May 25, 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 REQUESTS RR-ENG-2-39 and RR-ENG-2-40 FOR APPROVAL OF TEMPORARY NON-CODE REPAIR AND DEFERRAL OF CODE REPAIR OF ESSENTIAL COOLING WATER SYSTEM PIPING, TRAINS 1B AND 1C (TAC NOS. MC7632 AND MC7633)

Dear Mr. Sheppard:

The Nuclear Regulatory Commission (NRC) staff has reviewed and evaluated the information provided by STP Nuclear Operating Company (the licensee) in its two letters dated July 19, 2005. You requested relief from the requirements of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (Code), Section XI, and authorization for temporary non-Code repairs on Trains 1B and 1C 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 and the licensee is proposing to defer the permanent Code repairs for Trains 1B and 1C of the ECW system piping until the next scheduled outage exceeding 30 days, but no later than the next refueling outage.

Based on the information provided in your submittals, the NRC staff concludes that requiring immediate compliance with Code requirements would result in hardship without compensating increase in quality or safety. Performing the required Code repair immediately would require 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 requested alternatives are authorized for STPEGS, Unit 1, until the next scheduled outage exceeding 30 days, but not beyond the next refueling outage. Code repairs will be performed at that time.

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

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

DISTRIBUTION
PUBLIC
LPLIV Reading
RidsOgcRp
RidsAcrsAcnwMailCenter
RidsNrrDorlLplg
RidsNrrPMMThadani
RidsNrrLADJohnson
RidsRgn4MailCenter
TBloomer, Region IV EDO

ACCESSION NO: ML061090754 *No significant change to SE input

OFFICE	NRR/LPL4/PM	NRR/LPL4/LA	CNPB/BC	OGC	NRR/LPL4/BC
NAME	MThadani	DJohnson	TChan*	AHodgen (NLO w/cmts)	DTerao
DATE	5/17/06	5/16/06	01/17/2006	5/24/06	5/25/06

OFFICIAL RECORD COPY

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 two letters dated July 19, 2005 (Agencywide Documents Access and Management System Accession Nos. ML052130211 and ML052130207), STP Nuclear Operating Company (the licensee) requested, pursuant to 10 CFR 50.55a(g)(5)(iii), authorization of temporary non-Code repairs on Trains 1B (RR-ENG-2-39) and 1C (RR-ENG-2-40) of the Essential Cooling Water (ECW) system piping at its South Texas Project 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 (Code) Class 3 system and the licensee is proposing to defer the permanent Code repair of the identified flaws until the next scheduled outage exceeding 30 days, but no later than the next scheduled refueling outage. The relief was requested 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 in the 30-inch pipe and several small holes/indications in aluminum-bronze pipe of Unit 1 Train B; and through-wall indications in 30-inch pipe and several small holes/indications in Unit 1 Train C. No leakages have ben found on the identified flaws. As stated above, the licensee has performed non-Code repairs on the identified flaws.

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

2.0 REGULATORY EVALUATION

As specified in Title 10 of the *Code of Federal Regulations* (10 CFR) 50.55a(g), 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). 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. The regulation at 10 CFR 50.55a(g)(5)(iii) states 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 relief requests 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

(A) Unit 1 ECW Train B

Through-wall indications have been identified on the 30-inch pipe of STPEGS, Unit 1, Train B of the ECW system, downstream of ECW valve EW-0064. Damage consists of pitting located immediately downstream of throttle valve EW-0064 on the inside wall of the pipe in an area covered outside the pipe by a slip-on flange. Some pitting has a maximum depth of 0.75-inch with corrosion extending into the flange. While there is some damage to the slip-on flange, the slip-on flange and the attendant welds prevent leakage from the ECW system. Pitting is along the rim of the pipe in two discrete regions separated by approximately 11 inches. The regions are approximately 6 inches long and 6-1/2 inches long, respectively. The root cause of the damage was identified as apparent cavitation resulting from required throttling of the upstream valve.

(B) Unit 1 ECW Train C

Through-wall indications have been identified on the 30-inch pipe of STPEGS, Unit 1, Train C of the ECW system downstream of ECW valve EW-0101. Damage consists of pitting located immediately downstream of throttle valve EW-0101 on the inside wall of the pipe in an area covered outside the pipe by a slip-on flange. Some pitting has a maximum depth of 0.78-inch with corrosion extending into the flange. The root cause of the pitting was apparent cavitation resulting from required throttling of the upstream valve. While there is some damage to the slip-on flange, the slip-on flange and the attendant welds continue to prevent leakage from the ECW system. In addition, linear pipe indications were identified in the pipe underneath the flange in the following two areas.

