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L-PI-13-052
TS 5.6.7

JUN 21 2013

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

Prairie Island Nuclear Generating Plant Unit 1
Docket 50-282
Renewed License No. DPR-42

2012 Unit 1 180-Day Steam Generator Tube Inspection Report

In accordance with Prairie Island Nuclear Generating Plant, Unit 1 Technical Specification 5.6.7 "Steam Generator Tube Inspection Report", Northern States Power Company, a Minnesota corporation, doing business as Xcel Energy (hereafter "NSPM") submits the enclosed report of steam generator tube inspections performed during the 2012 refueling and maintenance outage on Unit 1.

Summary of Commitments

This letter contains no new commitments and no revisions to existing commitments.

James E. Lynch
Site Vice President, Prairie Island Nuclear Generating Plant
Northern States Power Company - Minnesota

Enclosure

cc: Administrator, Region III, USNRC
Project Manager, Prairie Island, USNRC
Resident Inspector, Prairie Island, USNRC

ENCLOSURE 1

Prairie Island Nuclear Generating Plant – Unit 1
2012 Steam Generator Tube Inspection Report

In accordance with Prairie Island Nuclear Generating Plant (PINGP), Unit 1 Technical Specification 5.6.7, Xcel Energy Nuclear Department submits this report of steam generator tube inspections performed during the 2012 refueling and maintenance outage for Unit 1 (1R28).

PINGP Unit 1 has two Framatome Model 56/19 Replacement Steam Generators (RSGs) with approximately 5,600 square meters of heat transfer area utilizing tubes with 19 millimeter outside diameter. Each RSG has 4,868 thermally-treated Alloy 690 u-tubes manufactured by Sandvik which have an outside diameter of 0.750 inch and a nominal wall thickness of 0.043 inch. The tubes are configured in a square pitch of 1.0425 inches with 55 rows and 114 columns. The tube u-bends vary in radius from 2.7000 inches for a row 1 tube to 58.9950 inches for a row 55 tube. The tubes vary in length from 738.16 inches for row 1 tubes to 923.04 inches for row 55 tubes. Row 1 through row 9 tubes were subject to stress relieving following the bending process using the thermal treatment process for an additional 2 hour minimum soak time. The tubes were hydraulically expanded at each end for the full depth of the tubesheet with the expansion transition being between 0.079 inches and 0.236 inches below the secondary tubesheet face.

The tubesheet is low alloy steel 21.46 inches thick with alloys 82 and 182 cladding 0.375" thick for an overall thickness of 21.835 inches. The tubes are supported by eight tube support plates (TSPs) and five anti-vibration bars (AVBs) intersecting tubes between 1, 3, 5, 7 and 9 times (see Figure 1). There is one straight bar that intersects all rows at the center of each bend, two 57 degree bars that intersect rows 13 through 55 and two 14 degree bars that intersect rows 25 through 55. In addition there are 24 peripheral tubes with nine staples (one at each AVB location) that carry the entire load of the complete AVB assembly. All TSPs are constructed from Type 410 stainless steel. The TSPs have a minimum thickness of 1.181 inch and have quatrefoil-shaped holes through which the tubes pass. The AVBs are constructed from Type 405 stainless steel and are rectangular in cross section (0.5 inch by 0.3 inch).

Each RSG is equipped with a Loose Parts Trapping Systems (LPTS), which is composed of screens at the top of the downcomer and at the top of the primary (cyclone) separators. These screens (0.14" square mesh formed from 0.031" diameter wire), prevent foreign material from entering the steam generator tube area from the main feedwater and auxiliary feedwater systems (see Figure 1).

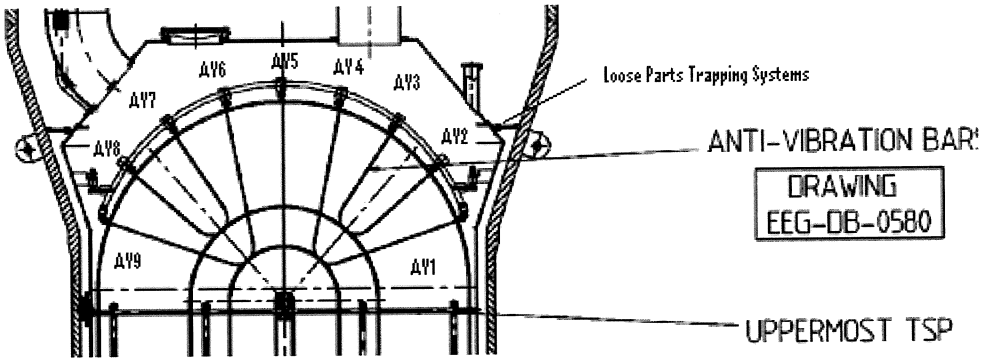

Figure 1

The original Westinghouse Model 51 Steam Generators (SGs) were replaced during the 2004 refueling outage after 25.75 EFPY of operation. During the 2006 refueling outage the first inservice inspection (100% full length bobbin) was conducted on the RSGs after accumulating the initial 1.36 EFPY of RSG operation. Based on the lack of a definitive root cause for TSP wear and only a single cycle growth rate trend for both AVB and TSP wear identified during 1R24, the Licensee conservatively elected to inspect the RSGs during 1R25 after an additional 1.62 EFPY of RSG operation (2.98 RSG cumulative EFPY). Based on the inspection results of both 1R24 and 1R25, the Licensee elected to skip two inspections (1R26 and 1R27) and perform a inspection of the RSGs during 1R28 after an additional 4.18 EFPY of RSG operation (7.16 RSG cumulative EFPY).

NOTE:	*Italicized* text represents technical specification excerpts. Each excerpt is followed by the appropriate information intended to address each specific requirement and also includes additional details based on benchmarking previous submittals and Staff requests for additional information of peer Licensees. A legend of codes and field names is included at the end of the report.

T.S. 5.6.7 Steam Generator Tube Inspection Report

a. *A report shall be submitted within 180 days after initial entry into MODE 4 following completion of an inspection performed in accordance with the Specification 5.5.8, Steam Generator (SG) Program.*

Initial entry into MODE 4 occurred on December 26, 2012, dictating submittal of this report on or before June 24, 2013.

The report shall include:

1. *The scope of inspections performed on each SG,*

Table 1 and the notes that follow, provides the scope of inspections performed during 1R28.

TABLE 1

SCOPE	EXTENT	TECHNIQUE	SG 11	SG 12
Row 8 through 55	TEHTEC	X-Probe①	100% (4067)	100% (4064)
Row 1 through 7	TEH08H	X-Probe①	100% (798)	100% (798)
Row 1 through 7	TEC08C	X-Probe①	100% (798)	100% (798)
Row 1	AV5TEH	Bobbin	100% (114)	100% (114)
Row 1	AV5TEC	Bobbin	100% (114)	100% (114)
Row 2 through 7	TEH08C	Bobbin	100% (684)	100% (684)
Special Interest②	Various	MRPC®	0.7% (33)	0.5% (23)
Post Plug Pull③	TSHTEC	X-Probe①	N/A	100% (3)
Plug	N/A	Visual	100% (6)	100% (12)
Upper Internals④	N/A	Visual	100%	100%
Top of Tubesheet⑤	N/A	Visual	100%	100%
In-bundle⑥	N/A	Visual	~17%	~17%
PLP⑦ FOSAR	N/A	Visual	100% (31)	N/A

Notes:

The scope of inspections is provided as a percentage of the open tubes (or plugs) followed by the total number of tests parenthetically where practical.

① The X-Probe deployed contained both a standard bobbin coil and 16 coil array of transmit/receive coils.

② Special Interest MRPC® testing is intended to bridge the X-Probe technology with the previously employed +Point technology. The selection and percentage (number) of tubes was based on 1R25 Special Interest results.

③ Two cold leg plugs (R55C58 and R31C104) installed in 1R24 for TSP wear and one cold leg plug (R52C61) installed in 1R25 for AVB wear were removed to identify growth of repeat indications seen in prior inspections and to identify any new indications to see how they compared against indications seen in in-service tubes.

④ Inspections of the upper internals included the visual inspections of J-Tubes, Feedwater Ring Helix, Primary (Moisture) Separators, Loose Parts Trapping screens, Downcomer Loose Parts Trapping System (LPTS) and wrapper position per NRC Generic Letter 97-06 and Prairie Island Unit 1 56/19 Replacement Steam Generator Operation and Maintenance Manual.

⑤ Tube lane and periphery of the tube bundle inspected using Camera Transporter System.

⑥ Random fiber-optic inspection of one out of every six columns.

⑦ Foreign Object Search and Retrieval of possible loose part (PLP) indications for evaluation and possible removal based on eddy current results (not necessary on SG 12).

2. *Active degradation mechanisms found,*

Primary Side Inspections - TSP wear and AVB wear were the only active degradation mechanisms found in both SGs during 1R28. The findings of the 1R28 steam generator examination are bounded by the behavior projected in the 1R25 operational assessment. In addition to none of AVB or TSP wear indications approaching the condition monitoring (CM) limit, the growth rates from 1R28 have decreased by approximately one-half or less (Average and Upper 95th) of the growth rates in 1R25 and the number of actual indications is less than the projected indications.

