Nuclear Operating Company
South Texas Project Electric Generating Station P.O. Box 289 Wadsworth, Texas 77483

February 18, 2014
NOC-AE-14003079
10 CFR 54
STI: 33815239
File: G25

U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, DC 20555-0001

South Texas Project
Units 1 and 2
Docket Nos. STN 50-498, STN 50-499
Response to Requests for Additional Information for the
Review of the South Texas Project, Units 1 and 2,
License Renewal Application – RWST Cracking, Set 24 (TAC Nos. ME4936 and ME4937)

References:
1. Letter from G. T. Powell, STPNOC, to NRC Document Control Desk, "License Renewal Application", dated October 25, 2010 (NOC-AE-10002607) (ML103010257)
2. Letter from NRC to STPNOC, "Requests for Additional Information for the Review of the South Texas Project, Units 1 and 2, License Renewal Application – RWST Cracking, Set 24 (TAC Nos. ME4936 and ME4937)", October 3, 2012 (ML12256B049) (AE-NOC-12002355)
3. Letter from G.T. Powell, STPNOC, to NRC Document Control Desk, "Supplement 1 to Request for NRC Staff to Suspend Safety Review of the South Texas Project License Renewal Application (TAC Nos. ME4936 and ME4937)", December 19, 2012 (NOC-AE-12002942) (ML12363A102)

By Reference 1, STP Nuclear Operating Company (STPNOC) submitted a License Renewal Application (LRA) for South Texas Project (STP) Units 1 and 2. By Reference 2, the NRC staff requested additional information for review of the STPNOC LRA. STPNOC temporarily suspended license renewal activities and committed in Reference 3 to provide a response to Reference 2 by February 28, 2014. STPNOC's response to the requests for additional information is provided in Enclosure 1 to this letter. Changes to LRA pages described in Enclosure 1 are depicted as line-in/line-out pages provided in Enclosure 2.

There is one regulatory commitment added to Table A4-1 of the LRA and is provided in Enclosure 3 to this letter. There are no other regulatory commitments in this letter.

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NRR

Should you have any questions regarding this letter, please contact either Arden Aldridge, STP License Renewal Project Lead, at (361) 972-8243 or Rafael Gonzales, STP License Renewal Project regulatory point-of-contact, at (361) 972-4779.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on February 18, 2014
Date

G.T. Powell
Site Vice President

RJG

Enclosures:
1. STPNOC Response to Requests for Additional Information
2. STPNOC LRA Changes with Line-in/Line-out Annotations
3. Regulatory Commitments

cc:
(paper copy)

Regional Administrator, Region IV
U. S. Nuclear Regulatory Commission
1600 East Lamar Boulevard
Arlington, Texas 76011-4511

Balwant K. Singal
Senior Project Manager
U.S. Nuclear Regulatory Commission
One White Flint North (MS 8B1)
11555 Rockville Pike
Rockville, MD 20852

Senior Resident Inspector
U. S. Nuclear Regulatory Commission
P. O. Box 289, Mail Code: MN116
Wadsworth, TX 77483

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

Jim Collins
City of Austin
Electric Utility Department
721 Barton Springs Road
Austin, TX 78704

John W. Daily
License Renewal Project Manager (Safety)
U.S. Nuclear Regulatory Commission
One White Flint North (MS O11-F1)
Washington, DC 20555-0001

Tam Tran
License Renewal Project Manager
(Environmental)
U. S. Nuclear Regulatory Commission
One White Flint North (MS O11F01)
Washington, DC 20555-0001

(electronic copy)

A. H. Gutterman, Esquire
Kathryn M. Sutton, Esquire
Morgan, Lewis & Bockius, LLP

John Ragan
Chris O'Hara
Jim von Suskil
NRG South Texas LP

Kevin Pollo
Richard Pena
L.D. Blaylock
City Public Service

Peter Nemeth
Crain Caton & James, P.C.

