ROCHESTER GAS & ELECTRIC CORPORATION
RESEARCH AND SCIENCES DEPARTMENT
MATERIALS ENGINEERING DIVISION

1986 STEAM GENERATOR EDDY CURRENT

EXAMINATION SUMMARY REPORT

FOR

R.E. GINNA NUCLEAR POWER PLANT

MARCH 1, 1986

PREPARED BY: _____ DATE: 3-1-86
G.L. Henry, NDE Technician, Materials Engineering
Level II ET

PREPARED BY: _____ DATE: 3-3-86
T.F. Snell, NDE Technician, Materials Engineering
Level II ET

APPROVED BY: _____ DATE: 3-3-86
A.E. Curtis III, Manager, Materials Engineering
Level III Examiner

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1.0 INTRODUCTION

The following report is a summary of the results of the multifrequency eddy current examination performed during the February 1986 Annual Refueling and Maintenance Outage at the R.E. Ginna Nuclear Power Station. The examination was performed on both the "A" and "B" recirculating steam generators which are Westinghouse Series-44 design, containing 3260 Inconel tubes having a nominal 0.875" O.D. by 0.050" wall thickness.

The examination was performed by Rochester Gas & Electric (RG&E) personnel that have been trained and qualified in the eddy current method to at least a Level I certification. Other personnel support during data acquisition was provided by Westinghouse Electric Corporation and the Babcock & Wilcox Company (B&W). The initial data analysis review was performed by a team of ZETEC personnel. An independent data analysis review was performed by RG&E and B&W personnel subsequent to the Zetec analysis. The data analysis was performed, by both teams, utilizing the Zetec DDA-4 Digital Data Analysis System. In addition, Westinghouse Electric Corporation's Intelligent Eddy Current Data Analysis System (IEDA) was utilized as a third review of the data as part of an RG&E Research and Development Project. Final resolutions of all data analysis performed by RG&E Level II and III personnel.

The purpose of the eddy current examination was to assess any corrosion or mechanical damage that may have occurred during the operation cycle since April 1985. Particular attention was given to detecting intergranular attack (IGA) and stress corrosion cracking (SCC) in the tubesheet crevice region; pitting and wastage between the tubesheet and first tube support plate; denting and wear fretting at the antivibration bar to tube intersections in the U-bend region.

2.0 DATA ACQUISITION PROGRAM

The eddy current examination of the "A" & "B" steam generators was performed utilizing the Zetec MIZ-18 Digital Data Acquisition System. The frequencies selected were 400, 200, 100 and 15kHz, all of which were run in the differential and absolute modes. The examination was performed primarily with a standard 0.740" - 0.720" O.D. bobbin coil with smaller diameter probes used to traverse the smaller radius U-bends.

Prior to the examination of the steam generators, a program was established for each leg (inlet and outlet) of both the "A" and "B" steam generator. The philosophy in generating this program is to provide 100% examination of each steam generator up to the first tube support plate along with one fifth of the tubes being selected for a full length inspection. This will provide 100% inspection of all tubes every five years. Table I is a breakdown, by steam generator, of all tubes examined and to the extent tested.

STEAM GENERATOR "A"

1986 EDDY CURRENT EXAMINATION PROGRAM

PRIOR TO CORRECTIVE ACTION

EXTENT TESTED	NUMBER OF TUBES	PERCENTAGE
FULL LENGTH	612	18.8%
PART LENGTH FROM INLET		
#1 TSP H	2240	68.7%
#2 TSP H	248	7.6%
#3 TSP H	24	0.7%
#4 TSP H	6	0.2%
#5 TSP H	0	0.0%
#6 TSP H	4	0.1%
SLEEVED TUBES	6	100.0%
TUBES PERMANENTLY PLUGGED	126	3.9%
PART LENGTH FROM OUTLET		
#1 TSP C	0	0.0%
#2 TSP C	0	0.0%
#3 TSP C	0	0.0%
#4 TSP C	0	0.0%
#5 TSP C	0	0.0%
#6 TSP C	9	0.3%
U-BEND	0	0.0%
#6 TSP H	2	0.1%
#5 TSP H	0	0.0%
#4 TSP H	0	0.0%
#3 TSP H	0	0.0%
#2 TSP H	0	0.0%
#1 TSP H	0	0.0%
HTS	0	0.0%

