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

August 9, 2023
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STI: 35497201

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

South Texas Project
Unit 2
Docket No. STN 50-499
2RE22 Inspection Summary Report
for Steam Generator Tubing Rev 1 (EPID: L-2023-LRO-0029)

Reference: Letter; C. Georgeson (STP) to Document Control Desk (NRC); "2RE22 Inspection Summary Report for Steam Generator Tubing;" April 24, 2023; (NOC-AE-23003958) (ML23114A341)

STP Nuclear Operating Company is submitting the attached Revision 1 to the referenced letter regarding the summary report of the South Texas Project Unit 2 steam generator tube inspection. The revision reflects clarification in Section 2 and Section 5.

There are no commitments in this letter.

If there are any questions regarding this report, please contact me at (361) 972-7806, or Stephanie Rodgers at (361) 972-4527.

C. H. Georgeson

Christopher Georgeson
General Manager, Engineering

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Enclosure: 2RE22 Inspection Summary Report for Steam Generator Tubing (Rev. 1) South Texas Project Electric Generating Station Unit 2

cc:

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

2RE22 INSPECTION SUMMARY REPORT

FOR STEAM GENERATOR TUBING (Rev. 1)

SOUTH TEXAS PROJECT

ELECTRIC GENERATING STATION UNIT 2

P.O. BOX 289, WADSWORTH, TEXAS 77483

Commercial Operation: June 19, 1989
Issue Date: April 24th, 2023

USNRC DOCKET NO.:	50-499
OPERATING LICENSE NO.:	NPF-80
COMMERCIAL OPERATION DATE:	June 19th, 1989

Prepared By: _____ 8/9/23
M. Garner — Date
Steam Generator Engineer

Approved By: _____ 8/9/23
C. Georgeson — Date
Manager, General Engineering

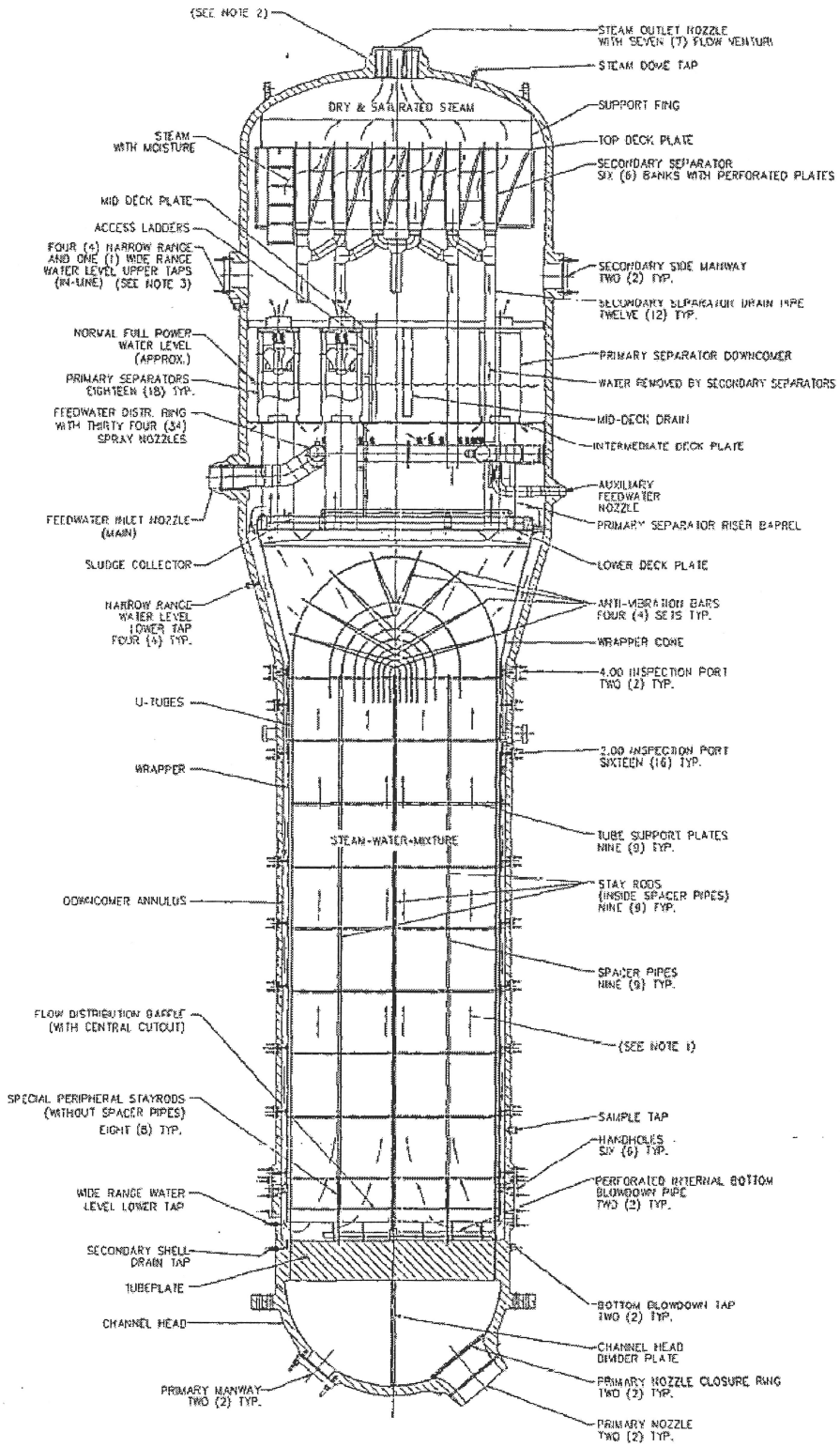
180-Day Steam Generator Tube Inspection Report

South Texas Project Unit 2 Cycle 22

1. DESIGN AND OPERATING PARAMETERS

Steam Generator Design and Operating Parameters	
SG Model / Tube Material / # SGs per unit	Delta 94 Replacement SG / Alloy 690TT / 4
# of tubes per SG / Nominal Tube Dia. / tube thickness	7,585 / 11/16 in / 0.040 in
Support Plate Style / Material	Broached Trefoil / 405 Stainless Steel
Last Inspection Date	April 2018
EFPM since the last inspection	51.12 EFPM
Total cumulative SG EFPY	17.64 EFPY
Mode 4 initial entry	April 24th, 2018
Observed P/S Leak Rate since the last inspection and how it trended with time	0.00 GPD RT-8027 radiation monitor
Nominal indicated value of Thot during Cycle X at full power	621.8 degrees F (This value was taken at RCTA0430A on July 10th, 2022)
Degradation mechanism sub population	Potential pitting mechanism similar the STP Unit 1 volumetric indication discovered under hardened sludge collar during 1RE19 (Fall 2015).
Deviations from SGMP guidelines since the last inspection	None
Steam Generator Schematic	Schematic is attached. See next page.

