



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
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Rockville, MD 20852-2738

South Texas Project
Unit 2
Docket No. STN 50-499
2RE13 Inspection Summary Report for Steam Generator Tubing

Enclosed are four copies of the summary report describing the results of the steam generator tube inspection performed during refueling outage 2RE13. The summary report satisfies the reporting requirements of ASME Section XI, Article IWA-6230, and Section 6.9.1.7 of the South Texas Project Technical Specifications.

This inspection was not required by STP Technical Specification Section 6.8.3.o for maintaining steam generator tube integrity and therefore is not for surveillance credit. This report has been prepared to continue appropriate communication with the Nuclear Regulatory Commission regarding all examinations performed during 2RE13 and their results.

There are no commitments in this letter.

If there are any questions regarding this report, please contact either Mr. P. L. Walker at (361) 972-8392 or me at (361) 972-7030.

Michael Berg *Lyle Spivey for Mike Berg*
Manager,
Testing/Programs

PLW

Enclosure: 2RE13 Inspection Summary Report for Steam Generator Tubing of the South Texas Project Electric Generating Station Unit 2

STI: 32448955

AD47
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**2RE13 INSPECTION SUMMARY REPORT
FOR STEAM GENERATOR TUBING**

of the

SOUTH TEXAS PROJECT

ELECTRIC GENERATING STATION

UNIT 2

P.O. BOX 289

WADSWORTH, TEXAS 77483

Owner: STP Nuclear Operating Company

Commercial Operation: June 19, 1989

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FOR STEAM GENERATOR TUBING

of the

SOUTH TEXAS PROJECT ELECTRIC GENERATING STATION

UNIT 2

USNRC DOCKET NO.: STN 50-499

OPERATING LICENSE NO.: NPF-80

COMMERCIAL OPERATION DATE: June 19, 1989

Prepared By: *Dave Stuhler* 3/23/2009
D. A. Stuhler Date
Test Engineering

Approved By: *L. D. Spiess* 3/24/2009
L. D. Spiess Date
Supervisor, Test Engineering

SOUTH TEXAS PROJECT UNIT 2

2RE13 INSPECTION SUMMARY REPORT FOR STEAM GENERATOR TUBING

Introduction

This summary report describes the inspection of steam generator tubing at South Texas Project (STP) Unit 2 performed during refueling outage 2RE13 in October 2008. Steam generator eddy current inspection, sludge lancing, and Foreign Object Search and Retrieval (FOSAR) were conducted in steam generators 2A, 2B, 2C, and 2D.

This report provides the information required by STP Technical Specification 6.8.3.o for maintaining steam generator tube integrity and the reporting requirements of Technical Specification 6.9.1.7.

Scope of Examinations

The inservice inspection program, "2008 Outage Plan for the In-service Inspection of Steam Generator Tubing at the South Texas Project Electric Generating Station, Unit 2," (ISI Outage Plan) identified the steam generator tube areas to be examined by eddy current (EC) testing and the procedures expected to be used during the inservice inspection. A Degradation Assessment written prior to the outage established the scope of eddy current inspections.

EPRI guidelines require that all steam generators undergo a 50% general purpose EC bobbin inspection during the outage nearest the midpoint of the operative sequential period. Similarly, 20% examinations (+Point) of regions potentially susceptible to stress corrosion cracking should also be performed during the outage nearest the midpoint of the sequential operating period. For STP Unit 2, the operative sequential period is 144 effective full power months beginning with refueling outage 2RE10, the first inservice inspection for the current steam generators. The 2RE13 inspection scope is outlined below:

- Bobbin inspection - 100% of outer three peripheral tubes, full length
- Bobbin inspection - 50% of remaining tubes, other than outer three peripheral tubes, full length
- +Point inspection - U-bend region (upper TSP hot leg to upper TSP cold leg) 20% of rows 1-2
- +Point inspection – 100% hot leg top of tube sheet of outer three peripheral tubes TSH +6”/-3”
- +Point inspection – 100% cold leg top of tube sheet of outer three peripheral tubes TSC +6”/-3”
- +Point inspection - 20% of remaining hot leg top of tube sheet region, other than outer three peripheral tubes, TSH +6”/-3”
- +Point inspection - 50% hot leg sample of previously identified expansion anomalies within the tubesheet

