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U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
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Reference: Docket No. 50-285

SUBJECT: Fort Calhoun Station (FCS) Steam Generator Eddy Current Test Report - 2002 Refueling Outage

Pursuant to FCS Unit No. 1 Technical Specification 3.17(5)(ii), Omaha Public Power District (OPPD) submits the attached FCS Steam Generator Eddy Current Test Report which summarizes testing performed during the Spring 2002 Refueling Outage.

If you have any questions or require additional information, please contact Dr. R. L. Jaworski at (402) 533-6833. No commitments are made to the NRC in this letter.

Sincerely,

R. T. Ridenoure
Division Manager
Nuclear Operations

RTR/JKM/rrl

Attachment: Fort Calhoun Station Steam Generator Eddy Current Test Report, 2002 Refueling Outage

c: E. W. Merschoff, NRC Regional Administrator, Region IV
A. B. Wang, NRC Project Manager
J. G. Kramer, NRC Senior Resident Inspector
Winston & Strawn (w/o Attachment)

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ATTACHMENT

FORT CALHOUN STATION
STEAM GENERATOR EDDY CURRENT
TEST REPORT

2002 REFUELING OUTAGE

FORT CALHOUN STATION
STEAM GENERATOR EDDY CURRENT TEST REPORT
2002 REFUELING OUTAGE

INTRODUCTION

This report summarizes steam generator eddy current test results obtained during the Fort Calhoun Station (FCS) 2002 refueling outage (RFO). Omaha Public Power District (OPPD) submitted summaries of results of the two previous eddy current inspections to the NRC in the following documents:

- *Fort Calhoun Station (FCS) Steam Generator Eddy Current Test Report - 2001 Refueling Outage,* dated September 28, 2001 (LIC-01-0086)

- *Fort Calhoun Station (FCS) Steam Generator Eddy Current Test Report - 1999 Refueling Outage,* dated April 25, 2000 (LIC-00-0039)

DESCRIPTION OF FCS STEAM GENERATORS

FCS has two steam generators of the vertical recirculating type manufactured by Combustion Engineering Inc. (CE). The steam generators each contain 5005 tubes installed in low alloy steel tubesheets by a full depth explosive expansion process. The tubes are seal welded to the primary faces of the tubesheets. The steam generator tubes at Fort Calhoun are seamless Inconel Alloy 600 with an outside diameter of ¾ inch and a nominal wall thickness of 0.048 inch.

All tube supports in the FCS steam generators are carbon steel. The vertical supports at the top of the tube bundle are of the vertical strap/scallop bar design typical of early CE steam generators. Support is provided in the U-bend region by diagonal bars, or "batwings", also a common CE design. The uppermost horizontal support is a partial drilled plate which supports all tubes in rows 74 and above. The remaining horizontal supports are of the egg crate lattice type which have drilled tube support plates integrated into the egg crates on both the hot and the cold leg sides at each elevation. Approximately 975 tubes pass through at least one drilled plate, and several hundred tubes pass through all of the drilled plates. The solid drilled plates also have ¼ inch diameter flow holes nominally in the center of each triangular array of three tubes.

FCS steam generator support notations referenced throughout this report can be found on Figure 1.

SCOPE OF EXAMINATION

Westinghouse conducted an inservice eddy current nondestructive examination of the steam generator (SG) tubing at Omaha Public Power District's Fort Calhoun Nuclear Power Plant in May 2002. Fort Calhoun has two steam generators designated as RC-2A and RC-2B. The purpose of the examination was to assess the condition of the SGs, identify tubes requiring repair, and to provide the necessary information needed to fulfill Technical Specification

requirements.

The examination program included multifrequency bobbin testing for indications of degradation or dents and motorized rotating pancake/plus point coil testing for axial and circumferential cracking and further evaluation of detected bobbin indications.

The eddy current raw data was transmitted by the site by T-1 data lines to the Verner & James (primary analysis) data room in Snoqualmie, WA and the Zetec (secondary analysis) data room in Issaquah, WA where it was independently analyzed by these two groups of analysts. In addition to the primary and secondary analysis, Zetec preformed a tertiary analysis by using Computerized Data Screening (CDS) on the Bobbin Data. Analysis results were then transmitted to Fort Calhoun where discrepancies between the two sets of evaluation results were resolved by two groups of Level III Resolution Analysts representing primary and secondary analysis groups. All data analysts were certified to a minimum of ECT Level IIA and they successfully completed the EPRI Qualified Data Analyst (QDA) program, which is documented on their personal certifications. Data Analysts received familiarization training on the data during the Data Analyst Indoctrination Optical disks with data from Fort Calhoun, similar CE plants, and Indian Point Unit 2 were also available for review. Data analysts were qualified by proficiency examination on Fort Calhoun data and supplementary data from Maine Yankee and Indian Point Unit 2 for damage mechanisms not detected to date at Fort Calhoun.