- The ECW pipe separated from the connecting fillet weld resulting in a gap between the pipe and the flange. The separation extends approximately 20 inches along the pipe circumference.

- The second flaw was a through-wall circumferential crack 6.5 inches long located 3.5 inches from the flange face.

The apparent cause of these linear indications is high residual stresses initiated during assembly and exacerbated by high-cycle fatigue.

2.1.2 Applicable Code Edition and Addenda

ASME Code, Section XI, 1989 Edition.

2.1.3 Applicable Code Requirement

ASME Code Section XI, Article 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 STPEGS, Unit 1, ECW Train B flaws were discovered on May 17, 2005, and the Unit 1 ECW Train C flaws were discovered on May 23, 2005, while performing maintenance. In both cases, the flaws involved aluminum-bronze piping material.

2.1.5 Licensee's Impracticality Determination

In accordance with the provisions of 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 repairs within the allowed outage time for the ECW System at STPEGS, 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.

Based on the above considerations, the licensee requests approval of these relief requests on the basis of impracticality. However, as described below, the staff is authorizing an alternative basis, pursuant to 10 CFR 50.55a(a)(3)(ii).

2.1.6 Proposed Alternative and Basis for Use

Proposed Alternative

Non-Code repairs were performed on the STPEGS, Unit 1, ECW piping of Train B (Line Number EW 1205WT3) downstream of Valve 1-EW0064.

- Voids and imperfections on wetted surfaces of the 30-inch ECW return line from Component Cooling Water Heat Exchanger 1B 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 further erosion and corrosion until Code repairs can be implemented.

The Non-Code repairs performed on the STPEGS, Unit 1, Train C piping (Line Number EW 1305-WT3) downstream of Valve 1-EW0101 consist of the following:

- Area 1: Pitting/through-wall indications on the pipe near the flange face fillet weld were repaired by applying a seal weld to the pipe wall, or removing the pipe wall where pitting was excessive. The remaining pipe was repaired by seal welding to the carbon steel slip-on flange, or removing the pipe wall where pitting was excessive. The area from which the pipe is removed had a replacement pipe segment installed that was seal welded on the perimeter to the existing pipe/flange. Welded areas were visually examined.

- Area 2: Separation between either side of the inside diameter fillet weld and the pipe wall/flange was repaired by applying seal weld between the pipe wall and flange. Welded areas were visually examined.

- Area 3: Minor pitting of the pipe wall wetted surfaces near the flange was repaired by applying a seal weld to the pipe wall, or removing the pipe wall where pitting was excessive, and seal-welding the remaining pipe to the carbon steel slip-on flange, or removing the pipe wall where pitting is excessive. The area from which the pipe is removed may have a replacement pipe segment installed. That shall be seal welded on the perimeter of the existing pipe/flange. Welded areas were visually examined.

- Area 4: Linear indication in the pipe wall 3.5 inches from the flange face were repaired by applying seal weld to the length of the crack. The seal weld was built up to approximately 1/4 inch thickness. The weld area was tested with dye penetrant to ensure the crack is fully seal welded. Voids and imperfections on wetted surfaces downstream of Valve 1-EW0101 were filled with Belzona 1111 to minimize further degradation until permanent repairs were completed. 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 pounds per square inch (psi) and a design pressure of 120 psi. Therefore, the consequences associated with failure of high-energy lines are not applicable to this relief request.

Consequences of potential systems interactions, including flooding, spray on equipment, and loss of flow to the system, have been evaluated and are bounded by Appendix 9A of the STPEGS 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. Similar pitting of the aluminum-bronze piping at this location is expected to have occurred in the remaining ECW trains. However, based on similarity in design between the ECW trains, affected ECW trains are expected to be able to continue to perform their intended design-basis function until Code-based repairs can be implemented.

Belzona coatings have been used in various components at the STPEGS 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 consists of evaluating the flaw stability by linear elastic fracture mechanics methodology. Enclosure 1 to Generic Letter 90-05 details the methodology. The "Limit Load" methodology was used to determine the allowed maximum critical crack size and the bending loads.

