



1717 Wakonade Drive
Welch, MN 55089

January 17, 2022

L-PI-22-002
TS 5.6.7

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

Prairie Island Nuclear Generating Plant, Unit 2
Docket No. 50-306
Renewed Facility Operating License No. DPR-60

Prairie Island Nuclear Generating Plant (PINGP) 2021 Unit 2 180-Day Steam Generator
Tube Inspection Report

Northern States Power Company, a Minnesota corporation, doing business as Xcel Energy (hereafter "NSPM"), hereby submits the report of steam generator tube inspections performed during the 2021 refueling and maintenance outage on Unit 2 per Technical Specification 5.6.7, Steam Generator Tube Inspection Report.

If you have any questions about this submittal, please contact Carrie Seipp, Senior Regulatory Engineer, at 612-330-5576.

Summary of Commitments

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

A handwritten signature in black ink, appearing to read 'Christopher P. Domingos', written over a horizontal line.

Christopher P. Domingos
Site Vice President, Prairie Island Nuclear Generating Plant
Northern States Power Company – Minnesota

Enclosure (1)

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

ENCLOSURE 1

PRAIRIE ISLAND NUCLEAR GENERATING PLANT – UNIT 2 2021 STEAM GENERATOR TUBE INSPECTION REPORT

In accordance with Prairie Island Nuclear Generating Plant (PINGP), Unit 2 Technical Specification 5.6.7, TSTF-577-A, Rev.1 and Appendix G of *Steam Generator Management Program: Steam Generator Integrity Assessment Guidelines: Revision 5*. EPRI, Palo Alto, CA: 2021. Deliverable Number: 3002020909, Xcel Energy Nuclear Department submits this report of steam generator tube inspections performed during the 2021 refueling and maintenance outage for Unit 2 (2R32).

PINGP Unit 2 has two Areva Model 56/19 Replacement Steam Generators (RSGs) (see Figure 1 – Steam Generator Schematic) 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 (see Figure 2). 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 3). 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 1.18 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 (nominally 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 3).

Figure 1

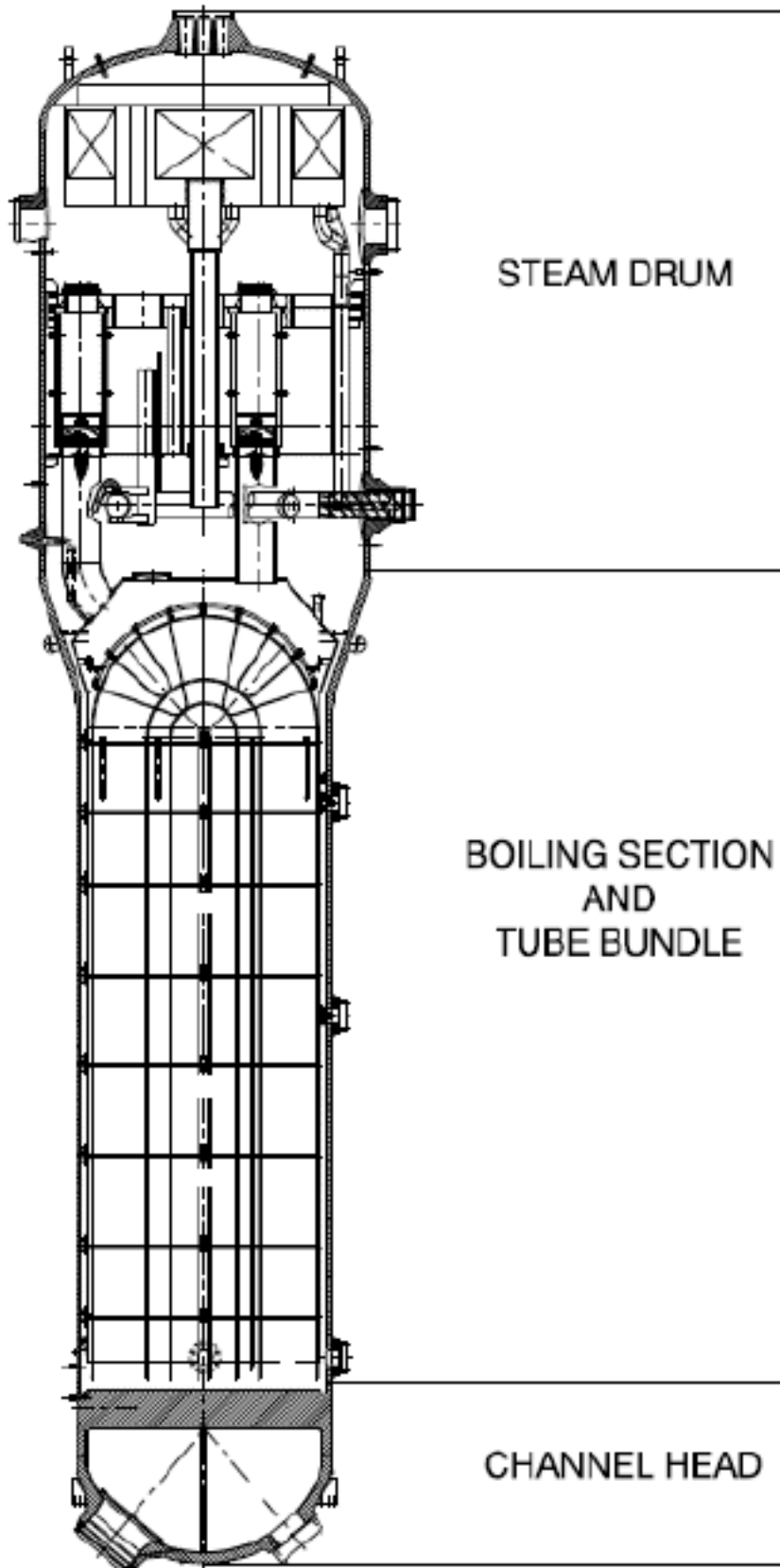
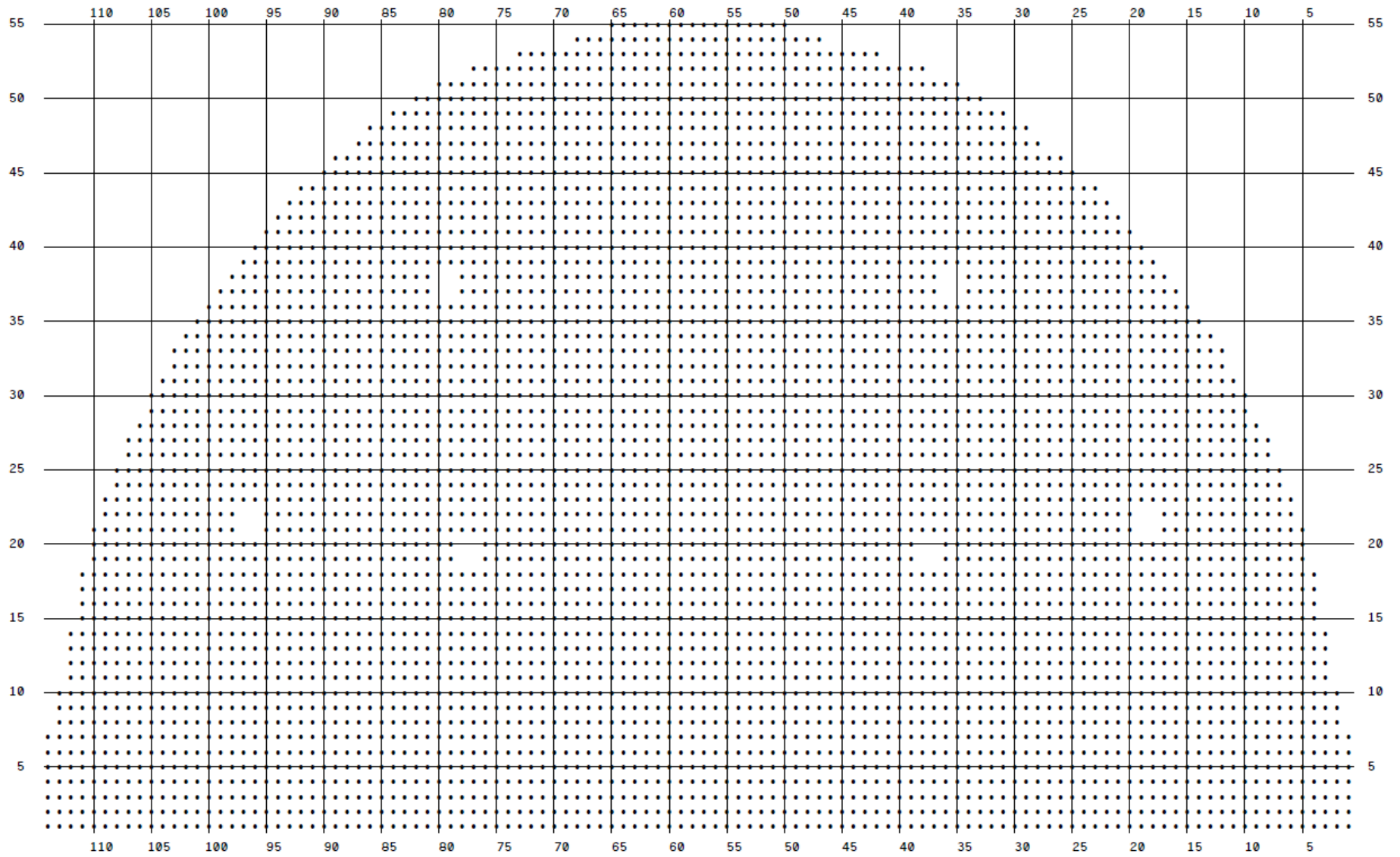