TABLE 1

STEAM GENERATOR "B"

1986 EDDY CURRENT EXAMINATION PROGRAM

PRIOR TO CORRECTIVE ACTION

EXTENT TESTED	NUMBER OF TUBES	PERCENTAGE
FULL LENGTH	703	21.6%
PART LENGTH FROM INLET		
#1 TSP H	2293	70.3%
#2 TSP H	14	0.4%
#3 TSP H	1	<0.1%
#4 TSP H	0	0.0%
#5 TSP H	1	<0.1%
#6 TSP H	59	1.8%
SLEEVED TUBES	171	100.0%
TUBES PERMANENTLY PLUGGED	177	5.4%
PART LENGTH FROM OUTLET		
#1 TSP C	0	0.0%
#2 TSP C	0	0.0%
#3 TSP C	0	0.0%
#4 TSP C	0	0.0%
#5 TSP C	0	0.0%
#6 TSP C	63	1.9%
U-BEND	0	0.0%
#6 TSP H	4	0.1%
#5 TSP H	0	0.0%
#4 TSP H	0	0.0%
#3 TSP H	0	0.0%
#2 TSP H	0	0.0%
#1 TSP H	0	0.0%
HTS	0	0.0%
SLEEVE END	159	93.0%

TABLE 1 (CON'T)

3.0 DATA ANALYSIS RESULTS SUMMARY

The initial and independent review data analysis was performed using the Zetec DDA-4 Digital Data Analysis System. Edition 18.1 of the data analysis software was used to analyze data from the MIZ-18 digital data acquisition system. This system provides on-line data digitization and storage on to a magnetic data cartridge. All digital data (up to 8 channels) is sent directly to the HP-9836 computer from the data cartridge recorder. The tube number identification is encoded on the data cartridge. A message block is available should any comments be desired during data acquisition.

All data cartridges were reviewed by displaying the 400 kHz data on the CRT along with the vertical component of the differential and absolute mix outputs in strip chart form. Other frequencies and their components were selected as needed for final resolution. All recordable indications were logged into the computer and stored on floppy disk. The final report form summarizing all crevice and $\geq$20% TWD indications for each steam generator (inlet and outlet) can be found in this section. An explanation of the abbreviations and nomenclature used on these lists has been compiled for ease of interpretation.

Table II has been compiled to show a list of the total number of dents at each axial elevation and a breakdown of defects by percent TWD. The dent indications on this table are only those with signal amplitude of 5 volts and greater, which would approximate about a 0.025" dent on the diameter of the tube.

S/G "A" DENT & DEFECT LOG

FEBRUARY 1986 INSPECTION

INLET		OUTLET	
DENTS:		**DENTS:**	
HTS-HID	- 9	CTS-HID	- 0
HTS	- 242	CTS	- 3
HTS-1H	- 6	CTS-1C	- 3
1H	- 230	1C	- 6
1H-2H	- 4	1C-2C	- 0
2H	- 17	2C	- 5
2H-3H	- 0	2C-3C	- 1
3H	- 0	3C	- 1
3H-4H	- 0	3C-4C	- 0
4H	- 1	4C	- 3
4H-5H	- 0	4C-5C	- 0
5H	- 10	5C	- 1
5H-6H	- 2	5C-6C	- 1
6H	- 117	6C	- 7
>6H	- 1	>6C	- 0
AVB1	- 0	AVB4	- 0
>AVB1	- 0	>AVB4	- 0
AVB2	- 0	AVB3	- 0
>AVB2	- 0	>AVB3	- 0
TOTAL DENTS	- 639	TOTAL DENTS	- 31
DEFECTS:		**DEFECTS:**	
0-19%	- 416	0-19%	- 124
20-29%	- 145	20-29%	- 12
30-39%	- 16	30-39%	- 1
40-49%	- 1	40-49%	- 0
50-59%	- 0	50-59%	- 0
60-69%	- 0	60-69%	- 0
70-79%	- 1	70-79%	- 0
80-89%	- 0	80-89%	- 0
90-100%	- 0	90-100%	- 0
TOTAL DEFECTS	- 579	TOTAL DEFECTS	- 137