There were also two (2) Level III Independent QDAs representing OPPD who were not part of the Primary, Secondary, or Resolution analysis teams. These analysts were responsible for review, comments and changes to the Analysis Procedure, and for review of all acquisition and analysis technique sheets. The Independent QDAs reviewed all "I" codes which had been dispositioned to no detectable degradation (NDD) by the Resolution team. They were also responsible for randomly sampling inspection results to ensure proper disposition of resolved indications, to ensure proper reporting, to review repairable indications, and to review and disposition calls which were contested by either the Primary or Secondary analyst. The functions of these Independent Level IIIs position were in accordance with EPRI PWR Steam Generator Examination Guidelines, Revision 5.

The test program included:

1. Full length bobbin coil testing of 100% of the open tubes in steam generators RC-2A and RC-2B.
2. Various Rotating coil examinations were performed, including 100% of the open hot leg top-of-tubesheet transitions in steam generators RC-2A and RC-2B with Plus Point® probes.
3. A 20% sample of the U-bend region of rows 1-4 were tested with a mid-frequency range plus point coil. In addition, a 20% sample of rows 1 and 2 was examined with a high frequency plus point coil which were the same tubes tested with the mid-range plus point coil.
4. 4 tubes in S/G A and 16 tubes in S/G B with previous less than zero indications were tested with an MRPC probe.
5. A 20% sample of freespan dings were tested in both steam generators.

6. Extensive motorized rotating probe coil (MRPC) examinations were conducted at all hot leg intersections and C8 which included all open tubes in the drilled tube supports on the hot leg and 20% of C8.
7. All tubes in the hot leg critical area (CA) where the partial drilled plate sections are superpositioned were tested from DBH to H5. In addition, 20% of these examinations were tested up to V1.
8. An additional 20% of the dents in supports outside of the CA on the hot leg were tested.
9. An additional 45 tubes outside of the CA were tested in each steam generator to inspect the 90-degree bend.
10. There was also an expansion to 100% of the dented intersections at H1 and H2 in both steam generators due to axial cracks detected in the base program.
11. Diagnostic examinations of bobbin coil indications and positive identifications totaled 187 in RC2-A, and 333 in RC2-B

INSPECTION EQUIPMENT AND TECHNIQUES

The state-of-the-art equipment used included the Zetec MIZ-30® digital ECT tester system for data acquisition and the Eddynet98® digital analysis system for data interpretation. The two systems were linked on a local area network via fiber optic cable. Software revision 2.21 was used for the 2002 refueling outage examination.

The ECT probes used included a standard bobbin probe (A540MULC and A560MULC) and spring flex bobbin probes (A560SFRM and A540SFRM) for the full-length inspections. Three coil motorized rotating coils were used at the hot and cold leg top-of-tubesheet and to investigate bobbin indications. Various versions of the rotating coil probe were used to inspect the vertical runs, horizontal runs and square bend sections as required. Low row U-bends were also inspected with rotating coil technology.

The frequencies used for the bobbin examination are as follows:

400 kHz differential and absolute
200 kHz differential and absolute
100 kHz differential and absolute
35 kHz differential and absolute
400/100 kHz differential support ring mix
400/100 kHz absolute support ring mix

The primary frequency of 400 kHz satisfies the requirements of the ASME Boiler and Pressure Vessel Code for the examination of nonferromagnetic steam generator tubing. A technique using the differential support mix and a voltage base of 2.75 volts on the 20% outer diameter (OD) ASME signal was used to perform dent sizing consistent with current industry techniques. The 100 kHz is provided for the confirmation of flaw indications and as a frequency used in the mixes to eliminate support and OD deposit signals. The 100 kHz absolute detects gradual wall thickness variations. The 200 kHz frequency is for confirmation of flaw indications. The 35 kHz is provided to facilitate locating the probe position in the steam generator. The 400/100 kHz differential mix is used to eliminate the tube support signal and OD tube deposits. The 400/100

absolute mix is used to detect gradual wall loss.