Secondary Side Inspections – No active degradation was found. However, the upper bundle inspection found numerous (approximately 1.5 pounds) machining remnants on the SG 11 Downcomer LPTS which were subsequently removed. The top of tubesheet and in bundle FOSAR inspections in SG 11 found and removed 17 machining remnants that correlated with 28 eddy current PLP indications. Two (2) other eddy current PLP indications were confirmed to be sludge and one (1) PLP was not confirmed visually (nothing found). In adition, the upper bundle inspection found a few (approximately 1 ounce) machining remnants on the SG 12 Downcomer LPTS which were subsequently removed. The top of tubesheet and in bundle inspections in SG 12 found no additional machining remnants and no eddy current PLP indications were detected.

3. *Nondestructive examination techniques utilized for each degradation mechanism,*

Table 2 and the notes that follow, provides the Electric Power Research Institute (EPRI) Examination Technique Specification Sheet (ETSS) (techniques) utilized during 1R28 for active, potential, non-degradation and unexpected degradation.

TABLE 2

CLASSIFICATION①	MECHANISM	LOCATION	TECHNIQUE②
Active	Wear	AVB	96004.1 Rev. 13
Active	Wear	TSP	96004.1 Rev. 13
Potential	Wear	Staple	96004.1 Rev. 13
Potential	Wear	PLP	27091.2 Rev. 0
Potential	Wear	Tube-to-Tube	27091.3 Rev. 0

Notes:

① Active is synonymous with the term "existing" degradation that is found in the EPRI Steam Generator Integrity Assessment Guidelines. Therefore the classical definition applies (i.e., one indication equates to active).

② In addition: 1) Bobbin ETSS's 96010.1 Rev. 7, 24013.1 Rev. 2 and 96007.1 Rev. 12 were site validated for use on non-degradation (MBMs, DNGs, PDSs and cold laps), 2) Bobbin ETSS's 96005.2 Rev. 9, 96001.1 Rev. 11 and 96007.1 Rev. 12 were site validated for unexpected pitting, wastage and outside diameter stress corrosion cracking (ODSCC) degradation, 3) +Point® ETSS's 96910.1 Rev. 10 was site validated as an alternate wear sizing technique, 4) +Point® ETSS's 21409.1 Rev. 7, 21410.1 Rev. 6, 20510.1 Rev. 7, 20511.1 Rev. 8 and 96511.2 Rev. 16 were site validated for unexpected ODSCC and primary water stress corrosion cracking (PWSCC) degradation and 5) X-Probe ETSS's 10413.2 Rev. 0,11956.1 Rev. 0, 11956.2 Rev. 0, 11956.3 Rev. 0, 11956.4 Rev. 0, 24998.1 Rev. 1, 20400.1 Rev. 5,20402.1 Rev. 5, 20403.1 Rev. 5, 20500.1 Rev. 4, 20501.1 Rev. 4, 20502.1 Rev. 4 and 20513.1 Rev. 3 were site validated for wear and unexpected pitting, ODSCC and PWSCC degradation.

4. *Location, orientation (if linear), and measured sizes (if available) of service induced indications,*

Tables 3, 4, 5 and 6 provide the location, orientation and measured size of each reported TSP wear indication and each reported AVB wear indication in each steam generator respectively for the two active degradation mechanisms found during 1R28. All the tubes in these four tables were returned to service.

Tables 7 and 8 provide the location, orientation and measured sizes of AVB and TSP wear indications in each steam generator respectively for tubes preventively plugged during 1R28. The preventive tube plugging (PTP) criteria implemented during 1R28 for both AVB and TSP wear was $\geq$ 21% for new indications and $\geq$ 23% for previous inservice indications. Table 8 also includes the plugging of three tubes (R55C58, R52C61 and R31C104) that were unplugged on the cold leg to validate growth assumptions of plugged tubes.

Within Tables 3 through 8, tubes reported with multiple VOL calls at the same ROW/COL/LOCATION confirm indications of double sided AVB wear or multiple wear location sites on multiple land contact points of Quatrefoil TSPs. Conversely, single VOL calls confirm single sided wear sites at AVB and TSP locations. Tubes without a VOL entry were not confirmed by the array coil.

A legend of fields and codes with brief explanations is provided at the end of this enclosure for clarification purposes.

TABLE 3
Steam Generator 11 TSP Wear

TUBE #	IND #	ROW	COL	VOLTS	PCT	LOCATION	ELEV_FROM	ELEV_TO	LENGTH
1	1	3	1	0.16	14	04C	0.45		
1	1	3	1	0.82	VOL	04C	-0.37	0.61	0.98
1	2	3	1	0.08	7	05H	-0.95		
1	2	3	1	0.54	VOL	05H	-0.95	-0.61	0.34
2	3	27	9	0.09	8	06C	-0.59		
2	3	27	9	0.45	VOL	06C	-0.86	-0.56	0.30
3	4	32	12	0.13	11	06C	-0.61		
3	4	32	12	0.57	VOL	06C	-0.93	-0.53	0.40
4	5	33	14	0.13	11	06C	-0.64		
4	5	33	14	0.48	VOL	06C	-0.99	-0.53	0.46
5	6	34	14	0.14	12	06C	-0.59		
5	6	34	14	0.63	VOL	06C	-0.94	-0.56	0.38
6	7	37	18	0.12	10	04H	-0.83		
6	7	37	18	0.57	VOL	04H	-0.83	-0.51	0.32
7	8	38	19	0.13	11	06C	-0.56		
7	8	38	19	0.71	VOL	06C	-0.99	-0.45	0.54
8	9	42	23	0.11	10	06C	-0.54		
8	9	42	23	0.76	VOL	06C	-0.99	-0.54	0.45
9	10	38	27	0.13	11	06C	-0.62		
9	10	38	27	0.78	VOL	06C	-0.94	-0.62	0.32
10	11	8	28	0.10	9	06C	-0.56		
10	11	8	28	0.42	VOL	06C	-0.99	-0.56	0.43
11	12	48	29	0.09	8	08H	-1.01		
11	12	48	29	0.58	VOL	08H	-1.03	-0.58	0.45
12	13	50	37	0.19	15	02H	0.27		
12	13	50	37	0.52	VOL	02H	0.24	0.64	0.40
12	14	50	37	0.16	13	04H	-0.88		
12	14	50	37	0.46	VOL	04H	-1.04	-0.16	0.88
13	15	51	37	0.18	15	02H	0.29		
13	15	51	37	0.49	VOL	02H	0.19	0.64	0.45
14	16	50	38	0.11	9	04H	-0.83		
14	16	50	38	0.84	VOL	04H	-0.88	-0.56	0.32
15	17	51	38	0.16	14	02H	0.32		
15	17	51	38	0.44	VOL	02H	0.19	0.59	0.40
16	18	49	39	0.16	13	04H	0.21		
16	18	49	39	0.48	VOL	04H	0.16	0.59	0.43
17	19	51	39	0.12	11	04H	-0.88		
17	19	51	39	0.43	VOL	04H	-0.99	-0.40	0.59
17	20	51	39	0.13	11	06H	-0.85		
17	20	51	39	0.55	VOL	06H	-0.99	-0.59	0.40
18	21	52	39	0.16	14	04H	0.29		
18	21	52	39	0.52	VOL	04H	0.24	0.64	0.40
19	22	51	40	0.16	13	02H	0.29		
19	22	51	40	0.49	VOL	02H	0.29	0.61	0.32
19	23	51	40	0.13	11	08C	-0.44		