TABLE 2

S/G "B" DENT & DEFECT LOG

FEBRUARY 1986 INSPECTION

INLET			OUTLET		
DENTS:			DENTS:		
HTS-MID	-	6	CTS-MID	-	0
HTS	-	303	CTS	-	61
HTS-1H	-	7	CTS-1C	-	0
1H	-	21	1C	-	4
1H-2H	-	1	1C-2C	-	0
2H	-	0	2C	-	8
2H-3H	-	0	2C-3C	-	0
3H	-	0	3C	-	1
3H-4H	-	0	3C-4C	-	0
4H	-	0	4C	-	1
4H-5H	-	0	4C-5C	-	0
5H	-	1	5C	-	1
5H-6H	-	0	5C-6C	-	0
6H	-	36	6C	-	10
>6H	-	0	>6C	-	62
AVB1	-	0	AVB4	-	1
>AVB1	-	0	>AVB4	-	0
AVB2	-	0	AVB3	-	0
>AVB2	-	0	>AVB3	-	0
TOTAL DENTS	-	375	TOTAL DENTS	-	149
DEFECTS:			DEFECTS:		
0-19%	-	265	0-19%	-	75
20-29%	-	32	20-29%	-	1
30-39%	-	7	30-39%	-	2
40-49%	-	2	40-49%	-	0
50-59%	-	4	50-59%	-	0
60-69%	-	5	60-69%	-	0
70-79%	-	13	70-79%	-	0
80-89%	-	12	80-89%	-	0
90-100%	-	9	90-100%	-	0
SQR	-	4			
TOTAL DEFECTS	-	353	TOTAL DEFECTS	-	78

TABLE 2 (CON'T)

LIST OF > 20% INDICATION AND CREVICE INDICATION NOMENCLATURE

Top of List Information

SG - Steam Generator and Leg (ie: 1 = A, 2 = B and 1 = Inlet, 2 = Outlet)

ROW - ROW number from the tube identification.

COL - Column number from the tube identification.

VOLTS - P-P amplitude of the measured indication signal response.

% - Percent through wall from O.D. based on measured signal.

CH# - Channel from which indication was determined.

LOCATION - Location of indication relative to tubesheet or support plate.

INDEX - Location of tube data on data disk.

Information Under %

<20 - Measurable indication less than 20% through wall (IGA-SCC).

>40 - Absolute indication measured from absolute mix where depth determination could not be accurately performed (IGA only).

SQR - Multiple indications interferring with a depth determination (IGA-SCC).

DS - Distorted roll transition indication that cannot be confirmed or measured.

XX - The measure percent through wall of the deepest penetration (SCC) within an IGA patch or area.

TWD - Through Wall Dimension

Information Under CH#

1 - Indication determined and measured with 400 kHz differential for final interpretation.

M2 - Indication determined with absolute mix, depth cannot be accurately determined, but based upon amplitude is felt to be above 40% IGA.

LIST OF >20% INDICATION AND CREVICE INDICATION NOMENCLATURE (CON'T)

Information Under LOCATION

HTS - Secondary face of inlet tubesheet.

TSP - Tube Support Plate

CTS - Secondary face of outlet tubesheet.

-XX.X - Depth below the secondary face of the tubesheet or support plates where the indication is located.

+XX.X - Height above the secondary face of the tubesheet or support plates where the indication is located.