C. Mele
City of Austin

Robert Free
Texas Department of State Health Services

Richard A. Ratliff
Alice Rogers
Texas Department of State Health Services

Balwant K. Singal
John W. Daily
Tam Tran
U. S. Nuclear Regulatory Commission

Enclosure 1

STPNOC Response to Requests for Additional Information

**SOUTH TEXAS PROJECT, UNITS 1 AND 2,
REQUEST FOR ADDITIONAL INFORMATION
RWST Cracking, SET 24
(TAC NOS. ME4936 AND ME4937)**

RAI Set 24, RWST Cracking (076)

RAI B2.1.16-3

Background:

License renewal application (LRA) Table 3.2.2-4, Safety Injection System, contains an aging management review (AMR) item for the stainless steel refueling water storage tanks (RWSTs), which are exposed internally to treated borated water and are managed for loss of material with the Water Chemistry and One-Time Inspection programs.

The response to request for additional information (RAI) 4.7.2-1, dated May 12, 2011, states that the Unit 1 RWST had an indication of a small active leak at the top of the shell to base plate weld. In documentation associated with the relief request for this leak (South Texas Project (STP) letters dated November 29, 1999; December 16, 1999; and later supplements), the leak was attributed to a crack in the tank base plate. Altran Technical Report No. 00115-TR-001, "Evaluation of the Refueling Water Storage Tank Bottom Plate Crack," concluded that the apparent cracking mechanism was stress corrosion cracking, based on evidence of transgranular crack propagation and branching.

The leak in the Unit 1 RWST has not been repaired. On August 23, 2001, an inspection of the interior of the tank was conducted using a video camera in the submerged environment; however, the identification of the defect was not successful. STP letter dated October 25, 2001, states that there are no plans to conduct further analysis, inspection, or repair activities with respect to detection of the defect during the service life of the Unit 1 RWST, including service life extension, except those inspections required by American Society of Mechanical Engineers (ASME) Code Section XI, or approved alternative, and those required by the STP RWST Monitoring Program. This program consists of exterior visual inspections and monitoring of tank levels in the control room.

The U.S. Nuclear Regulatory Commission (NRC or the staff) granted relief from the requirements of ASME Code Section XI by letter dated December 14, 2001. The staff concluded, "[t]he NRC staff further determined that it is not necessary for the licensee to renew the relief request that was granted on June 22, 2000, regarding the RWST leakage because the licensee has upgraded its inservice inspection program to the 1989 Edition of the Code."

Issue:

It is unclear to the staff why the RWSTs and similar tanks will not be managed for cracking, given the occurrence of this aging effect. While the staff acknowledges that the original crack detected in the Unit 1 RWST in 1999 appears to be in a low-stress area in the tank base plate, and thus may be unlikely to grow, the staff notes that there is no basis to conclude that other cracking will not occur in higher-stress areas in tank sidewalls. As a result, in the absence of inspections on the interiors of tanks capable of detecting stress corrosion cracking, the staff cannot conclude that the structural integrity of the tanks will not be challenged during the period of extended operation.

Request:

1. Describe the inspections that will be performed on the interior surfaces of the Unit 1 and Unit 2 RWSTs during the period of extended operation to detect cracking and to specifically characterize the existing defect to ensure it has not grown into the tank sidewall. In the response, include information on the inspection technique, sampling methodology, timing, and frequency. Alternatively, state the basis for how internal cracking will be effectively managed in the absence of such inspections.
2. Given the presence of cracking in the Unit 1 RWST, describe how cracking will be managed for similar stainless steel tanks, such as the auxiliary feedwater storage tank (i.e., large-volume, near atmospheric pressure, safety-related tanks that rest on concrete and contain water), or state the basis why managing the aging effect of cracking is not necessary.

STPNOC Response:

Overview:

Radially oriented cracks were detected at the Refueling Water Storage Tank (RWST) in the base plate exterior to the tank. The cracks initiated from the exterior bottom tank plate and propagated up through the plate thickness to the tank interior. Evidence of transgranular crack propagation and branching was present. The apparent cracking mechanism was determined to be stress corrosion cracking initiating from the bottom of the tank near the periphery and propagating up through the base plate. No crack indications were identified in the vertical wall of the tank.