- +Point inspection - 2RE13 "I-code" and non-quantifiable signal as determined by bobbin coil or any previously reported signal that has changed
- +Point inspection - any previously identified dents and dings > 5 volts not included in the scope above
- +Point inspection –bounding of loose parts identified by the following methods: (1) those reported during scheduled eddy current examinations; (2) those reported by visual secondary side inspections; and (3) any previous loose part location where the part itself was not removed. In each case, two tube locations absent of a loose part and/or wear signal are considered acceptable bounding.
- Visual inspection of installed plugs (all generators)
- Sludge lancing (all generators)
- Cleanliness inspection of the no-tubelane and tube bundle annulus (all generators)
- Sludge collector pumping and video probe inspection (2D only)
- Top of tubesheet FOSAR of periphery, no-tubelane, and inbundle (Every fourth column in 2A, 2B, 2C and every other column in 2D)
- Video probe inbundle inspection at the 9th support plate – (2A [HL] only)
- Steam drum inspection (2C and 2D only)
- Upper steam drum inspection and steam nozzle inspection (2D only)
- Tube scale profiling (2B and 2C only)

Examination Results

No tube corrosion or wear indications related to anti-vibration bars (AVBs) or foreign objects were reported during the 2RE13 ISI. A small number of benign signals were observed. These signals included dings/dents (DNG/DNT), manufacturing burnish marks (MBM), and signals cleared as free from degradation by MRPC (+ Point) examination as "NQS" (non-quantifiable signal). Signals representative of tube diameter increases, "BLG" (bulges), were also reported from the bobbin inspection analyses. The benign signals in the 2RE13 inspection data were assessed by reviewing the prior available ISI data. If the history lookup did not support the classification as a pre-existing benign signal or the signal exhibited a significant change, they were resolved by MRPC inspection. All identified benign signals are to be inspected in future outages as required by EPRI guidelines. Table 1 summarizes eddy current indications recorded during 2RE13.

As shown in Table 1, two bulges (BLG) were called, one in SG 2A (R82C134 HL) and one in SG 2B (R4C94 HL), one volumetric (VOL) was called in SG 2A (R7C57 CL), and twenty-five PLP calls were reported. The BLG indications were located in the upper freespan region and were reported in the baseline and dispositioned in the first ISI (2004). These locations were included

in the base scope bobbin program. There was no change in the bobbin signals; hence, no RPC testing was required.

During the 2RE13 planned bobbin scope, a distorted support indication (DSI) signal was reported at R7C57 CL in SG 2A at the 8th support structure. The signal itself correlates with the TSP land contact and is slightly inward from the edge. The indication was sized at 4% through-wall using bobbin coil and reclassified as "VOL" (volumetric) from the RPC test. This location will be monitored by inclusion in future eddy current inspection plans.

A 50% +Point sample inspection of previously reported tubesheet anomalies based on proximity to the expansion transition was performed. A total of 36 anomalies (11 in SG 2A, 12 in SG 2B, 6 in SG 2C, and 7 in SG 2D) were inspected. No degradation was noted. This inspection will be the basis for potential future +Point programs should it become necessary in future outages to inspect such locations for pressurized water stress corrosion cracking (PWSCC), currently regarded as a non-relevant damage mechanism in the Unit 2 replacement steam generators (RSG) due to the Alloy 690TT tubes' resistance to PWSCC.

Foreign object search and retrieval inspection was performed at top of the tubesheet in all four SGs. Several foreign objects were identified during the top of tubesheet video probe inspections. Flexitallic gasket fragments, machining remnants, wire bristles, weld slag, pieces of tube scale and sludge rocks account for the majority of material observed. During the eddy current inspection program, twenty five PLP calls were reported. As required by the EPRI examination guidelines, coordinated inspection scope between the eddy current and secondary visual inspection was maintained. All top of the tubesheet tube locations showing PLP signals by eddy current were visually inspected to identify the source of the signal. In addition, all top of the tubesheet tube locations where foreign objects were identified during visual inspections were included in the top of tubesheet +Point inspection program.

Based on existing wear analyses and top of the tubesheet velocity maps, prioritization criteria were developed and used to assign priorities to each of the identified foreign objects.

- Priority 1) Items must be removed to support three cycles of operation.
- Priority 2) Items acceptable for three cycles of operation but due to the potential for wear, need to be addressed in future inspection outages.
- Priority 3) Items considered unlikely to cause tube damage under any operational conditions.

For identified foreign objects not removed, wear analyses were performed to support structural integrity through Cycle 16. One Priority 1 object identified during inbundle foreign object mapping could not be removed from SG D. The appearance of the foreign object suggested it was most likely weld slag, which is known to cause wear. Attempts to remove the object were unsuccessful. Based on the wear calculations of the slag, the calculated amount of time for the part to potentially wear a tube to the structural limit (60% through-wall) ranged from less than 2.5 years to 4.6 years, depending on the local flow fields and orientation.