PLANT : RG&E - GINNA
OUTAGE : RG&E 1986 SGA

STEAM GENERATOR : A
INSPECTED FROM : BOTH HL&CL

REPORT : TUBES WITH INDICATIONS 20% OR GREATER

ABW - Anti-Vibration Bar Wear
CHT - Chatter
CKS - Cracked Support Plate
DNG - Ding
DTS - Distorted Tube Sheet
FRT - Fretting
IGA - Intergranular Attack
MGV - Machining Groove
NDD - No Detectable Defects
OBS - Obstructed
PRM - Permeability
RPG - Removed Plug
SLG - Sludge
TPG - Template Plug
UBC - U-Bend Crack
WTH - Wall Thinning
1&2 - B&W Sleeve Tapes

BLG - Bulge
CPR - Copper
DNT - Dent
DRT - Distorted Roll Transition
DSP - Distorted Tube Support Plate
INC - Incomplete Test
SCC - Stress Corrosion Crack
MAG - Magnetite
NSY - Noisy Tube
PPG - Permanent Plug
PIT - Pitting
SLV - Sleeved
SQR - Squirrel
TBR - To Be Rerun
UDS - Undefined Signal
WAS - Wastage

ROW	COL	VOLTS	DEG	IND	CH	ELEV		INCHES	COMMENTS	EXTENT	REEL	PS	ID
7	20	1.54	158	23	1	HTS	+	2.5		#1 TSP H	2	740	HL
7	20	2.14	162	20	1	HTS	+	1.9		#1 TSP H	2	740	HL
8	20	1.52	161	20	1	HTS	+	2.2		#1 TSP H	2	740	HL
8	20	1.43	162	20	1	HTS	+	1.8		#1 TSP H	2	740	HL
8	21	2.47	158	23	1	HTS	+	1.9		#1 TSP H	2	740	HL
9	21	2.81	150	29	1	HTS	+	2.2		#1 TSP H	2	740	HL
10	21	1.01	159	22	1	HTS	+	2.0		#1 TSP H	2	740	HL
11	21	4.15	151	29	1	HTS	+	2.0		#1 TSP H	2	740	HL
13	21	2.66	158	23	1	HTS	+	2.5		#1 TSP H	2	740	HL
14	21	2.16	159	22	1	HTS	+	1.7		#1 TSP H	2	740	HL
15	21	3.98	149	30	1	HTS	+	1.6		#1 TSP H	2	740	HL
16	21	2.91	153	27	1	HTS	+	1.1		#1 TSP H	2	740	HL
17	21	1.93	149	30	1	HTS	+	1.2		#1 TSP H	2	740	HL
10	22	2.15	162	20	1	HTS	+	3.1		#1 TSP H	2	740	HL
11	22	2.77	157	24	1	HTS	+	2.5		#1 TSP H	2	740	HL
12	22	2.08	157	24	1	HTS	+	1.8		#1 TSP H	2	740	HL
14	22	3.59	159	22	1	HTS	+	2.0		#1 TSP H	2	740	HL
15	22	3.30	157	24	1	HTS	+	2.0		#1 TSP H	2	740	HL
18	22	3.28	155	25	1	HTS	+	1.2		#1 TSP H	2	740	HL
19	22	1.52	158	23	1	HTS	+	0.9		#1 TSP H	2	740	HL
12	23	4.70	158	23	1	HTS	+	2.8		#1 TSP H	2	740	HL
12	23	2.70	158	23	1	HTS	+	2.1		#1 TSP H	2	740	HL
13	23	8.83	150	29	1	HTS	+	3.2		#1 TSP H	2	740	HL
14	23	4.43	156	25	1	HTS	+	3.0		#1 TSP H	2	740	HL
21	23	2.56	156	25	1	HTS	+	1.5		#1 TSP H	2	740	HL
21	23	1.83	156	25	1	HTS	+	0.9		#1 TSP H	2	740	HL
10	24	1.84	162	20	1	HTS	+	1.9		#6 TSP H	2	740	HL
11	24	2.16	159	22	1	HTS	+	2.8		#6 TSP H	2	740	HL
12	24	4.10	161	20	1	HTS	+	2.8		#6 TSP H	2	740	HL
13	24	5.23	156	25	1	HTS	+	2.7		#6 TSP H	2	740	HL
12	25	3.72	157	23	1	HTS	+	2.4		#6 TSP H	3	740	HL
13	25	3.88	146	32	1	HTS	+	2.3		#6 TSP H	3	740	HL
14	25	7.55	153	26	1	HTS	+	2.7		#6 TSP H	3	740	HL
17	25	6.86	150	29	1	HTS	+	2.3		#6 TSP H	3	740	HL
17	25	2.82	161	20	1	HTS	+	2.9		#6 TSP H	3	740	HL
9	26	3.84	153	26	1	HTS	+	0.9		#6 TSP H	3	740	HL
21	26	3.80	152	27	1	HTS	+	1.9		#6 TSP H	3	740	HL
21	26	2.77	159	21	1	HTS	+	2.7		#6 TSP H	3	740	HL
23	26	1.27	152	27	1	HTS	+	1.8		#6 TSP H	3	740	HL
17	27	3.57	154	25	1	HTS	+	2.9		#6 TSP H	3	740	HL
17	27	3.53	149	30	1	HTS	+	2.3		#6 TSP H	3	740	HL
18	27	5.47	145	33	1	HTS	+	2.7		#6 TSP H	3	740	HL
22	27	5.42	151	28	1	HTS	+	1.9		#6 TSP H	3	740	HL
22	27	5.63	153	26	1	HTS	+	2.7		#6 TSP H	3	740	HL
24	27	2.10	156	24	1	HTS	+	1.6		#6 TSP H	3	740	HL
25	27	1.68	155	25	1	HTS	+	1.2		#6 TSP H	3	740	HL
14	28	1.58	160	21	1	HTS	+	2.1		#6 TSP H	3	740	HL
24	28	5.18	153	26	1	HTS	+	1.7		#6 TSP H	3	740	HL