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Steam Generator 11 TSP Wear

TUBE #	IND #	ROW	COL	VOLTS	PCT	LOCATION	ELEV_FROM	ELEV_TO	LENGTH
19	23	51	40	0.79	VOL	08C	-0.97	-0.42	0.55
20	24	37	44	0.10	9	08C	-0.58		
20	24	37	44	0.69	VOL	08C	-1.10	-0.58	0.52
21	25	51	44	0.07	7	05H	-0.69		
21	25	51	44	0.76	VOL	05H	-0.83	-0.56	0.27
22	26	53	44	0.15	13	07H	-0.96		
22	26	53	44	0.87	VOL	07H	-0.98	-0.58	0.40
23	27	20	45	0.13	11	04H	-0.67		
23	27	20	45	0.95	VOL	04H	-0.91	-0.59	0.32
24	28	36	45	0.10	9	08C	-0.65		
24	28	36	45	0.58	VOL	08C	-0.98	-0.63	0.35
25	29	52	46	0.08	7	05H	-0.96		
25	29	52	46	0.74	VOL	05H	-0.96	-0.53	0.43
26	30	21	47	0.18	14	03H	-0.64		
26	30	21	47	0.68	VOL	03H	-0.88	-0.54	0.34
27	31	23	47	0.15	12	03H	-0.62		
27	31	23	47	0.70	VOL	03H	-0.88	-0.48	0.40
28	32	17	49	0.15	13	05H	-0.75		
28	32	17	49	0.90	VOL	05H	-1.05	-0.59	0.46
29	33	19	49	0.18	15	05H	-0.75		
29	33	19	49	0.75	VOL	05H	-1.00	-0.59	0.41
30	34	21	49	0.15	12	04H	-0.77		
30	34	21	49	1.17	VOL	04H	-0.91	-0.53	0.38
31	35	52	49	0.10	9	07H	-0.69		
31	35	52	49	0.69	VOL	07H	-0.94	-0.59	0.35
32	36	53	49	0.14	12	02H	0.53		
32	36	53	49	0.53	VOL	02H	0.16	0.61	0.45
33	37	53	50	0.18	14	04H	-0.61		
33	37	53	50	1.05	VOL	04H	-0.88	-0.40	0.48
34	38	54	50	0.13	11	05H	-0.66		
34	38	54	50	1.04	VOL	05H	-0.88	-0.53	0.35
35	39	48	51	0.10	9	04H	-0.77		
35	39	48	51	0.62	VOL	04H	-0.91	-0.59	0.32
36	40	53	51	0.08	7	03H	-0.64		
36	40	53	51	0.45	VOL	03H	-0.85	-0.29	0.56
36	41	53	51	0.16	13	04H	-0.72		
36	41	53	51	0.64	VOL	04H	-0.80	-0.56	0.24
36	41	53	51	0.76	VOL	04H	-0.91	-0.35	0.56
36	42	53	51	0.07	7	05H	0.29		
36	42	53	51	0.61	VOL	05H	0.08	0.53	0.45
37	43	54	51	0.12	11	04H	-0.80		
37	43	54	51	0.80	VOL	04H	-0.93	-0.32	0.61
37	44	54	51	0.15	12	07H	-0.67		
37	44	54	51	0.88	VOL	07H	-0.96	-0.56	0.40
38	45	53	52	0.08	8	03H	-0.69		
38	45	53	52	0.76	VOL	03H	-0.82	-0.59	0.23

TABLE 3
Steam Generator 11 TSP Wear

TUBE #	IND #	ROW	COL	VOLTS	PCT	LOCATION	ELEV_FROM	ELEV_TO	LENGTH
38	46	53	52	0.18	14	04H	-0.72		
38	46	53	52	1.02	VOL	04H	-0.93	-0.56	0.37
38	47	53	52	0.10	9	06H	-0.61		
38	47	53	52	0.96	VOL	06H	-0.88	-0.61	0.27
39	48	54	52	0.15	13	04H	0.40		
39	48	54	52	0.63	VOL	04H	-0.16	0.53	0.69
40	49	55	52	0.13	11	03H	-0.64		
40	49	55	52	0.96	VOL	03H	-0.80	-0.35	0.45
40	50	55	52	0.12	11	07H	-0.82		
40	50	55	52	0.65	VOL	07H	-0.95	-0.53	0.42
41	51	52	53	0.13	11	03H	-0.43		
41	51	52	53	0.31	VOL	03H	-0.83	-0.40	0.43
41	52	52	53	0.13	11	04H	-0.61		
41	52	52	53	0.82	VOL	04H	-0.85	-0.48	0.37
42	53	54	53	0.12	11	04H	-0.75		
42	53	54	53	0.57	VOL	04H	-0.88	-0.61	0.27
43	54	55	53	0.16	13	04H	-0.67		
43	54	55	53	0.59	VOL	04H	-0.96	-0.56	0.40
43	55	55	53	0.09	8	07H	-0.96		
43	55	55	53	0.65	VOL	07H	-0.96	-0.59	0.37
43	55	55	53	0.89	VOL	07H	-0.98	-0.59	0.39
44	56	48	54	0.15	12	03H	-0.77		
44	56	48	54	0.67	VOL	03H	-0.85	-0.56	0.29
45	57	54	54	0.07	6	03H	0.43		
45	58	54	54	0.15	13	04H	-0.72		
45	58	54	54	1.13	VOL	04H	-0.88	-0.32	0.56
46	59	55	54	0.14	12	02H	0.48		
46	59	55	54	0.43	VOL	02H	0.29	0.53	0.24
46	60	55	54	0.13	11	04H	-0.61		
46	60	55	54	1.13	VOL	04H	-0.82	-0.32	0.50
46	61	55	54	0.06	6	08H	-0.69		
46	61	55	54	0.61	VOL	08H	-0.94	-0.64	0.30
47	62	53	55	0.12	10	04H	-0.64		
47	62	53	55	0.60	VOL	04H	-0.85	-0.56	0.29
48	63	54	55	0.11	10	03H	0.51		
48	63	54	55	0.31	VOL	03H	0.21	0.48	0.27
48	64	54	55	0.09	8	04H	-0.72		
48	64	54	55	0.96	VOL	04H	-0.91	-0.21	0.70
49	65	55	55	0.13	11	05C	0.35		
49	65	55	55	0.55	VOL	05C	0.27	0.56	0.29
50	66	42	56	0.08	8	05H	0.40		
50	66	42	56	0.27	VOL	05H	0.29	0.48	0.19
51	67	53	56	0.08	7	04H	-0.74		
51	67	53	56	0.68	VOL	04H	-0.88	-0.61	0.27
52	68	54	56	0.06	5	01H	-0.80		
52	68	54	56	0.44	VOL	01H	-0.69	0.08	0.77

TABLE 3
Steam Generator 11 TSP Wear

TUBE #	IND #	ROW	COL	VOLTS	PCT	LOCATION	ELEV_FROM	ELEV_TO	LENGTH
52	69	54	56	0.10	9	02H	0.40		
52	70	54	56	0.06	5	03H	-0.82		
52	71	54	56	0.14	12	04H	-0.80		
52	71	54	56	0.57	VOL	04H	-0.93	-0.29	0.64
52	72	54	56	0.16	13	07H	-0.77		
52	72	54	56	0.76	VOL	07H	-0.98	-0.59	0.39
53	73	55	57	0.09	8	04H	-0.53		
53	73	55	57	0.74	VOL	04H	-0.86	-0.59	0.27
54	74	54	58	0.14	12	02C	0.42		
54	74	54	58	0.48	VOL	02C	0.11	0.63	0.52
54	75	54	58	0.08	7	03H	0.43		
54	76	54	58	0.13	11	04H	-0.72		
54	76	54	58	0.44	VOL	04H	-0.96	-0.51	0.45
55	77	55	58	0.20	16	02H	0.40		
55	77	55	58	0.63	VOL	02H	0.13	0.61	0.48
55	78	55	58	0.10	9	03H	-0.64		
55	78	55	58	0.72	VOL	03H	-0.80	-0.29	0.51
55	79	55	58	0.12	11	04H	-0.75		
55	79	55	58	0.68	VOL	04H	-0.88	-0.59	0.29
55	80	55	58	0.08	7	05H	-0.85		
55	80	55	58	1.03	VOL	05H	-0.88	-0.56	0.32
56	81	44	59	0.11	10	04H	-0.53		
56	81	44	59	0.72	VOL	04H	-0.93	-0.61	0.32
57	82	50	59	0.07	7	03H	-0.35		
57	82	50	59	0.63	VOL	03H	-0.77	-0.53	0.24
58	83	54	59	0.13	11	01H	-0.59		
58	83	54	59	0.78	VOL	01H	-0.69	0.13	0.82
58	84	54	59	0.14	12	04H	-0.48		
58	84	54	59	0.67	VOL	04H	-0.91	-0.56	0.35
59	85	55	59	0.12	10	01H	-0.53		
59	85	55	59	0.62	VOL	01H	-0.83	0.05	0.88
59	86	55	59	0.08	7	02H	0.67		
59	87	55	59	0.08	7	07H	-0.61		
59	87	55	59	0.79	VOL	07H	-1.09	-0.56	0.53
60	88	52	60	0.14	12	04H	-0.80		
60	88	52	60	0.51	VOL	04H	-0.88	-0.45	0.43
61	89	54	60	0.18	14	02H	0.40		
61	89	54	60	0.48	VOL	02H	0.13	0.64	0.51
61	90	54	60	0.12	10	04H	-0.72		
61	90	54	60	0.65	VOL	04H	-0.88	-0.53	0.35
62	91	55	60	0.27	20	03H	-0.64		
62	91	55	60	1.03	VOL	03H	-0.91	-0.11	0.80
62	92	55	60	0.06	6	07H	-0.50		
62	92	55	60	0.76	VOL	07H	-0.98	0.03	1.01
63	93	34	61	0.09	8	06H	-0.64		
63	93	34	61	0.64	VOL	06H	-1.01	-0.53	0.48