Figure 2



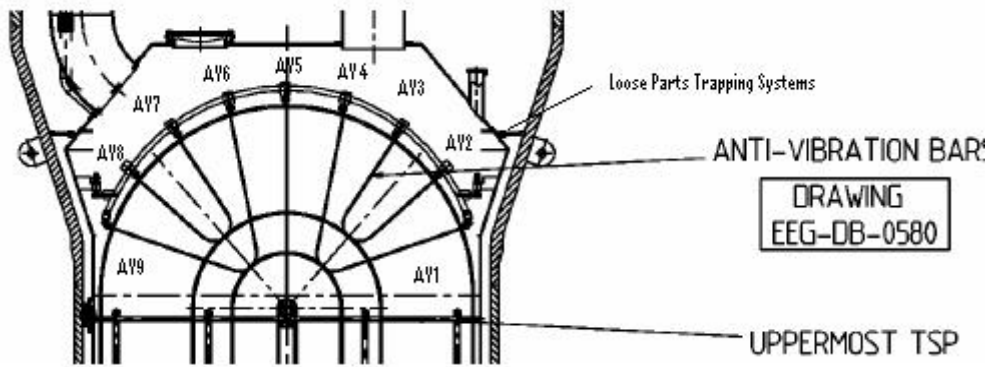


Figure 3

The original Westinghouse Model 51 Steam Generators (SGs) were replaced during the 2013 refueling outage after 33.56 EFPY of operation. The prior inspection outage was completed during the 2015 refueling outage and it was the first in-service inspection (ISI) conducted on the RSGs after installation and an initial accumulating of 1.66 EFPY of operation. The RSGs accumulated 5.37 EFPY between the first ISI and the current inspection. During the 2021 refueling outage the second in-service inspection (ISI) was conducted on the RSGs after accumulating the 7.03 EFPY of RSG operation. At Prairie Island U2R32, approximately 64.4 effective full power months (EFPM) of the 144 EFPM in the first sequential period have been accrued with no operational leakage reported during this operating interval. The nominal T_{HOT} during the past inspection interval was 595°F. There were no Degradation Assessment defined sub-populations of tubes with increased degradation susceptibility. There were no deviations taken from Mandatory and/or Needed (Shall) requirements important to tube integrity from the EPRI Guidelines referenced by NEI 97-06 since the last inspection.

NOTE:	<i>Italicized</i> text represents technical specification excerpts. Each excerpt is followed by the appropriate information intended to address each specific requirement and includes additional details based on benchmarking previous submittals, Staff requests for additional information of peer Licensees, TSTF-577-A Rev.1 reporting requirements and EPRI Tube Integrity Assessment Guidelines reporting requirements. A legend of codes and field names is included at the end of the report.
--------------	---

5.6 Reporting Requirements

5.6.7 Steam Generator Tube Inspection Report

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 October 25, 2021, dictating submittal of this report on or before April 23, 2022.

The report shall include:

- a. The scope of inspections performed on each SG and if applicable, a discussion of the reason for scope expansion,

Table 1 and the notes that follow, provides the scope of inspections performed during 2R32. There was no NDE inspection scope expansion required during Prairie Island 2R32.

TABLE 1

SCOPE	LEG	EXTENT	TECHNIQUE	SG 21	SG 22
Row 7 through 55 ^①	H/C	F/L	X-Probe™	100% (4182)	100% (4177)
Row 6	H	AV5TEH	X-Probe™	100% (114)	100% (114)
Row 6	C	AV5TEC	X-Probe™	100% (114)	100% (114)
Row 1 through 5 ^②	H	08HTEH	X-Probe™	100% (570)	100% (570)
Row 1 through 5 ^②	C	08CTEC	X-Probe™	100% (570)	100% (570)
Row 1 through 5 ^③	H/C	BEND	Bobbin	100% (570)	100% (570)
Special Interest ^④	H	01HTEH	X-Probe™	100% (8)	N/A
Channel Head ^⑤	H/C	N/A	Visual	100%	100%
Inservice Plugs ^⑥	H/C	N/A	Visual	100% (4)	100% (14)
Post Plugging ^⑥	H/C	N/A	Visual	100% (2)	100% (10)
Upper Internals ^⑦	N/A	N/A	Visual	100%	100%
Top of Tubesheet ^⑧	H/C	N/A	Visual	100%	100%
In-bundle ^⑨	H/C	N/A	Visual	~17%	~17%
PLP FOSAR ^⑩	H/C	N/A	Visual	N/A	100% (2)

Notes:

- The X-Probe™ deployed contained both a standard bobbin coil and a 16-coil array of transmit/receive coils.
 - 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 Row 7 through 55 inspections were completed from both legs (either hot or cold) over the full length (F/L) of each tube (TEHTEC or TECTEH).
- ② Rows 1 and 2 had limited array coverage at the upper tube support plates (08H and 08C) because the array probe was not able to run through the Rows 3 through 5 u-bends or completely through the Rows 1 and 2 upper tube support plates and u-bends.
- ③ The Row 1 through 5 inspections were completed from both legs (either hot or cold) over the full bend portion of each tube (08HTEC or 08CTEH).
- ④ Special Interest X-Probe™ examinations on tubes surrounding a foreign object post retrieval.
- ⑤ Westinghouse NSAL-12-1 video camera inspections of the entire channel head cladding, including the divider plate-to-channel head weld and the channel head-to-tubesheet girth weld seam region.
- ⑥ Inservice tube plugs were visually examined for signs of leakage and proper location. Post tube plugging visual inspections were conducted by Engineering to validate the tube plug location and proper insertion/installation.
- ⑦ Inspections of the upper internals included the visual inspections of all bolted closures (manways and camera ports), Feedwater Ring J-tubes, 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 2 56/19 Replacement Steam Generator Operation and Maintenance Manual.
- ⑧ Tube lane and periphery of the bundle inspected looking down both rows and columns in-bundle using remote video equipment.
- ⑨ Video inspection of one out of every six columns traversing from the periphery to the open tube lane.
- ⑩ Foreign Object Search and Retrieval of possible loose part (PLP) indications for evaluation and possible removal based on eddy current.

b. Degradation mechanisms found,

Primary Side Inspections - AVB wear and TSP wear were the only degradation mechanisms found in either SG during 2R32.

For AVB wear, the deepest %TW sizing of any AVB wear indication by either bobbin or array probe observed during 2R32 was measured at 12% TW (by array) in both SG 22 tube R54C52 and SG22 tube R29C57. The measured depth is considerably less than the worst case AVB support wear indication projection of 27%TW from the 2R29 Operational Assessment (OA).

For TSP wear, the deepest %TW sizing of any TSP wear indication observed during 2R32 was measured at 31% TW by both the bobbin and array probes. This indication in SG22 tube R55C57 is less than the worst-case projected TSP wear indication of 43%TW from the 2R29 OA.

Secondary Side Inspections – No secondary side degradation was found.

b. The nondestructive examination techniques utilized for tubes with increased degradation susceptibility,

Prairie Island does not have any specifically identified tubing areas with an increased degradation susceptibility. However, as described in Table 1 above, the X-Probe™ was utilized on 100% of the tubing full length (from tube end to tube end) except for portions of rows 1 through 5 u-bends.

c. The nondestructive examination techniques utilized for each degradation mechanism found,

Table 2 and the notes that follow, provide the Electric Power Research Institute (EPRI) Examination Technique Specification Sheet (ETSS) (techniques) utilized during 2R32 for existing and potential degradation.

TABLE 2

CLASSIFICATION ^①	MECHANISM	LOCATION	PROBE	TECHNIQUE ^②
Existing	Wear	TSP	Bobbin	96004.1 Rev. 13
			X-Probe™	M11956.1 Rev. 4 ^③
Existing	Wear	AVB	Bobbin	M96041.1 Rev. 6 ^③
			X-Probe™	M17909.2 Rev. 1 ^③
Potential	Wear	Staple	Bobbin	M96041.1 Rev. 6 ^③
			X-Probe™	M17909.2 Rev. 1 ^③
Potential	Wear	PLP	Bobbin	27091.2 Rev. 2
			X-Probe™	1790#.# Rev. # ^④
Potential	Wear	Tube-to-Tube	Bobbin	13091.1 Rev. 0
			X-Probe™	13902.1 Rev. 0

Notes:

- ① Existing or Potential degradation as defined in the EPRI SGMP: Steam Generator Integrity Assessment Guidelines, Revision 4.
- ② Each listed technique was site validated for both detection and sizing. In addition, 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).
- ③ M indicates the cited ETSS is an Appendix I qualified technique with system performance quantified using Model Assisted Probability of Detection (MAPOD).
- ④ # Users select the best EPRI ETSS (1 through 6, .1 or .3, Current Revision) based on the wear shape, coil detection set and applies the published performance indices.

- d. *Location, orientation (if linear), and measured sizes (if available) of service induced indications, and voltage responses of each indication.* For tube wear at support structures less than 20 percent through-wall, only the total number of indications needs to be reported,

Tables 3 and 4 provide the location, orientation, voltage, and measured size of each reported AVB and TSP wear indication in each steam generator respectively for the degradation found during 2R32 that were sized less than 20% through wall by the both the bobbin and/or array techniques. All the tubes in these two tables were returned to service.

Tables 5 and 6 provide the location, orientation, voltage, and measured size of each reported AVB and TSP wear indication in each steam generator respectively for the degradation found during 2R32 that were sized greater than or equal to 20% through wall by either the bobbin or the array technique and includes all other indications in the same tube sized less than 20% through wall. All the tubes in these two tables were also returned to service.

Tables 7 and 8 provide the location, orientation, voltage, and measured sizes of AVB and TSP wear indications in each steam generator respectively for tubes preventively plugged during 2R32 and includes all indications in the same tube regardless of percent through wall.

Within Table 3, one tube (R18C55), had two wear scars at separate TSP contact points at the same relative elevation confirmed by the array coil. Within Table 4, three tubes (R32C15, R51C37 and R28C104), each had two wear scars at separate TSP contact points at the same relative elevation confirmed by the array coil. Within Tables 3 through 8, no other tubes were reported with multiple VOL calls at the same ROW/COL/LOC/PROBE which would confirm indications of double sided AVB wear or multiple wear location sites on multiple land contact points of a Quatrefoil TSP. Conversely, all VOL calls at the same ROW/COL/LOC/PROBE confirm only single sided wear sites at all AVB and all other TSP locations.