PLANT : RG&E - GINNA
OUTAGE : RG&E 1986 SGA

STEAM GENERATOR : A
INSPECTED FROM : BOTH HL&CL

REPORT : TUBES WITH INDICATIONS 20% OR GREATER

ROW	COL	VOLTS	DEG	IND	CH	ELEV		INCHES	COMMENTS	EXTENT	REEL	PS	ID
15	29	4.02	150	29	1	HTS	+	3.0	WAS CPR	#6 TSP H	4	740	HL
24	29	3.11	153	26	1	HTS	+	1.3	WAS CPR	#6 TSP H	4	740	HL
23	30	4.73	153	26	1	HTS	+	1.8	WAS CPR	#6 TSP H	4	740	HL
24	30	3.83	149	30	1	HTS	+	1.4	WAS CPR*	#6 TSP H	4	740	HL
25	30	6.84	155	25	1	HTS	+	1.3	WAS CPR	#6 TSP H	4	740	HL
16	31	1.52	161	20	1	HTS	+	3.7	WAS	#6 TSP H	4	740	HL
23	31	4.54	147	31	1	HTS	+	2.5	WAS	#6 TSP H	4	740	HL
23	31	6.00	145	33	1	HTS	+	1.8	WAS	#6 TSP H	4	740	HL
24	31	4.49	147	31	1	HTS	+	1.6	WAS	#6 TSP H	4	740	HL
25	31	5.00	153	26	1	HTS	+	1.3	WAS	#6 TSP H	4	740	HL
26	31	2.54	161	20	1	HTS	+	1.1	WAS CPR	#6 TSP H	4	740	HL
26	31	2.37	157	21	1	CTS	+	1.7	WAS	#6 TSP H	14	720	CL
20	32	3.35	146	32	1	HTS	+	2.8	WAS	#6 TSP H	4	740	HL
22	32	8.03	149	30	1	HTS	+	1.8	WAS	#6 TSP H	4	740	HL
23	32	6.02	148	30	1	HTS	+	2.5	WAS	#6 TSP H	4	740	HL
24	32	6.20	154	25	1	HTS	+	1.6	WAS	#6 TSP H	4	740	HL
26	32	3.86	153	26	1	HTS	+	0.9	WAS CPR	#6 TSP H	4	740	HL
28	32	1.48	158	20	1	CTS	+	1.1	WAS	#6 TSP H	14	720	CL
21	33	3.13	156	20	1	HTS	+	2.0		#6 TSP H	5	740	HL
22	33	7.18	152	24	1	HTS	+	2.4		#6 TSP H	5	740	HL
23	33	6.20	150	26	1	HTS	+	2.2		#6 TSP H	5	740	HL
25	33	3.98	157	20	1	HTS	+	1.7		#6 TSP H	5	740	HL
19	34	2.19	143	32	1	HTS	+	2.1		#6 TSP H	5	740	HL
21	34	4.47	151	25	1	HTS	+	2.2		#6 TSP H	5	740	HL
23	34	3.66	153	23	1	HTS	+	2.6		#6 TSP H	5	740	HL
25	34	5.47	155	21	1	HTS	+	1.7		#6 TSP H	5	740	HL
26	34	5.22	154	22	1	HTS	+	1.2		#6 TSP H	5	740	HL
19	35	3.68	151	25	1	HTS	+	2.2		#6 TSP H	5	740	HL
21	35	4.68	155	21	1	HTS	+	2.2		#6 TSP H	5	740	HL
21	35	2.15	157	20	1	HTS	+	0.9		#6 TSP H	5	740	HL
