Nuclear Operating Company

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

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U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
One White Flint North
11555 Rockville Pike
Rockville, MD 20852-2738

South Texas Project
Units 1 and 2
Docket Nos. STN 50-498, STN 50-499
Response to Requests for Additional Information for the
South Texas Project License Renewal Application
Aging Management Program, Set 13 (TAC Nos. ME4936 and ME4937)

References: 1. STPNOC letter dated October 25, 2010, from G. T. Powell to NRC Document Control Desk, "License Renewal Application" (NOC-AE-10002607) (ML103010257)
2. NRC letter dated February 15, 2012, "Requests for Additional Information for the Review of the South Texas Project, Units 1 and 2, License Renewal Application – Aging Management, Set 13 (TAC Nos. ME4936 and ME 4937)" (ML12039A240)

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 requests additional information for review of the STP LRA. STPNOC's response to the requests for additional information is provided in the Enclosure to this letter.

There are no regulatory commitments provided in this letter.

Should you have any questions regarding this letter, please contact either Arden Aldridge, STP License Renewal Project Lead, at (361) 972-8243 or Ken Taplett, STP License Renewal Project regulatory point-of-contact, at (361) 972-8416.

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

Executed on 3-12-2012
Date

G. T. Powell
Vice President,
Generation

KJT

Enclosure: STPNOC Response to Requests for Additional Information

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NRR

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STPNOC Response to Requests for Additional Information

**SOUTH TEXAS PROJECT, UNITS 1 AND 2
REQUEST FOR ADDITIONAL INFORMATION -
AGING MANAGEMENT, SET 13
(TAC NOS. ME4936 AND ME4937)**

RAI 4.7.5-1 (068)

Background:

In the submittal, the applicant stated that "to reduce the inspection frequency and scope STP amended its initial compliance with Regulatory Guide (RG) 1.14 by implementing a Westinghouse Topical Report on Reactor Coolant Pump Motor Flywheel Inspection Elimination."

Staff assumes that the applicant is relying on the fatigue crack growth analysis in WCAP-14535-A, "Topical Report on Reactor Coolant Pump Flywheel Inspection Elimination," (ADAMS Legacy Library Accession #9601290404) as the time-limited aging analysis (TLAA) for the reactor coolant pump (RCP) flywheels. The staff verified that the Nuclear Regulatory Commission (NRC) endorsed the methodology and results in this WCAP report for use in a safety evaluation (SE) dated September 12, 1996 (ADAMS Legacy Library Accession #9609230010). However, in the conclusion section of the SE (Section 4.0), the staff concluded that the inspections of the flywheels should be performed even if all of the recommendations of RG 1.14, Revision 1, "Reactor Coolant Pump Flywheel Integrity," were met and that the inspections of the RCP flywheels should not be completely eliminated.

Issue:

The applicant has not clearly linked the operating experience at STP Units 1 and 2 with the fatigue crack growth analysis in WCAP-14535-A. In addition, it is not clear from the TLAA discussion whether the applicant intends to be consistent with the position taken in the staff's SE of September 12, 1996 and continue the inservice inspection (ISI) of the RCP flywheels during the period of extended operation, or whether the applicant is proposing to discontinue the ISI of the RCP flywheels during the period of extended operation.

Request:

1. Confirm that the Westinghouse report referred to in the submittal is WCAP-14535-A.

2. Discuss the past examination results for the RCP flywheels at STP Units 1 and 2 and how those results justify the use of the WCAP-14535-A.

3. Clarify whether the applicant intends to continue the ISI of the RCP flywheels consistent with the NRC's SE on WCAP-14535, dated September 12, 1996. If ISI will be performed during the period of extended operation, the staff also requests the applicant to justify what type of inspections will be performed on the RCP flywheels during the

period of extended operation and the frequency that will be used for the inspections. Otherwise, the applicant is requested to justify its basis for discontinuing the ISI of the RCP flywheels if the ISI will be discontinued during the period of extended operation.

STPNOC Response:

1. WCAP-14535-A, Topical Report on Reactor Coolant Pump Flywheel Inspection Elimination, (ADAMS Legacy Library Accession #9601290404) is the report referred to in STP LRA Section 4.7.5.