+Point inspection of tubes adjacent to the foreign object, as well as surrounding tubes, was performed. The eddy current results showed PLP signals at R50C140, R49C141, and R51C141. No indication of wear was noted for any of the tubes tested which included 2 tube

bounding for all indicated PLPs. Based on the wear analyses not supporting three Cycles of operation, four tubes (both hot and cold leg) were plugged.

In addition to the inbundle visual inspection, video probe inspection of periphery was performed to further identify the presence of any foreign objects in the periphery of the bundle or in the annulus between the tube bundle and shell.

All installed plugs were visually examined. No anomalies were noted.

Tube Plugging

Based on the wear analyses not supporting three Cycles of operation, four tubes in SG 2D (both hot and cold leg) were plugged. The following is a list of tubes plugged during 2RE13:

- Row 48 Column 140
- Row 50 Column 140
- Row 49 Column 141
- Row 51 Column 141

The total number of tubes plugged to date and percentages are as follows:

Steam Generator 2A	1	0.01%
Steam Generator 2B	2	0.03%
Steam Generator 2C	3	0.04%
Steam Generator 2D	4	0.05%

Condition Monitoring Results

Based on the Condition Monitoring evaluation, inspections of tubes in service during Cycles 11, 12, and 13 confirm that they all meet Regulatory Guide 1.121 structural integrity requirements. There were no confirmed indications of tube degradation as defined by the EPRI steam generator examination guidelines. Since no degradation mechanisms were detected during the 2RE13 inspection and no primary to secondary leakage had been observed prior to the end of Cycle 13 (EOC 13), the condition monitoring assessment requirements for SG operation were satisfied. No challenges to the SG Performance Criteria were identified; therefore, the Condition Monitoring requirements for the Unit 2 RSG tube bundles at EOC 13 are satisfied.

Table 1 - Summary of 2RE13 Eddy Current Indications

SG - A THX	SG - B THX
Ind	Ind
-----	-----
BLG 1	BLG 1
DNG 110	DNG 23
DNS 20	DNS 35
INR 169	INR 69
MBM 27	MBM 36
NDD 7640	NDD 7698
NDF 35	NDF 12
NQS 3	NQS 6
PCT 1	PLP 6
PLP 4	RBD 41
RBD 64	RIC 8
RIC 3	
VOL 1	

SG - C THX	SG - D THX
Ind	Ind
-----	-----
DNG 57	DNG 11
DNS 23	DNS 5
INR 149	INR 60
MBM 35	MBM 56
NDD 7675	NDD 8070
NDF 9	NDF 9
NQS 24	NQS 6
PLP 7	PLP 8
RBD 41	RBD 39
RIC 3	



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NDD	7640	NDD	7698
NDF	35	NDF	12
NQS	3	NQS	6
PCT	1	PLP	6
PLP	4	RBD	41
RBD	64	RIC	8
RIC	3		
VOL	1		
SG - C THX		SG - D THX	
Ind		Ind	
-----		-----	
DNG	57	DNG	11
DNS	23	DNS	5
INR	149	INR	60
MBM	35	MBM	56
NDD	7675	NDD	8070
NDF	9	NDF	9
NQS	24	NQS	6
PLP	7	PLP	8
RBD	41	RBD	39
RIC	3		



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Foreign object search and retrieval inspection was performed at top of the tubesheet in all four SGs. Several foreign objects were identified during the top of tubesheet video probe inspections. Flexitallic gasket fragments, machining remnants, wire bristles, weld slag, pieces of tube scale and sludge rocks account for the majority of material observed. During the eddy current inspection program, twenty five PLP calls were reported. As required by the EPRI examination guidelines, coordinated inspection scope between the eddy current and secondary visual inspection was maintained. All top of the tubesheet tube locations showing PLP signals by eddy current were visually inspected to identify the source of the signal. In addition, all top of the tubesheet tube locations where foreign objects were identified during visual inspections were included in the top of tubesheet +Point inspection program.

Based on existing wear analyses and top of the tubesheet velocity maps, prioritization criteria were developed and used to assign priorities to each of the identified foreign objects.

- Priority 1) Items must be removed to support three cycles of operation.
- Priority 2) Items acceptable for three cycles of operation but due to the potential for wear, need to be addressed in future inspection outages.
- Priority 3) Items considered unlikely to cause tube damage under any operational conditions.