22	35	4.04	153	23	1	HTS	+	1.6		#6 TSP H	5	740	HL
22	35	2.79	157	20	1	HTS	+	2.1		#6 TSP H	5	740	HL
23	35	4.92	153	23	1	HTS	+	2.6		#6 TSP H	5	740	HL
25	35	4.67	155	21	1	HTS	+	1.5		#6 TSP H	5	740	HL
26	35	4.27	157	20	1	HTS	+	1.2		#6 TSP H	5	740	HL
39	35	.26	122	33	1	#4 AVB	+	0.0	*P 61%ABW	#6 TSP H	15	720	CL
39	35	2.52	78	21	M 2	#3 AVB	+	0.0	ABW	#6 TSP H	15	720	CL
20	36	2.18	154	22	1	HTS	+	1.8		#6 TSP H	5	740	HL
21	36	4.21	154	22	1	HTS	+	2.3		#6 TSP H	5	740	HL
26	36	3.90	150	26	1	HTS	+	1.5		#6 TSP H	5	740	HL
27	36	5.01	145	30	1	HTS	+	1.5		#6 TSP H	5	740	HL
28	36	3.25	148	28	1	HTS	+	1.0	CPR WAS	#6 TSP H	6	740	HL
21	37	3.33	157	21	1	CTS	+	2.2	WAS	#6 TSP H	15	720	CL
21	37	5.81	152	25	1	HTS	+	1.8	WAS	#6 TSP H	6	740	HL
22	37	3.67	158	20	1	HTS	+	1.6	WAS	#6 TSP H	6	740	HL
24	37	4.81	157	20	1	HTS	+	2.1	WAS	#6 TSP C	6	740	HL
25	37	5.75	151	26	1	HTS	+	1.3	WAS	#6 TSP H	6	740	HL
26	37	4.80	156	21	1	HTS	+	2.1	WAS	#6 TSP H	6	740	HL
27	37	4.14	149	27	1	HTS	+	1.7	WAS	#6 TSP H	6	740	HL
24	38	4.30	147	29	1	HTS	+	2.2	WAS	#6 TSP H	6	740	HL
25	38	5.96	151	26	1	HTS	+	2.3	WAS	#6 TSP H	6	740	HL
27	38	3.55	149	27	1	HTS	+	1.9	WAS	#6 TSP H	6	740	HL
20	39	3.36	155	24	1	CTS	+	1.6		#6 TSP H	16	720	CL
20	39	3.89	158	20	1	CTS	+	2.2	CPR WAS	#6 TSP C	18	720	CL
21	39	4.29	157	22	1	CTS	+	1.8		#6 TSP H	16	720	CL
25	39	4.17	152	25	1	HTS	+	1.9	WAS*	#6 TSP H	6	740	HL
26	39	6.70	156	21	1	HTS	+	2.0	WAS	#6 TSP H	6	740	HL
26	39	6.70	156	21	1	HTS	+	2.0	WAS	#6 TSP H	6	740	HL
28	43	5.30	159	21	1	HTS	+	1.9		#1 TSP H	7	720	HL
29	44	5.49	158	22	1	HTS	+	1.3		#1 TSP H	7	720	HL
20	45	5.08	8	20	1	CTS	-	15.6	ID	#6 TSP C	18	720	CL
21	45	7.34	10	25	1	CTS	-	15.6	ID	#6 TSP C	18	720	CL
29	45	4.62	8	20	1	CTS	-	1.9	ID	#6 TSP C	18	720	CL
26	46	4.39	157	23	1	#1 TSP H	+	1.4		#1 TSP H	7	720	HL
20	47	4.93	11	26	1	CTS	-	16.3		#6 TSP H	22	720	CL