South Texas Delta 94 RSGs Fabricated by Equipos Nucleares, S.A. (ENSA)



2. SCOPE OF INSPECTIONS PERFORMED ON EACH STEAM GENERATOR

The primary side inspection consisted of 100% full length bobbin of all tubes in all four SGs, and additional inspections of dents/dings, portions of the cold leg tubesheet, and special interest. No newly discovered indication locations were identified during the 2RE22 inspection. There were six (6) small indications being tracked from previous inspections that finally met the threshold to be reported in 2RE22; and are listed as newly reported. No expansions were needed.

Bobbin Coil Inspection

- 100% Full length bobbin coil inspection of all tubes.

Rotating Coil Inspection U-Bend

- 100% +POINT probe inspection of the upper TSP hot leg to upper TSP cold leg of Rows 1 and 2.

Rotating Coil Inspection - Straight Section

- +Point probe inspection of outer three tubes of periphery and divider lane TTS +6 inches/-3 inches, including hot leg (HL) and cold leg (CL), to aid in foreign objects detection.
- 40% Sample +Point probe inspection of TSH +6 inches/-3 inches.
- 100% +Point probe inspection of TSH +6 inches/-16 inches in tubes with bulges and over-expansions.
- +Point probe inspection of kidney region (hot leg sludge pile area) with 2 tube locations surrounding the sludge pile, +6 inches/-3 inches in all four steam generators (Appendix B).

Rotating Coil Inspection - Special Interest

- +Point probe inspection of all previously identified dents and dings > 5 volts, bobbin inspection of all previously identified dents and dings ≤ 5 volts.
- +Point probe inspection of all prior and 2RE22 "I-code" and/or non-quantifiable indications as determined by bobbin coil inspection or any previously reported signal that has changed.
- +Point probe inspection of possible loose parts (PLPs) in the eddy current database as identified by previous eddy current inspections.
- +Point probe inspection of a minimum two tube locations surrounding all observed foreign objects identified during 2RE22 secondary side video inspections.
- +Point probe inspection of a minimum two tube locations surrounding any newly identified PLP.
- +Point probe inspection of any tube-to-tube wear indications detected by bobbin coil.
- +Point probe inspection of all bobbin proximity (PRO) signals >2.5 volts.
- +Point probe inspection of all MBM bobbin coil indications that have increased by •0.5 volt for existing bobbin coil MBM indications.
- +Point probe inspection of prior cycle MBMs that are tube-to-tube wear (TTW) candidates.
- +Point probe inspection of all wear indications left in service.

Other Primary Side Inspections

- Video inspection of all installed tube plugs from the primary side.
- Video inspection of hot and cold leg bowl looking for thinning or missing cladding and associated wastage

3. THE NONDESTRUCTIVE EXAMINATION TECHNIQUES UTILIZED FOR TUBES WITH INCREASED DEGRADATION SUSCEPTIBILITY

- Rotating Coil inspection of kidney region (hot leg sludge pile area) with 2 tube locations surrounding the sludge pile, +6 inches/-3 inches in all four steam generators was performed to identify any pitting mechanisms similar to STP Unit 1 (1RE19 during the Fall of 2015).

- Rotating coil was utilized for other special interest locations as listed in the inspection scope.

- No indications were identified, or expansions needed.

4. THE NONDESTRUCTIVE EXAMINATION TECHNIQUES UTILIZED FOR EACH DEGRADATION MECHANISM FOUND

Table 7-1: STP 2RE22 SG Tube Degradation Mechanisms and Inspection Requirements

Degradation Mechanisms	Inspection Requirements	Inspection Program	Probe	Detection Technique[1] ETSS #	Sizing Technique[1] ETSS #	Inspection Expansion Contingency	Plugging Limit[6]	Structural Limit[2]	Condition Monitoring Limit[2]
Existing									
TSP Wear	100%	Bobbin Base Scope	Bobbin	96004.1 R13	96004.1 R13	None – 100% inspections for base scope	40% TW, or per OA if limiting	63% for 1.125"	57% for 1.125"
		Special Interest	+Point	27905.3 R2	27905.3 R2				58% for 1.125"
Hardened Sludge Pile Pitting	100%	Hardened sludge pile region plus a minimum of a two tube border. TTS +6/-3" in HL (see Appendix B)	+Point	21998.1 R4	21998.1 R4	Add a four tube border in all 4 RSGs (Appendix B)	Plug on Detection	78% for 0.25"	64% for 0.25"
Potential									
AVB Wear	100%	Bobbin Base Scope	Bobbin	196041.1R5	196041.1R5	None – 100% inspections for base scope	40% TW, or per OA if limiting	66% for 0.61"	63% for 0.61"
		100% U-bend inspection of Rows 1/ 2, and Special Interest)	+Point	10908.4 R1	10908.4 R1				60% for 0.61"
Foreign Objects Wear	PLP or wear locations (Note 3)	Bobbin Base Scope	Bobbin	27091.2 R2	Sizing by MRPC see next two rows	Minimum of a "Boxing" inspection of surrounding tubes. See Section 6.3	40% TW if object not present, otherwise as per engineering evaluation	See Table 7-4 below	N/A
		Outer three peripheral tubes TTS +6/-3" in HL and CL and Special Interest	+Point	21998.1 R4	21998.1 R4				See Table 7-4 below
				Alternate 2790X see note 4	Alternate 2790X see note 4				N/A
Tube-to-Tube Wear	100% in inspection period	Bobbin Base Scope	Bobbin	96010.1 R7	Follow w/ MRPC see next 4 rows	Minimum of a "Boxing" inspection of surrounding tubes. See Section 6.3	40% TW, or per engineering evaluation	60% for 3.0"	N/A
		100% of TTW detected by bobbin and PRO indications >2.5 volt	+Point	see previous row	27905.3 R2				56% for 3"
		100% of new Channel 6 calls that are paired with another new or old Channel 6 call, in an adjacent tube and at a common elevation (Note 6)							
		100% of MBMs that have increased by ≥0.5 volt bobbin (existing MBMs)							