The frequencies used for the 3 coil top-of-tubesheet examination are as follows:

400 kHz Pancake, Mid-Freq. Plus PT. coil, and High-Freq. Panc. coil
300 kHz Pancake, and Mid-Freq. Plus PT. coil
100 kHz Pancake, and Mid-Freq. Plus PT. coil
700 kHz High-Freq. Panc. coil
20 kHz Pancake, and Mid-Freq. Plus PT. Coil

The frequencies used for the single coil mid-frequency U-bend examinations were as follows:

400 kHz Mid-Freq. Plus PT. coil
300 kHz Mid-Freq. Plus PT. coil
200 kHz Mid-Freq. Plus PT. coil
100 kHz Mid-Freq. Plus PT. coil
20 kHz Mid-Freq. Plus PT. coil

The frequencies used for the single coil high frequency U-bend examinations were as follows:

800 kHz High-Freq. Plus PT. coil
600 kHz High-Freq. Plus PT. coil
400 kHz High-Freq. Plus PT. coil
300 kHz High-Freq. Plus PT. coil

The frequencies for the 2 coil Flex probe MRPC examinations were as follows:

400 kHz Pancake, and Mid-Freq. Plus PT. coil
300 kHz Pancake, and Mid-Freq. Plus PT. Coil
200 kHz Pancake, and Mid-Freq. Plus PT. coil
100 kHz Pancake, and Mid-Freq. Plus PT. coil
20 kHz Pancake, and Mid-Freq. Plus PT. Coil

The frequencies for the 2 coil modular probe were as follows:

400 kHz High-Freq. Plus PT. coil
300 kHz High-Freq. Plus PT. coil
100 kHz High-Freq. Plus PT. coil
20 kHz High-Freq. Plus PT. coil

The recorded multi-frequency eddy current data are analyzed by two independent teams of data analysts for the presence of flaw indications and dents. Discrepancies between the two sets of evaluation results are reviewed and dispositioned by the resolution analysts. Primary and Secondary analyst feedback was accomplished through the use of the Analyst Performance Tracking Software. The primary and secondary analysts were required to review all missed calls and a sample of overcalls. If there were any calls which were dispositioned as requiring no

further action by the resolution team which the primary or secondary analyst felt should have remained, that analyst could appeal the call and the appeal was then assigned to the independent Level III QDA for final disposition.

The bobbin probe is used primarily as a screening tool to flag indications for further evaluation by means of historical reviews and/or additional testing with rotating coil technology. All of the data for all examined regions was analyzed. Indications left in service were not sized due to lack of a qualified sizing technique for the indications present, and have been determined to be either non-reportable or manufacturing related through the use of diagnostic testing and historical reviews. Indications were not left in service based on depth sizing estimates.

Bobbin testing was performed mainly from the outlet side of each SG. The probe is positioned at the tubes using a GENESIS robot manipulator. Probes are inserted and withdrawn using a 10D probe pusher and controller. Bobbin tests speeds ranged from 12" to 36" per second and varied depending on presence of dents or low row diameter restrictions. Bobbin test speeds were within the requirements of the EPRI Appendix H approved techniques.

MRPC test speeds also varied depending on test location and probe type. Test speeds were from .1" to .55"/second axially with the sampling rate adjusted in accordance with EPRI Appendix H Qualified Techniques as detailed in analysis procedure.

INSPECTION RESULTS

The numbers and locations of each type of indication found are summarized in Tables 1 and 2. Support notations are shown on Figure 1 and definitions of indication acronyms can be found in the Appendix.

All pluggable indications are reported in Tables 3 and 4. Support notation for each steam generator is shown in Figure 1. Depth estimates were made only on pluggable indications for the purpose of providing input to assessments of overall steam generator condition. No tubes were left in service on the basis of sizing.