For identified foreign objects not removed, wear analyses were performed to support structural integrity through Cycle 16. One Priority 1 object identified during inbundle foreign object mapping could not be removed from SG D. The appearance of the foreign object suggested it was most likely weld slag, which is known to cause wear. Attempts to remove the object were unsuccessful. Based on the wear calculations of the slag, the calculated amount of time for the part to potentially wear a tube to the structural limit (60% through-wall) ranged from less than 2.5 years to 4.6 years, depending on the local flow fields and orientation.

+Point inspection of tubes adjacent to the foreign object, as well as surrounding tubes, was performed. The eddy current results showed PLP signals at R50C140, R49C141, and R51C141. No indication of wear was noted for any of the tubes tested which included 2 tube

bounding for all indicated PLPs. Based on the wear analyses not supporting three Cycles of operation, four tubes (both hot and cold leg) were plugged.

In addition to the inbundle visual inspection, video probe inspection of periphery was performed to further identify the presence of any foreign objects in the periphery of the bundle or in the annulus between the tube bundle and shell.

All installed plugs were visually examined. No anomalies were noted.

Tube Plugging

Based on the wear analyses not supporting three Cycles of operation, four tubes in SG 2D (both hot and cold leg) were plugged. The following is a list of tubes plugged during 2RE13:

- Row 48 Column 140
- Row 50 Column 140
- Row 49 Column 141
- Row 51 Column 141

The total number of tubes plugged to date and percentages are as follows:

Steam Generator 2A	1	0.01%
Steam Generator 2B	2	0.03%
Steam Generator 2C	3	0.04%
Steam Generator 2D	4	0.05%

Condition Monitoring Results

Based on the Condition Monitoring evaluation, inspections of tubes in service during Cycles 11, 12, and 13 confirm that they all meet Regulatory Guide 1.121 structural integrity requirements. There were no confirmed indications of tube degradation as defined by the EPRI steam generator examination guidelines. Since no degradation mechanisms were detected during the 2RE13 inspection and no primary to secondary leakage had been observed prior to the end of Cycle 13 (EOC 13), the condition monitoring assessment requirements for SG operation were satisfied. No challenges to the SG Performance Criteria were identified; therefore, the Condition Monitoring requirements for the Unit 2 RSG tube bundles at EOC 13 are satisfied.

Table 1 - Summary of 2RE13 Eddy Current Indications

SG - A THX		SG - B THX	
Ind		Ind	
-----		-----	
BLG	1	BLG	1
DNG	110	DNG	23
DNS	20	DNS	35
INR	169	INR	69
MBM	27	MBM	36
NDD	7640	NDD	7698
NDF	35	NDF	12
NQS	3	NQS	6
PCT	1	PLP	6
PLP	4	RBD	41
RBD	64	RIC	8
RIC	3		
VOL	1		
SG - C THX		SG - D THX	
Ind		Ind	
-----		-----	
DNG	57	DNG	11
DNS	23	DNS	5
INR	149	INR	60
MBM	35	MBM	56
NDD	7675	NDD	8070
NDF	9	NDF	9
NQS	24	NQS	6
PLP	7	PLP	8
RBD	41	RBD	39
RIC	3		



**2RE13 INSPECTION SUMMARY REPORT
FOR STEAM GENERATOR TUBING**

of the

SOUTH TEXAS PROJECT

ELECTRIC GENERATING STATION

UNIT 2

P.O. BOX 289

WADSWORTH, TEXAS 77483

Owner: STP Nuclear Operating Company

Commercial Operation: June 19, 1989

Issue Date: March 24, 2009

2RE13 INSPECTION SUMMARY REPORT

FOR STEAM GENERATOR TUBING

of the

SOUTH TEXAS PROJECT ELECTRIC GENERATING STATION

UNIT 2

USNRC DOCKET NO.: STN 50-499

OPERATING LICENSE NO.: NPF-80

COMMERCIAL OPERATION DATE: June 19, 1989

Prepared By: *Dave Stuhler* 3/23/2009
D. A. Stuhler Date
Test Engineering

Approved By: *L. D. Spiess* 3/24/2009
L. D. Spiess Date
Supervisor, Test Engineering

SOUTH TEXAS PROJECT UNIT 2

2RE13 INSPECTION SUMMARY REPORT FOR STEAM GENERATOR TUBING

Introduction

This summary report describes the inspection of steam generator tubing at South Texas Project (STP) Unit 2 performed during refueling outage 2RE13 in October 2008. Steam generator eddy current inspection, sludge lancing, and Foreign Object Search and Retrieval (FOSAR) were conducted in steam generators 2A, 2B, 2C, and 2D.