Degradation Mechanisms	Inspection Requirements	Inspection Program	Probe	Detection Technique[1] ETSS #	Sizing Technique[1] ETSS #	Inspection Expansion Contingency	Plugging Limit	Structural Limit[2]	Condition Monitoring Limit[2]
Non-Relevant (Diagnostic Sample)									
MBM	Diagnostic	Bobbin Base Scope	Bobbin	96010.1 R7	96010.1 R7	NA	NA	Note 5	Note 5
ODSCC at TTS Expansion Transition	Diagnostic	• +Point probe: HL/CL periphery and divider lane TTS +6/-3 • 100% Sample +Point probe inspection of TSH +6/-3 • 100% Sample +Point probe, TSH +6/-16 tubes w/ BLG/OXP	+Point	I28424 R4 Axial ODSCC	I28431 R3 Axial ODSCC	100% +Point probe inspection TSH +6/-16" in the affected SG, 20% expansion in other SGs	Plug on Detection	Note 5	Note 5
			+Point	I28425 R4 Axial ODSCC	I28432 R2 Axial ODSCC				
			+Point	21410.1R6 Circ ODSCC	21410.1R6 Circ ODSCC				
ODSCC at Dings/Dents ≥ 5V	Diagnostic	Bobbin Base Scope	Bobbin	I28413 R5 Axial ODSCC	I28432 R2 (+Point) Axial ODSCC	100% of dents/dings >2V and <5V	Plug on Detection	Note 5	Note 5
		+Point probe inspection of all previously identified dents and dings >5 volts	+Point	I28424 R4 Sludge pile axial ODSCC	I28431 R3 Axial ODSCC				
			+Point	I28425 R4 Freespan/TSP axial ODSCC	I28432 R2 Axial ODSCC				
			+Point	21410.1 R6 Circ ODSCC	21410.1 R6 Circ ODSCC				
ODSCC at Dings/Dents < 5V	Diagnostic	Bobbin Base Scope	Bobbin	24013.1 R2 Dings 2-5V	Sizing: see next 3 rows	100% of reportable dents/dings in affected SG and 20% in other SGs	Plug on Detection	Note 5	Note 5
			Bobbin	I28413 R5 Axial ODSCC Freespan and TSP Dents ≤2V	I28432 R2 (+Point) Freespan and TSP				
			Bobbin	I28413 R5 Axial ODSCC in Sludge Dents ≤2V	I28431 R3 (+Point) Sludge				
		• +Point probe: HL/CL periphery and divider lane TTS +6/-3 • 100% Sample +Point probe inspection of TSH +6/-3 • 100% Sample +Point probe, TSH +6/-16 tubes w/ BLG/OXP	+Point	21410.1 R6 Circ ODSCC	21410.1 R6 Circ ODSCC				

Table 7-1: STP 2RE22 SG Tube Degradation Mechanisms and Inspection Requirements

Degradation Mechanisms	Inspection Requirements	Inspection Program	Probe	Detection Technique[1] ETSS #	Sizing Technique[1] ETSS #	Inspection Expansion Contingency	Plugging Limit	Structural Limit[2]	Condition Monitoring Limit[2]
Non-Relevant (Diagnostic Sample)									
TSP Axial ODSCC	Diagnostic	Bobbin Base Scope	Bobbin	128413 R5	128432 R2 (+Point)	100% Bobbin in affected SG and 20% in other SGs	Plug on Detection	Note 5	Note 5
Freespan Axial ODSCC	Diagnostic	Bobbin Base Scope	Bobbin	128413 R5	128432 R2 (+Point)	100% Bobbin in affected SG and 20% in other SGs	Plug on Detection	Note 5	Note 5
U-bend ODSCC	Diagnostic	100% inspection of Rows 1 & 2 U-bends	Bobbin (Zephyr)	128413 R5	128432 R2 (+Point)	100% inspection with Zephyr or +Point probe of rows 1-4 U-bends in affected SG and 20% in other SGs	Plug on Detection	Note 5	Note 5
			+Point	128425 R4 Axial ODSCC	128432 R2				
			+Point	21410.1R6 Circ ODSCC	21410.1R6 Circ ODSCC				
TSP Dent ODSCC	Diagnostic	+Point probe inspection of all previously identified dents and dings >5 volts	+Point	128425 R4 Axial ODSCC	128432 R2	100% of dents/dings >2V and <5V	Plug on Detection	Note 5	Note 5
			+Point	21410.1R6 Circ ODSCC	21410.1R6 Circ ODSCC				
Resolution for Classification of Indications	Indications such as anomalous tubesheet signals, MBMs, PVNs, and "benign signals" do not represent tube degradation and require no inspection program; they are encountered in the periodic sampling with bobbin and with rotating probes. If the indication is new or changed from its origin or prior characterization, history review and/or rotating probe examinations are required to resolve signals that could mask potential flaws for disposition with respect to continued service or plugging.								