TABLE 3
Steam Generator 11 TSP Wear

TUBE #	IND #	ROW	COL	VOLTS	PCT	LOCATION	ELEV_FROM	ELEV_TO	LENGTH
64	94	41	61	0.06	6	04H	-0.56		
64	94	41	61	0.63	VOL	04H	-0.90	-0.61	0.29
65	95	55	61	0.13	11	03H	-0.53		
65	95	55	61	0.58	VOL	03H	-0.85	-0.11	0.74
66	96	24	62	0.10	9	06H	-0.75		
66	96	24	62	0.90	VOL	06H	-1.09	-0.53	0.56
67	97	54	62	0.14	12	04H	-0.72		
67	97	54	62	0.89	VOL	04H	-0.91	-0.51	0.40
68	98	53	63	0.14	12	04H	-0.53		
68	98	53	63	0.41	VOL	04H	-0.94	-0.43	0.51
69	99	54	63	0.15	13	02H	0.51		
69	99	54	63	0.23	VOL	02H	0.27	0.51	0.24
69	100	54	63	0.16	13	03H	-0.51		
69	100	54	63	0.60	VOL	03H	-0.88	-0.35	0.53
69	101	54	63	0.11	10	04H	-0.59		
69	101	54	63	0.56	VOL	04H	-0.91	-0.53	0.38
70	102	55	63	0.14	12	02H	0.56		
70	102	55	63	0.25	VOL	02H	0.32	0.61	0.29
71	103	47	64	0.16	13	03H	0.40		
72	104	49	64	0.14	12	08C	-0.80		
72	104	49	64	0.55	VOL	08C	-0.92	-0.50	0.42
73	105	53	64	0.11	10	04H	-0.80		
73	105	53	64	0.94	VOL	04H	-0.93	-0.35	0.58
74	106	54	64	0.15	13	02H	0.40		
74	106	54	64	0.59	VOL	02H	0.19	0.61	0.42
74	107	54	64	0.10	9	03H	0.32		
74	107	54	64	0.52	VOL	03H	0.61	0.85	0.24
74	108	54	64	0.13	11	04H	-0.67		
74	108	54	64	0.89	VOL	04H	-0.93	-0.27	0.66
74	109	54	64	0.14	12	08H	-0.78		
74	109	54	64	0.72	VOL	08H	-0.99	-0.56	0.43
75	110	55	64	0.20	16	02C	0.34		
75	110	55	64	0.43	VOL	02C	0.24	0.64	0.40
75	111	55	64	0.11	9	04H	-0.56		
75	111	55	64	0.66	VOL	04H	-0.88	-0.59	0.29
76	112	47	65	0.14	12	04H	-0.67		
76	112	47	65	0.64	VOL	04H	-0.93	-0.51	0.42
77	113	54	65	0.18	14	02C	0.45		
77	113	54	65	0.42	VOL	02C	0.34	0.63	0.29
77	114	54	65	0.09	8	04H	-0.56		
77	114	54	65	0.99	VOL	04H	-0.91	-0.37	0.54
78	115	48	66	0.19	15	03H	-0.64		
78	115	48	66	0.45	VOL	03H	-0.85	-0.51	0.34
78	115	48	66	0.74	VOL	03H	-0.85	-0.56	0.29
78	116	48	66	0.12	11	04H	-0.80		
78	116	48	66	0.52	VOL	04H	-0.96	-0.53	0.43

TABLE 3
Steam Generator 11 TSP Wear

TUBE #	IND #	ROW	COL	VOLTS	PCT	LOCATION	ELEV_FROM	ELEV_TO	LENGTH
79	117	32	67	0.13	11	04H	0.45		
79	117	32	67	0.49	VOL	04H	0.08	0.56	0.48
80	118	53	67	0.16	13	02C	0.50		
80	118	53	67	0.43	VOL	02C	0.13	0.66	0.53
80	119	53	67	0.12	10	08C	-0.99		
80	119	53	67	0.72	VOL	08C	-0.81	-0.39	0.42
81	120	54	67	0.23	18	02C	0.32		
81	120	54	67	0.55	VOL	02C	0.13	0.64	0.51
82	121	51	68	0.12	10	03H	0.43		
83	122	53	68	0.24	18	02C	0.66		
83	122	53	68	0.62	VOL	02C	0.21	0.71	0.50
84	123	54	68	0.15	13	02C	0.61		
84	123	54	68	0.28	VOL	02C	0.32	0.56	0.24
84	124	54	68	0.09	8	06C	-0.61		
84	124	54	68	0.40	VOL	06C	-0.91	-0.53	0.38
84	125	54	68	0.11	9	08C	-0.86		
84	125	54	68	0.60	VOL	08C	-0.91	-0.50	0.41
84	126	54	68	0.08	7	08H	-0.62		
84	126	54	68	0.62	VOL	08H	-1.00	-0.48	0.52
85	127	52	69	0.15	13	02C	0.50		
85	127	52	69	0.53	VOL	02C	0.13	0.61	0.48
85	128	52	69	0.13	11	03C	0.43		
86	129	27	70	0.15	13	04H	-0.69		
86	129	27	70	0.70	VOL	04H	-0.91	-0.43	0.48
87	130	52	70	0.13	11	04H	-0.75		
87	130	52	70	0.61	VOL	04H	-0.99	-0.53	0.46
87	131	52	70	0.08	7	08C	-0.80		
87	131	52	70	0.49	VOL	08C	-0.94	-0.47	0.47
88	132	53	70	0.07	6	03H	-0.80		
88	132	53	70	0.18	VOL	03H	-0.85	-0.61	0.24
89	133	40	71	0.17	14	04H	0.32		
89	133	40	71	0.29	VOL	04H	0.24	0.42	0.18
90	134	53	71	0.13	11	08C	-0.75		
90	134	53	71	0.53	VOL	08C	-0.91	-0.53	0.38
91	135	49	72	0.17	14	03H	-0.88		
91	135	49	72	0.25	VOL	03H	-0.83	-0.64	0.19
91	135	49	72	0.58	VOL	03H	-0.85	-0.61	0.24
91	136	49	72	0.14	12	08C	-0.61		
91	136	49	72	0.64	VOL	08C	-1.06	-0.58	0.48
92	137	23	73	0.07	6	04H	-0.65		
92	137	23	73	0.26	VOL	04H	-0.89	-0.59	0.30
93	138	50	73	0.10	9	03H	0.35		
93	138	50	73	0.34	VOL	03H	0.35	0.53	0.18
94	139	49	75	0.13	11	04H	-0.78		
94	139	49	75	0.76	VOL	04H	-0.94	-0.53	0.41
95	140	49	76	0.12	10	04H	-0.43		

TABLE 3
Steam Generator 11 TSP Wear

TUBE #	IND #	ROW	COL	VOLTS	PCT	LOCATION	ELEV_FROM	ELEV_TO	LENGTH
95	140	49	76	0.65	VOL	04H	-0.94	-0.54	0.40
96	141	49	77	0.16	13	04H	-0.77		
96	141	49	77	0.57	VOL	04H	-0.93	-0.59	0.34
97	142	50	77	0.19	15	02C	0.48		
97	142	50	77	0.43	VOL	02C	0.21	0.59	0.38
97	143	50	77	0.17	14	04H	-0.69		
97	143	50	77	0.86	VOL	04H	-0.96	-0.59	0.37
98	144	51	77	0.24	18	02C	0.23		
98	144	51	77	0.48	VOL	02C	0.26	0.71	0.45
98	145	51	77	0.12	10	03C	0.28		
98	145	51	77	0.66	VOL	03C	0.34	0.54	0.20
99	146	51	78	0.20	16	02C	0.45		
99	146	51	78	0.69	VOL	02C	0.03	0.63	0.60
100	147	46	79	0.10	9	04H	0.29		
101	148	50	79	0.09	8	02C	0.58		
101	148	50	79	0.24	VOL	02C	0.34	0.58	0.24
102	149	51	79	0.12	11	02C	0.66		
102	149	51	79	0.40	VOL	02C	0.34	0.58	0.24
103	150	47	81	0.05	5	08C	-0.52		
103	150	47	81	0.47	VOL	08C	-1.10	-0.58	0.52
104	151	46	82	0.08	7	08H	-0.94		
104	151	46	82	0.75	VOL	08H	-1.07	-0.56	0.51
105	152	49	82	0.17	14	02C	0.53		
105	152	49	82	0.56	VOL	02C	0.11	0.69	0.58
106	153	48	84	0.18	15	03H	-0.77		
106	153	48	84	0.66	VOL	03H	-0.91	-0.53	0.38
107	154	47	87	0.30	22	03H	-0.69		
107	154	47	87	0.70	VOL	03H	-0.93	-0.43	0.50
108	155	44	88	0.09	8	04H	-0.75		
108	155	44	88	0.41	VOL	04H	-0.83	-0.64	0.19
109	156	40	96	0.11	10	04H	-0.72		
109	156	40	96	0.70	VOL	04H	-0.94	-0.37	0.57
110	157	27	106	0.08	7	06C	-0.81		
110	157	27	106	0.48	VOL	06C	-0.89	-0.62	0.27
111	158	24	108	0.20	16	04C	-0.59		
111	158	24	108	0.68	VOL	04C	-0.88	-0.54	0.34
112	159	21	109	0.06	5	04C	-0.78		
112	159	21	109	0.36	VOL	04C	-0.88	-0.56	0.32
113	160	4	113	0.14	12	05C	-0.75		
113	160	4	113	0.45	VOL	05C	-0.88	-0.53	0.35