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

TABLE 3

Steam Generator 21 Less Than 20% Through Wall

TUBE #	IND #	ROW	COL	VOLTS	PCT	IND	LOC	ELEV	LENGTH	PROBE	UTIL1	UTIL2	UTIL3
1	1	5	1	0.11	10	WAR	04C	-0.75		Bobbin	DQA		CBA
1	1	5	1	0.29	13	VOL	04C	-0.72	0.25	Array	WAR	TPR	
2	2	2	2	0.34	14	VOL	04C	-0.69	0.53	Array	DJL	TPR	NBC
3	3	3	2	0.12	10	WAR	04C	-0.74		Bobbin			CBA
3	3	3	2	0.37	15	VOL	04C	-0.72	0.56	Array	WAR	TPR	
4	4	5	2	0.1	9	WAR	04C	-0.75		Bobbin	DQA		CBA
4	4	5	2	0.49	16	VOL	04C	-0.7	0.59	Array	WAR	TPR	
5	5	5	5	0.28	13	VOL	04C	-0.72	0.25	Array	WAR	TPR	NBC
6	6	23	9	0.34	14	VOL	04H	0.4	0.24	Array	WAR	TPR	
6	6	23	9	0.09	8	WAR	04H	0.67		Bobbin			CBA
7	7	26	11	0.51	17	VOL	02C	0.37	0.56	Array	WAR	TPR	
7	7	26	11	0.1	9	WAR	02C	0.4		Bobbin			CBA
8	8	27	11	0.53	17	VOL	02C	0.42	0.48	Array	WAR	TPR	
8	8	27	11	0.08	7	WAR	02C	0.42		Bobbin			CBA
9	9	24	14	0.4	15	VOL	04H	-0.67	0.32	Array		TPR	NBC
10	10	10	15	0.5	16	VOL	04C	0.33	0.3	Array	WAR	TPR	
10	10	10	15	0.13	11	WAR	04C	0.36		Bobbin			CBA
11	11	37	16	0.16	13	WAR	02C	0.4		Bobbin			CBA
11	11	37	16	0.67	18	VOL	02C	0.42	0.53	Array	WAR	TPR	
12	12	38	20	0.2	11	VOL	05H	0.48	0.21	Array	WAR	TPR	
12	12	38	20	0.1	9	WAR	05H	0.83		Bobbin			CBA
13	13	36	21	0.14	12	WAR	05C	0.37		Bobbin			CBA
13	13	36	21	0.41	10	VOL	05C	0.64	0.38	Array	WAR	TPR	
14	14	43	22	0.12	10	WAR	02C	0.43		Bobbin			CBA
14	14	43	22	0.5	16	VOL	02C	0.43	0.79	Array	WAR	TPR	
15	15	12	25	0.56	17	VOL	05C	0.33	0.45	Array	WAR	TPR	
15	15	12	25	0.17	14	WAR	05C	0.36		Bobbin			CBA
16	16	11	30	0.12	10	WAR	05H	0.42		Bobbin			CBA
16	16	11	30	0.38	15	VOL	05H	0.61	0.31	Array	WAR	TPR	
17	17	12	35	0.42	15	VOL	05C	0.42	0.39	Array	WAR	TPR	
17	17	12	35	0.09	8	WAR	05C	0.56		Bobbin			CBA
18	18	11	37	0.15	13	WAR	02H	0.56		Bobbin			CBA
18	18	11	37	0.22	12	VOL	02H	0.56	0.32	Array	WAR	TPR	
19	19	48	37	0.29	13	VOL	05C	-0.72	0.25	Array		TPR	NBC
20	20	49	37	0.42	15	VOL	04H	-0.73	0.42	Array	WAR	TPR	NBC
21	21	11	39	0.32	14	VOL	03H	0.46	0.16	Array	WAR	TPR	
21	21	11	39	0.12	10	WAR	03H	0.48		Bobbin			CBA
22	22	42	40	0.11	10	WAR	06H	0.27		Bobbin			CBA
22	22	42	40	0.38	9	VOL	06H	0.32	0.34	Array	WAR	TPR	
23	23	51	41	0.51	17	VOL	04H	-0.73	0.59	Array	WAR	TPR	
23	23	51	41	0.11	10	WAR	04H	-0.59		Bobbin			CBA
24	24	36	42	0.29	13	VOL	04H	0.35	0.35	Array	WAR	TPR	

TABLE 3

Steam Generator 21 Less Than 20% Through Wall

TUBE #	IND #	ROW	COL	VOLTS	PCT	IND	LOC	ELEV	LENGTH	PROBE	UTIL1	UTIL2	UTIL3
24	24	36	42	0.12	10	WAR	04H	0.48		Bobbin			CBA
25	25	46	43	0.09	8	WAR	05H	0.43		Bobbin			CBA
25	25	46	43	0.31	14	VOL	05H	0.43	0.27	Array	WAR	TPR	
26	26	48	43	0.37	15	VOL	08C	-0.7	0.36	Array		TPR	NBC
27	27	51	43	0.58	12	VOL	06H	-0.7	0.34	Array	WAR	TPR	
27	27	51	43	0.13	11	WAR	06H	-0.67		Bobbin			CBA
28	28	52	45	0.3	13	VOL	02C	0.53	0.22	Array	WAR	TPR	
28	28	52	45	0.24	18	WAR	02C	0.56		Bobbin			CBA
28	29	52	45	0.3	13	VOL	04H	-0.72	0.43	Array	WAR	TPR	NBC
29	30	47	47	0.42	6	VOL	AV3	-0.16	0.82	Array	WAR	TPR	
29	30	47	47	0.11	4	AVB	AV3	-0.08		Bobbin			CBA
30	31	54	47	0.58	17	VOL	05C	0.35	0.93	Array	WAR	TPR	
30	31	54	47	0.11	10	WAR	05C	0.37		Bobbin			CBA
31	32	48	48	0.27	13	VOL	06C	-0.7	0.3	Array		TPR	NBC
32	33	53	49	0.34	14	VOL	04H	-0.66	0.63	Array	WAR	TPR	
32	33	53	49	0.12	10	WAR	04H	-0.6		Bobbin			CBA
33	34	54	49	0.44	16	VOL	06H	-0.77	0.61	Array	WAR	TPR	NBC
33	35	54	49	0.56	11	VOL	AV9	0.05	0.64	Array	WAR	TPR	
33	35	54	49	0.06	2	AVB	AV9	0.61		Bobbin			CBA
34	36	53	51	0.25	12	VOL	07H	-0.78	0.32	Array	WAR	TPR	NBC
35	37	54	51	0.34	14	VOL	04H	-0.67	0.51	Array	WAR	TPR	
35	37	54	51	0.08	7	WAR	04H	-0.59		Bobbin			CBA
36	38	45	52	0.32	14	VOL	06C	-0.72	0.26	Array	WAR	TPR	
36	38	45	52	0.07	6	WAR	06C	-0.67		Bobbin			CBA
37	39	54	52	0.35	14	VOL	03H	-0.69	0.45	Array	WAR	TPR	
37	39	54	52	0.08	7	WAR	03H	-0.64		Bobbin			CBA
37	40	54	52	0.36	14	VOL	04H	-0.7	0.54	Array		TPR	NBC
37	41	54	52	0.18	11	VOL	06C	-0.74	0.47	Array	WAR	TPR	
37	41	54	52	0.09	8	WAR	06C	-0.74		Bobbin			CBA
37	42	54	52	0.14	12	WAR	07H	-0.69		Bobbin			CBA
37	42	54	52	0.47	16	VOL	07H	-0.69	0.66	Array	WAR	TPR	
38	43	55	52	0.36	14	VOL	02C	-0.64	0.96	Array		TPR	NBC
38	44	55	52	0.46	16	VOL	04C	0.29	0.61	Array	WAR	TPR	
38	44	55	52	0.11	10	WAR	04C	0.32		Bobbin			CBA
39	45	52	53	0.08	8	WAR	04C	-0.81		Bobbin			CBA
39	45	52	53	0.37	15	VOL	04C	-0.81	0.28	Array	WAR	TPR	
39	46	52	53	0.24	12	VOL	06C	-0.7	0.31	Array	WAR	TPR	NBC
40	47	53	53	0.09	8	WAR	03H	-0.64		Bobbin			CBA
40	47	53	53	0.3	13	VOL	03H	-0.64	0.4	Array	WAR	TPR	
40	48	53	53	0.08	7	WAR	05H	-0.72		Bobbin			CBA
40	48	53	53	0.33	14	VOL	05H	-0.66	0.5	Array	WAR	TPR	
41	49	54	53	0.48	16	VOL	04H	0.42	0.59	Array	WAR	TPR	