During Unit 1 2012 Fall Refueling Outage (1RE17) the Unit 1 RWST internal tank bottom inspections were performed as follows:

- Visual Weld (VTW); Liquid Penetrant (PT); and Vacuum Box (VB) Leak Test for the four known leak locations.
- VTW entire floor bottom plate.
- VTW bottom-to-side weld inside tank (accessible)
- Vacuum Box (VB) Leak Test bottom-to-side weld inside tank (accessible)
- Vacuum Box (VB) Leak Test floor welds inside tank (accessible)
- PT or Eddy Current (ET) bottom-to-side weld inside tank (accessible)
- PT at any new leak locations if not already performed

All identified cracks were repaired and the Unit 1 RWST was restored to a code compliant condition.

Metallurgical results of four material samples removed during 1RE17 determined cracking in the stainless steel plate was transgranular stress corrosion cracking that initiated primarily along the outside diameter (OD) surface and propagated through wall. The presence of Sulfur (S) and Chlorides (Cl) in the oxide deposits on the crack faces suggests that the stress corrosion cracking (SCC) formed due to the presence of an aqueous solution containing both S and Cl on the OD surface.

Previous robotic interior ultrasonic inspection and the 1RE17 internal tank bottom inspections of the Unit 1 RWST did not identify any internally initiated degradation mechanisms. The degradation mechanism in the Unit 1 RWST is unique to the environmental conditions specifically experienced in Unit 1 and are initiated from the exterior of the tank.

The Unit 1 RWST is located in the Mechanical-Electrical Auxiliary Building (MEAB) below grade elevation. A wall penetration near the tank leaked groundwater and the Unit 1 RWST experienced ground water intrusion at the base of the tank because it did not have a berm to prevent water from collecting at the base of the tank. The ground water intrusion concentrated the chlorides at the base of the tank causing an environment conducive to stress corrosion cracking. On October 2013, a berm was installed around the circumference of RWST to prevent future groundwater intrusion.

The latest visual inspection of the exterior of the Unit 2 RWST, performed on September 5, 2013, did not identify any similar failure mechanism or degradation. The Unit 2 RWST has a berm around the base of the tank that does not allow ground water to collect at the base of the tank.

Response to request 1:

The stress corrosion cracking found in the RWST tank base was initiated from the external surface not from the interior surface of the tank. All identified cracks were repaired during 1RE17 and the Unit 1 RWST is restored to a code compliant condition.

A new commitment is added to LRA Table A4-1 to perform a one-time internal inspection of the Unit 1 RWST five years prior to entering the period of extended operation. This one-time internal inspection is to confirm the effectiveness of the corrective actions to repair the leaking tank. The inspection will include VTW; PT; and Vacuum Box Test of susceptible locations of the floor bottom and side welds to ensure no leaks the floor bottom and side welds.

LRA Table 3.2.2-4 is revised in accordance with NUREG-1801, Revision 2 recommendations to add cracking as an aging effect requiring management for the Unit 1 and 2 RWST external surfaces exposed to plant indoor air.

LRA Appendixes A1.20 and B2.1.20, External Surfaces Monitoring Program, are revised in accordance with NUREG-1801, Revision 2, Aging Management Program XI.M36 , External Surfaces Monitoring of Mechanical Components to require a visual inspection of the Units 1 and 2 RWST external surfaces for leakage to detect cracks on the external surfaces of the stainless steel. The frequency of the inspections will be every refueling cycle.

Enclosure 2 provides the line-in/line-out revision to LRA Appendix A1.20, Appendix B2.1.20 and Table 3.2.2-4.

Enclosure 3 provides the new regulatory commitment 47 to LRA Table A4-1.

Response to request 2:

The degradation mechanism in the Unit 1 RWST is unique to the environmental conditions specifically experienced in Unit 1 for the reasons stated above. The other indoor stainless steel tanks are not subject to ground water intrusion and therefore cracking is not an applicable aging effect, which requires management. There is no plant operating experience that has identified cracking as an applicable aging affect for stainless steel exposed to only plant indoor air.

The auxiliary feedwater storage tank (AFWST) is a stainless steel tank enclosed in concrete. The concrete shell tightly adheres to the tank with no gaps for water entry and is not subject to ground water intrusion. Volumetric inspection of the AFWST tank bottom by aging management program B2.1.22, Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components will assure no loss of material is occurring on the tank bottom surfaces in contact with concrete. See RAI response B2.1.20-5 submitted in STP letter NOC-AE-11002730 (ML11266A019) and RAI response B2.1.20-5A submitted in STP letter NOC-AE-11002772 (ML12013A206).