TABLE 4
Steam Generator 12 TSP Wear

TUBE #	IND #	ROW	COL	VOLTS	PCT	LOCATION	ELEV_FROM	ELEV_TO	LENGTH
1	1	11	4	0.17	14	03H	-0.75		
1	1	11	4	0.79	VOL	03H	-0.91	-0.56	0.35
2	2	17	8	0.15	13	05C	0.56		
2	2	17	8	0.33	VOL	05C	0.24	0.54	0.30
3	3	35	16	0.07	7	05C	-0.37		
3	3	35	16	0.51	VOL	05C	-0.99	-0.61	0.38
4	4	42	25	0.13	11	05C	-0.64		
4	4	42	25	0.44	VOL	05C	-0.93	-0.53	0.40
5	5	44	26	0.11	10	05C	-0.50		
5	5	44	26	0.41	VOL	05C	-0.96	-0.56	0.40
6	6	46	26	0.21	16	04C	-0.59		
6	6	46	26	0.37	VOL	04C	-0.85	-0.61	0.24
7	7	47	32	0.09	8	04H	-0.88		
7	7	47	32	0.41	VOL	04H	-0.88	-0.64	0.24
8	8	48	34	0.14	12	04H	-0.62		
8	8	48	34	0.79	VOL	04H	-0.91	-0.53	0.38
9	9	51	36	0.17	14	03H	0.45		
9	9	51	36	0.85	VOL	03H	0.13	0.59	0.46
9	10	51	36	0.13	11	04H	-0.59		
9	10	51	36	0.46	VOL	04H	-0.75	-0.48	0.27
9	11	51	36	0.08	7	05H	0.37		
9	11	51	36	0.83	VOL	05H	0.11	0.56	0.45
10	12	50	38	0.16	13	03H	-0.61		
10	12	50	38	0.38	VOL	03H	-0.83	-0.64	0.19
11	13	52	40	0.16	13	04H	-0.61		
11	13	52	40	0.84	VOL	04H	-0.96	-0.51	0.45
12	14	51	41	0.23	17	04H	0.40		
12	14	51	41	0.43	VOL	04H	0.27	0.51	0.24
12	15	51	41	0.09	8	06H	-0.78		
12	15	51	41	0.64	VOL	06H	-0.96	-0.59	0.37
13	16	52	41	0.19	15	04H	-0.67		
13	16	52	41	0.77	VOL	04H	-0.88	-0.48	0.40
14	17	29	43	0.17	14	03H	0.32		
14	17	29	43	0.40	VOL	03H	0.32	0.61	0.29
15	18	52	44	0.17	14	08C	-0.75		
15	18	52	44	0.64	VOL	08C	-1.03	-0.59	0.44
16	19	54	47	0.11	10	06H	-0.67		
16	19	54	47	0.81	VOL	06H	-0.96	-0.56	0.40
17	20	54	48	0.17	14	04C	0.51		
17	20	54	48	0.29	VOL	04C	0.29	0.48	0.19
18	21	54	51	0.16	13	08C	-0.81		
18	21	54	51	0.63	VOL	08C	-1.00	-0.59	0.41
18	21	54	51	0.37	VOL	08C	-1.05	-0.59	0.46
19	22	55	53	0.09	8	07C	-0.72		
19	22	55	53	0.50	VOL	07C	-0.99	-0.53	0.46
20	23	55	55	0.13	11	02C	-0.59		

TABLE 4
Steam Generator 12 TSP Wear

TUBE #	IND #	ROW	COL	VOLTS	PCT	LOCATION	ELEV_FROM	ELEV_TO	LENGTH
20	23	55	55	0.76	VOL	02C	-0.77	-0.40	0.37
21	24	55	56	0.16	13	03C	-0.61		
21	24	55	56	0.40	VOL	03C	-0.85	-0.61	0.24
22	25	53	57	0.13	11	08C	-0.55		
22	25	53	57	0.41	VOL	08C	-1.01	-0.58	0.43
23	26	54	57	0.10	9	08C	-0.41		
23	26	54	57	0.46	VOL	08C	-0.90	-0.66	0.24
24	27	55	57	0.15	13	01C	-0.26		
24	27	55	57	0.33	VOL	01C	-0.61	-0.32	0.29
24	28	55	57	0.16	13	02C	0.64		
24	28	55	57	0.67	VOL	02C	-0.90	1.20	2.10
24	29	55	57	0.21	17	03C	-0.40		
24	29	55	57	0.78	VOL	03C	-0.86	-0.46	0.40
24	30	55	57	0.15	12	04C	-0.46		
24	30	55	57	0.53	VOL	04C	-0.86	-0.46	0.40
25	31	53	58	0.13	11	04C	0.59		
25	31	53	58	0.26	VOL	04C	0.03	0.72	0.69
26	32	54	59	0.12	10	02C	-0.29		
26	32	54	59	0.43	VOL	02C	-0.72	0.59	1.31
27	33	55	59	0.17	14	01C	-0.37		
27	33	55	59	0.23	VOL	01C	-0.58	-0.40	0.18
27	34	55	59	0.11	9	04C	-0.48		
27	34	55	59	0.57	VOL	04C	-0.83	-0.40	0.43
28	35	53	60	0.16	13	05C	0.45		
28	35	53	60	0.58	VOL	05C	0.27	0.59	0.32
29	36	54	60	0.16	13	01C	-0.51		
29	36	54	60	0.50	VOL	01C	-0.67	0.16	0.83
30	37	55	60	0.15	13	01C	-0.62		
30	37	55	60	0.70	VOL	01C	-0.86	-0.05	0.81
30	38	55	60	0.22	17	02C	0.48		
30	38	55	60	0.99	VOL	02C	-0.74	0.62	1.36
30	39	55	60	0.14	12	07C	-0.75		
30	39	55	60	0.70	VOL	07C	-0.97	-0.56	0.41
31	40	55	61	0.17	14	05C	0.62		
31	40	55	61	0.50	VOL	05C	-0.21	0.64	0.85
32	41	55	62	0.13	11	02C	0.51		
32	41	55	62	0.38	VOL	02C	-0.58	0.61	1.19
33	42	54	63	0.17	14	04C	0.64		
33	42	54	63	0.54	VOL	04C	-0.29	0.61	0.90
34	43	52	64	0.17	14	04H	-0.69		
34	43	52	64	0.60	VOL	04H	-0.91	-0.51	0.40
35	44	55	64	0.22	17	04C	-0.64		
35	44	55	64	0.79	VOL	04C	-0.91	-0.59	0.32
36	45	54	65	0.13	11	04C	-0.51		
36	45	54	65	0.55	VOL	04C	-0.94	-0.56	0.38
37	46	53	70	0.11	10	04H	0.27		
37	47	53	70	0.12	10	08C	-0.59		

TABLE 4
Steam Generator 12 TSP Wear

TUBE #	IND #	ROW	COL	VOLTS	PCT	LOCATION	ELEV_FROM	ELEV_TO	LENGTH
37	47	53	70	0.86	VOL	08C	-0.97	-0.62	0.35
38	48	52	73	0.14	12	05C	0.59		
38	48	52	73	0.57	VOL	05C	0.32	0.56	0.24
39	49	50	76	0.12	11	05C	-0.45		
39	49	50	76	0.44	VOL	05C	-0.88	-0.48	0.40
40	50	50	77	0.14	12	04C	-0.75		
40	50	50	77	0.33	VOL	04C	-0.85	-0.61	0.24
41	51	39	83	0.12	10	06H	-0.59		
41	51	39	83	0.79	VOL	06H	-1.02	-0.56	0.46
42	52	36	97	0.15	13	03H	-0.75		
42	52	36	97	0.52	VOL	03H	-1.09	-0.13	0.96
43	53	32	101	0.18	15	05C	-0.48		
43	53	32	101	0.52	VOL	05C	-0.86	-0.59	0.27
44	54	33	102	0.11	10	04C	-0.75		
44	54	33	102	0.40	VOL	04C	-0.88	-0.59	0.29
45	55	27	105	0.16	13	05C	-0.59		
45	55	27	105	0.86	VOL	05C	-0.91	-0.56	0.35
46	56	25	106	0.12	10	04C	-0.67		
46	56	25	106	0.40	VOL	04C	-0.96	-0.46	0.50
47	57	26	106	0.15	13	05C	-0.78		
47	57	26	106	0.90	VOL	05C	-0.89	-0.54	0.35
48	58	25	107	0.19	15	04C	-0.59		
48	58	25	107	0.37	VOL	04C	-0.83	-0.59	0.24
49	59	25	108	0.17	14	04C	-0.53		
49	59	25	108	0.65	VOL	04C	-0.91	-0.48	0.43
50	60	11	111	0.07	7	06C	-0.70		
50	60	11	111	0.54	VOL	06C	-0.86	-0.62	0.24
51	61	4	113	0.16	13	05C	-0.72		
51	61	4	113	0.50	VOL	05C	-0.83	-0.59	0.24