2. The license amendment request to change the STP Units 1 and 2 reactor coolant pump (RCP) flywheel inspection requirements, "Proposed Revision to Technical Specification 4.4.10 for Alternate Inservice Inspection of Reactor Coolant Pump Flywheels", dated January 26, 1999 (NOC-AE-000241)(ADAMS Legacy Library Accession #9902050244) provides the justification for the use of WCAP-14535-A. The request states that the Unit 1 RCP flywheels were examined during the 1RE03 (spring 1991), 1RE05 (spring 1995), and 1RE07 (fall 1997) refueling outages, and the Unit 2 RCP flywheels were examined during the 2RE01 (fall 1990), 2RE03 (spring 1993), 2RE05 (spring 1997), and 2RE06 (fall 1998) refueling outages in compliance with regulatory position C.4.b(1) of NRC Regulatory Guide 1.14. No flaw indications were detected in the flywheels.

   The RCP flywheels received ultrasonic examination during the Unit 1 1RE15 (fall 2009) and the Unit 2 (fall 2008) refueling outages in compliance with the 10-year inspection interval. The examinations identified no flaw indications.

3. South Texas Project (STP) will continue RCP flywheel inspections through the period of extended operation consistent with the NRC safety evaluation of WCAP-14535-A, dated September 12, 1996. Each RCP flywheel will receive an in-place ultrasonic examination over the volume from the inner bore of the flywheel to the circle of one-half of the outer radius in accordance with the South Texas Project Surveillance Frequency Control Program. This frequency is currently at least once every 10 years for each Unit. These examination methods and frequency are consistent with WCAP-14535-A and approved by the NRC in the safety evaluation for STP license amendments #106 (Unit 1) and #93 (Unit 2), dated April 16, 1999 (ST-AE-NOC-000381) (ADAMS Legacy Library Accession #9904220037).

RAI 4.2.2-1 (059)

Background:

The STP Units 1 and 2 licensing renewal application (LRA) Tables 4.2-2, 4.2-3, 4.2-4 and 4.2-5, include data for the extended beltline materials (i.e., the inlet and outlet nozzles, nozzle shell, bottom head Taurus, bottom head dome, and associated welds). The NRC's Reactor Vessel Integrity Database (RVID) does not contain information for these materials.

Issue:

Licensees for all light water nuclear power reactors must meet fracture toughness requirements and maintain a material surveillance program for the reactor coolant pressure boundary. These requirements are set forth in Appendices G and H to 10 CFR Part 50. It has been demonstrated that some reactor pressure vessel (RPV) integrity evaluations are very sensitive to the consideration of new data, therefore information regarding RPV beltline materials should be consistent with the requirements in Generic Letter 92-01, and changes to values related to fracture toughness must provide a technical basis for the change.

Request:

1) Discuss the procedures used to determine the chemistry data, RT_{NDT}, margins and initial USE values for the extended beltline materials to demonstrate that you have applied consistent approaches in determining the above mentioned material information for all of the extended beltline materials. Although nozzle materials are listed in Tables 4.2-2 through 4.2-5, the nozzle-to-reactor pressure vessel (RPV) welds have not been included. If nozzle-to-RPV welds have predicted neutron fluence values greater or equal to 1×10^{17} n/cm^2 (E > 1MeV), add the data for those nozzle-to-RPV welds to Tables 4.2-2 though 4.2-5; include descriptions of the procedures used to determine the chemistry data, initial RT_{NDT}, margins and USE values.

2) Resolve the following discrepancies:

   a) For STP Unit 2 welds with heat number 90209, the RVID contains a nickel chemical composition value of 0.126 weight-percent. In the submittal, the nickel chemical composition value for this heat of material is 0.11 weight-percent. Explain the basis for the change in nickel chemical composition values for heat number 90209.

   b) For STP Unit 1, the copper values for the upper to intermediate circumferential weld and the lower shell to lower head circumferential weld are not consistent in Tables 4.2-2 and 4.2-4 (0.1 and 0.35 weight percent copper respectively). Explain the differences and provide updated Tables with consistent values, as appropriate.

   c) For STP Unit 2, the copper values for the upper to intermediate circumferential weld and lower shell to lower head circumferential weld are not consistent in Tables 4.2-3 and 4.2-5 (0.1 and 0.35 weight percent copper respectively). Explain the differences and provide updated Tables with consistent values, as appropriate.