TABLE 3

Steam Generator 21 Less Than 20% Through Wall

TUBE #	IND #	ROW	COL	VOLTS	PCT	IND	LOC	ELEV	LENGTH	PROBE	UTIL1	UTIL2	UTIL3
41	49	54	53	0.14	12	WAR	04H	0.45		Bobbin			CBA
41	50	54	53	0.35	14	VOL	06H	-0.77	0.37	Array	WAR	TPR	
41	50	54	53	0.09	8	WAR	06H	-0.67		Bobbin			CBA
41	51	54	53	0.25	12	VOL	07H	-0.72	0.37	Array	WAR	TPR	
41	51	54	53	0.11	10	WAR	07H	-0.67		Bobbin			CBA
42	52	53	54	0.08	7	WAR	04C	0.31		Bobbin			CBA
42	52	53	54	0.36	14	VOL	04C	0.39	0.62	Array	WAR	TPR	
42	53	53	54	0.1	9	WAR	06H	-0.79		Bobbin			CBA
42	53	53	54	0.36	14	VOL	06H	-0.79	0.28	Array	WAR	TPR	
43	54	54	54	0.52	17	VOL	04H	0.4	0.63	Array	WAR	TPR	
43	54	54	54	0.09	8	WAR	04H	0.4		Bobbin			CBA
43	55	54	54	0.34	14	VOL	05H	0.45	0.26	Array	WAR	TPR	
43	55	54	54	0.17	14	WAR	05H	0.51		Bobbin			CBA
44	56	55	54	0.14	12	WAR	04C	0.32		Bobbin			CBA
44	56	55	54	0.59	18	VOL	04C	0.35	0.59	Array	WAR	TPR	
44	57	55	54	0.11	10	WAR	06C	-0.77		Bobbin			CBA
44	57	55	54	0.39	15	VOL	06C	-0.75	0.59	Array	WAR	TPR	
44	58	55	54	0.14	12	WAR	08C	-0.85		Bobbin			CBA
44	58	55	54	0.49	16	VOL	08C	-0.77	0.32	Array	WAR	TPR	
45	59	18	55	0.23	12	VOL	03H	0.45	0.29	Array	WAR	TPR	
45	59	18	55	0.21	16	WAR	03H	0.45		Bobbin			CBA
45	59	18	55	0.36	14	VOL	03H	0.45	0.37	Array	WAR	TPR	
46	60	46	56	0.09	8	WAR	04H	0.4		Bobbin			CBA
46	60	46	56	0.32	14	VOL	04H	0.43	0.4	Array	WAR	TPR	
47	61	47	56	0.09	8	WAR	04H	-0.67		Bobbin			CBA
47	61	47	56	0.36	14	VOL	04H	-0.61	0.53	Array	WAR	TPR	
48	62	53	56	0.08	7	WAR	04H	-0.61		Bobbin			CBA
48	62	53	56	0.36	14	VOL	04H	-0.59	0.77	Array	WAR	TPR	
49	63	52	57	0.37	15	VOL	06C	-0.7	0.28	Array		TPR	NBC
50	64	54	57	0.35	14	VOL	04C	-0.72	0.29	Array	WAR	TPR	
50	64	54	57	0.07	6	WAR	04C	-0.72		Bobbin			CBA
51	65	52	58	0.61	18	VOL	05H	-0.75	0.36	Array	WAR	TPR	
51	65	52	58	0.11	10	WAR	05H	-0.64		Bobbin			CBA
52	66	55	58	0.44	16	VOL	02C	-0.24	1.09	Array		TPR	NBC
53	67	54	59	0.41	15	VOL	08C	-0.8	0.5	Array	WAR	TPR	
53	67	54	59	0.1	9	WAR	08C	-0.8		Bobbin			CBA
54	68	55	59	0.13	11	WAR	01C	-0.56		Bobbin			CBA
54	68	55	59	0.67	18	VOL	01C	-0.53	1.22	Array	WAR	TPR	
54	69	55	59	0.1	9	WAR	01H	-0.5		Bobbin			CBA
54	69	55	59	0.51	17	VOL	01H	-0.48	0.53	Array	WAR	TPR	
54	70	55	59	0.09	8	WAR	04C	-0.74		Bobbin			CBA
54	70	55	59	0.24	12	VOL	04C	-0.66	0.72	Array	WAR	TPR	

TABLE 3

Steam Generator 21 Less Than 20% Through Wall

TUBE #	IND #	ROW	COL	VOLTS	PCT	IND	LOC	ELEV	LENGTH	PROBE	UTIL1	UTIL2	UTIL3
54	71	55	59	0.32	14	VOL	08C	-0.77	0.37	Array		TPR	NBC
55	72	53	60	0.08	7	WAR	04C	-1.14		Bobbin			CBA
55	72	53	60	0.3	13	VOL	04C	-0.69	0.74	Array	WAR	TPR	
56	73	54	60	0.14	12	WAR	06C	-0.74		Bobbin			CBA
56	73	54	60	0.66	18	VOL	06C	-0.72	0.83	Array	WAR	TPR	
57	74	55	60	0.23	18	WAR	02C	-0.69		Bobbin			CBA
57	74	55	60	0.36	14	VOL	02C	-0.61	1.22	Array	WAR	TPR	
58	75	43	61	0.09	8	WAR	04H	-0.69		Bobbin			CBA
58	75	43	61	0.27	13	VOL	04H	-0.66	0.26	Array	WAR	TPR	
59	76	26	62	0.17	14	WAR	04H	0.35		Bobbin			CBA
59	76	26	62	0.47	16	VOL	04H	0.41	0.27	Array	WAR	TPR	
60	77	54	62	0.37	9	VOL	06H	-0.8	0.32	Array	WAR	TPR	NBC
60	78	54	62	0.65	18	VOL	08C	0.3	0.4	Array	WAR	TPR	
60	78	54	62	0.18	15	WAR	08C	0.32		Bobbin			CBA
61	79	55	62	0.11	10	WAR	04C	-0.56		Bobbin			CBA
61	79	55	62	0.37	9	VOL	04C	-0.56	0.38	Array	WAR	TPR	
61	80	55	62	0.08	7	WAR	07H	-0.85		Bobbin			CBA
61	80	55	62	0.29	13	VOL	07H	-0.8	0.38	Array	WAR	TPR	
62	81	42	63	0.11	10	WAR	05C	0.45		Bobbin			NCA
63	82	54	64	0.11	10	WAR	02C	-0.56		Bobbin			CBA
63	82	54	64	0.67	18	VOL	02C	-0.42	0.8	Array	WAR	TPR	
64	83	54	66	0.41	15	VOL	05C	0.45	0.25	Array	WAR	TPR	
64	83	54	66	0.19	15	WAR	05C	0.5		Bobbin			CBA
64	84	54	66	0.09	8	WAR	07H	-0.76		Bobbin			CBA
64	84	54	66	0.25	12	VOL	07H	-0.73	0.54	Array	WAR	TPR	
65	85	53	67	0.35	14	VOL	04C	-0.7	0.47	Array	WAR	TPR	
65	85	53	67	0.09	8	WAR	04C	-0.64		Bobbin			CBA
66	86	53	68	0.37	15	VOL	04C	-0.67	0.31	Array	WAR	TPR	
66	86	53	68	0.06	5	WAR	04C	-0.64		Bobbin			CBA
66	87	53	68	0.11	10	WAR	07H	-0.81		Bobbin			CBA
66	87	53	68	0.36	14	VOL	07H	-0.76	0.34	Array	WAR	TPR	
67	88	54	68	0.12	10	WAR	04H	0.39		Bobbin			CBA
67	88	54	68	0.42	15	VOL	04H	0.42	0.48	Array	WAR	TPR	
68	89	49	69	0.09	8	WAR	07H	-0.78		Bobbin			CBA
68	89	49	69	0.31	14	VOL	07H	-0.73	0.28	Array	WAR	TPR	
69	90	35	70	0.09	8	WAR	04H	-0.78		Bobbin			CBA
69	90	35	70	0.24	12	VOL	04H	-0.7	0.35	Array	WAR	TPR	
70	91	51	70	0.12	10	WAR	03H	-0.78		Bobbin			CBA
70	91	51	70	0.24	12	VOL	03H	-0.58	0.47	Array	WAR	TPR	
71	92	53	70	0.1	9	WAR	03H	-0.83		Bobbin			CBA
71	92	53	70	0.23	12	VOL	03H	-0.67	0.58	Array	WAR	TPR	
72	93	5	71	0.24	12	VOL	02H	0.35	0.27	Array	WAR	TPR	

TABLE 3

Steam Generator 21 Less Than 20% Through Wall

TUBE #	IND #	ROW	COL	VOLTS	PCT	IND	LOC	ELEV	LENGTH	PROBE	UTIL1	UTIL2	UTIL3
72	93	5	71	0.11	10	WAR	02H	0.43		Bobbin			CBA
73	94	45	71	0.41	15	VOL	04C	-0.67	0.5	Array	WAR	TPR	
73	94	45	71	0.13	11	WAR	04C	-0.61		Bobbin			CBA
74	95	53	71	0.27	13	VOL	08C	-0.84	0.34	Array	WAR	TPR	
74	95	53	71	0.07	6	WAR	08C	-0.81		Bobbin			CBA
75	96	50	72	0.35	14	VOL	05C	-0.95	0.25	Array	WAR	TPR	
75	96	50	72	0.12	10	WAR	05C	-0.64		Bobbin			CBA
76	97	48	74	0.22	12	VOL	05C	0.45	0.22	Array	WAR	TPR	
76	97	48	74	0.12	10	WAR	05C	0.5		Bobbin			CBA
77	98	52	74	0.09	8	WAR	07H	0.25		Bobbin			CBA
77	98	52	74	0.4	15	VOL	07H	0.31	0.72	Array	WAR	TPR	
78	99	47	79	0.32	14	VOL	06C	-0.73	0.3	Array	WAR	TPR	
78	99	47	79	0.09	8	WAR	06C	-0.71		Bobbin			CBA
79	100	48	79	0.41	15	VOL	06C	-0.75	0.31	Array		TPR	NBC
80	101	44	81	0.17	11	VOL	04H	-0.7	0.4	Array		TPR	NBC
81	102	49	82	0.33	14	VOL	08C	-0.76	0.28	Array		TPR	NBC
82	103	49	83	0.51	17	VOL	04H	0.36	0.34	Array	WAR	TPR	
82	103	49	83	0.19	15	WAR	04H	0.39		Bobbin			CBA
83	104	47	87	0.28	13	VOL	03H	-0.7	0.24	Array	WAR	TPR	NBC
84	105	39	88	0.4	15	VOL	03H	0.32	0.33	Array	WAR	TPR	
84	105	39	88	0.2	16	WAR	03H	0.38		Bobbin			CBA
85	106	40	90	0.13	11	WAR	05H	0.32		Bobbin			CBA
85	106	40	90	0.49	16	VOL	05H	0.41	0.27	Array	WAR	TPR	
86	107	42	91	0.21	12	VOL	04H	-0.7	0.43	Array		TPR	NBC
87	108	31	96	0.07	7	WAR	05H	-1.16		Bobbin			CBA
87	108	31	96	0.29	13	VOL	05H	-0.78	0.3	Array	WAR	TPR	
88	109	33	100	0.18	15	WAR	02H	0.43		Bobbin			CBA
88	109	33	100	0.41	15	VOL	02H	0.46	0.32	Array	WAR	TPR	
89	110	35	101	0.42	15	VOL	04H	-0.7	0.55	Array	WAR	TPR	NBC
90	111	25	105	0.32	9	VOL	05H	0.37	0.37	Array	WAR	TPR	
90	111	25	105	0.12	10	WAR	05H	0.37		Bobbin			CBA
91	112	6	113	0.11	10	WAR	02H	-0.74		Bobbin			CBA
91	112	6	113	0.17	11	VOL	02H	-0.69	0.9	Array	WAR	TPR	
92	113	5	114	0.1	9	WAR	02C	-0.61		Bobbin			CBA
92	113	5	114	0.32	14	VOL	02C	-0.51	0.56	Array	WAR	TPR	