Enclosure 2

STPNOC LRA Changes with Line-in/Line-out Annotations

List of Revised LRA Sections

RAI	Affected LRA Section
B2.1.16 3	A1.20
	B2.1.20
	Table 3.2.2-4

A1.20 EXTERNAL SURFACES MONITORING PROGRAM

The External Surfaces Monitoring program manages loss of material for external surfaces of steel, stainless steel, aluminum, copper alloy components and elastomers, including protective paints, coatings, caulking, and sealants. The program also manages hardening and loss of strength for elastomers and cracking of stainless steel. The program includes those systems and components within the scope of license renewal that require external surface monitoring. Visual inspections of external surfaces conducted during engineering walkdowns will be used to identify aging effects and leakage. When appropriate for the component configuration and material, physical manipulation of at least 10 percent of the available surface area will be used to augment visual inspection to confirm the absence of elastomer hardening and loss of strength.

Periodic monitoring of the stainless steel external surfaces of Refueling Water Storage Tanks will include visual inspection for leakage to detect cracks.

Loss of material for external surfaces is managed by the Boric Acid Corrosion program (A1.4) for components in a system with treated borated water or reactor coolant environment on which boric acid corrosion may occur, Buried Piping and Tanks Inspection program (A1.8) for buried components, and Structures Monitoring Program (A1.32) for civil structures, and other structural items which support and contain mechanical and electrical components.

The External Surfaces Monitoring program is a new program that will be implemented prior to the period of extended operation. Industry and plant-specific operating experience will be evaluated in the development and implementation of this program.

B2.1.20 External Surfaces Monitoring Program

Program Description

The External Surfaces Monitoring Program manages loss of material for external surfaces of steel, stainless steel, aluminum, copper alloy components and elastomers, and hardening and loss of strength for elastomers. The program also manages cracking of stainless steel. The program is a monitoring program that includes those systems and components within the scope of license renewal. Visual inspections are used to identify aging effects and leakage of steel, stainless steel, aluminum, copper alloy components, and elastomers. When appropriate for the component configuration and material, physical manipulation of at least 10 percent of the available surface area of elastomers is used to augment visual inspections to confirm the absence of hardening or loss of strength. Personnel performing external surfaces monitoring inspections will be qualified in accordance with site controlled procedures and processes.

The External Surfaces Monitoring Program will be implemented by a new procedure. System inspections and walkdowns will be required and will consist of periodic visual inspections for indications of loss of material, leakage, elastomer hardening and loss of strength, and aging effects of protective paints, coatings, caulking, and sealants. Periodic monitoring of the stainless steel external surfaces of Refueling Water Storage Tanks at least every re-fueling cycle will include visual inspection for leakage to detect cracks.

The following aging management programs are used to manage aging for external surfaces that are not within the scope of the External Surfaces Monitoring Program.

1) Boric Acid Corrosion program (B2.1.4) for components in a system with treated borated water or reactor coolant environment in which boric acid corrosion may occur.

2) Buried Piping and Tanks Inspection program (B2.1.18) for buried components.

3) Structures Monitoring Program (B2.1.32) for civil structures, and other structural items which support and contain mechanical and electrical components.

The External Surfaces Monitoring Program is a new program that will be implemented prior to the period of extended operation. Within the ten year period prior to the period of extended operation, and continuing into the period of extended operation, periodic inspections will be performed.

NUREG-1801 Consistency

The External Surfaces Monitoring program is a new program that, when implemented, will be consistent, with exception to NUREG-1801, Section XI.M36, External Surfaces Monitoring.

Exceptions to NUREG-1801

Program Elements Affected:

Scope of Program (Element 1) and Detection of Aging Effects (Element 4)

NUREG-1801, Section XI.M36 requires the program to visually inspect the external surface of in-scope components and monitor external surfaces of steel components in systems within the

scope of license renewal and subject to AMR for loss of material and leakage. The External Surfaces Monitoring Program has expanded the materials inspected to include stainless steel, aluminum, copper alloy, and elastomer external surfaces within the scope of license renewal. The use of visual inspection to detect loss of material and leakage of stainless steel, aluminum, copper alloy and elastomer external surfaces is an effective method for these materials.