Notes

Note 1: All ETSSs are from EPRI Appendix H unless prefixed with an 'I' (example I28413) in which case it is an Appendix I ETSS.
Note 2: Calculated using Axial Thinning model (Flaw Handbook, Wall Thinning with Limited Circumferential and Axial Extent).
Note 3: Locations of 2RE19 FOs retained in the SGs will be +Point probe examined. +Point probe inspection of a minimum two tube locations surrounding any newly identified PLP and any secondary side foreign objects identified by FOSAR as necessary to support the OA during 2RE22.
Note 4: The applicable ETSSs are numbered 2790X, where X is one of the following: 1.2, 2.3, 3.2, 4.2, 5.3, 6.2 or 7.2. See Table 7-3 for revision numbers.
Note 5: Structural and condition monitoring limits are not calculated for non-relevant degradation mechanisms since such indications are not expected in the current inspection.
Note 6: Channel 6 calls include MBM, ADI/ADS, etc.

5. THE LOCATION, ORIENTATION (IF LINEAR), MEASURED SIZE (IF AVAILABLE), AND VOLTAGE RESPONSES OF EACH INDICATION. FOR TUBE WEAR AT SUPPORT STRUCTURES LESS THAN 20 PERCENT THROUGH-WALL, ONLY THE TOTAL NUMBER OF INDICATIONS NEEDS TO BE REPORTED

The 2RE22 inspection includes a bobbin noise threshold of 0.5-volt in all regions of interest. This threshold is lower than the value required by the must-detect flaws, and a common threshold for similar 690TT plants. Therefore, it is established that any indications greater than or equal to the must detect depth will be reported.

During the STP Unit 2 steam generator inspections conducted during 2RE22, ten locations were found to have TSP wear. There were six (6) small indications being tracked from previous inspections that finally met the threshold to be reported. There was one newly reported indication in SG 2A: R1C79 08C; three newly reported indications in SG 2C: R1C121 07C, R4C82 07C, R4C124 06C; and two newly reported indications in SG 2D: R6C118 05C, R6C118 08C. There were no new indications to report in SG 2B. A historic data re-analysis was performed on these newly reportable indications and these indications were able to be seen in previous outages. See Table 2-2 for additional information.

Table 2-2: TSP Indications Reported During 2RE22

SG	Row	Col	Loc	2004 2RE10 %TW	2008 2RE13 %TW	2013 2RE16 %TW	2018 2RE19 %TW	2022 2RE22 %TW	# TSP Lands
2A	1	79	08C	NDD	3(1)	5(1)	5(1)	7(1)	Single
2A	7	57	08C	3	4	8	7	9	Single
2A	8	154	06C	NDD	5	9	9	13	Single
2C	1	121	07C	NDD	NDD	6(1)	6(1)	7	Single
2C	3	115	06C	NDD	4	6	6	8	Single
2C	4	82	07C	NDD	Not Tested	3(1)	Not Tested	5	Single
2C	4	124	06C	NDD	Not Tested	6(1)	Not Tested	10	Single
2D	6	118	05C	NDD	NDD	5(1)	Not Tested	6	Single
2D	6	118	08C	NDD	NDD	4(1)	Not Tested	5	Single
2D	23	153	09C	NDD	3	5	5	5	Single
New Indication 2RE22				Note (1): Sizing was not done at that outage, but during data reanalysis at 2RE22					

The following table evaluates the ten locations as PCT and WAR; and includes voltage.

SGID	Row	Col	Volts	Deg	Ind	Per	Chn	Locn	Inch1	Inch2	CrLen	CrWid	Ceg	BegT	EndT	PDia	PType	Cal	L	Idx	Newly Reported	2RE18 % TW
A	1	79	0.14	139	PCT	7	P2	08C	-0.63					TEC	TEH	0.56	CBAU2	55	H	31	Yes	
A	1	79	0.14	55	WAR		P4	08C	-0.74					08C	08C	0.56	ZPS3N	82	C	10		
A	7	57	0.19	72	PCT	9	P2	08C	0.56					TEC	TEH	0.56	CBAU2	71	H	138		7%
A	7	57	0.2	55	WAR		P4	08C	0.56					08C	08C	0.56	ZPS3N	82	C	11		
A	8	154	0.28	0	PCT	13	P2	06C	-0.5					TEH	TEC	0.56	CBAU2	10	C	20		9%
A	8	154	0.2	59	WAR		P4	06C	-0.5					06C	06C	0.56	ZPS3N	82	C	8		
C	1	121	0.12	132	PCT	7	P2	07C	0.58					TEC	TEH	0.56	CBAU2	69	H	40	Yes	
C	1	121	0.33	103	WAR		P4	07C	0.58		0.82	0.37	62	07C	07C	0.56	ZPS3N	24	C	12		
C	3	115	0.15	76	PCT	8	P2	06C	0.53					TEC	TEH	0.56	CBAU2	69	H	46		6%
C	3	115	0.3	96	WAR		P4	06C	0.53		0.36	0.39	65	06C	06C	0.56	ZPS3N	24	C	11		
C	4	82	0.09	103	PCT	5	P2	07C	0.51					TEC	TEH	0.56	CBAU2	69	H	77	Yes	
C	4	82	0.16	105	WAR		P4	07C	0.51		0.34	0.3	51	07C	07C	0.56	ZPS3N	24	C	10		
C	4	124	0.21	90	PCT	10	P2	06C	0.48					TEC	TEH	0.56	CBAU2	69	H	37	Yes	
C	4	124	0.47	94	WAR		P4	06C	0.48		0.48	0.38	63	06C	06C	0.56	ZPS3N	24	C	13		
D	6	118	0.13	100	PCT	6	P2	05C	0.47					TEC	TEH	0.56	CBAU2	57	H	204	Yes	
D	6	118	0.27	94	WAR		P4	05C	0.47					05C	05C	0.56	ZPS3N	22	C	8		
D	6	118	0.11	126	PCT	5	P2	08C	0.43					TEC	TEH	0.56	CBAU2	57	H	204	Yes	
D	6	118	0.19	83	WAR		P4	08C	0.43					08C	08C	0.56	ZPS3N	22	C	8		
D	23	153	0.11	150	PCT	5	P2	09C	0.34					TEC	TEH	0.56	CBAU2	49	H	179		5%
D	23	153	0.18	98	WAR		P4	09C	0.34					09C	09C	0.56	ZPS3N	22	C	9		

6. A DESCRIPTION OF THE CONDITION MONITORING ASSESSMENT AND RESULTS, INCLUDING THE MARGIN TO THE TUBE INTEGRITY PERFORMANCE CRITERIA AND COMPARISON WITH THE MARGIN PREDICTED TO EXIST AT THE INSPECTION BY THE PREVIOUS FORWARD-LOOKING TUBE INTEGRITY ASSESSMENT

Based on the inspection data and the condition monitoring assessment, no tubes exhibited degradation in excess of the condition monitoring limits. No tubes required in situ pressure testing to demonstrate structural and leakage integrity. There was no reported SG primary-to-secondary leakage prior to the end of the South Texas Unit 2 RSG inspection interval. Therefore, the SG performance criteria for structural and leakage integrity were satisfied for all degradation mechanisms detected for the preceding South Texas Unit 2 SG operating interval. The condition monitoring results are summarized in Table 3-1.