TABLE 4

Steam Generator 22 Less Than 20% Through Wall

TUBE #	IND #	ROW	COL	VOLTS	PCT	IND	LOC	ELEV	LENGTH	PROBE	UTIL1	UTIL2	UTIL3
1	1	6	2	0.08	7	WAR	04C	-0.76		Bobbin			CBA
1	1	6	2	0.28	13	VOL	04C	-0.68	0.32	Array	WAR	TPR	
2	2	1	4	0.29	13	VOL	06C	-0.69	0.42	Array	WAR	TPR	LAC
2	2	1	4	0.07	6	WAR	06C	-0.5		Bobbin		LAC	CBA
3	3	16	5	0.13	11	WAR	04H	0.42		Bobbin			NCA
4	4	22	10	0.08	7	WAR	04H	-0.73		Bobbin			CBA
4	4	22	10	0.33	14	VOL	04H	-0.73	0.31	Array	WAR	TPR	
5	5	25	11	0.14	12	WAR	04C	-0.75		Bobbin			CBA
5	5	25	11	0.28	13	VOL	04C	-0.73	0.28	Array	WAR	TPR	
6	6	27	11	0.14	12	WAR	04H	0.42		Bobbin			CBA
6	6	27	11	0.36	14	VOL	04H	0.42	0.36	Array	WAR	TPR	
7	7	6	13	0.26	13	VOL	05C	-0.71	0.8	Array	WAR	TPR	NBC
8	8	27	13	0.16	13	WAR	05C	-0.75		Bobbin			NCA
8	8	27	13	0.39	9	VOL	05C	-0.72	0.33	Array	WAR	TPR	
9	9	32	15	0.3	13	VOL	04C	-0.76	0.31	Array	WAR	TPR	
9	9	32	15	0.38	15	VOL	04C	-0.76	0.31	Array	WAR	TPR	
9	9	32	15	0.17	14	WAR	04C	-0.76		Bobbin			CBA
10	10	30	16	0.1	9	WAR	04H	-0.67		Bobbin			NCA
11	11	37	16	0.52	17	VOL	04H	-0.73	0.37	Array	WAR	TPR	
11	11	37	16	0.16	13	WAR	04H	-0.64		Bobbin			CBA
11	12	37	16	0.35	14	VOL	05C	-0.75	0.31	Array		TPR	NBC
12	13	37	17	0.32	14	VOL	04H	-0.76	0.56	Array	WAR	TPR	
12	13	37	17	0.09	8	WAR	04H	-0.7		Bobbin			CBA
13	14	33	18	0.1	9	WAR	05C	-0.78		Bobbin			CBA
13	14	33	18	0.48	16	VOL	05C	-0.72	0.45	Array	WAR	TPR	
14	15	43	26	0.1	9	WAR	04C	0.39		Bobbin			CBA
14	15	43	26	0.25	12	VOL	04C	0.42	0.22	Array	WAR	TPR	
15	16	39	27	0.49	16	VOL	05C	-0.75	0.3	Array	WAR	TPR	
15	16	39	27	0.14	12	WAR	05C	-0.75		Bobbin			CBA
16	17	45	29	0.12	10	WAR	05C	-0.7		Bobbin			CBA
16	17	45	29	0.56	17	VOL	05C	-0.67	0.44	Array	WAR	TPR	
17	18	47	30	0.28	13	VOL	05C	-0.72	0.34	Array		TPR	NBC
18	19	27	31	0.09	8	WAR	05C	0.03		Bobbin			CBA
18	19	27	31	0.51	17	VOL	05C	0.31	0.42	Array	WAR	TPR	
19	20	48	31	0.31	14	VOL	04H	0.39	0.73	Array	WAR	TPR	
19	20	48	31	0.23	18	WAR	04H	0.45		Bobbin			CBA
20	21	48	32	0.54	17	VOL	05H	-0.72	0.47	Array	WAR	TPR	
20	21	48	32	0.15	13	WAR	05H	-0.67		Bobbin			CBA
21	22	49	32	0.45	16	VOL	04H	0.39	0.36	Array	WAR	TPR	
21	22	49	32	0.21	16	WAR	04H	0.45		Bobbin			CBA
22	23	1	33	0.31	14	VOL	03C	0.44	0.33	Array	WAR	TPR	LAC
22	23	1	33	0.12	10	WAR	03C	0.47		Bobbin		LAC	NCA

TABLE 4

Steam Generator 22 Less Than 20% Through Wall

TUBE #	IND #	ROW	COL	VOLTS	PCT	IND	LOC	ELEV	LENGTH	PROBE	UTIL1	UTIL2	UTIL3
23	24	48	33	0.32	14	VOL	05C	-0.76	0.26	Array		TPR	NBC
24	25	50	33	0.31	14	VOL	05H	-0.67	0.68	Array	WAR	TPR	
24	25	50	33	0.09	8	WAR	05H	-0.39		Bobbin			CBA
25	26	14	34	0.26	13	VOL	03H	0.45	0.16	Array	WAR	TPR	
25	26	14	34	0.1	9	WAR	03H	0.73		Bobbin			CBA
26	27	48	34	0.14	12	WAR	04H	0.47		Bobbin			NCA
27	28	51	35	0.56	17	VOL	04H	-0.65	0.43	Array	WAR	TPR	
27	28	51	35	0.12	10	WAR	04H	-0.62		Bobbin			CBA
28	29	44	36	0.15	13	WAR	05C	-0.78		Bobbin			CBA
28	29	44	36	0.34	14	VOL	05C	-0.72	0.53	Array	WAR	TPR	
29	30	51	36	0.52	17	VOL	05H	-0.72	0.31	Array	WAR	TPR	
29	30	51	36	0.13	11	WAR	05H	-0.7		Bobbin			CBA
30	31	24	37	0.08	7	WAR	05H	-0.7		Bobbin			CBA
30	31	24	37	0.44	16	VOL	05H	-0.67	0.48	Array	WAR	TPR	
31	32	51	37	0.38	15	VOL	04H	-0.73	0.33	Array	WAR	TPR	
31	32	51	37	0.08	7	WAR	04H	-0.45		Bobbin			CBA
31	33	51	37	0.3	13	VOL	07H	-0.76	0.34	Array	WAR	TPR	
31	33	51	37	0.35	14	VOL	07H	-0.73	0.62	Array	WAR	TPR	
31	33	51	37	0.09	8	WAR	07H	-0.7		Bobbin			CBA
32	34	52	38	0.11	10	WAR	05C	-0.81		Bobbin			CBA
32	34	52	38	0.27	13	VOL	05C	-0.72	0.34	Array	WAR	TPR	
33	35	45	39	0.32	14	VOL	04H	-0.73	0.4	Array	WAR	TPR	
33	35	45	39	0.11	10	WAR	04H	-0.68		Bobbin			CBA
34	36	48	39	0.35	14	VOL	04H	-0.73	0.56	Array	WAR	TPR	
34	36	48	39	0.08	7	WAR	04H	-0.42		Bobbin			CBA
35	37	49	39	0.4	15	VOL	05H	-0.76	0.59	Array	WAR	TPR	
35	37	49	39	0.1	9	WAR	05H	-0.7		Bobbin			CBA
36	38	50	39	0.13	11	WAR	04H	0.45		Bobbin			NCA
37	39	52	39	0.1	9	WAR	04C	0.42		Bobbin			CBA
37	39	52	39	0.3	13	VOL	04C	0.45	0.2	Array	WAR	TPR	
37	40	52	39	0.43	15	VOL	04H	-0.7	0.54	Array	WAR	TPR	NBC
38	41	44	40	0.23	12	VOL	05H	0.36	0.28	Array	WAR	TPR	
38	41	44	40	0.12	10	WAR	05H	0.45		Bobbin			CBA
39	42	42	41	0.4	15	VOL	07H	-0.76	0.36	Array	WAR	TPR	
39	42	42	41	0.08	7	WAR	07H	-0.7		Bobbin			CBA
40	43	52	41	0.56	17	VOL	05H	-0.73	0.76	Array	WAR	TPR	
40	43	52	41	0.1	9	WAR	05H	-0.65		Bobbin			CBA
40	44	52	41	0.63	18	VOL	07H	-0.7	0.65	Array	WAR	TPR	
40	44	52	41	0.16	13	WAR	07H	-0.42		Bobbin			CBA
41	45	46	42	0.1	9	WAR	05C	-0.75		Bobbin			CBA
41	45	46	42	0.44	16	VOL	05C	-0.72	0.34	Array	WAR	TPR	
42	46	52	42	0.59	18	VOL	04H	-0.69	0.53	Array	WAR	TPR	