PLANT : RG&E - GINNA
OUTAGE : RG&E 1986 SGA

STEAM GENERATOR : A
INSPECTED FROM : BOTH HL&CL

REPORT : TUBES WITH INDICATIONS 20% OR GREATER

ROW	COL	VOLTS	DEG	IND	CH		ELEV		INCHES	COMMENTS	EXTENT	REEL	PS	ID
21	47	10.78	10	25	1	CTS		-	15.6	ID	#6 TSP C	18	720	CL
16	48	1.00	162	20	1	HTS		+	2.3	WAS	#1 TSP H	8	720	HL
26	48	5.83	162	20	1	HTS		+	1.4	CPR WAS	#1 TSP H	8	720	HL
28	48	7.31	158	23	1	HTS		+	1.0	WAS	#1 TSP H	8	720	HL
30	48	4.41	157	24	1	HTS		+	0.9	WAS	#1 TSP H	8	720	HL
31	48	2.65	162	20	1	HTS		+	0.8	WAS	#1 TSP H	8	720	HL
20	49	1.80	158	23	1	HTS		+	1.6		#1 TSP H	8	720	HL
26	49	3.13	160	21	1	HTS		+	1.6		#1 TSP H	8	720	HL
28	49	5.71	153	27	1	HTS		+	0.5		#3 TSP H	8	720	HL
28	49	4.80	155	25	1	HTS		+	1.4		#3 TSP H	8	720	HL
16	50	2.71	157	24	1	HTS		+	5.1		#2 TSP H	8	720	HL
23	50	0.43	155	25	1	HTS		+	0.7		#1 TSP H	8	720	HL
27	50	2.75	161	20	1	HTS		+	0.4		#1 TSP H	8	720	HL
28	50	2.26	162	20	1	HTS		+	1.6		#1 TSP H	8	720	HL
29	50	1.26	160	21	1	HTS		+	0.7		#1 TSP H	8	720	HL
29	50	1.15	156	24	1	HTS		+	1.1		#1 TSP H	8	720	HL
16	51	1.65	153	27	1	HTS		+	4.5		#1 TSP H	8	720	HL
17	51	2.53	159	22	1	HTS		+	0.6		#1 TSP H	8	720	HL
27	51	1.72	153	27	1	HTS		+	1.9		#1 TSP H	8	720	HL
28	51	3.19	161	20	1	HTS		+	1.3		#1 TSP H	8	720	HL
13	52	3.20	145	33	1	HTS		+	1.7		#1 TSP H	8	720	HL
15	52	0.47	158	23	1	HTS		+	4.1		#1 TSP H	8	720	HL
16	52	4.74	158	23	1	HTS		+	5.0		#2 TSP H	8	720	HL
16	53	2.66	157	24	1	HTS		+	4.8		#1 TSP H	8	720	HL
17	53	0.82	158	23	1	HTS		+	4.8		#1 TSP H	8	720	HL
17	53	0.82	138	38	1	HTS		+	3.8		#1 TSP H	8	720	HL
19	53	0.62	152	28	1	HTS		+	1.9		#1 TSP H	8	720	HL
29	53	2.11	160	21	1	HTS		+	0.9		#1 TSP H	8	720	HL
17	54	1.53	158	23	1	HTS		+	3.0		#1 TSP H	8	720	HL
17	54	0.83	156	24	1	HTS		+	0.7		#1 TSP H	8	720	HL
18	54	1.73	152	28	1	HTS		+	2.7		#1 TSP H	8	720	HL
16	55	4.19	158	23	1	HTS		+	4.0		#1 TSP H	8	720	HL
16	55	1.41	159	22	1	HTS		+	3.2		#1 TSP H	8	720	HL
22	57	7.07	149	26	1	HTS		+	1.7	WAS	#1 TSP H	9	720	HL
15	59	4.35	154	21	1	HTS		+	2.3		#1 TSP H	9	720	HL
15	61	4.86	155	20	1	HTS		+	2.1		#1 TSP H	9	720	HL