Table 3-1: South Texas Unit 2 2RE22 Condition Monitoring Summary

Degradation Mechanism (assumed flaw length)	Maximum Depth (%TW)	CM Limit Depth (%TW)	Conclusion
TSP Wear (1.125 in)	13	57	Bounded
AVB Wear (0.61 in)	NONE REPORTED	63	Bounded
Foreign Object Wear (0.50 in)	NONE REPORTED	51	Bounded

7. DISCUSS ANY DEGRADATION THAT WAS NOT BOUNDED BY THE PRIOR OPERATIONAL ASSESSMENT IN TERMS OF PROJECTED MAXIMUM FLAW DIMENSIONS, MINIMUM BURST STRENGTH, AND/OR ACCIDENT INDUCED LEAK RATE. PROVIDE DETAILS OF ANY IN-SITU PRESSURE TEST.

There was no degradation found in 2RE22 that was not bounded by the prior Operational Assessment (2RE19). No tubes required in-situ pressure testing to support the Condition Monitoring (CM) assessment based on the DA and Electric Power Research Institute (EPRI) In Situ Pressure Test Guidelines.

8. THE NUMBER OF TUBES PLUGGED [OR REPAIRED] DURING THE INSPECTION OUTAGE. ALSO, PROVIDE THE TUBE LOCATION AND REASON FOR PLUGGING.

No tubes were plugged during the 2RE22 outage. No tubes have exhibited degradation exceeding the tube integrity criteria given in the Degradation Assessment (DA) for the 2RE22 outage.

9. THE REPAIR METHODS UTILIZED, AND THE NUMBER OF TUBES REPAIRED BY EACH REPAIR METHOD.

STPNOC does not repair tubes, tubes are plugged if they do not meet acceptance criteria. No tubes were plugged during the 2RE22 outage. Historically, a total of ten tubes have been plugged in the STP Unit 2 RSGs leading up to 2RE22:

SG	# Tubes	# Plugged	% Plugging
2A	7585	1	0.013
2B	7585	2	0.026
2C	7585	3	0.040
2D	7585	4	0.052
Total	30340	10	0.033

10. AN ANALYSIS SUMMARY OF THE TUBE INTEGRITY CONDITIONS PREDICTED TO EXIST AT THE NEXT SCHEDULED INSPECTION (THE FORWARD-LOOKING TUBE INTEGRITY ASSESSMENT) RELATIVE TO THE APPLICABLE PERFORMANCE CRITERIA, INCLUDING THE ANALYSIS METHODOLOGY, INPUTS, AND RESULTS. THE EFFECTIVE FULL POWER MONTHS OF OPERATION PERMITTED FOR THE CURRENT OPERATIONAL ASSESSMENT.

An operational assessment of each existing tube degradation mechanism identified during the 2RE22 inspection along with the foreign objects that remain on the secondary side is provided in the following sections:

Mechanical Wear at Tube Support Plates

The operational assessment for TSP wear considers both detected and undetected flaws, as well as conservative growth rates, to ensure structural and leakage integrity for a 5-cycle interval (to EOC 27).

The growth rates are determined given an operating duration between two inspections of the same tube. Seven tubes were inspected previously in 2RE19, and two were inspected previously in 2RE16. The inspection between 2RE19 to 2RE22 is 4.26 EFPY and the inspection interval between 2RE16 to 2RE22 is 8.29 EFPY. Taking the largest difference in growth between the two inspections, for 2RE19 and 2RE22 is 4% TW and 2RE16 to 2RE22 is 4% TW, and divided by the EFPY of the inspection interval, 4.26 EFPY for 2RE19 to 2RE22 and 8.29 EFPY for 2RE16 to 2RE22, a growth rate is determined.

From Table 4-1, the largest projected TSP wear flaw size is 60.8% TW for a five-cycle operating interval between inspections. These values satisfy the 3ΔPNO structural integrity performance criteria. For pressure-only loading of volumetric flaws, satisfaction of the structural integrity performance criteria implies satisfaction of leakage integrity performance criteria at accident conditions. Therefore, it is projected that both detected and assumed undetected indications of TSP wear will not violate the SG tube integrity performance criteria during five cycle operating interval between inspections.

Table 4-1: South Texas 2RE22 TSP Wear OA Projection to EOC 27

Degradation Mechanism	Max RTS Flaw	Duration (EFPY)	Flaw Length (inch)	Growth Rate	Projected Depth	EOC Structural Limit	SG Integrity Performance Criteria Met?
TSP Wear	13%TW Max RTS	7.5	1.125	5%TW/EFPY	60.8	63% TW	Yes
	19%TW Undetected	7.5			56.5		Yes

Assessment of Mechanical Wear at Anti-Vibration Bars

The operational assessment for AVB wear considers undetected flaws and conservative growth rates, to ensure structural and leakage integrity for a 5-cycle interval (to EOC 27).

Since there has been no reported AVB wear at South Texas Unit 2 to date, an undetected population flaw depth of 19% TW is assumed to remain in service for 5-operating cycles between inspections with each cycle conservatively assumed to be 1.5 EFPY. Table 4-2 shows the resulting projected flaw depth which is then compared to the EOC Structural Limit of 66% for a conservatively assumed flat 0.61-inch wear scar.