TABLE 5
Steam Generator 11 AVB Wear

TUBE #	IND #	ROW	COL	VOLTS	PCT	LOCATION	ELEV_FROM	ELEV_TO	LENGTH
1	1	51	41	0.16	6	AV3	-0.05		
1	1	51	41	0.59	VOL	AV3	-0.13	0.37	0.50
1	2	51	41	0.12	5	AV5	-0.03		
1	2	51	41	0.61	VOL	AV5	-0.11	0.35	0.46
2	3	52	41	0.09	3	AV5	-0.03		
2	3	52	41	0.52	VOL	AV5	-0.19	0.40	0.59
3	4	50	42	0.08	3	AV3	-0.19		
4	5	42	45	0.36	12	AV2	-0.05		
4	5	42	45	1.25	VOL	AV2	-0.27	0.32	0.59
5	6	49	49	0.07	3	AV6	0.13		
5	6	49	49	0.43	VOL	AV6	-0.40	0.21	0.61
5	7	49	49	0.11	4	AV7	-0.11		
5	7	49	49	0.61	VOL	AV7	-0.48	0.03	0.51
6	8	49	53	0.13	5	AV5	-0.05		
6	8	49	53	0.52	VOL	AV5	-0.24	0.21	0.45
6	9	49	53	0.27	10	AV6	-0.05		
6	9	49	53	1.36	VOL	AV6	-0.35	0.19	0.54
6	10	49	53	0.12	4	AV7	-0.03		
6	10	49	53	0.65	VOL	AV7	-0.13	0.37	0.50
7	11	40	56	0.10	4	AV4	0.03		
7	11	40	56	0.51	VOL	AV4	-0.43	0.05	0.48
8	12	33	57	0.08	3	AV3	-0.03		
8	12	33	57	0.85	VOL	AV3	-0.35	0.24	0.59
8	13	33	57	0.10	4	AV4	-0.11		
8	13	33	57	0.45	VOL	AV4	-0.05	0.16	0.21
8	14	33	57	0.13	5	AV6	-0.05		
8	14	33	57	0.39	VOL	AV6	-0.51	-0.08	0.43
8	15	33	57	0.17	6	AV8	-0.05		
8	15	33	57	0.58	VOL	AV8	-0.13	0.29	0.42
8	16	33	57	0.22	8	AV9	-0.05		
8	16	33	57	0.49	VOL	AV9	-0.24	0.03	0.27
9	17	42	59	0.07	3	AV6	-0.08		
9	17	42	59	0.50	VOL	AV6	-0.51	-0.19	0.32
10	18	46	61	0.05	2	AV3	-0.11		
10	18	46	61	0.48	VOL	AV3	-0.38	0.03	0.41
10	19	46	61	0.12	5	AV4	-0.11		
10	19	46	61	0.61	VOL	AV4	-0.40	0.05	0.45
10	20	46	61	0.11	4	AV6	-0.08		
10	20	46	61	0.41	VOL	AV6	-0.13	0.21	0.34
11	21	40	62	0.11	4	AV7	-0.03		
11	21	40	62	0.48	VOL	AV7	-0.29	0.05	0.34
12	22	48	62	0.23	8	AV3	0.00		
12	22	48	62	1.22	VOL	AV3	-0.29	0.29	0.58
12	23	48	62	0.21	8	AV5	-0.05		
12	23	48	62	0.66	VOL	AV5	-0.37	0.16	0.53
12	24	48	62	0.12	5	AV6	-0.08		

TABLE 5
Steam Generator 11 AVB Wear

TUBE #	IND #	ROW	COL	VOLTS	PCT	LOCATION	ELEV_FROM	ELEV_TO	LENGTH
12	24	48	62	0.45	VOL	AV6	-0.21	0.19	0.40
12	25	48	62	0.11	4	AV9	0.11		
12	25	48	62	0.41	VOL	AV9	-0.05	0.30	0.35
13	26	50	65	0.17	6	AV6	-0.03		
13	26	50	65	0.63	VOL	AV6	-0.62	0.00	0.62
13	27	50	65	0.18	7	AV7	-0.08		
13	27	50	65	0.78	VOL	AV7	-0.30	0.13	0.43
13	28	50	65	0.05	2	AV8	-0.22		
13	28	50	65	0.15	VOL	AV8	-0.38	-0.08	0.30
14	29	48	67	0.10	4	AV5	-0.24		
14	29	48	67	0.91	VOL	AV5	-0.32	0.21	0.53

TABLE 6
Steam Generator 12 AVB Wear

TUBE #	IND #	ROW	COL	VOLTS	PCT	LOCATION	ELEV_FROM	ELEV_TO	LENGTH
1	1	12	35	0.13	5	AV5	-0.08		
1	1	12	35	0.43	VOL	AV5	-0.40	-0.03	0.37
2	2	51	42	0.14	5	AV4	-0.05		
2	2	51	42	0.64	VOL	AV4	-0.40	0.11	0.51
3	3	45	43	0.13	5	AV4	-0.08		
3	3	45	43	0.57	VOL	AV4	-0.37	0.13	0.50
4	4	50	45	0.16	6	AV7	0.03		
4	4	50	45	0.75	VOL	AV7	-0.32	0.27	0.59
5	5	49	46	0.07	3	AV3	-0.03		
5	5	49	46	0.35	VOL	AV3	-0.35	0.16	0.51
6	6	41	49	0.06	2	AV3	-0.16		
6	6	41	49	0.18	VOL	AV3	-0.29	-0.16	0.13
7	7	50	49	0.25	8	AV3	-0.08		
7	7	50	49	0.98	VOL	AV3	-0.37	0.27	0.64
7	8	50	49	0.16	6	AV5	-0.05		
7	8	50	49	0.50	VOL	AV5	0.00	0.16	0.16
8	9	42	50	0.08	3	AV4	-0.03		
8	9	42	50	0.20	VOL	AV4	-0.08	0.16	0.24
8	10	42	50	0.18	6	AV5	-0.05		
8	10	42	50	0.44	VOL	AV5	-0.24	0.16	0.40
8	10	42	50	0.38	VOL	AV5	-0.27	0.13	0.40
9	11	48	50	0.22	8	AV3	-0.05		
9	11	48	50	0.85	VOL	AV3	0.03	0.19	0.16
9	12	48	50	0.17	6	AV4	-0.08		
9	12	48	50	0.36	VOL	AV4	-0.13	0.11	0.24
9	12	48	50	0.66	VOL	AV4	-0.45	0.16	0.61
9	13	48	50	0.24	8	AV5	-0.05		
9	13	48	50	1.25	VOL	AV5	-0.43	0.21	0.64
9	14	48	50	0.24	9	AV6	-0.05		
9	14	48	50	1.21	VOL	AV6	-0.35	0.32	0.67
10	15	48	52	0.10	4	AV3	-0.05		
10	15	48	52	0.35	VOL	AV3	-0.24	0.05	0.29
11	16	35	53	0.20	7	AV1	-0.08		
11	16	35	53	0.62	VOL	AV1	-0.27	0.19	0.46
11	17	35	53	0.19	7	AV2	-0.05		
11	17	35	53	0.64	VOL	AV2	-0.40	0.29	0.69
11	18	35	53	0.29	10	AV3	0.00		
11	18	35	53	1.15	VOL	AV3	-0.29	0.29	0.58
11	19	35	53	0.13	5	AV4	-0.03		
11	19	35	53	0.56	VOL	AV4	-0.19	0.16	0.35
11	20	35	53	0.39	12	AV5	-0.05		
11	20	35	53	1.61	VOL	AV5	-0.48	0.19	0.67
11	21	35	53	0.15	5	AV6	-0.03		
11	21	35	53	0.23	VOL	AV6	-0.16	0.03	0.19
11	21	35	53	0.62	VOL	AV6	-0.27	0.08	0.35
11	22	35	53	0.15	5	AV7	-0.03		