Summary of evaluation results for Train B:

s = stress at the flaw location
s = 8.2 ksi
K = stress intensity factor
K = 38.426

Stresses	Pressure + Dead Weight	Faulted	Thermal
Stress (psi)	4632	7797	2396
Allowable Stress (psi)	18000	43200	27000
Safety Margin	3.88	5.5	11.2

Summary of evaluation results for Train C:

s = stress at the flaw location
s = 5.8 ksi
K = stress intensity factor
K = 57.051

Stresses	Pressure + Dead Weight	Faulted	Thermal
Stress (psi)	4769	3324	1612
Allowable Stress (psi)	18000	43200	27000
Safety Margin	3.77	12.99	16.75

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 a 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 through-wall flaws were discovered during the performance of routine maintenance activities on the ECW system at STPEGS, Unit 1, station. Specifically, the ECW Train B flaws were discovered on May 17, 2005, and the ECW Train C flaws were discovered on May 23, 2005. In both cases the through-wall flaws 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 due to cavitation resulting from required throttling of the upstream valve. 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 has performed a temporary non-Code repair of the flawed areas 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 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. Analysis using "Limit Load" methodology was used to determine allowed maximum critical crack size and bending loads. 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. Structural integrity analysis showed that at the locations of maximum stress in the piping, very large cracks would be required to cause sudden failure. As can be seen from the tables included in Section 2.1.6 above, stress safety margin without complete replacement of the flaws is at least 3.88 for Train B and 3.77 for Train C. Therefore, through-wall 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 provides reasonable assurance of structural integrity, because the structural integrity analysis employs the methods specified in NRC Generic Letter 90-05 and because the results showed that safety margins of 3.88 and 3.77 exist without complete replacement of the flaws for both ECW Trains B and C.

The licensee also stated that the performance of 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 arises due to the fact that a lot of time is needed to implement the repair, there is potential for fit-up problems during repair, and other unforseen uncertainties may be encountered during the performance of the repairs. The NRC staff finds that 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 submittals and the above evaluation, the NRC staff concludes that requiring immediate compliance with the Code would result in hardship without a compensating increase in the level of quality or safety. Performing the required Code repair immediately 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 a reasonable assurance of structural integrity during the interim period prior to the next refueling outage. Therefore, pursuant to 10 CFR 50.55a(a)(3)(ii), the alternative is authorized for STPEGS, 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 25, 2006

cc:

Senior Resident Inspector
U.S. Nuclear Regulatory Commission
P. O. Box 910
Bay City, TX 77414

C. Kirksey/C. M. Canady
City of Austin
Electric Utility Department
721 Barton Springs Road
Austin, TX 78704

Mr. J. J. Nesrsta
Mr. R. K. Temple
City Public Service Board
P. O. Box 1771
San Antonio, TX 78296

INPO
Records Center
700 Galleria Parkway
Atlanta, GA 30339-3064

Regional Administrator, Region IV
U.S. Nuclear Regulatory Commission
611 Ryan Plaza Drive, Suite 400
Arlington, TX 76011

Steve Winn
Texas Genco, LP
12301 Kurland Drive
Houston, TX 77034

Judge, Matagorda County
Matagorda County Courthouse
1700 Seventh Street
Bay City, TX 77414

A. H. Gutterman, Esq.
Morgan, Lewis & Bockius
1111 Pennsylvania Avenue, NW
Washington, DC 20004

E. D. Halpin
Vice President Oversight
STP Nuclear Operating Company
P. O. Box 289
Wadsworth, TX 77483

S. M. Head, Manager, Licensing
STP Nuclear Operating Company
P. O. Box 289, Mail Code: N5014
Wadsworth, TX 77483

Environmental and Natural Resources
Policy Director
P. O. Box 12428
Austin, TX 78711-3189

Jon C. Wood
Cox, Smith, & Matthews
112 East Pecan, Suite 1800
San Antonio, TX 78205

Director
Division of Compliance & Inspection
Bureau of Radiation Control
Texas Department of State Health Services
1100 West 49th Street
Austin, TX 78756

Brian Almon
Public Utility Commission
William B. Travis Building
P. O. Box 13326
1701 North Congress Avenue
Austin, TX 78701-3326

Susan M. Jablonski
Office of Permitting, Remediation
and Registration
Texas Commission on
Environmental Quality
MC-122
P.O. Box 13087
Austin, TX 78711-3087

Mr. Terry Parks, Chief Inspector
Texas Department of Licensing
and Regulation
Boiler Division
P. O. Box 12157
Austin, TX 78711

Mr. Ted Enos
4200 South Hulen
Suite 630
Ft. Worth, Texas 76109