This report provides the information required by STP Technical Specification 6.8.3.o for maintaining steam generator tube integrity and the reporting requirements of Technical Specification 6.9.1.7.

Scope of Examinations

The inservice inspection program, "2008 Outage Plan for the In-service Inspection of Steam Generator Tubing at the South Texas Project Electric Generating Station, Unit 2," (ISI Outage Plan) identified the steam generator tube areas to be examined by eddy current (EC) testing and the procedures expected to be used during the inservice inspection. A Degradation Assessment written prior to the outage established the scope of eddy current inspections.

EPRI guidelines require that all steam generators undergo a 50% general purpose EC bobbin inspection during the outage nearest the midpoint of the operative sequential period. Similarly, 20% examinations (+Point) of regions potentially susceptible to stress corrosion cracking should also be performed during the outage nearest the midpoint of the sequential operating period. For STP Unit 2, the operative sequential period is 144 effective full power months beginning with refueling outage 2RE10, the first inservice inspection for the current steam generators. The 2RE13 inspection scope is outlined below:

- Bobbin inspection - 100% of outer three peripheral tubes, full length
- Bobbin inspection - 50% of remaining tubes, other than outer three peripheral tubes, full length
- +Point inspection - U-bend region (upper TSP hot leg to upper TSP cold leg) 20% of rows 1-2
- +Point inspection – 100% hot leg top of tube sheet of outer three peripheral tubes TSH +6”/-3”
- +Point inspection – 100% cold leg top of tube sheet of outer three peripheral tubes TSC +6”/-3”
- +Point inspection - 20% of remaining hot leg top of tube sheet region, other than outer three peripheral tubes, TSH +6”/-3”
- +Point inspection - 50% hot leg sample of previously identified expansion anomalies within the tubesheet

- +Point inspection - 2RE13 "I-code" and non-quantifiable signal as determined by bobbin coil or any previously reported signal that has changed
- +Point inspection - any previously identified dents and dings > 5 volts not included in the scope above
- +Point inspection –bounding of loose parts identified by the following methods: (1) those reported during scheduled eddy current examinations; (2) those reported by visual secondary side inspections; and (3) any previous loose part location where the part itself was not removed. In each case, two tube locations absent of a loose part and/or wear signal are considered acceptable bounding.
- Visual inspection of installed plugs (all generators)
- Sludge lancing (all generators)
- Cleanliness inspection of the no-tubelane and tube bundle annulus (all generators)
- Sludge collector pumping and video probe inspection (2D only)
- Top of tubesheet FOSAR of periphery, no-tubelane, and inbundle (Every fourth column in 2A, 2B, 2C and every other column in 2D)
- Video probe inbundle inspection at the 9th support plate – (2A [HL] only)
- Steam drum inspection (2C and 2D only)
- Upper steam drum inspection and steam nozzle inspection (2D only)
- Tube scale profiling (2B and 2C only)

Examination Results

No tube corrosion or wear indications related to anti-vibration bars (AVBs) or foreign objects were reported during the 2RE13 ISI. A small number of benign signals were observed. These signals included dings/dents (DNG/DNT), manufacturing burnish marks (MBM), and signals cleared as free from degradation by MRPC (+ Point) examination as "NQS" (non-quantifiable signal). Signals representative of tube diameter increases, "BLG" (bulges), were also reported from the bobbin inspection analyses. The benign signals in the 2RE13 inspection data were assessed by reviewing the prior available ISI data. If the history lookup did not support the classification as a pre-existing benign signal or the signal exhibited a significant change, they were resolved by MRPC inspection. All identified benign signals are to be inspected in future outages as required by EPRI guidelines. Table 1 summarizes eddy current indications recorded during 2RE13.

As shown in Table 1, two bulges (BLG) were called, one in SG 2A (R82C134 HL) and one in SG 2B (R4C94 HL), one volumetric (VOL) was called in SG 2A (R7C57 CL), and twenty-five PLP calls were reported. The BLG indications were located in the upper freespan region and were reported in the baseline and dispositioned in the first ISI (2004). These locations were included

in the base scope bobbin program. There was no change in the bobbin signals; hence, no RPC testing was required.

During the 2RE13 planned bobbin scope, a distorted support indication (DSI) signal was reported at R7C57 CL in SG 2A at the 8th support structure. The signal itself correlates with the TSP land contact and is slightly inward from the edge. The indication was sized at 4% through-wall using bobbin coil and reclassified as "VOL" (volumetric) from the RPC test. This location will be monitored by inclusion in future eddy current inspection plans.

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