NUREG-1801, Section XI.M36 requires the program to manage loss of material and leakage. The External Surfaces Monitoring Program also includes, among the aging effects to be managed, cracking, elastomer hardening and loss of strength. Elastomer hardening and loss of strength ~~this aging effect~~ is managed by physical manipulation of elastomer components to detect hardening and loss of strength.

NUREG-1801, Section XI.M36 requires a program of visual inspection to detect loss of material and leakage. The External Surfaces Monitoring Program primarily uses visual inspection to detect loss of material and leakage and is augmented by physical manipulation of at least 10 percent of the available surface area of elastomers when appropriate to the component material and design. Manipulation of elastomers is an effective method to augment the visual inspection of elastomers in detecting the aging effect of hardening and loss of strength.

Enhancements

None

Operating Experience

The External Surfaces Monitoring Program is a new program. Routine system walkdowns are performed as part of the systems engineering program. The STP condition reporting program is used in conjunction with the system walkdowns to identify and resolve issues to plant equipment. Industry operating experience that forms the basis for this program is included in the operating experience element of the corresponding NUREG-1801 aging management program. A review of plant condition reporting documents, as well as other STP current licensing basis documents, since 1998, was performed to ensure that there is no unique, plant-specific operating experience in addition to that in NUREG-1801. The review identified no unique operating experience. The condition reporting program was proven to be effective in maintaining the material condition of plant systems.

As additional industry and plant-specific applicable operating experience becomes available, it will be evaluated and incorporated into the program through the STP condition reporting and operating experience programs.

Conclusion

The implementation of the External Surfaces Monitoring program will provide reasonable assurance that aging effects will be managed such that the systems and components within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

Table 3.2.2-4 Engineered Safety Features – Summary of Aging Management Evaluation – Safety Injection System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Tank	PB	Stainless Steel	Borated Water Leakage (Ext)	None	None	V.F-13	3.2.1.57	C
Tank	PB	Stainless Steel	Plant Indoor Air (Ext)	~~None~~Cracking	~~None~~ External Surfaces Monitoring Program (B2.1.20)	~~V.F-12~~ None	~~3.2.1.53~~ None	~~C~~ H,2
Tank	PB	Stainless Steel	Plant Indoor Air (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	V.D1-29	3.2.1.08	E

Notes for Table 3.2.2-4:

Standard Notes:

A Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.

B Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP takes some exceptions to NUREG-1801 AMP.

C Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.

D Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. AMP takes some exceptions to NUREG-1801 AMP.

E Consistent with NUREG-1801 for material, environment, and aging effect, but a different aging management program is credited or NUREG-1801 identifies a plant-specific aging management program.

H Aging effect not in NUREG-1801 for this component, material and environment combination.

Plant Specific Notes:

1 Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16) manage loss of material due to pitting and crevice corrosion and cracking due to stress corrosion cracking. The One-Time Inspection program (B2.1.16) includes selected components at susceptible locations.

2 Cracking of stainless steel external surface of the Reactor Water Storage Tank exposed to plant indoor air is managed by External Surfaces Monitoring Program (B2.1.20)

Enclosure 3

Regulatory Commitments

A4 LICENSE RENEWAL COMMITMENTS

Table A4-1 identifies proposed actions committed to by STPNOC for STP Units 1 and 2 in its License Renewal Application. These and other actions are proposed regulatory commitments. This list will be revised, as necessary, in subsequent amendments to reflect changes resulting from NRC questions and STPNOC responses. STPNOC will utilize the STP commitment tracking system to track regulatory commitments. The Condition Report (CR) number in the Implementation Schedule column of the table is for STPNOC tracking purposes and is not part of the amended LRA.

Table A4-1 License Renewal Commitments

Item #	Commitment	LRA Section	Implementation Schedule
47	Unit 1 RWST only: Perform a one time internal tank bottom and side weld inspection to confirm the effectiveness of the corrective actions to repair the leaking tank floor 5 years prior to entering the period of extended operation. The inspection will include VTW; PT; and Vacuum Box (VB) Leak Test of susceptible locations of the floor bottom and side welds to ensure no leaks.	B2.1.20	Five years prior to the Period of Extended Operation CR 14-1154