Table 4-2: South Texas Unit 2 2RE22 AVB Wear OA Projection to EOC 27

Degradation Mechanism	Max RTS Flaw	Duration (EFPY)	Flaw Length (inch)	Growth Rate	Projected Depth	EOC Structural Limit	SG Integrity Performance Criteria Met?
AVB Wear	19%TW Undetected	7.5	0.61	5%TW/EFPY	56.5	66% TW	Yes

Assessment of Foreign Object Wear

There has been no reported foreign object wear reported at South Texas Unit 2 to date. Therefore, without any foreign object wear, no operational assessment is needed.

Table 2-4 shows the known remaining objects in the SG secondary side following the 2RE22 inspections. These include non-metallic items such as tube scale and hard sludge deposits. These non-metallic objects are of no concern for tube integrity as industry operating experience has shown them to be incapable of causing tube wear degradation. Regarding the metallic objects, the objects remaining in each SG have been examined to ensure excessive degradation will not occur over the operating duration until the next secondary side inspection that will occur in 5-cycles. An engineering evaluation of the remaining foreign objects in each SG (performed with respect to the worst flow conditions and tube vibration) shows that all of the objects that will remain in the SGs at South Texas Unit 2 have wear times greater than 10-cycles. Results of this evaluation are shown as Wear Time in Table 2-4. (See next page)
No tube wear has been detected by the eddy current test program on tubes adjacent to these objects.

Therefore, it is projected that there will be no challenge to the South Texas Unit 2 SG structural and leakage integrity performance criteria relative to these foreign objects that still reside in the SGs over an operating interval of 7.5 EFPY before the next planned inspection at EOC 27.

Table 2-4: Foreign Objects Observed During FOSAR at South Texas Unit 2 2RE22

SG No.	Foreign Object No.	Retrieval Status	Priority	Foreign Object Description	Leg / Region	Inspection Elevation	Beginning Row	End Row	Beginning Col	End Col	Length (In.)	Width (In.)	Height (In.)	Diameter (In.)	High/Low Flow	Wear Time
SG 2A	FO 2A001	Retrieved	2	Gasket Material	Hot Leg	TTS	113	115	79	80	0.5	0.25	0.125		High	>15
SG 2A	FO 2A002	Non-Relevant	3	graphite	Cold Leg	TTS	119	119	99	100	0.175	0.165	0.04		High	>15
SG 2A	FO 2A003	Attempted but not retrieved	3	Wire Bristle	Tubelane	TTS	1	1	100	100	0.26	0.0625	0.0625	0.0625	Low	>15
SG 2A	FO 2A004	Retrieved	2	Gasket Material	Hot Leg	TTS	127	127	70	70	0.7	0.25	0.125		High	>15
SG 2B	FO 2B001	Retrieved	1	Wire Bristle	Hot Leg	TTS	127	127	84	128	0.5	0.1	0.1	0.1	High	>15
SG 2B	FO 2B002	Will Not Retrieve	3	possible gasket	Hot Leg	TTS	13	14	97	98	0.04	0.025	0.01		Low	>15
SG 2C	FO 2C001	Non-Relevant	3	Scale	Hot Leg	TTS	22	23	153	154	0.158	0.2	0.03		High	NA[1]
SG 2C	FO 2C002	Attempted but not retrieved	3	weld slag	Cold Leg	TTS	121	122	83	84	0.17	0.09	0.01		High	>15
SG 2C	FO 2C003	Attempted but not retrieved	2	Machine Turning	Cold Leg	TTS	72	73	83	84	0.17	0.15	0.01		High	>15
SG 2C	FO 2C004	Retrieved	3	Weld Slag	Hot Leg	TTS	95	96	89	90	0.0625	0.03125	0.03125		Low	>15
SG 2C	FO 2C005	Non-Relevant	3	Machine Turning	Hot Leg	TTS	76	76	137	138	0.05	0.05	0.1		Low	>15
SG 2C	FO 2C006	Retrieved	3	Gasket Material	Hot Leg	TTS	118	119	113	114	0.17	0.09	0.01		11.0 ft/sec	>15
SG 2C	FO 2C007	Will Not Retrieve	3	Wire Bristle	Hot Leg	TTS	114	115	111	112	0.08			0.01	High	>15
SG 2C	FO 2C008	Will Not Retrieve	3	Wire Bristle	Hot Leg	TTS	125		89	90	0.07			0.01	High	>15
SG 2C	FO 2C009	Will Not Retrieve	3	Wire Bristle	Hot Leg	TTS	26	27	27	28	0.05			0.01	High	>15
SG 2C	FO 2C010	Will Not Retrieve	3	Wire Bristle	Hot Leg	TTS	114	114	43	44	0.05			0.01	Low	>15
SG 2C	FO 2C011	Will Not Retrieve	3	Wire Bristle	Hot Leg	TTS	50	51	45	46	0.05			0.01	High	>15
SG 2C	FO 2C012	Retrieved	3	possible end cap	Hot Leg	TTS	28	29	67	68	0.15	0.1417	0.05		High	>15
SG 2C	FO 2C013	Attempted but not retrieved	3	Metal tab	Cold Leg	TTS	22	23	55	56	0.17	0.15	0.01		Low	>15
SG 2C	FO 2C014	Non-Relevant	3	Gasket Material	Cold Leg	TTS	118	119	69	70	0.125	0.01	0.02		Low	>15
SG 2D	FO 2D001	Attempted but not retrieved	3	Wire Bristle	Hot Leg	TTS	37	38	75	76	0.5	0.0625	0.0625	0.06	Low	>15
SG 2D	FO 2D002	Retrieved	3	Wire Bristle	Hot Leg	TTS	99	99	85	85	0.09	0.01	0.01		Low	>15
SG 2D	FO 2D003	Attempted but not retrieved	2	Wire Bristle	Hot Leg	TTS	31	31	81	82	0.5	0.01	0.01		Low	>15
SG 2D	FO 2D004	Attempted but not retrieved	3	Wire Bristle	Hot Leg	TTS	28	28	79	80	0.5	0.01	0.01		Low	>15
SG 2D	FO 2D005	Attempted but not retrieved	3	Wire Bristle	Hot Leg	TTS	25	25	79	79	0.15	0.01	0.01		Low	>15
SG 2D	FO 2D006	Attempted but not retrieved	3	Wire Bristle	Hot Leg	TTS	33	33	76	77	0.7	0.03125	0.03125		Low	>15
SG 2D	FO 2D007	Attempted but not retrieved	3	Wire Bristle	Hot Leg	TTS	31	31	75	76	0.3			0.03125	Low	>15
SG 2D	FO 2D008	Non-Relevant	3	Wire Bristle	Hot Leg	TTS	34	35	75	76	0.15			0.01	Low	>15
Retrieved		Non-Relent	Attempted but not Retrieved	Note 1: Scale crumbles and will not cause wear on the tubes												