STPNOC Response:

STPNOC will provide a response prior to March 29, 2012.

STP TLAA Exemptions (058)

RAI 4.1-2a

Background:

In RAI 4.1-2 the staff asked the applicant to clarify which edition of the American Society of Mechanical Engineers (ASME) Code Section was applicable to the design of the containment liners, and to clarify whether the design code of record for the liners required a metal fatigue analysis. In the applicant's response to RAI 4.1-2 (November 21, 2011), the applicant provided its basis on why a fatigue analysis was not needed to be performed for the containment liners, based on their ASME Section III, Division 2 design code. The applicant stated that this design code did not require the liners to be analyzed to ASME III NE-3000 requirements, and therefore that the current licensing basis (CLB) did not include a fatigue analysis for the containment liners.

Issue:

The staff has confirmed the accuracy of the information in the applicant's response to RAI 4.1-2 through an audit of the applicant's design specification for the STP containment liner, penetrations, airlocks, and equipment hatches. However the design specification states that the "requirements for an 'analysis of cyclical loading' will be investigated in accordance with Section NE-3222.4 and NE-3121 . . . of the ASME Code Section III." Thus, the staff needs further clarification on whether the fatigue analysis statement in the design specification was only applicable to those containment components designed to ASME Code Section III, Division 1 requirements (e.g., the containment penetrations) or whether the fatigue analysis statement in the design specification is also applicable to the containment liners that were designed to ASME Code Section III, Division 2 requirements.

Request:

Clarify whether the fatigue analysis statement in the containment liner design specification is only applicable to those components in the specification that were designed to ASME Code Section III, Division 1 requirements (e.g., the containment penetrations) or whether the fatigue analysis statement is also applicable to the containment liners as well, which were designed to ASME Code Section III, Division 2 requirements.

If the fatigue analysis statement in the design specification is applicable to the containment liners, clarify whether the liners would have been required to be analyzed for a fatigue analysis in accordance with the ASME Section III NE-3222.4 and NE-3121 code paragraphs, or else, provide clarification on whether the liners were exempted from a fatigue analysis in accordance with the fatigue waiver provision in NE-3222.4(d). If the NE-3222.4 code provisions are applicable to containment liners, provide your justification on why the fatigue analysis or fatigue waiver analysis (whichever is applicable to the liners) would not need to be identified as a TLAA, when compared to the six criteria for TLAAs in 10 CFR 54.3.

STPNOC Response:

STPNOC will provide a response prior to March 29, 2012.

RAI 4.1-3a

Background:

In the applicant's response to RAI 4.1-3 (November 21, 2011), the applicant indicated that the design basis information in the Updated Final Safety Analysis Report (UFSAR) Section 5.2.3.3.2 provides the applicant's design basis for addressing underclad cracking in the reactor vessel nozzles made from SA-508, Class 2 forging materials. The applicant also stated that the referenced "special evaluation" UFSAR Section 5.3.1.2 does not need to be identified as a TLAA because the regulatory position in NRC RG 1.43 for qualifying clad-to-forging weld qualification tests do not account for an aging mechanism or involve a time-dependent aging parameter. The staff's original request for additional information (RAI) 4.1-3 provides a more detailed background and summary of the staff's initial concern regarding this issue.

Issue:

In its response to RAI 4.1-3, the applicant based its "absence of a TLAA" conclusion for the RV SA-508 Class 2 forging components on the criteria that were established in RG 1.43 and not on the activities or analyses that were implemented in the CLB in order to conform to the weld qualification test criteria in RG 1.43. Nor was the applicant's conclusion based on a comparison of these activities or evaluations to the criteria for identifying TLAAs in 10 CFR 54.3.