As a result of the inspection, several conclusions can be derived as follows:

Single Axial Indications (SAI) There were 74 axial indications recorded at various elevations of both steam generators. The majority of the indications reside in the drill support plates tubing between H1 and H4 in the critical area where the partial tube support plates are superpositioned. Most of these indications were transparent to the bobbin coil and were detected with the more sensitive rotating plus point coil. The deepest indication which was not detected by the bobbin coil was 45% as sized by plus point amplitude. This indication was at a dent where bobbin performance is degraded from liftoff. The deepest indication missed by the bobbin coil where no denting is present was 47%. Historical data reviews from the 2001 refueling outage inspection were conducted by the senior analyst during the course of the 2002 refueling outage examination. Of the 74 indications all were reviewed to determine whether the flaw was present and if so, did it appear to grow. Thirty three (33) indications showed no change and 3 showed change. Some

indications which were detected by the plus point coil only could not be reviewed because that area of the tube had not been tested by plus point in 2000 or 2001. The results from this data review are qualitative in nature with no detailed sizing performed. 17 indications were reviewed in RC-2A and 19 indications were reviewed in RC-2B. In RC-2A 1 (6%) indications showed growth. In RC-2B 2 (11%) indications showed growth. There was one indication in RC-2B that appears to be inner diameter (ID) in nature, this indication is in conjunction with a 31 volt dent.

Single Volumetric Indications (SVI) One (1) indication was found in RC-2B steam generator. The indication was located above the sixth hot leg support. This is the region where axial ouiteer diameter stress corrosion cracking (ODSCC) occurs and the damage mechanism which produced the ECT indications is presumed to be a patch of inter-granular attack (IGA).

Single Circumferential Indications (SCI's) Nine (9) indication were found, three (3) at the top of the hot leg tubesheet (HTS) in RC-2A and six (6) at hot leg drilled support plates in each steam generator. These are the first instance of circumferential indications at the hot leg expansion transition in these steam generators. The maximum circumferential extent of the HTS indications was 55 degrees and the maximum indicated depth by plus point phase analysis was 61% through-wall. The maximum circumferential extent of the drilled support plate indications was 95 degrees and the maximum indicated depth by plus point phase analysis was 47% through-wall. Several of the indications show growth from the last cycle. Of the 6 SCI indications reported at drilled supports all are associated with a dent from the bobbin coil. The dent voltages range from 2.3 volts to 22.09 volts.

Two tubes in RC-2A that were uninspectable due to a severe geometric condition that made it impossible to inspect the support with the rotating +point coil, were preventively plugged. Of the two tubes, one was at V1 and the other one was at V2.

One tube in RC-2B was preventively placed on the repair list due to excessive ECT noise on the bobbin coil.

All of the tubes with the above indications were repaired by plugging. Tubes with circumferential indications were stabilized as well. A total of 40 tubes were plugged in RC-2A and 40 tubes were plugged in RC-2B with indications, there were 4 tubes plugged in both steam generators to facilitate future use of the flat-rail system. A total of 44 tubes were plugged in each steam generator.

IN-SITU PRESSURE TESTS AND RESULTS

In-situ pressure tests were performed on 1 defect in 1 tubes with the Westinghouse in-situ pressure test device to verify structural and leakage performance criteria were satisfied. Specifically, this tube was tested to demonstrate that leakage would be below 150 gallons per day at normal operating differential pressure (NODP), below 1 gallon per minute at peak accident (main steam line break (MSLB)) differential pressure, and that it would be able to sustain a pressure of 3 times NODP without burst.

The defect tested covered axial indication. The indication exceeded screening criteria for pressure testing. Table 5 shows the indications tested with the in-situ pressure test method and gives the results of the test. The indications did not leak at pressures up to 3 times NODP. Based on the eddy current and in-situ pressure test results, the performance criteria were met for the entire previous operating cycle, and the requirement for condition monitoring was satisfied.

CONCLUSIONS

Based on the results of the extensive eddy current examination and the in-situ pressure tests performed, OPPD has reached the conclusion that the steam generator tube performance criteria were met for the entire previous operating cycle, and the requirements for condition monitoring were fulfilled.

All tubes with identified degradation were plugged. Tubes with circumferential indications were stabilized. No tubes were repaired by sleeving. Overall, 44 tubes were plugged in steam generator RC-2A, and 44 tubes were plugged in steam generator RC-2B. To date, RC-2A has a total of 262 tubes plugged (5.36%), and RC-2B has a total of 271 tubes plugged (5.54%).