11. THE NUMBER AND PERCENTAGE OF TUBES PLUGGED [OR REPAIRED] TO DATE, AND THE EFFECTIVE PLUGGING PERCENTAGE IN EACH SG

No tubes were plugged during the 2RE22 outage. Historically, a total of ten tubes have been plugged in the STP Unit 2 RSGs leading up to 2RE22:

SG	# Tubes	# Plugged	% Plugging
2A	7585	1	0.013
2B	7585	2	0.026
2C	7585	3	0.040
2D	7585	4	0.052
Total	30340	10	0.033

12. THE RESULTS OF ANY SG SECONDARY-SIDE INSPECTIONS. THE NUMBER, TYPE, AND LOCATION (IF AVAILABLE) OF LOOSE PARTS THAT COULD DAMAGE TUBES REMOVED OR LEFT IN SERVICE IN EACH SG

During 2RE22 inspections there were no foreign objects discovered corresponding to new PLPs.

Table 2-4 shows the known remaining objects in the SG secondary side following the 2RE22 inspections. These include non-metallic items such as tube scale and hard sludge deposits. These non-metallic objects are of no concern for tube integrity as industry operating experience has shown them to be incapable of causing tube wear degradation. Regarding the metallic objects, the objects remaining in each SG have been examined to ensure excessive degradation will not occur over the operating duration until the next secondary side inspection that will occur in 5-cycles. An engineering evaluation of the remaining foreign objects in each SG (performed with respect to the worst flow conditions and tube vibration) shows that the all objects that will still reside in the SGs at South Texas Unit 2 have wear times greater than 10-cycles. Results of this evaluation are shown as Wear Time in Table 2-4.

No tube wear has been detected by the eddy current test program on tubes adjacent to these objects.

Therefore, it is projected that there will be no challenge to the South Texas Unit 2 SG structural and leakage integrity performance criteria relative to these foreign objects that still reside in the SGs over an operating interval of 7.5 EFPY before the next planned inspection at EOC 27.

Table 2.4:

Table 2-4: Foreign Objects Observed During FOSAR at South Texas Unit 2 2RE22

SG No.	Foreign Object No.	Retrieval Status	Priority	Foreign Object Description	Leg / Region	Inspection Elevation	Beginning Row	End Row	Beginning Col	End Col	Length (In.)	Width (In.)	Height (In.)	Diameter (In.)	High/Low Flow	Wear Time
SG 2A	FO 2A001	Retrieved	2	Gasket Material	Hot Leg	TTS	113	115	79	80	0.5	0.25	0.125		High	>15
SG 2A	FO 2A002	Non-Relevant	3	graphite	Cold Leg	TTS	119	119	99	100	0.175	0.165	0.04		High	>15
SG 2A	FO 2A003	Attempted but not retrieved	3	Wire Bristle	Tubelane	TTS	1	1	100	100	0.26	0.0625	0.0625	0.0625	Low	>15
SG 2A	FO 2A004	Retrieved	2	Gasket Material	Hot Leg	TTS	127	127	70	70	0.7	0.25	0.125		High	>15
SG 2B	FO 2B001	Retrieved	1	Wire Bristle	Hot Leg	TTS	127	127	84	128	0.5	0.1	0.1	0.1	High	>15
SG 2B	FO 2B002	Will Not Retrieve	3	possible gasket	Hot Leg	TTS	13	14	97	98	0.04	0.025	0.01		Low	>15
SG 2C	FO 2C001	Non-Relevant	3	Scale	Hot Leg	TTS	22	23	153	154	0.158	0.2	0.03		High	N/A[1]
SG 2C	FO 2C002	Attempted but not retrieved	3	weld slag	Cold Leg	TTS	121	122	83	84	0.17	0.09	0.01		High	>15
SG 2C	FO 2C003	Attempted but not retrieved	2	Machine Turning	Cold Leg	TTS	72	73	83	84	0.17	0.15	0.01		High	>15
SG 2C	FO 2C004	Retrieved	3	Weld Slag	Hot Leg	TTS	95	96	89	90	0.0625	0.03125	0.03125		Low	>15
SG 2C	FO 2C005	Non-Relevant	3	Machine Turning	Hot Leg	TTS	76	76	137	138	0.05	0.05	0.1		Low	>15
SG 2C	FO 2C006	Retrieved	3	Gasket Material	Hot Leg	TTS	118	119	113	114	0.17	0.09	0.01		11.0 ft/sec	>15
SG 2C	FO 2C007	Will Not Retrieve	3	Wire Bristle	Hot Leg	TTS	114	115	111	112	0.08			0.01	High	>15
SG 2C	FO 2C008	Will Not Retrieve	3	Wire Bristle	Hot Leg	TTS	125		89	90	0.07			0.01	High	>15
SG 2C	FO 2C009	Will Not Retrieve	3	Wire Bristle	Hot Leg	TTS	26	27	27	28	0.05			0.01	High	>15
SG 2C	FO 2C010	Will Not Retrieve	3	Wire Bristle	Hot Leg	TTS	114	114	43	44	0.05			0.01	Low	>15
SG 2C	FO 2C011	Will Not Retrieve	3	Wire Bristle	Hot Leg	TTS	50	51	45	46	0.05			0.01	High	>15
SG 2C	FO 2C012	Retrieved	3	possible end cap	Hot Leg	TTS	28	29	67	68	0.15	0.1417	0.05		High	>15
SG 2C	FO 2C013	Attempted but not retrieved	3	Metal tab	Cold Leg	TTS	22	23	55	56	0.17	0.15	0.01		Low	>15
SG 2C	FO 2C014	Non-Relevant	3	Gasket Material	Cold Leg	TTS	118	119	69	70	0.125	0.01	0.02		Low	>15
SG 2D	FO 2D001	Attempted but not retrieved	3	Wire Bristle	Hot Leg	TTS	37	38	75	76	0.5	0.0625	0.0625	0.06	Low	>15
SG 2D	FO 2D002	Retrieved	3	Wire Bristle	Hot Leg	TTS	99	99	85	85	0.09	0.01	0.01		Low	>15
SG 2D	FO 2D003	Attempted but not retrieved	2	Wire Bristle	Hot Leg	TTS	31	31	81	82	0.5	0.01	0.01		Low	>15
SG 2D	FO 2D004	Attempted but not retrieved	3	Wire Bristle	Hot Leg	TTS	28	28	79	80	0.5	0.01	0.01		Low	>15
SG 2D	FO 2D005	Attempted but not retrieved	3	Wire Bristle	Hot Leg	TTS	25	25	79	79	0.15	0.01	0.01		Low	>15
SG 2D	FO 2D006	Attempted but not retrieved	3	Wire Bristle	Hot Leg	TTS	33	33	76	77	0.7	0.03125	0.03125		Low	>15
SG 2D	FO 2D007	Attempted but not retrieved	3	Wire Bristle	Hot Leg	TTS	31	31	75	76	0.3			0.03125	Low	>15
SG 2D	FO 2D008	Non-Relevant	3	Wire Bristle	Hot Leg	TTS	34	35	75	76	0.15			0.01	Low	>15
Retrieved		Non-Relent	Attempted but not Retrieved		Note 1: Scale crumbles and will not cause wear on the tubes											

