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

March 12, 2010

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

SUBJECT: SOUTH TEXAS PROJECT, UNIT 2 - RELIEF REQUEST RR-ENG-2-52 FOR THE ESSENTIAL COOLING WATER SYSTEM (TAC NO. ME0899)

Dear Mr. Halpin:

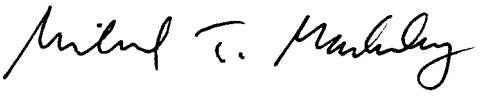
By letter dated March 12, 2009, as supplemented by letter dated December 9, 2009, STP Nuclear Operating Company (the licensee) requested approval of Relief Request RR-ENG-2-52 from the requirements of IWA-5250 of Section XI of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code) at South Texas Project, Unit 2 (STP-2). Relief Request No. RR-ENG-2-52 will allow deferral of the code repair of a flaw identified in the Unit 2 Essential Cooling Water (ECW) Class 3 piping. The licensee stated that an ASME Code repair of the flaw at the time was impractical. In accordance with the guidance provided in U.S. Nuclear Regulatory Commission (NRC) Generic Letter 90-05, "Guidance for Performing Temporary Non-Code Repair of ASME Code Class 1, 2, and 3 Piping," dated June 15, 1990, and subject to NRC approval, the licensee stated that a code repair would be implemented no later than the next scheduled Unit 2 refueling outage. However, the licensee repaired the degraded flange in accordance with the ASME Code on April 24, 2009.

Although the flange was repaired in accordance with the ASME Code on April 24, 2009, the NRC needs to review the proposed alternative to ensure that the plant would have been in compliance with 10 CFR 50.55a from December 2, 2008 to April 24, 2009. Operability and functionality of the system was maintained and deferring the repair did not affect the health and safety of the public.

The NRC staff has reviewed the licensee's submittal and determined that conformance with ASME Code requirements to repair the degraded flange during the period from December 2, 2008, to April 24, 2009, was impractical. Pursuant to paragraph 50.55a(g)(6)(i) of Title 10 of the *Code of Federal Regulations* (10 CFR), the NRC grants the use of Relief Request No. RR-ENG-2-52, as revised by letter dated December 9, 2009, for the repair of a through-wall flaw on the downstream flange of ECW return throttle valve 2-EW-1004 from Essential Chiller 22B at STP-2 for the period from December 2, 2008, to April 24, 2009.

A copy of the Safety Evaluation is enclosed. All other ASME Code, Section XI, requirements for which relief has not been specifically requested and approved remain applicable, including third-party review by the Authorized Nuclear Inservice Inspector.

Sincerely,



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

Docket No. 50-499

Enclosure:
Safety Evaluation

cc w/encl: Distribution via Listserv

UNITED STATES
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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO ESSENTIAL COOLING WATER SYSTEM

RELIEF REQUEST NO. RR-ENG-2-52

STP NUCLEAR OPERATING COMPANY

SOUTH TEXAS PROJECT, UNIT 2

DOCKET NO. 50-499

1.0 INTRODUCTION

By letter dated March 12, 2009 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML090830517), STP Nuclear Operating Company (STPNOC, the licensee) requested approval of Relief Request No. RR-ENG-2-52 from IWA-5250 of Section XI of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code) at South Texas Project (STP), Unit 2. Relief Request No. RR-ENG-2-52 will allow deferral of code repair of a flaw identified in STP, Unit 2 Essential Cooling Water (ECW) Class 3 piping at STP, Unit 2. The licensee stated that an ASME Code repair of the flaw at the time was impractical. In accordance with the guidance provided in U.S. Nuclear Regulatory Commission (NRC) Generic Letter 90-05, "Guidance for Performing Temporary Non-Code Repair of ASME Code Class 1, 2, and 3 Piping," dated June 15, 1990, and subject to NRC approval, the ASME Code repair will be implemented no later than the next scheduled STP, Unit 2 refueling outage.

On December 2, 2008, the licensee detected a through-wall flaw on the downstream flange of ECW return throttle valve 2-EW-1004 from Essential Chiller 22B. The flaw is a linear indication (approximately 3/8-inch long) with residue buildup on the downstream flange side of a flange-to-piping weld. The root cause of the flaw was determined by the licensee to be dealloying. Evaluation of the flaw using fracture mechanics methodology provided by Generic Letter 90-05 determined that the structural integrity of the ECW piping is reasonable assured.