TABLE 1

	STEAM GENERATOR RC-2A INDICATION[3] LISTING BY LOCATION[1,2]								
Location	SAI	MAI	SCI	SVI	CVI	MVI	VOL	OB	Total
HTS	10		3						13
HTS+									0
H1	10		1						11
H1+									0
H2	5								5
H2+									0
H3	4								4
H3+	1								1
H4	2								2
H4+									0
H5									0
H5+									0
H6	1								1
H6+									0
H7			1						1
H7+	2								2
H8									0
H8+									0
DIAG									0
DIAG+									0
V1									0
V1+									0
V2									0
V2+									0
V3									0
V3+									0
DIAG									0
C8+									0
C8									0
C7+									0
C7									0
C6+									0
C6									0
C5+									0
C5									0
C4+									0
C4									0
C3+									0
C3									0
C2+							1		1
C2									0
C1+									0
C1									0
CTS+									0
CTS									0
TOTAL	35	0	5	0	0	0	1	0	41

[1] Numbers are totals and include multiple locations for each tube if separated by more than ~1"
[2] Locations are +/- 2", Locations with a "+" are >2" from support location.
[3] Indication Definitions are given in Appendix after Tables.

TABLE 2

	STEAM GENERATOR RC-2B INDICATION[3] LISTING BY LOCATION[1,2]								
Location	SAI	MAI	SCI	SVI	CVI	MVI	VOI	OB	Total
HTS	7								7
HTS+									0
H1	7								7
H1+									0
H2	6								6
H2+									0
H3	3								3
H3+									0
H4	4								4
H4+									0
H5			1						1
H5+	1								1
H6	4								4
H6+	2			1			1		4
H7	2		2						4
H7+							1		1
H8	1		1						2
H8+	2								2
DIAG									0
DIAG+									0
V1									0
V1+									0
V2									0
V2+									0
V3									0
V3+									0
DIAG									0
C8+									0
C8									0
C7+									0
C7									0
C6+									0
C6									0
C5+									0
C5									0
C4+									0
C4									0
C3+									0
C3									0
C2+									0
C2									0
C1+									0
C1									0
CTS+									0
CTS									0
TOTAL	39	0	4	1	0	0	2	0	46

[1] Numbers are totals and include multiple locations for each tube if separated by more than ~1"
[2] Locations are +/- 2", Locations with a "+" are >2" from support location.
[3] Indication Definitions are given in Appendix after Tables.

TABLE 3
LIST OF RC-2A TUBES PLUGGED

Row	Line	Location	Flaw Type(1)	Estimated Depth(%)
9	28	HTS + 0.38	SAI	27
9	96	HTS + 0.18	SCI	55
10	91	HTS + 0.07	SCI	53
11	90	HTS + 0.11	SCI	61
11	94	HTS + 0.39	SAI	32
12	55	HTS + 0.26	SAI	27
12	63	HTS + 0.21	SAI	28
12	91	HTS + 0.22	SAI	26
12	95	HTS + 0.60	SAI	29
15	70	HTS + 0.21	SAI	28
24	107	HTS + 0.64	SAI	30
25	52	HTS + 0.99	SAI	25
26	55	HTS + 1.19	SAI	27
31	66	H1 + 0.41	SAI	45
67	54	H2 +0.99	SAI	33
69	56	H2 +1.16	SAI	26
70	79	H1 + 0.77	SAI	52
73	58	H2 + 0.12	SAI	30
73	58	H4 + 0.14	SAI	43
80	59	H1 + 1.29	SAI	50
80	59	H1 + 1.25	SAI	33
80	65	Not testable at V1	NA	NA
81	58	H1 + 1.29	SAI	31
88	77	Not testable at V2	NA	NA
90	49	H1 + 0.98	SAI	27
90	69	H4 - 0.21	SAI	32
92	79	H3 - 1.05	SAI	36
94	47	H3 - 0.19	SAI	31
94	81	H1 + 0.41	SAI	33
95	84	H1 + 0.20	SCI	35
96	47	H1 + 0.24	SAI	44
96	57	H6 +19.10	SAI	27
98	45	H3 + 0.14	SAI	33
98	69	H7 + 13.56	SAI	33
99	46	H3 +0.06	SAI	26
99	48	H3 - 0.07	SAI	33
99	50	H1 + 0.04	SAI	42
99	80	H1 - 0.22	SAI	31
101	56	H2 - 0.03	SAI	25
101	62	H7 + 0.21	SCI	47
101	66	H2 + 0.16	SAI	35
103	62	H7 + 7.55	SAI	40

[1] Flaw Type Definitions are given in Appendix after Tables.