TABLE 6
Steam Generator 12 AVB Wear

TUBE #	IND #	ROW	COL	VOLTS	PCT	LOCATION	ELEV_FROM	ELEV_TO	LENGTH
11	22	35	53	0.18	VOL	AV7	-0.16	0.03	0.19
11	22	35	53	0.41	VOL	AV7	-0.29	0.13	0.42
11	23	35	53	0.20	7	AV8	-0.05		
11	23	35	53	0.85	VOL	AV8	-0.29	0.11	0.40
11	24	35	53	0.36	12	AV9	-0.05		
11	24	35	53	0.26	VOL	AV9	-0.19	0.11	0.30
11	24	35	53	1.03	VOL	AV9	-0.29	0.17	0.46
12	25	47	53	0.15	5	AV5	0.00		
12	25	47	53	0.38	VOL	AV5	-0.24	0.05	0.29
12	26	47	53	0.32	10	AV6	-0.03		
12	26	47	53	1.34	VOL	AV6	-0.37	0.29	0.66
12	27	47	53	0.17	6	AV7	0.00		
12	27	47	53	0.66	VOL	AV7	-0.21	0.19	0.40
13	28	42	54	0.20	7	AV2	-0.05		
13	28	42	54	1.07	VOL	AV2	-0.40	0.24	0.64
13	29	42	54	0.34	12	AV3	-0.05		
13	29	42	54	0.71	VOL	AV3	-0.32	0.24	0.56
13	29	42	54	0.54	VOL	AV3	-0.35	0.16	0.51
13	30	42	54	0.56	17	AV4	-0.08		
13	30	42	54	0.55	VOL	AV4	-0.24	0.11	0.35
13	30	42	54	1.86	VOL	AV4	-0.53	0.08	0.61
13	31	42	54	0.47	15	AV5	-0.05		
13	31	42	54	0.90	VOL	AV5	-0.59	-0.13	0.46
13	31	42	54	1.16	VOL	AV5	-0.67	0.03	0.70
13	32	42	54	0.48	15	AV6	-0.11		
13	32	42	54	0.30	VOL	AV6	-0.13	0.16	0.29
13	32	42	54	1.91	VOL	AV6	-0.35	0.32	0.67
13	33	42	54	0.33	11	AV7	-0.03		
13	33	42	54	0.52	VOL	AV7	-0.32	0.05	0.37
13	33	42	54	0.83	VOL	AV7	-0.48	0.03	0.51
13	34	42	54	0.26	9	AV8	-0.05		
13	34	42	54	0.49	VOL	AV8	-0.21	0.16	0.37
13	34	42	54	0.66	VOL	AV8	-0.37	0.27	0.64
14	35	54	54	0.07	3	AV4	-0.11		
14	35	54	54	0.30	VOL	AV4	-0.35	-0.16	0.19
14	36	54	54	0.12	4	AV5	-0.08		
14	36	54	54	0.34	VOL	AV5	-0.21	0.08	0.29
14	37	54	54	0.34	11	AV6	-0.08		
14	37	54	54	1.54	VOL	AV6	-0.48	0.11	0.59
14	38	54	54	0.21	8	AV7	-0.03		
14	38	54	54	0.98	VOL	AV7	-0.51	-0.05	0.46
14	39	54	54	0.41	13	AV8	0.03		
14	39	54	54	0.59	VOL	AV8	-0.03	0.37	0.40
14	39	54	54	0.89	VOL	AV8	-0.24	0.40	0.64
15	40	51	55	0.08	3	AV3	-0.03		
15	40	51	55	0.40	VOL	AV3	-0.19	0.19	0.38
16	41	39	56	0.25	9	AV2	-0.05		

TABLE 6
Steam Generator 12 AVB Wear

TUBE #	IND #	ROW	COL	VOLTS	PCT	LOCATION	ELEV_FROM	ELEV_TO	LENGTH
16	41	39	56	1.04	VOL	AV2	-0.54	0.03	0.57
16	42	39	56	0.33	11	AV3	0.00		
16	42	39	56	1.46	VOL	AV3	-0.05	0.56	0.61
16	43	39	56	0.18	7	AV4	-0.08		
16	43	39	56	0.69	VOL	AV4	-0.51	-0.05	0.46
16	44	39	56	0.28	10	AV5	-0.03		
16	44	39	56	0.24	VOL	AV5	-0.27	0.03	0.30
16	44	39	56	0.96	VOL	AV5	-0.46	0.16	0.62
16	45	39	56	0.31	10	AV6	-0.05		
16	45	39	56	0.55	VOL	AV6	-0.29	0.16	0.45
16	45	39	56	0.73	VOL	AV6	-0.37	0.21	0.58
16	46	39	56	0.16	6	AV8	-0.05		
16	46	39	56	0.56	VOL	AV8	-0.32	0.19	0.51
17	47	46	56	0.15	5	AV3	-0.13		
17	47	46	56	0.85	VOL	AV3	-0.29	0.21	0.50
17	48	46	56	0.41	13	AV5	-0.08		
17	48	46	56	1.35	VOL	AV5	-0.37	0.19	0.56
17	49	46	56	0.41	13	AV6	-0.08		
17	49	46	56	0.79	VOL	AV6	-0.37	0.16	0.53
17	49	46	56	0.96	VOL	AV6	-0.40	0.16	0.56
17	50	46	56	0.49	15	AV7	-0.03		
17	50	46	56	1.62	VOL	AV7	-0.43	0.21	0.64
17	51	46	56	0.25	8	AV8	-0.03		
17	51	46	56	0.84	VOL	AV8	-0.35	0.24	0.59
18	52	55	56	0.08	3	AV4	-0.03		
18	52	55	56	0.46	VOL	AV4	-0.35	0.21	0.56
18	53	55	56	0.51	15	AV5	-0.03		
18	53	55	56	1.75	VOL	AV5	-0.40	0.24	0.64
18	54	55	56	0.42	13	AV6	-0.05		
18	54	55	56	1.50	VOL	AV6	-0.40	0.21	0.61
18	55	55	56	0.30	10	AV7	-0.03		
18	55	55	56	1.45	VOL	AV7	-0.37	0.29	0.66
19	56	42	58	0.25	8	AV7	0.00		
19	56	42	58	0.86	VOL	AV7	-0.29	0.24	0.53
20	57	47	58	0.18	6	AV3	-0.16		
20	57	47	58	0.89	VOL	AV3	-0.29	0.11	0.40
20	58	47	58	0.18	6	AV4	-0.11		
20	58	47	58	0.86	VOL	AV4	-0.37	0.03	0.40
21	59	33	60	0.18	6	AV7	0.00		
21	59	33	60	0.69	VOL	AV7	0.05	0.29	0.24
22	60	39	61	0.19	7	AV3	-0.05		
22	60	39	61	0.76	VOL	AV3	-0.03	0.43	0.46
22	61	39	61	0.13	5	AV4	-0.05		
22	61	39	61	0.46	VOL	AV4	0.03	0.37	0.34
23	62	54	61	0.17	6	AV3	-0.08		
23	62	54	61	0.52	VOL	AV3	-0.13	0.16	0.29
24	63	55	61	0.11	4	AV9	0.03		

TABLE 6
Steam Generator 12 AVB Wear

TUBE #	IND #	ROW	COL	VOLTS	PCT	LOCATION	ELEV_FROM	ELEV_TO	LENGTH
24	63	55	61	0.46	VOL	AV9	0.05	0.51	0.46
25	64	41	64	0.35	11	AV3	-0.03		
25	64	41	64	1.05	VOL	AV3	-0.38	0.16	0.54
25	65	41	64	0.10	4	AV4	-0.05		
25	65	41	64	0.58	VOL	AV4	-0.24	0.32	0.56
25	66	41	64	0.20	7	AV6	-0.05		
25	66	41	64	0.76	VOL	AV6	-0.27	0.24	0.51
26	67	35	65	0.13	5	AV4	-0.08		
26	67	35	65	0.37	VOL	AV4	-0.03	0.27	0.30
27	68	47	65	0.22	7	AV3	0.00		
27	68	47	65	0.90	VOL	AV3	-0.11	0.45	0.56
27	69	47	65	0.14	5	AV4	-0.11		
27	69	47	65	0.43	VOL	AV4	-0.05	0.24	0.29
27	70	47	65	0.30	10	AV5	-0.03		
27	70	47	65	0.79	VOL	AV5	0.11	0.37	0.26
27	70	47	65	0.25	VOL	AV5	-0.05	0.19	0.24
28	71	39	66	0.05	2	AV3	-0.05		
28	71	39	66	0.57	VOL	AV3	-0.48	0.27	0.75
28	72	39	66	0.40	12	AV4	-0.08		
28	72	39	66	0.26	VOL	AV4	0.11	0.29	0.18
28	72	39	66	1.41	VOL	AV4	-0.35	0.37	0.72
28	73	39	66	0.21	7	AV6	-0.03		
28	73	39	66	1.09	VOL	AV6	-0.40	0.24	0.64
28	74	39	66	0.34	11	AV7	-0.11		
28	74	39	66	1.70	VOL	AV7	-0.43	0.19	0.62
28	75	39	66	0.15	5	AV8	-0.03		
28	75	39	66	0.87	VOL	AV8	-0.43	0.61	1.04
29	76	51	66	0.07	3	AV4	-0.05		
29	76	51	66	0.56	VOL	AV4	-0.62	0.35	0.97
29	77	51	66	0.13	4	AV6	-0.08		
29	77	51	66	0.71	VOL	AV6	-0.80	0.05	0.85
29	78	51	66	0.13	4	AV7	-0.19		
29	78	51	66	0.57	VOL	AV7	-0.40	0.08	0.48
30	79	41	67	0.08	3	AV7	0.00		
30	79	41	67	0.26	VOL	AV7	-0.03	0.16	0.19
31	80	37	69	0.13	5	AV4	-0.05		
31	80	37	69	0.32	VOL	AV4	-0.13	0.16	0.29
32	81	42	71	0.10	4	AV3	-0.11		
32	81	42	71	0.49	VOL	AV3	-0.69	0.35	1.04
32	82	42	71	0.10	4	AV6	-0.03		
32	82	42	71	0.42	VOL	AV6	-0.40	0.53	0.93
33	83	47	73	0.15	6	AV4	-0.08		
33	83	47	73	0.59	VOL	AV4	-0.46	-0.11	0.35
33	84	47	73	0.08	3	AV5	-0.08		
33	84	47	73	0.45	VOL	AV5	-0.29	0.11	0.40
34	85	51	74	0.13	5	AV4	-0.03		
34	85	51	74	0.64	VOL	AV4	-0.56	0.32	0.88