On April 24, 2009, the licensee repaired the degraded component in accordance with the ASME Code.

Although the flange was repaired in accordance with the ASME Code on April 24, 2009, the NRC needs to review the proposed alternative to ensure that the plant would have been in compliance with 10 CFR 50.55a from December 2, 2008 to April 24, 2009. Operability and functionality of the system was maintained and deferring the repair did not affect the health and safety of the public.

The NRC staff requested additional information by email dated August 25, 2009 (ADAMS Accession No. ML100540530). The licensee responded to the NRC staff's request by letter dated December 9, 2009 (ADAMS Accession No. ML093560366) and updated Relief Request No. RR-ENG-2-52. The staff's evaluation is based on the relief request dated December 9, 2009.

2.0 REGULATORY EVALUATION

Pursuant to paragraph 50.55a(g)(4) of Title 10 of the *Code of Federal Regulations* (10 CFR), ASME Code Class 1, 2, and 3 components (including supports) will meet the requirements, except the design and access provisions and the preservice examination requirements, set forth in the ASME Code, Section XI, "Rules for Inservice Inspection (ISI) of Nuclear Power Plant Components," to the extent practical within the limitations of design, geometry, and materials of construction of the components. The regulations require that inservice examination of components and system pressure tests conducted during the first 10-year ISI interval and subsequent intervals comply with the requirements in the latest edition and addenda of Section XI of the ASME Code incorporated by reference in 10 CFR 50.55a(b) 12 months prior to the start of the 120-month interval, subject to the limitations and modifications listed therein.

Pursuant to 10 CFR 50.55a(a)(3), alternatives to requirements may be authorized by the NRC if the licensee demonstrates that: (i) the proposed alternative provides 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 ISI Code of record for the second 10-year ISI interval at STP-2 is the ASME Code, Section XI, the 1989 Edition.

3.0 TECHNICAL EVALUATION

3.1 Components Affected By the Relief Request

The affected component is an ASME Code Class 3, aluminum-bronze flange downstream of Essential Cooling Water (ECW) return throttle valve 2-EW-1004 from Essential Chiller 22B.

In its letter dated December 9, 2009, the licensee states:

> 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. Valve 2-EW-1004 provides manual throttling capability and is locked in place to control the fluid flow rate through the Essential Chiller.

3.2 Applicable Code Edition and Addenda (as stated by the licensee)

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

3.3 Applicable Code Requirements (as stated by the licensee)

ASME [Code] Section XI, IWA-5250(a)(3) requires that the source of leakage be evaluated for repair or replacement in accordance with IWA-4000 or IWA-7000. Relief from the requirements of IWA-5250(a)(3) is requested for deferral of code repair of the through-wall flaw at this location until the following 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.

3.4 Reason for Request (as stated by the licensee)

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. Requesting relief from ASME Code requirements is appropriate when performing the repair at the time of discovery is determined to be impractical.

Generic Letter 90-05 defines a repair as being 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.

STPNOC applies risk-managed Technical Specifications in accordance with the Configuration Risk Management Program. If there is a need to extend the allowed outage time for the affected ECW loop, risk analysis techniques are applied that take into account real-time plant status to keep overall risk below 1.0E-5 up to a maximum of 30 days. However, taking an otherwise operable ECW loop out of service while at power not only increases overall risk to the plant, but also limits flexibility in dealing with other plant equipment issues that may arise in the interim.

Isolating the subject pipe for a code repair makes the affected ECW train unavailable for service for the duration of the repair. Assigning a specific amount of time to complete a flaw repair when a flaw is first identified and using that as a criterion for initiating a train outage is not appropriate. At the time of discovery of a flaw, an estimate of the amount of time needed to complete the repair would be a rough approximation. Flaw repairs are added to the tasks to be performed during a scheduled train outage of sufficient duration to accommodate the repairs with minimal impact on plant operations. Lengthening or initiating a train outage to perform repairs when it has not already been scheduled may conflict with other train outages or disrupt the schedule for activities such as surveillances that must be performed at set intervals. Delays in the preparation process if a train has already been taken out of service may result in a train outage that exceeds the limiting condition for operation defined in the Technical Specifications. Prior to

the train outage scheduled for the repair, preparations prior to the actual repair would be put in place while the train is in service. Preparation activities are not necessarily performed in series, and may be performed in parallel, and the time to be used for preparation would be determined by the train outage schedule.