Request:

Summarize and describe in sufficient detail the type of tests or evaluations that were performed as part of the CLB in order to meet the recommended weld qualification criteria RG 1.43. If an analysis, evaluation, or calculation was performed as part of the CLB for STP's weld qualification basis, clarify how the applicable document of record compares to each of the six (6) criteria for TLAAs in 10 CFR 54.3, and identify whether the analysis, evaluation or calculation needs to be identified as a TLAA in accordance with 10 CFR 54.21(c)(1). Justify the basis for your determinations and conclusions.

STPNOC Response:

STPNOC will provide a response prior to March 29, 2012.

RAI 4.1-5a

Background:

In the applicant's response to RAI 4.1-5 (November 21, 2011), the applicant identified that Westinghouse proprietary reports WCAP-7879, WCAP-8766-P-A, and WCAP-9946 are relied upon as part of the CLB for conforming to RG 1.20 and that the methodologies in these reports do include high cycle fatigue modeling analyses that evaluated the impact of flow induced vibrations of the measured strains for the components. The applicant identifies that the analyses assume that a specific number of high-cycle vibrations will occur in the RVI components that are analyzed for in the reports. The applicant then states that the fatigue analyses in these reports do not need to be identified as TLAAs for the LRA in accordance with 10 CFR 54.21(c)(1) because they do not involve any time dependent assumptions (i.e., they do not conform to TLAA identification Criterion 3 in 10 CFR 54.3).

Issue:

The staff has determined that the high cycle fatigue analyses in these WCAP reports do conform to Criteria 1, 2, 4, 5, and 6 for defining TLAAs in 10 CFR 54.3. However, the assumption of vibratory cycles in the fatigue analyses is a time-dependent parameter that is analyzed for in the reports. Thus, the vibratory analyses in the WCAPs are time-dependent and the applicant's "absence of a TLAA" basis is valid only if the applicant can establish that the vibratory fatigue analyses in the reports were not defined in terms of the current operating life for the units (i.e., for example, on a 40-year operating basis).

Request:

Clarify whether the analysis of vibratory cycles (i.e., the time-dependent parameter in the assessments) in Westinghouse proprietary reports WCAP-7879, WCAP-8766-P-A, and WCAP-9946 is defined in terms of the current operating term (of 40-year design life) for the STP units. Based on this clarification, justify why the high cycle vibratory analyses in these reports would not need to be identified as TLAAs for the STP LRA.

STPNOC Response:

The basis for high cycle vibratory analyses in WCAP-7879, WCAP-8766-P-A, and WCAP-9946 is not defined in terms of the current operating life (40-year design life). WCAP-7879, WCAP-8766-P-A, and WCAP-9946 conclude that the component stress ranges remain below the endurance limit, defined as 10^{11} cycles on the applicable fatigue curves. The endurance limit is the stress range below which the material will not experience fatigue failure. The analyses demonstrate that high cycle vibratory stress ranges are sufficiently low that fatigue failure will not occur. Since stress ranges remain below the endurance limit, the number of these stress range cycles is not limited over the current operating life (40-year design life). Therefore, the supporting analyses are not based on time-dependent assumptions defined by the current operating term and are not TLAAs in accordance with 10 CFR 54.3(a), Criterion 3.

RAI 4.5-1 (062)

Background:

In a teleconference on January 4, 2012, the staff asked the applicant to discuss apparent anomalies in the application and results of the Containment Tendon Prestress surveillances. The staff noted that in LRA Table 4.5-1, the measured liftoff forces for the shop and field ends of vertical control tendon V126 and the field end of horizontal control tendon 1H091 were larger in the year-20 inspection than in the year-10 inspection. The staff asked the applicant to explain why the tendon liftoff forces increased from the year-10 to year-20 inspections, as tendon liftoff forces are not expected to increase over time. Prestressed tendons are expected to lose their prestressing forces with time due to creep and shrinkage of concrete, and relaxation of the prestressing steel. The applicant responded that these results were acceptable per ASME/IWL-2522(b). However, ASME IWL-2522(b) discusses calibration of the jacking equipment used to measure tendon liftoff forces, as follows:

> "Equipment used to measure tendon force shall be calibrated in accordance with a calibration procedure prior to the first tendon force measurement and following the final tendon force measurement of the inspection period. Accuracy of the calibration shall be within 1.5% of the specified minimum ultimate strength of the tendon. If the post-test calibration differs from the pretest calibration by more than the specified accuracy tolerance, the results of the examination shall be evaluated."