TABLE 4

Steam Generator 22 Less Than 20% Through Wall

TUBE #	IND #	ROW	COL	VOLTS	PCT	IND	LOC	ELEV	LENGTH	PROBE	UTIL1	UTIL2	UTIL3
42	46	52	42	0.14	12	WAR	04H	-0.69		Bobbin			CBA
43	47	51	43	0.37	15	VOL	08H	-0.78	0.51	Array	WAR	TPR	
43	47	51	43	0.11	10	WAR	08H	-0.73		Bobbin			CBA
44	48	52	43	0.07	6	WAR	05C	-0.75		Bobbin			CBA
44	48	52	43	0.41	15	VOL	05C	-0.7	0.39	Array	WAR	TPR	
45	49	12	44	0.12	10	WAR	06C	-0.81		Bobbin			NCA
46	50	53	44	0.41	15	VOL	04H	-0.69	0.58	Array	WAR	TPR	
46	50	53	44	0.1	9	WAR	04H	-0.5		Bobbin			CBA
47	51	51	46	0.45	16	VOL	07H	-0.75	0.53	Array	WAR	TPR	
47	51	51	46	0.16	13	WAR	07H	-0.7		Bobbin			CBA
48	52	37	47	0.3	13	VOL	05H	0.73	0.22	Array	WAR	TPR	NBC
49	53	54	47	0.11	10	WAR	04H	-0.7		Bobbin			CBA
49	53	54	47	0.57	17	VOL	04H	-0.7	0.56	Array	WAR	TPR	
50	54	49	48	0.08	7	WAR	07C	-0.81		Bobbin			CBA
50	54	49	48	0.31	14	VOL	07C	-0.76	0.28	Array	WAR	TPR	
51	55	52	48	0.13	11	WAR	07H	-0.73		Bobbin			CBA
51	55	52	48	0.43	15	VOL	07H	-0.73	0.34	Array	WAR	TPR	
52	56	53	48	0.45	16	VOL	07H	-0.7	0.34	Array	WAR	TPR	
52	56	53	48	0.12	10	WAR	07H	-0.67		Bobbin			CBA
53	57	51	49	0.71	19	VOL	07H	-0.73	0.53	Array	WAR	TPR	
53	57	51	49	0.15	13	WAR	07H	-0.67		Bobbin			CBA
54	58	54	49	0.35	14	VOL	04H	-0.73	0.25	Array	WAR	TPR	
54	58	54	49	0.06	6	WAR	04H	-0.67		Bobbin			CBA
55	59	43	51	0.22	17	WAR	04H	0.47		Bobbin			CBA
55	59	43	51	0.22	12	VOL	04H	0.53	0.19	Array	WAR	TPR	
56	60	54	51	0.47	16	VOL	07H	-0.73	0.59	Array	WAR	TPR	
56	60	54	51	0.1	9	WAR	07H	-0.67		Bobbin			CBA
57	61	54	52	0.1	9	WAR	07H	-0.63		Bobbin			CBA
57	61	54	52	0.47	16	VOL	07H	-0.63	0.58	Array	WAR	TPR	
57	62	54	52	0.6	12	VOL	AV6	0	0.43	Array	WAR	TPR	
57	62	54	52	0.09	3	AVB	AV6	0		Bobbin			CBA
58	63	54	53	0.33	14	VOL	07H	0.35	0.46	Array	WAR	TPR	
58	63	54	53	0.06	6	WAR	07H	0.4		Bobbin			CBA
59	64	55	53	0.27	13	VOL	05C	-0.75	0.37	Array		TPR	NBC
60	65	55	54	0.35	14	VOL	07H	-0.76	0.96	Array	WAR	TPR	
60	65	55	54	0.11	10	WAR	07H	-0.73		Bobbin			CBA
60	66	55	54	0.61	18	VOL	08H	-0.75	0.36	Array	WAR	TPR	
60	66	55	54	0.14	12	WAR	08H	-0.73		Bobbin			CBA
61	67	54	56	0.76	19	VOL	07H	-0.73	0.61	Array	WAR	TPR	
61	67	54	56	0.23	18	WAR	07H	-0.64		Bobbin			CBA
61	68	54	56	0.46	16	VOL	08H	-0.78	0.84	Array	WAR	TPR	
61	68	54	56	0.14	12	WAR	08H	-0.7		Bobbin			CBA

TABLE 4

Steam Generator 22 Less Than 20% Through Wall

TUBE #	IND #	ROW	COL	VOLTS	PCT	IND	LOC	ELEV	LENGTH	PROBE	UTIL1	UTIL2	UTIL3
62	69	29	57	0.16	6	AVB	AV3	-0.14		Bobbin			CBA
62	69	29	57	0.4	12	VOL	AV3	-0.11	0.48	Array	WAR	TPR	
63	70	54	57	0.09	8	WAR	02C	0.45		Bobbin			CBA
63	70	54	57	0.44	16	VOL	02C	0.45	0.72	Array	WAR	TPR	
63	71	54	57	0.5	16	VOL	05H	-0.73	0.76	Array	WAR	TPR	
63	71	54	57	0.09	8	WAR	05H	-0.73		Bobbin			CBA
64	72	55	58	0.18	15	WAR	02C	0.5		Bobbin			CBA
64	72	55	58	0.35	14	VOL	02C	0.56	0.37	Array	WAR	TPR	
65	73	31	60	0.34	9	VOL	AV5	-0.06	0.45	Array	WAR	TPR	
65	73	31	60	0.11	4	AVB	AV5	0.03		Bobbin		TPR	CBA
66	74	55	60	0.25	19	WAR	02C	0.53		Bobbin			CBA
66	74	55	60	0.59	18	VOL	02C	0.53	0.48	Array	WAR	TPR	
67	75	49	64	0.29	13	VOL	07H	-0.79	0.33	Array	WAR	TPR	
67	75	49	64	0.11	10	WAR	07H	-0.76		Bobbin			CBA
68	76	54	64	0.13	11	WAR	05H	-0.7		Bobbin			CBA
68	76	54	64	0.78	14	VOL	05H	-0.48	0.81	Array	WAR	TPR	
69	77	55	64	0.63	18	VOL	02C	0.5	0.41	Array	WAR	TPR	
69	77	55	64	0.22	17	WAR	02C	0.53		Bobbin			CBA
70	78	44	65	0.43	15	VOL	05H	0.31	0.33	Array	WAR	TPR	
70	78	44	65	0.2	16	WAR	05H	0.36		Bobbin			CBA
71	79	42	67	0.15	13	WAR	05H	0.34		Bobbin			NCA
72	80	53	67	0.27	13	VOL	05H	-0.73	0.67	Array	WAR	TPR	
72	80	53	67	0.13	11	WAR	05H	-0.73		Bobbin			CBA
73	81	53	68	0.39	10	VOL	04H	-0.73	0.27	Array		TPR	NBC
73	82	53	68	0.3	8	VOL	08C	-0.73	0.28	Array		TPR	NBC
74	83	52	69	0.38	15	VOL	04H	-0.75	0.47	Array	WAR	TPR	
74	83	52	69	0.14	12	WAR	04H	-0.7		Bobbin			CBA
75	84	53	70	0.43	15	VOL	04C	-0.7	0.69	Array	WAR	TPR	NBC
76	85	39	75	0.35	14	VOL	06C	-0.81	0.31	Array	WAR	TPR	
76	85	39	75	0.1	9	WAR	06C	-0.75		Bobbin			CBA
77	86	38	76	0.45	16	VOL	03C	0.48	0.28	Array	WAR	TPR	
77	86	38	76	0.26	19	WAR	03C	0.54		Bobbin			CBA
78	87	48	77	0.44	16	VOL	04H	-0.71	0.42	Array	WAR	TPR	
78	87	48	77	0.1	9	WAR	04H	-0.65		Bobbin			CBA
79	88	50	78	0.09	8	WAR	07H	-0.9		Bobbin			CBA
79	88	50	78	0.38	15	VOL	07H	-0.73	0.4	Array	WAR	TPR	
80	89	47	79	0.34	14	VOL	05C	-0.72	0.45	Array	WAR	TPR	
80	89	47	79	0.1	9	WAR	05C	-0.67		Bobbin			CBA
81	90	51	79	0.09	8	WAR	07C	-0.83		Bobbin			CBA
81	90	51	79	0.32	14	VOL	07C	-0.71	0.33	Array	WAR	TPR	
82	91	47	82	0.3	13	VOL	05C	-0.73	0.28	Array	WAR	TPR	NBC
83	92	39	85	0.35	14	VOL	05H	-0.75	0.28	Array		TPR	NBC