In this instance, a replacement flange was ordered. A purchase order was issued January 29, 2009, with a due date of April 17, 2009.

Performance of code repairs within the allowed outage time for the ECW system, 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, relief is requested on the basis of impracticality.

3.5 Proposed Alternative (as stated by the licensee)

Repair of the defect would be performed when adequate time is available for the repair, but no later than the following Unit 2 refueling outage. The next Unit 2 refueling outage is currently scheduled to begin in March 2010 (2RE14). Compensatory actions were implemented to detect changes in the condition of the flaw until a repair could be implemented.

3.6 Duration of Proposed Alternative (as stated by the licensee)

Rework of the defect to restore the flange to its design condition was deferred until sufficient time was available. The flange was replaced in accordance with the ASME Code on April 24, 2009.

3.7 NRC Staff Evaluation

10 CFR 50.55a(a)(2) requires that systems and components of boiling and pressurizer water reactors meet the ASME Code specified in paragraphs (b), (c), (d), (e), (f), and (g) of 10 CFR 50.55a. 10 CFR 50.55a(a)(2) requires that if a component is degraded, it must be repaired in accordance with the ASME Code, Section XI. However, 10 CFR 50.55a(a)(3) permits licensees to apply alternatives to the requirements of the ASME Code, Section XI, when authorized by the NRC.

Although the flange was repaired in accordance with the ASME Code on April 24, 2009, the NRC needs to review the proposed alternative to ensure that the plant would be in compliance with 10 CFR 50.55a from December 2, 2008 to April 24, 2009.

During the period from the discovery of the flaw in the flange on December 2, 2008 to April 24, 2009 when the flange was repaired, operability and functionality of the system was maintained and deferring the repair did not affect the health and safety of the public.

The staff evaluated the structural integrity of the pipe/flange during the period while it was degraded from December 2, 2008 to April 24, 2009.

3.7.1 Flaw Characterization

On December 2, 2008, during periodic examination of ECW large bore piping, the licensee found an indication of a through-wall flaw on the downstream flange of Essential Chiller 22B ECW return throttle valve 2-EW-1004.

In its letter dated December 9, 2009, the licensee states, in part, that:

> Leakage residue buildup in a line parallel to the circumferential weld was found at the weld on the downstream flange of the valve, with an underlying flaw of approximately 3/8-inch in length. The flaw appears to be a tight crack as leakage is not readily measurable. Nominal ECW pipe diameter is 8 inches with a pipe wall thickness of 0.322 inch.

In its December 9, 2009, letter the licensee also states that:

> The flaw is due to dealloying. 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.

In its email dated August 25, 2009, the NRC staff requested the licensee to describe the flaw size that would cause a leak rate such that the ECW system could not provide sufficient make-up to fulfill its intended function. In its response dated December 9, 2009, the licensee states:

> Flooding calculations indicate a potential flooding rate of approximately 14.5 cu ft/min [cubic feet per minute] through a postulated crack in the ECW pipe. However, this is enveloped by the maximum flood rate of approximately 80 cu ft/min due to a postulated crack in the Component Cooling Water line in Mechanical Auxiliary Building room 067E, the location of the flawed ECW pipe. There is no effect on nearby safe shutdown equipment by postulated leakage/spray effects. The ECW pumps and the cooling reservoir have adequate design margin and make-up capability to account for postulated leakage and are therefore fully capable of fulfilling the design-basis functions and mission times during a design-basis accident. Conservatism in the assumed seepage losses from the Essential Cooling Pond (ECP) and ECP inventory margin bounds water loss that would occur due to a crack 15 inches by 1/8 inch.

The NRC staff has determined that the ECW system has sufficient make-up capacity to compensate for leakage from a crack size/area of 15 inches by 1/8 inch. The staff further determined that dealloying flaw size is much smaller than the postulated crack size/area. Therefore, there was reasonable assurance that the ECW system was adequate in performing its intended function during the period of degradation from December 2, 2008, to April 24, 2009.