The provisions of ASME IWL-2522(b) are related to maintaining the calibration of equipment, not evaluation of unexpected liftoff results. The purpose of IWL-2522(b) is to verify that equipment maintains calibration during the examination by requiring that equipment be calibrated before and after the tendon liftoff examination, to determine that the calibration of the equipment post-examination is within 1.5% of its initial calibration.

Issue:

For the Unit 1 control tendons, the measured liftoff forces for the year-20 surveillance were greater than the year-10 values. The applicant has not presented a sufficient evaluation to provide basis for the measured increase in tendon liftoff force.

Request:

Provide discussion of the method used to evaluate the acceptability of tendon liftoff forces and the results of the evaluation for the year-20 surveillance that were greater than the previous (year-10) examination. Show that the increase in liftoff forces was acceptable and within the range of expected values.

STPNOC Response:

The increases were very small and within the allowed instrument calibration error. ASME IWL 2522(b) requires that:

> Accuracy of the calibration shall be within 1.5% of the specified minimum ultimate strength of the tendon.

Since the equipment is calibrated to within 1.5%, individual measurements cannot be assumed to be more accurate than that. Also, the calibration tolerance is applied before and after a specific surveillance using the same equipment. Surveillances performed 10 years apart by different vendors using different equipment cannot be assumed to produce results at a single surveillance that are more accurate than the calibration tolerance specified in the ASME Code.

Using this 1.5% calibration tolerance as a benchmark, it is related to tendon force in the following way:

> STP tendons each have 186 wires of one-quarter inch diameter, for a total cross section of 9.13 square inches. The material ultimate strength is 240 ksi. Therefore, 1.5% of the specified minimum ultimate strength of a tendon is:
>
> (240 ksi)(9.13 in2)(0.015) = 33 kips

As stated in NRC Regulatory Guide 1.35.1, "Determining Prestressing Forces for Inspection of Prestressed Concrete Containments," tendon prestress loss is expected to be linear with the logarithm of time. This implies nearly all of the expected lifetime loss occurs within the first few years, with a very small loss (less than 1%) expected between year-10 and year-20. LRA Figures 4.5-1 through 4.5-4 illustrate this behavior.

The following table summarizes the anomalies found at year-20 and identified in the RAI.

Tendon	**End**	**10th Year Forces (Kips)**		**20th Year Forces (Kips)**		**Predicted Loss**	**Measured Increase**
		Predicted	**Measured**	**Predicted**	**Measured**		
V126	S	1348	1340	1338	1363	10	23
V126	F	1362	1380	1351	1389	11	9
1H091	F	1341	1280	1330	1300	11	20

These three tendon ends were predicted to lose either 10 or 11 kips between years 10 and 20. The greatest anomalous measured gain is at the shop end of tendon V126, which increased from 1340 kips at the 10th year to 1363 kips at the 20th year, an apparent increase of 23 kips. The measured value of 1363 kips can be construed as 33 kips higher than expected (10 + 23 = 33) even though it was actually just 25 kips higher than predicted (1363 – 1338 = 25). Either way, it is a very small discrepancy that is within the allowed calibration tolerance of 33 kips.

There is no requirement in IWL-3221 to explain anomalous high results. The acceptance criterion for an individual liftoff force [given in ASME IWL-3221.1(b)] is that the liftoff force measured using properly calibrated (but necessarily inexact) equipment must be at least 95% of the predicted value. The results obtained during the year-20 surveillance meet that acceptance criterion.

The anomalous results are consistent with the conclusion that the tendons are behaving as predicted. The very small apparent increase in three tendon liftoff forces between years 10 and 20 is attributed by STP to measurement error and not to actual tendon force increase. Taken as a whole, the results from all tendon surveillances during the first 20 years of plant operation, presented in Figures 4.5-1 through 4.5-4 of the LRA, confirm that the containment structures in both STP units maintain adequate levels of prestress, and are trending toward continued adequate prestress throughout the entire life of the plant and beyond through the period of extended operation.