TABLE 4

Steam Generator 22 Less Than 20% Through Wall

TUBE #	IND #	ROW	COL	VOLTS	PCT	IND	LOC	ELEV	LENGTH	PROBE	UTIL1	UTIL2	UTIL3
84	93	42	85	0.33	14	VOL	04H	-0.72	0.33	Array		TPR	NBC
85	94	43	85	0.18	15	WAR	04H	0.33		Bobbin			CBA
85	94	43	85	0.36	14	VOL	04H	0.39	0.31	Array	WAR	TPR	
86	95	46	85	0.31	14	VOL	05C	-0.75	0.28	Array		TPR	NBC
87	96	47	86	0.58	17	VOL	02C	0.48	0.4	Array	WAR	TPR	
87	96	47	86	0.16	13	WAR	02C	0.48		Bobbin			CBA
88	97	24	87	0.21	7	VOL	01C	-0.68	0.4	Array	WAR	TPR	NBC
89	98	44	88	0.1	9	WAR	05H	-0.76		Bobbin			CBA
89	98	44	88	0.34	14	VOL	05H	-0.76	0.23	Array	WAR	TPR	
90	99	46	88	0.35	14	VOL	04H	-0.75	0.45	Array	WAR	TPR	
90	99	46	88	0.13	11	WAR	04H	-0.73		Bobbin			CBA
91	100	1	89	0.11	10	WAR	03C	0.44		Bobbin		LAC	CBA
91	100	1	89	0.28	13	VOL	03C	0.58	0.31	Array	WAR	TPR	LAC
92	101	6	89	0.29	13	VOL	03C	-0.71	0.37	Array	DQA	TPR	
92	101	6	89	0.09	8	WAR	03C	-0.68		Bobbin	DQA		CBA
93	102	40	89	0.32	14	VOL	05H	-0.73	0.28	Array		TPR	NBC
94	103	45	89	0.31	14	VOL	04H	-0.73	0.33	Array	WAR	TPR	NBC
95	104	39	90	0.07	6	WAR	04H	-0.76		Bobbin			CBA
95	104	39	90	0.29	13	VOL	04H	-0.7	0.31	Array	WAR	TPR	
96	105	45	90	0.12	10	WAR	05H	-0.78		Bobbin			CBA
96	105	45	90	0.41	15	VOL	05H	-0.72	0.34	Array	WAR	TPR	
97	106	41	91	0.1	9	WAR	04H	-0.78		Bobbin			CBA
97	106	41	91	0.48	16	VOL	04H	-0.73	0.28	Array	WAR	TPR	
97	107	41	91	0.34	14	VOL	05C	-0.7	0.25	Array	WAR	TPR	
97	107	41	91	0.12	10	WAR	05C	-0.67		Bobbin			CBA
97	108	41	91	0.37	15	VOL	05H	-0.73	0.27	Array		TPR	NBC
97	109	41	91	0.35	14	VOL	06H	-0.73	0.78	Array		TPR	NBC
98	110	42	91	0.36	14	VOL	05C	-0.73	0.25	Array	WAR	TPR	
98	110	42	91	0.09	8	WAR	05C	-0.42		Bobbin			CBA
99	111	44	91	0.31	14	VOL	05H	-0.78	0.33	Array	WAR	TPR	NBC
100	112	38	93	0.12	10	WAR	04H	0.31		Bobbin			CBA
100	112	38	93	0.47	16	VOL	04H	0.36	0.45	Array	WAR	TPR	
101	113	41	93	0.1	9	WAR	05H	-0.78		Bobbin			CBA
101	113	41	93	0.61	18	VOL	05H	-0.73	0.33	Array	WAR	TPR	
102	114	43	93	0.26	13	VOL	04H	-0.73	0.82	Array		TPR	NBC
102	115	43	93	0.36	14	VOL	05H	0.31	0.45	Array		TPR	NBC
103	116	39	94	0.09	8	WAR	05H	-0.79		Bobbin			CBA
103	116	39	94	0.34	14	VOL	05H	-0.76	0.34	Array	WAR	TPR	
104	117	41	94	0.15	13	WAR	04H	-0.78		Bobbin			CBA
104	117	41	94	0.47	16	VOL	04H	-0.73	0.34	Array	WAR	TPR	
105	118	28	96	0.37	15	VOL	04H	-0.7	0.28	Array		TPR	NBC
106	119	28	97	0.36	14	VOL	04H	-0.75	0.54	Array		TPR	NBC

TABLE 4

Steam Generator 22 Less Than 20% Through Wall

TUBE #	IND #	ROW	COL	VOLTS	PCT	IND	LOC	ELEV	LENGTH	PROBE	UTIL1	UTIL2	UTIL3
107	120	38	97	0.12	10	WAR	04H	-0.76		Bobbin			CBA
107	120	38	97	0.22	12	VOL	04H	-0.67	0.64	Array	WAR	TPR	
108	121	39	97	0.33	14	VOL	05H	-0.75	0.37	Array		TPR	NBC
109	122	26	98	0.39	15	VOL	05C	-0.73	0.4	Array	WAR	TPR	
109	122	26	98	0.1	9	WAR	05C	-0.67		Bobbin			CBA
110	123	32	98	0.34	14	VOL	04H	0.34	0.28	Array	WAR	TPR	
110	123	32	98	0.13	11	WAR	04H	0.34		Bobbin			CBA
111	124	28	99	0.34	14	VOL	05H	-0.76	0.42	Array		TPR	NBC
112	125	32	99	0.26	13	VOL	05H	-0.73	0.37	Array		TPR	NBC
113	126	37	99	0.06	6	WAR	05H	-0.83		Bobbin			CBA
113	126	37	99	0.43	15	VOL	05H	-0.75	0.36	Array	WAR	TPR	
114	127	8	100	0.26	13	VOL	03H	-0.89	0.34	Array	WAR	TPR	
114	127	8	100	0.2	16	WAR	03H	-0.83		Bobbin			CBA
115	128	36	100	0.08	7	WAR	05H	-0.83		Bobbin			CBA
115	128	36	100	0.41	15	VOL	05H	-0.75	0.39	Array	WAR	TPR	
116	129	21	101	0.13	11	WAR	05C	0.45		Bobbin			NCA
117	130	30	101	0.38	15	VOL	05H	0.34	0.48	Array		TPR	NBC
118	131	30	102	0.08	7	WAR	04H	-0.79		Bobbin			CBA
118	131	30	102	0.44	16	VOL	04H	-0.7	0.28	Array	WAR	TPR	
119	132	32	102	0.07	6	WAR	05H	-0.79		Bobbin			CBA
119	132	32	102	0.27	13	VOL	05H	-0.73	0.45	Array	WAR	TPR	
120	133	33	102	0.37	15	VOL	04H	-0.73	0.28	Array		TPR	NBC
121	134	31	103	0.33	14	VOL	05C	-0.76	0.28	Array	WAR	TPR	
121	134	31	103	0.09	8	WAR	05C	-0.7		Bobbin			CBA
122	135	28	104	0.44	16	VOL	05C	-0.73	0.42	Array	WAR	TPR	
122	135	28	104	0.33	14	VOL	05C	-0.73	0.28	Array	WAR	TPR	
122	135	28	104	0.19	15	WAR	05C	-0.67		Bobbin			CBA
123	136	30	104	0.55	17	VOL	05C	-0.73	0.45	Array	WAR	TPR	
123	136	30	104	0.15	13	WAR	05C	-0.67		Bobbin			CBA
124	137	28	105	0.46	16	VOL	04C	-0.75	0.3	Array		TPR	NBC
125	138	26	106	0.41	15	VOL	05C	-0.73	0.34	Array	WAR	TPR	
125	138	26	106	0.11	10	WAR	05C	-0.64		Bobbin			CBA
126	139	27	106	0.36	14	VOL	05C	-0.73	0.33	Array		TPR	NBC
127	140	22	107	0.09	8	WAR	05H	-0.97		Bobbin			CBA
127	140	22	107	0.34	14	VOL	05H	-0.78	0.33	Array	WAR	TPR	
128	141	26	107	0.36	14	VOL	05C	-0.73	0.28	Array		TPR	NBC
129	142	13	108	0.32	9	VOL	04C	-0.72	0.22	Array	WAR	TPR	NBC
129	143	13	108	0.32	14	VOL	05C	-0.67	0.31	Array	WAR	TPR	
129	143	13	108	0.08	7	WAR	05C	-0.64		Bobbin			CBA
130	144	14	109	0.42	15	VOL	04C	-0.67	0.33	Array	WAR	TPR	NBC
131	145	21	109	0.2	16	WAR	05H	0.31		Bobbin			CBA
131	145	21	109	0.65	18	VOL	05H	0.31	0.34	Array	WAR	TPR	

TABLE 4**Steam Generator 22 Less Than 20% Through Wall**

TUBE #	IND #	ROW	COL	VOLTS	PCT	IND	LOC	ELEV	LENGTH	PROBE	UTIL1	UTIL2	UTIL3
132	146	17	110	0.32	14	VOL	05H	-0.76	0.31	Array	WAR	TPR	NBC
133	147	13	111	0.07	7	WAR	05H	-0.75		Bobbin			CBA
133	147	13	111	0.41	15	VOL	05H	-0.75	0.37	Array	WAR	TPR	
134	148	16	111	0.13	11	WAR	05H	-0.95		Bobbin			CBA
134	148	16	111	0.62	18	VOL	05H	-0.7	0.36	Array	WAR	TPR	
135	149	6	112	0.33	14	VOL	04C	-0.71	0.29	Array	WAR	TPR	NBC
136	150	7	112	0.54	17	VOL	05H	0.28	0.56	Array	WAR	TPR	
136	150	7	112	0.16	13	WAR	05H	0.28		Bobbin			CBA
137	151	6	113	0.69	19	VOL	04H	-0.71	0.61	Array	WAR	TPR	
137	151	6	113	0.24	18	WAR	04H	-0.66		Bobbin			CBA

TABLE 5**Steam Generator 21 Greater Than or Equal To 20% Through Wall**

TUBE #	IND #	ROW	COL	VOLTS	PCT	IND	LOC	ELEV	LENGTH	PROBE	UTIL1	UTIL2	UTIL3
1	1	43	23	0.13	11	WAR	02C	0.4		Bobbin			CBA
1	1	43	23	0.91	21	VOL	02C	0.43	0.75	Array	WAR	TPR	
2	2	54	56	0.59	18	VOL	03H	0.43	0.8	Array	WAR	TPR	
2	2	54	56	0.11	10	WAR	03H	0.43		Bobbin			CBA
2	3	54	56	0.92	21	VOL	04C	0.35	0.74	Array	WAR	TPR	
2	3	54	56	0.15	13	WAR	04C	0.37		Bobbin			CBA
2	4	54	56	0.13	11	WAR	04H	-0.64		Bobbin			CBA
2	4	54	56	0.5	16	VOL	04H	-0.56	0.67	Array	WAR	TPR	
2	5	54	56	0.49	16	VOL	07H	-0.67	0.77	Array	WAR	TPR	
2	5	54	56	0.12	10	WAR	07H	-0.24		Bobbin			CBA
3	6	55	57	0.13	11	WAR	06C	0.29		Bobbin			CBA
3	6	55	57	0.88	21	VOL	06C	0.32	0.99	Array	WAR	TPR	
4	7	55	61	0.18	15	WAR	02C	-0.58		Bobbin			CBA
4	7	55	61	0.58	17	VOL	02C	-0.37	0.93	Array	WAR	TPR	
4	8	55	61	1.08	22	VOL	04C	-0.05	1.38	Array	WAR	TPR	
4	8	55	61	0.18	15	WAR	04C	0.42		Bobbin			CBA
4	9	55	61	0.1	9	WAR	05C	0.44		Bobbin			CBA
4	9	55	61	0.5	16	VOL	05C	0.44	0.81	Array	WAR	TPR	
4	10	55	61	0.5	16	VOL	06C	0.35	0.83	Array	WAR	TPR	
4	10	55	61	0.08	7	WAR	06C	0.4		Bobbin			CBA