13. THE SCOPE, METHOD, AND RESULTS OF SECONDARY-SIDE CLEANING PERFORMED IN EACH SG

Secondary Side Base Scope

Sludge Lancing

- Top of the tubesheet sludge lancing was performed.

Foreign Object Search and Retrieval (FOSAR)

- FOSAR was performed on the top of the tubesheet, viewing every other column.

Steam Drum Inspections

- Visual inspections of SG2A and SG2D
- Sludge collector cleanings of SG2A and SG2D

9th TSP Visual inspection

- Visual inspection of the 9th TSP in SG2A

See Table 2.4 (previous page) for foreign objects remaining on secondary side. Sludge removed from top of tubesheet and sludge collectors is as follows:

Table 2-3: STP Unit 2 2RE22 SG Tubesheet Deposit Removal

SG	Deposit Amount Removed Sludge Lancing (lbs)	Deposit Amount Removed From Sludge Collector (lbs)
SG 2A	13.53	11.14
SG 2B	13.59	Not Performed
SG 2C	14.26	Not Performed
SG 2D	14.17	11.08
All SGs	55.55	22.22

14. THE RESULTS OF VISUAL INSPECTIONS PERFORMED IN EACH SG

NSAL-12-1 SG Channel Head Primary Side Bowl Inspection

A visual inspection of the bottom of the SG channel head bowl was performed in both legs of all SGs during South Texas Unit 2 2RE22. Visual inspections were performed on the entire inside surface of the SG channel head bowl. Key areas of inspection include the channel head cladding, the divider plate-to-channel head weld and the channel head-to-tubesheet weld. Inspections were performed in accordance with guidance provided by Westinghouse Nuclear Safety Advisory Letter (NSAL) NSAL-12-1 recommendations using the SG manway channel head bowl cameras. There was no apparent cladding loss in any of the channel head, and there was also no degradation of any welds within the channel heads. Satisfactory inspection results were observed in all SGs.

In-Bundle Inspection of the Ninth Tube Support Plate

To obtain visual information on the deposit loading in the upper region of the tube bundle, an in-bundle inspection of the 9th tube support plate of SG 2A was performed. Video probes were deployed from the tube lane using extensions that permitted visual

observation of flow slots, tube surfaces, and trefoil ligaments.

The inspection showed a very low level of magnetite covering the TSP top surface, with no loose deposits noted. No deposit bridging across the trefoil to tube outside diameter (OD) surface was observed. No departures from the expected appearance of the TSP ligaments were observed. No negative impact on steam generator operation is expected.

Steam Drums

Visual observations were made of the steam drums of SG 2A and SG 2D to assess the condition of the steam drum in each SG and to ensure reliable operations until the next inspection period. The steam drums were inspected for erosion, mechanical damage, cracked welds, corrosion, foreign material, and any unusual conditions.

The inspection revealed no abnormal conditions. All components were in good condition with no cracking, erosion, or deformation. Sludge collectors in SG 2A and 2D were cleaned and post cleanliness inspection showed minor sludge left in collectors, no significant findings of loose parts. The inspection of the steam drums showed that all surfaces were gray in color, similar to last inspection during 2RE19.

15. ANY PLANT-SPECIFIC REPORTING REQUIREMENTS, IF APPLICABLE

Sludge Pile Volumetric (Pitting)

Pitting is an assumed existing degradation mechanism in South Texas Unit 2. Pitting has not been identified in South Texas Unit 2, but as part of the resolution of the sludge pile volumetric indication that was found in South Texas Unit 1 during the 1RE19 inspection, South Texas Unit 2 will treat pitting as an existing degradation mechanism until both Units 1 and 2 have two consecutive inspections without any new sludge pile volumetric indications.

No sludge pile volumetric indications were identified during the South Texas Unit 2 2RE22 inspection. Since there has been two consecutive inspections at STP Unit 2 with no findings of these indications, the expanded scope for pitting can be removed from the base scope inspection plan and sludge pile volumetric indications will become a potential degradation mechanism for the next Unit 2 inspection.