and imperfections on wetted surfaces of the 30" ECW return line from CCW Heat Exchanger 1A (Line Number 30" EW 1105-WT3) downstream of Valve 1-EW0027 were filled with Belzona 1111 to minimize further degradation. The Belzona application is not intended to repair the pressure boundary parts to satisfy the piping minimum wall thickness requirements. Belzona will serve solely as a barrier against erosion and corrosion until code repairs can be implemented.

Basis for Use

The ECW System is a low-pressure system with normal operating pressures of approximately 50 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.

Consequences of potential system interactions, including flooding, spray on equipment, and loss of flow to the system, have been evaluated and are bounded by Appendix 9A of the STP Updated Final Safety Analysis Report.

The aluminum-bronze pipe has a nominal diameter of 30 inches and a nominal thickness of 0.25 inch. The pipe material is SB 169 CA-614 rolled and welded plate (6-8 percent aluminum) fabricated to SA-155 tolerances. The slip-on flange material is SA-105 carbon steel. The slip-on flange is welded to the 30-inch aluminum bronze pipe with fillet welds at both ends.

The ECW pumps and the cooling reservoir have adequate design margin and make-up capability to account for postulated small leakage and are, therefore, fully capable of fulfilling the design basis functions and mission times during a design basis accident.

Belzona coatings have been used in various components at STP as protective coatings for erosion and corrosion control. Subsequent inspections of these components have demonstrated that Belzona coatings perform well in an immersed ECW environment. The use of Belzona coatings does not pose a threat to the piping, downstream components, or the safety function of the ECW system.

Flaw Evaluation: The structural integrity of the flanged piping was assessed using the "through-wall flaw" evaluation approach in Section C-3a of NRC Generic Letter 90-05. This approach evaluates the flaw stability by linear elastic fracture mechanics methodology. Enclosure 1 to Generic Letter 90-05 details the methodology.

Summary of evaluation results for Train A:

s = stress at the flaw location
s = 7.92 ksi
K = stress intensity factor
K = 30.77

Stresses	Pressure + Dead Weight	Faulted	Thermal
Stress (psi)	4798	7341	2261
Allowable Stress (psi)	18000	43200	27000
Safety Margin	3.75	5.88	11.94

With the slip-on flange in place and piping flaws not extending through the flange, the flange acts as a pressure-retaining boundary and also provides additional structural support for piping joint. The current flaw size and the bending loads are less than the respective allowed critical crack size and the bending loads determined by the limit load methodology. Structural integrity analysis shows that at the locations of maximum stress in the piping, very large cracks would be required to cause sudden failure. Through-wall cracks are expected to be detected well before they reach a size sufficient to result in such failure.

Augmented Inspection: The ECW piping is readily accessible; consequently, through-wall system leakage resulting from deterioration of the ECW piping can be detected during weekly VT-2 inspections. Nondestructive examination using ultrasonic or radiographic testing is not feasible due to the configuration and dimensions in the affected area.

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 STP, Unit 1. Specifically, the ECW Train A flaw

was discovered on July 5, 2005, and the through-wall flaw involved aluminum-bronze piping material. Two types of degradation mechanisms were observed: pitting and linear indications. The root cause of the flaws caused by pitting was determined to be cavitation resulting from required throttling of valve EW-0027. The root cause for the linear indications in the pipe was determined to be high residual stresses initiated during assembly and subsequently exacerbated by high-cycle fatigue.

To stop the leakage and prevent further degradation, the licensee performed a temporary non-Code repair of the flawed area using a combination of repair welding and the application of Belzona 1111 coating. The licensee is monitoring the repaired areas weekly during scheduled VT-2 inspections until a permanent Code repair can be accomplished. The staff finds the licensee's temporary non-Code repair has stopped the leakage and further degradation of the piping by the application of Belzona 1111 coating. Further, the ECW piping is readily accessible and, therefore, additional through-wall system leakage resulting from deterioration of the ECW piping can be detected during the weekly VT-2 inspections.

To assess the structural integrity of the flawed piping, the licensee evaluated the piping using the "through-wall flaw" evaluation approach included in NRC Generic Letter 90-05. The evaluation results determined that the current flaw size and the bending loads are less than the respective allowed critical crack size and the bending loads determined by the limit load methodology. The structural integrity analysis showed that at the locations of maximum stress in the piping, a very large crack would be required to cause sudden failure. As can be seen from the table in Section 2.1.6 above, the stress safety margin without complete replacement of the flaws is at least 3.75 for Train A. Therefore, through-wall cracks are expected to be detected well before they reach a size sufficient to result in failure. The staff finds that the evaluation approach employed by the licensee provides reasonable assurance of structural integrity because the structural integrity analysis employed the methods specified in NRC Generic Letter 90-05 and because the results showed that a safety margin of 3.75 exists without complete replacement of the flaw for ECW Train A.

The licensee also stated that performance of a permanent 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 Code repair. This time limitation is projected to arise from the fact that a lot of time is needed to implement the repair, there is a potential for fit-up problems during repair, and other unforeseen uncertainties may be encountered during the completion of the task. Therefore, the 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 Code repair. Because any leakage can be detected during weekly inspections and because the licensee's analysis provides reasonable assurance of structural integrity, requiring immediate Code compliance would result in hardship without a compensating increase in the level of quality and safety relative to the proposed alternative.

3.0 CONCLUSION

Based on the information provided in the licensee's submittal, the NRC staff concludes that requiring immediate compliance with the Code would result in plant shutdown, creating a hardship for the licensee, without increasing the level of quality or safety relative to the

licensee's proposed alternative. Furthermore, the NRC staff concludes that the proposed alternative provides 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 STP, Unit 1, until the next scheduled outage exceeding 30 days, but not beyond the next refueling outage. At that time, a 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: May 12, 2006

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