The NRC staff also requested the licensee to discuss the changes to the flaw size and leakage since the discovery.

In its December 9, 2009 letter, the licensee states:

> The experience at the South Texas Project is that the dealloying process progresses very slowly. Changes observed in flaw conditions over a period of months have been inconsequential or non-existent. Any changes in flaw parameters would be identified well before the affected ECW train would be put at risk.

The licensee evaluated the subject flaw using the methodology in NRC Generic Letter 90-05 and determined that the degraded pipe/flange has adequate structural safety margin. The NRC staff has determined that the ECW piping is subject to relatively low loads. The licensee states that the normal operating pressure and temperature are 50 pounds per square inch gauge (psig) and 47 to 100 degrees Fahrenheit (°F), respectively. The design pressure is 120 psig and design-basis accident is not expected to exceed 120 °F. Based on the low pressure and temperature, the NRC staff concludes that the degraded pipe/flange should have sufficient fracture toughness to reasonably assure adequate structure integrity.

3.7.2 Inspection and Monitoring

In its email dated August 25, 2009, the NRC staff requested the licensee to describe the sensitivity of the sump level alarms (i.e., how low of a leak rate would the alarm annunciate) and at what leak rate will the operator take corrective actions.

In its response dated December 9, 2009, the licensee states:

> Leakage from ECW piping in [the degraded] location would end up at the Mechanical Auxiliary Building (MAB) sumps. Sump level alarms are available to warn operators if leakage exceeds the sump pump capacity.

In its letter dated December 9, 2009, the licensee states that the structural integrity is monitored by the following methods:

- Monthly monitoring for qualitative assessment of leakage (quantitative if measurable leaks are observed). There is no measurable leakage at this time.

- Continuation of large bore ECW piping periodic walkdowns. Walkdowns of all ECW train piping are regularly scheduled VT-2 examinations at six-month intervals to identify areas of dealloying. These inspections have proven to be an effective means of identifying flaws in ECW components prior to deterioration of structural integrity margins below ASME Section XI requirements. The dealloying process proceeds very slowly. Despite the increased frequency of inspection following identification of a flaw, changes observed in flaw conditions over a period of months have been inconsequential or non-existent. Dealloying flaws are only detectable by visual examination once they have reached the

> piping surface. Dealloying flaws are addressed under the station condition reporting program.

The licensee's proposed monthly walkdown as stated above is contrary to the recommended frequency in NRC Generic Letter 90-05 which recommends that weekly walkdowns be performed to determine any degradation of structural integrity of the affected component. In its email dated August 25, 2009, the NRC staff requested the licensee to justify the proposed monthly monitoring and to demonstrate that the proposed augmented inspection schedule will provide reasonable assurance that the operator has sufficient time to take corrective actions prior to the flaw in the flange growing uncontrollably to challenging operability of the affected ECW train.

By letter dated December 9, 2009, the licensee states:

> In the event a flawed area is discovered, augmented monthly inspections are performed to monitor the flaw to detect changes in the size of the discolored area or leakage rate. A flaw caused by dealloying is not detectable by either ultrasonic testing or radiography. The extent of the linear indication was determined by use of dye penetrant.
>
> Inspectors look for: change from residue buildup to active dripping; new indication at a different area on the component; or, a substantial change (about 2x or more) in the area of the original indication. Periodic monitoring and inspection by STPNOC provide confidence in the ability to detect changes in the leakage rate before leakage becomes a safety issue. Structural integrity and the monitoring frequency are re-evaluated if monitoring identifies significant changes in the condition of the flawed area.
>
> By the time of the repair, there were no changes evident in the flaw compared to its appearance at the time of discovery. No dealloyed area has shown sufficient change from the time of discovery to warrant accelerated implementation of corrective measures.

The NRC staff has determined that a monthly visual examination is acceptable for the routine inspection of the ECW piping that contains no flaws. However, the NRC staff does not agree with a monthly inspection frequency when a flaw is detected in the ECW piping. NRC Generic Letter 90-05 and ASME Code, Section XI, Code Case N-513, "Evaluation Criteria for Temporary Acceptance of Flaws in Moderate Energy Class 2 or 3 Piping Section XI, Division 1," both require shorter inspection intervals. However, the licensee has repaired the flaw; therefore, the inspection frequency issue is moot.