TABLE 6
Steam Generator 12 AVB Wear

TUBE #	IND #	ROW	COL	VOLTS	PCT	LOCATION	ELEV_FROM	ELEV_TO	LENGTH
35	86	39	79	0.15	5	AV5	-0.05		
35	86	39	79	0.97	VOL	AV5	-0.59	0.40	0.99
35	87	39	79	0.15	5	AV6	-0.03		
35	87	39	79	0.67	VOL	AV6	-0.70	0.48	1.18

TABLE 7
Steam Generator 11 Tube Plugging

TUBE #	IND #	ROW	COL	VOLTS	PCT	LOCATION	ELEV_FROM	ELEV_TO	LENGTH
1	1	55	56	0.39	25	01H	-0.58		
1	1	55	56	0.91	VOL	01H	-0.77	0.08	0.85
1	2	55	56	0.16	13	04H	0.32		
1	2	55	56	0.47	VOL	04H	0.19	0.53	0.34
1	3	55	56	0.12	11	08H	-0.80		
1	3	55	56	0.65	VOL	08H	-0.99	-0.51	0.48
2	4	54	57	0.33	23	01H	-0.51		
2	4	54	57	0.47	VOL	01H	-0.91	-0.21	0.70
2	5	54	57	0.13	11	02H	0.64		
2	5	54	57	0.29	VOL	02H	0.24	0.56	0.32
2	6	54	57	0.10	9	03H	0.69		
2	7	54	57	0.15	13	04H	-0.67		
2	7	54	57	0.74	VOL	04H	-0.96	-0.59	0.37
3	8	41	66	0.36	24	08C	0.30		
3	8	41	66	1.12	VOL	08C	-0.31	0.47	0.78
3	9	41	66	0.16	6	AV3	-0.05		
3	9	41	66	1.03	VOL	AV3	-0.32	0.27	0.59
3	10	41	66	0.47	15	AV4	-0.11		
3	10	41	66	2.11	VOL	AV4	-0.19	0.21	0.40
3	11	41	66	0.24	8	AV5	-0.03		
3	11	41	66	1.15	VOL	AV5	0.00	0.43	0.43
3	12	41	66	0.29	10	AV6	-0.08		
3	12	41	66	1.20	VOL	AV6	-0.37	0.29	0.66
3	13	41	66	0.54	17	AV7	-0.05		
3	13	41	66	2.14	VOL	AV7	-0.51	0.13	0.64
3	14	41	66	0.14	5	AV8	-0.08		
3	14	41	66	0.69	VOL	AV8	-0.43	0.13	0.56
3	15	41	66	0.20	7	AV9	-0.08		
3	15	41	66	0.93	VOL	AV9	-0.05	0.47	0.52

TABLE 8
Steam Generator 12 Tube Plugging

TUBE #	IND #	ROW	COL	VOLTS	PCT	LOCATION	ELEV_FROM	ELEV_TO	LENGTH
1	1	10	56	0.30	22	05C	0.43		
1	1	10	56	0.38	VOL	05C	0.16	0.53	0.37
2	2	55	58	0.54	31	03H	-0.79		
2	2	55	58	1.42	VOL	03H	-0.79	-0.38	0.41
2	3	55	58	0.18	15	04C	0.50		
2	3	55	58	0.72	VOL	04C	0.27	0.59	0.32
2	4	55	58	0.26	19	05C	0.44		
2	4	55	58	1.29	VOL	05C	0.21	0.62	0.41
3	5	52	61	0.14	5	AV1	0.12		
3	5	52	61	0.75	VOL	AV1	0.03	0.39	0.36
3	6	52	61	0.57	17	AV2	0.15		
3	6	52	61	2.04	VOL	AV2	-0.12	0.15	0.27
3	7	52	61	0.43	14	AV3	0.09		
3	7	52	61	1.65	VOL	AV3	-0.12	0.59	0.71
3	8	52	61	0.84	23	AV4	0.09		
3	8	52	61	1.60	VOL	AV4	-0.09	0.59	0.68
3	8	52	61	1.75	VOL	AV4	-0.09	0.65	0.74
3	9	52	61	0.96	25	AV5	0.03		
3	9	52	61	0.88	VOL	AV5	-0.03	0.53	0.56
3	9	52	61	2.40	VOL	AV5	-0.06	0.62	0.68
3	10	52	61	0.60	18	AV6	0.09		
3	10	52	61	0.62	VOL	AV6	-0.18	-0.03	0.15
3	10	52	61	1.68	VOL	AV6	-0.21	0.47	0.68
3	11	52	61	0.63	19	AV7	0.03		
3	11	52	61	0.72	VOL	AV7	-0.21	0.42	0.63
3	11	52	61	1.62	VOL	AV7	-0.21	0.53	0.74
3	12	52	61	0.24	9	AV8	0.06		
3	12	52	61	1.05	VOL	AV8	-0.09	0.53	0.62
3	13	52	61	0.14	5	AV9	0.09		
3	13	52	61	0.59	VOL	AV9	-0.15	0.27	0.42
4	14	31	104	0.48	29	03C	-0.62		
4	14	31	104	0.92	VOL	03C	-0.89	-0.53	0.36

5. *Number of tubes plugged or repaired during the inspection outage for each active degradation mechanism,*

   Table 9 provides the number of tubes plugged during 1R28.

TABLE 9

MECHANISM	SG 11	SG 12
AVB Wear	0	0
TSP Wear	3	1

6. *Total number and percentage of tubes plugged or repaired to date,*

   Table 10 provides the total number and percentage of tubes plugged to date.

TABLE 10

PLUGGING	SG 11	SG 12
TOTAL	6	7
PERCENT	0.12%	0.14%

7. *The results of condition monitoring, including the results of tube pulls and in-situ testing,*

   All of the detected indications met the CM screening criteria for both leakage and structural integrity; therefore CM performance criteria were met at 1R28. Additionally, the Operation assessment (OA) performed using conservative assumptions for NDE sizing uncertainty, growth rates and cycle length provides reasonable assurance that the performance criteria will not be exceeded during the upcoming operating cycles 28, 29 and 30 until the next SG inspection.

8. *The effective plugging percentage for all plugging and tube repairs in each SG,*

   There have been no repairs performed on these SGs; therefore the effective plugging percentage is equivalent to that reported in Table 10.

9. *Repair method utilized and the number of tubes repaired by each repair method, and*

   There have been no repairs performed on these SGs.

10. *The results of inspections performed under Specification 5.5.8.d.3 for all tubes that have flaws below the F* or EF* distance, and were not plugged. The report shall include: a) identification of F* and EF* tubes, and b) location and extent of degradation.*

    Specification 5.5.8.d.3 is not applicable to Unit 1.

LEGEND OF FIELDS AND CODES

FIELD	EXPLANATION
TUBE #	Distinct ROW/COL combination within each Table
IND #	Distinct ROW/COL/LOCATION combination within each Table
ROW	Row number of tube location
COL	Column number of tube location
VOLTS	Measured Voltage
PCT	Measured percent or three digit code - see below
LOCATION	Affected landmark - see below
ELEV_FROM	Measurement in inches from the centerline of the landmark to the center of the bobbin coil indication or the lower edge of the rotating coil indication
ELEV_TO	Measurement in inches from the centerline of the landmark to the upper edge of the rotating coil indication
LENGTH	Calculated Length (ELEV_FROM - ELEV_TO)

FIELD	CODE	EXPLANATION
PERCENT	DNG	Ding Signal – Bobbin Coil
	MBM	Manufacturing Burnish Mark – Bobbin Coil
	PDS	Pilger Drift Signal – Bobbin Coil
	PLP	Possible Loose Part
	VOL	Volumetric Indication – MRPC®
	0-100	As measured percent through wall – Bobbin Coil
LOCATION	TEH	Tube end hot (primary face)
	TSH	Tube sheet hot (secondary face)
	0?H	? = First through Eighth tube support plate on hot leg side
	AV?	? = First through Ninth anti-vibration bar
	0?C	? = First through Eighth tube support plate on cold leg side
	TSC	Tube sheet cold (secondary face)
	TEC	Tube end cold (primary face)