TABLE 4
LIST OF RC-2B TUBES PLUGGED

Row	Line	Location	Flaw Type (1)	Estimated Depth (%)
10	33	HTS + 0.92	SAI	37
19	46	HTS + 0.97	SAI	28
19	60	HTS + 1.28	SAI	33
20	59	HTS + 0.82	SAI	38
20	61	HTS + 0.54	SAI	38
22	61	HTS + 1.01	SAI	25
22	61	HTS + 1.19	SAI	23
28	83	H2 - 0.06	SAI	47
31	116	H2 + 0.40	SAI	36
38	79	H2 + 0 83	SAI	38
49	66	H1 - 0 64	SAI	35
59	22	NA	Noise	NA
68	41	H2 + 0 38	SAI	44
71	84	H2 - 0.15	SAI	44
74	39	H8 - 0 07	SAI	35
77	64	H4 - 0.15	SAI	38
77	64	H3 + 0.13	SAI	29
78	59	H4 + 0.09	SAI	66
78	63	H7 + 0.25	SCI	33
79	74	H6 + 3.19	SVI	48
80	35	H8 - 0.17	SCI	9
81	72	H7 - 0.17	SAI	37
82	69	H7 + 0 28	SCI	31
83	74	H5 + 1.33	SCI	32
84	55	H6 + 19.73	SAI	30
84	59	H6 + 21.26	SAI	35
85	66	H7 + 0 69	SAI	31
88	57	H6 + 0.73	SAI	29
88	67	H4 + 2.00	SAI	36
88	67	H6 + 1.73	SAI	29
89	66	H6 + 0.76	SAI	28
91	48	H1 - 0.18	SAI	29
91	58	H1 + 0.11	SAI	42
91	70	H1 - 0 06	SAI	37
51	70	H8 + 2.34	SAI	35
95	74	H1 + 0 06	SAI	25
95	74	H6 + 1.22	SAI	33
97	54	H5 + 36 02	SAI	26
99	56	H1 + 0 22	SAI	41
100	59	H2 + 0 26	SAI	30
101	52	H3 + 0 06	SAI	31
101	60	H1 + 0 03	SAI	34
101	70	H8 + 9 21	SAI	41
103	58	H4 + 0 01	SAI	35
103	70	H3 + 0 19	SAI	36

[1] Flaw Type Definitions are given in Appendix after Tables.

Table 5
IN-SITU PRESSURE TESTS

SG RC-2B Hot		Crack Profile						Pressure (psig)			
Row	Line	Location	Orientation	Volts	Depth Est. (%tw)	Length (in.)	Circ Extent (deg)	Target	Actual	Hold Time (min)	Leakage (gpm)
78	59	H4+0.04	Single Axial	1.29	55.18	1.00	N/A	1500	1600	2	0
								2500	2600	2	0
								3000	3100	2	0
								3500	3600	2	0
								4000	4050	2	0
								4500	4550	2	0

APPENDIX

DEFINITIONS

The acronyms defined below are used in Tables 1 through 5.

CVI: Circumferential Volumetric Indication – Volumetric indication with orientation in a circumferential plane (pluggable)

DFI: Differential Freespan Indication – An indication in the freespan that gives a flaw-like response on the bobbin coil (diagnostic/review required)

MAI: Multiple Axial Indication – Axial indications in the same plane (pluggable)

MVI: Multiple Volumetric Indication – Volumetric indications in the same plane (pluggable)

NSY: Noisy Tube – Any undesired signal or signals in a tube that may obscure for interpretation those signals that are of interest (diagnostic/review required)

OBS: Obstructed Tube – Tube which will not permit full length passage of the 0.540 inch diameter bobbin probe (pluggable)

SAI: Single Axial Indication – Axially oriented crack-like indication (pluggable)

SCI Single Circumferential Indication – Circumferentially oriented crack-like indication (pluggable)

SVI: Single Volumetric Indication – Indication which represents that volumetric (non-oriented) degradation is present (pluggable)

VOL: Volumetric – Indication which is volumetric in nature and generally associated with tube manufacturing (diagnostic/review required)

FIGURE 1
FCS STEAM GENERATOR ELEVATION DRAWING

HTE	Hot Leg Tube End
HTS	Hot Leg Tubesheet
H1-H6	Hot Leg Full Supports
H7	Hot Leg Partial Egg Crate
H8	Hot Leg Partial Drilled Support
DBH	Diagonal Bar Hot Leg
V1-V3	Vertical Supports
DBC	Diagonal Bar Cold Leg
C8	Cold Leg Partial Drilled Support
C7	Cold Leg Partial Egg Crate
C1-C6	Cold Leg Full Supports
CTS	Cold Leg Tubesheet
CTE	Cold Leg Tube End