TABLE 6**Steam Generator 22 Greater Than or Equal To 20% Through Wall**

TUBE #	IND #	ROW	COL	VOLTS	PCT	IND	LOC	ELEV	LENGTH	PROBE	UTIL1	UTIL2	UTIL3
1	1	54	55	0.83	20	VOL	06H	-0.73	0.81	Array	WAR	TPR	
1	1	54	55	0.19	15	WAR	06H	-0.67		Bobbin			CBA
2	2	55	55	0.21	16	WAR	04C	-0.72		Bobbin			CBA
2	2	55	55	0.38	15	VOL	04C	-0.7	0.61	Array	WAR	TPR	
2	3	55	55	1.08	22	VOL	07H	-0.7	0.51	Array	WAR	TPR	
2	3	55	55	0.3	21	WAR	07H	-0.67		Bobbin			CBA
3	4	20	110	0.49	16	VOL	05H	0.31	0.33	Array	WAR	TPR	NBC
3	5	20	110	0.29	21	WAR	06H	0.28		Bobbin			CBA
3	5	20	110	0.63	18	VOL	06H	0.33	0.41	Array	WAR	TPR	
4	6	4	113	0.84	20	VOL	04C	0.37	0.76	Array	WAR	TPR	
4	6	4	113	0.12	10	WAR	04C	0.37		Bobbin			CBA

TABLE 7**Steam Generator 21 Preventive Plugging**

TUBE #	IND #	ROW	COL	VOLTS	PCT	IND	LOC	ELEV	LENGTH	PROBE	UTIL1	UTIL2	UTIL3
1	1	42	58	0.53	17	VOL	05H	0.36	0.3	Array	WAR	TPR	
1	1	42	58	0.39	26	WAR	05H	0.42		Bobbin			CBA

TABLE 8
Steam Generator 22 Preventive Plugging

TUBE #	IND #	ROW	COL	VOLTS	PCT	IND	LOC	ELEV	LENGTH	PROBE	UTIL1	UTIL2	UTIL3
1	1	54	54	1.44	25	VOL	07H	-0.73	0.93	Array	WAR	TPR	
1	1	54	54	0.33	23	WAR	07H	-0.7		Bobbin			CBA
1	2	54	54	0.5	16	VOL	08H	-0.76	0.62	Array	WAR	TPR	
1	2	54	54	0.14	12	WAR	08H	-0.75		Bobbin			CBA
2	3	55	56	0.1	9	WAR	01H	-0.53		Bobbin			CBA
2	3	55	56	0.53	17	VOL	01H	-0.5	0.33	Array	WAR	TPR	
2	4	55	56	0.12	10	WAR	02C	0.42		Bobbin			CBA
2	4	55	56	0.53	17	VOL	02C	0.47	0.42	Array	WAR	TPR	
2	5	55	56	0.1	9	WAR	03C	-0.92		Bobbin			CBA
2	5	55	56	0.3	13	VOL	03C	-0.7	0.53	Array	WAR	TPR	
2	6	55	56	1.34	24	VOL	07H	-0.73	0.82	Array	WAR	TPR	
2	6	55	56	0.29	21	WAR	07H	-0.67		Bobbin			CBA
3	7	55	57	0.36	24	WAR	01H	-0.53		Bobbin			CBA
3	7	55	57	1.29	24	VOL	01H	-0.53	0.97	Array	WAR	TPR	
3	8	55	57	0.09	8	WAR	02C	0.42		Bobbin			CBA
3	8	55	57	0.6	18	VOL	02C	0.47	0.48	Array	WAR	TPR	
3	9	55	57	2.35	31	VOL	07H	-0.7	0.98	Array	WAR	TPR	
3	9	55	57	0.55	31	WAR	07H	-0.67		Bobbin			CBA
4	10	55	61	0.36	24	WAR	02C	0.5		Bobbin			CBA
4	10	55	61	1.04	22	VOL	02C	0.53	0.58	Array	WAR	TPR	
5	11	54	62	1.49	25	VOL	02C	0.45	0.75	Array	WAR	TPR	
5	11	54	62	0.3	21	WAR	02C	0.53		Bobbin			CBA

- e. *Number of tubes plugged during the inspection outage for each degradation mechanism,*

Table 9 provides the number of tubes plugged during 2R32.

TABLE 9

MECHANISM	SG 21	SG 22
AVB Wear	0	0
TSP Wear	1	5

- f. *The number and percentage of tubes plugged to date, and the effective plugging percentage in each steam generator, and*

Table 10 provides the total number and percentage of tubes plugged to date. No tubes were plugged during the RSG manufacturing or prior to service.

TABLE 10

PLUGGING	SG 21	SG 22
TOTAL	3	12
PERCENT	0.06%	0.25%

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

The deepest AVB wear indication reported during 2R32 was 12%TW as reported from the X-Probe™. The condition monitoring (CM) limit (probabilistically determined, using Monte Carlo simulations to apply tube material, relation, and ETSS depth uncertainties at 0.95 probability and 50% confidence level (95/50)) for flat (uniformly deep) AVB wear is 45.7%TW for the array probe. As the deepest indication is of lesser depth than the CM limit, CM is satisfied.

The deepest TSP wear indication reported during 2R32 was 31%TW tapered wear as reported from both the bobbin and the X-Probe™. The tapered wear TSP CM limit (probabilistically determined, using Monte Carlo simulations to apply tube material, relation, and ETSS depth uncertainties at 0.95 probability and 50% confidence level (95/50)) is 60.1%TW for the bobbin and 64.2% for the array probe. As the deepest indication is of lesser depth than the CM limits, CM is satisfied.

Additionally, an OA was performed that predicts a projected depth of:

- 33.1% for the largest AVB wear indication returned to service,
- 37.8% for the largest undetected AVB wear indication,
- 52.3% for the largest TSP wear indication returned to service,
- 50.2% for the largest undetected TSP wear indication,

all based on the array coil after an 8.0 EFPY operating interval. The OA also concludes that the structural and leakage integrity performance criteria will be maintained for both a 3- and 4-cycle inspection interval for all degradation

mechanisms observed. The OA calculations use a conservative simplified analysis technique with a mixed strategy of projecting the worst-case degraded tube and combining uncertainties. NDE uncertainties are applied at the 95th percentile to the largest flaw left in service. Growth rates are determined using the 95th percentile of site-specific point-to-point growth data between the previous and current inspection, or conservatively determined from historical site-specific data and new indication growth data that produces a higher growth rate than observed from the current point-to-point results. Undetected flaws are considered in the OA with an assumed depth equal to the 95th percentile using MAPOD software with EPRI ETSS specific voltage-depth correlation and bounding site-specific noise measurements from the current inspection inputs.

A top of tubesheet deposit cleaning process was performed in all SGs during Prairie Island U2R32. There are two main purposes of the cleaning process. The first is to remove hardened deposits that tend to form at the top of the tubesheet and the second is to force and filter out any loose parts or foreign objects that have migrated to the SG secondary side during operation. The mass of deposit material and debris removed by the top of tubesheet cleaning process was 10.75 lbs. in SG21 and 8.44 lbs. in SG22. Review of the system in-line filters was performed following the tubesheet cleaning process. There were no metallic objects deposited on the filter. The subsequent secondary side visual inspections showed the tubesheet to be essentially free of deposits with only a limited hard sludge pile region present in hot legs of both SG's spanning several tubes in the low flow region near the center of the bundle. In addition, a wire was discovered and retrieved during the FOSAR evolution. The wire (presumed to be wire feed filler metal from welding during SG fabrication) did not cause any tube damage based on visual and follow-up eddy current testing with the combination bobbin/array probe.

Visual inspections were performed of the SG channel head bowl in both SGs. These inspections are performed based on industry operating experience and guideline requirements. Visual inspections of the SG hot leg and cold leg divider plate, inclusive of the entire divider plate to channel head weld and all visible clad surfaces, were performed in accordance with the latest revision of Westinghouse NSAL-12-1. This inspection was performed using the SG manway channel head bowl cameras. Satisfactory inspection results were observed in both SGs with no indications of corrosion or cladding damage observed. Further, all previously installed tube plugs were also visually inspected by remote video camera from the primary side in each SG. The inspection results were satisfactory and showed no indication of tube plug leakage or failure.

LEGEND OF FIELDS AND CODES

<u>FIELD</u>	<u>EXPLANATION</u>
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 through wall
IND	Three Digit Code - see below
LOC	Location of landmark - see below
ELEV	Measurement in inches from the center of the landmark to the center of the indication
LENGTH	Calculated Indication Length
PROBE	Probe Coil Type – Array, Bobbin or +Point™
UTIL1	Clarifying Codes – see below
UTIL2	Clarifying Codes – see below
UTIL3	Clarifying Codes – see below

<u>FIELD</u>	<u>CODE</u>	<u>EXPLANATION</u>
IND	AVB	Anti-Vibration Bar
	VOL	Volumetric
	WAR	Wear
LOC	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
UTIL1	DQA	Data Quality Acceptable
	D L	Data Quality Acceptable and Limited Array Coverage
	WAR	Wear
UTIL2	TPR	Tapered wear
	LAC	Limited Array Coverage
UTIL3	CBA	Confirmed By Array coil
	LAC	Limited Array Coverage
	NBC	No Bobbin Call
	NCA	Not Confirmed by Array coil