The Code Case N-513-2 paragraph (f) requires that for through-wall leaking flaws, leakage shall be observed by daily walkdowns to confirm that the analysis conditions used in the flaw evaluation remain valid. In its email dated August 25, 2009, the NRC staff requested the licensee to discuss whether a daily walkdown will be performed if the subject flaw starts to leak.

By letter dated December 9, 2009, the licensee states:

> The ASME Section XI Code of record for the South Texas Project is the 1989 Edition. Code Case N-513 is applicable to the 1998 Edition. Code Case N-513-2 is applicable to the 2004 Edition. Consequently, this code case is not applicable to [STP, Unit 2].

The NRC staff has determined that the licensee's response is acceptable.

The staff requested the licensee to discuss whether examinations were performed on other ECW trains to identify similar flaws.

In its December 9, 2009 letter, the licensee states that examinations of all ECW train piping are performed every 6 months. No other areas of dealloying were found during the December 2, 2008, periodic examination. In addition, the licensee states that if identified, dealloying flaws are addressed under the station condition reporting program. The NRC staff has determined that the licensee has examined all ECW piping and no flaws were found other than the subject flaw.

NRC Generic Letter 90-05, Enclosure 1, Section 3 specifies that the integrity of the temporary non-code repair of Code Class 3 piping should be assessed at least every 3 months by either ultrasonic testing (UT) or radiographic testing (RT). The NRC staff questioned the reason these inspection methods were not specified in the proposed relief request.

By letter dated December 9, 2009, the licensee revised Section 6.2.5 of its relief request to state that a flaw caused by dealloying is not detectable by either ultrasonic testing or radiography. The extent of the linear indication was determined by use of dye penetrant. The NRC staff understands the difficulties of detecting the dealloying-initiated flaw by qualified UT and RT in terms of technology and piping configuration. Besides visual examination, dye penetrant or eddy current technique would be the preferred inspection method that could be used.

3.7.3 Impracticality

In its March 12, 2009, letter, the licensee used impracticality defined in Generic Letter 90-05 as the basis for the relief request. Generic Letter 90-05 defines impracticality as that the pipe cannot be isolated to complete a code repair within the time period permitted by the limiting condition for operation in the technical specifications and a plant shutdown may be necessary to complete the code repair. The NRC staff questioned the reason the subject pipe could not be isolated to complete an ASME Code repair. By letter dated December 9, 2009, the licensee states that isolating the subject pipe for a code repair makes the affected ECW train unavailable for service for the duration of the repair. Removing an operable ECW train from service while at power increases overall risk to the plant. Scheduled train work periods are rarely of sufficient duration to allow an ASME Code repair of this nature during the train outage without lengthening the outage, which will disrupt scheduled work activity to follow in work periods for other trains. The NRC staff concludes that the licensee has satisfactorily demonstrated impracticality of repair from December 2, 2008, to April 24, 2009.

4.0 CONCLUSION

The NRC staff has determined that conformance with ASME Code requirements to repair the degraded pipe/flange during the period from December 2, 2008, to April 24, 2009, is impractical. The NRC concludes that granting relief pursuant to 10 CFR 50.55a(g)(6)(i) is authorized by law and will not endanger life or property or the common defense and security, and is otherwise in the public interest giving due consideration to the burden upon the licensee that could result if the requirements were imposed on the licensee. Therefore, the NRC staff authorizes the use of Relief Request No. RR-ENG-2-52, as described in the licensee's letter dated December 9, 2009, for the repair of a through-wall flaw on the downstream flange of ECW return throttle valve 2-EW-1004 from Essential Chiller 22B at STP, Unit 2. Relief Request No. RR-ENG-2-52 is granted for the period from December 2, 2008, to April 24, 2009.

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

Principal Contributor: J. Tsao

Date: March 12, 2010

A copy of the Safety Evaluation is enclosed. All other ASME Code, Section XI, requirements for which relief has not been specifically requested and approved remain applicable, including third-party review by the Authorized Nuclear Inservice Inspector.

Sincerely,

/RA/

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

Docket No. 50-499

Enclosure:
Safety Evaluation

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