16	61	3.02	156	20	1	HTS		+	1.4		#1 TSP H	9	720	HL
19	61	3.48	148	27	1	HTS		+	1.6		#1 TSP H	9	720	HL
21	61	3.01	155	20	1	HTS		+	1.8		#1 TSP H	9	720	HL
15	62	4.37	155	20	1	HTS		+	1.9		#1 TSP H	9	720	HL
16	62	3.15	154	21	1	HTS		+	1.6		#1 TSP H	9	720	HL
20	62	3.03	153	22	1	HTS		+	1.7		#1 TSP H	9	720	HL
19	63	5.03	151	24	1	HTS		+	1.4		#1 TSP H	9	720	HL
17	64	4.40	155	20	1	HTS		+	1.6		#1 TSP H	10	720	HL
19	64	6.20	153	22	1	HTS		+	1.3		#1 TSP H	10	720	HL
18	66	4.67	152	23	1	HTS		+	1.8		#1 TSP H	10	720	HL
9	67	5.29	149	26	1	HTS		+	0.9		#1 TSP H	10	720	HL
19	67	3.10	156	20	1	HTS		+	1.5	CHT	#1 TSP H	10	720	HL
13	68	2.88	154	21	1	HTS		+	1.6		#1 TSP H	10	720	HL
16	68	4.58	155	20	1	HTS		+	2.0		#1 TSP H	10	720	HL
9	69	2.33	148	27	1	HTS		+	1.4		#1 TSP H	10	720	HL
6	70	2.75	154	21	1	HTS		+	0.9		#1 TSP H	10	720	HL
14	70	2.92	154	21	1	HTS		+	2.4		#1 TSP H	10	720	HL
6	71	4.43	154	21	1	HTS		+	1.0		#1 TSP H	10	720	HL
7	71	3.48	150	25	1	HTS		+	1.2		#1 TSP H	10	720	HL
9	72	5.44	158	23	1	HTS		+	1.4		#1 TSP H	11	720	HL
9	73	3.82	158	23	1	HTS		+	1.6		#2 TSP H	11	720	HL
12	73	5.64	153	28	1	HTS		+	1.1		#1 TSP H	11	720	HL
8	74	2.28	152	29	1	HTS		+	1.0		#3 TSP H	11	720	HL
12	76	1.58	161	20	1	HTS		+	00.5	WAS	#1 TSP H	11	720	HL
11	91	1.57	155	20	1	HTS		+	1.0		#1 TSP H	12	720	HL

END OF DATA

PLANT : RG&E - GINNA
OUTAGE : RG&E 1986 SGA

STEAM GENERATOR : A
INSPECTED FROM : HOT LEG

REPORT : TUBES REQUIRING CORRECTIVE ACTION

ABW - Anti-Vibration Bar Wear
CHT - Chatter
CKS - Cracked Support Plate
DNG - Ding
DTS - Distorted Tube Sheet
FRT - Fretting
IGA - Intergranular Attack
MGV - Machining Groove
NDD - No Detectable Defects
OBS - Obstructed
PRM - Permeability
RPG - Removed Plug
SLG - Sludge
TPG - Template Plug
UBC - U-Bend Crack
WTH - Wall Thinning
1&2 - B&W Sleeve Tapes

BLG - Bulge
CPR - Copper
DNT - Dent
DRT - Distorted Roll Transition
DSP - Distorted Tube Support Plate
INC - Incomplete Test
SCC - Stress Corrosion Crack
MAG - Magnetite
NSY - Noisy Tube
PPG - Permanent Plug
PIT - Pitting
SLV - Sleeved
SQR - Squirrel
TBR - To Be Rerun
UDS - Undefined Signal
WAS - Wastage

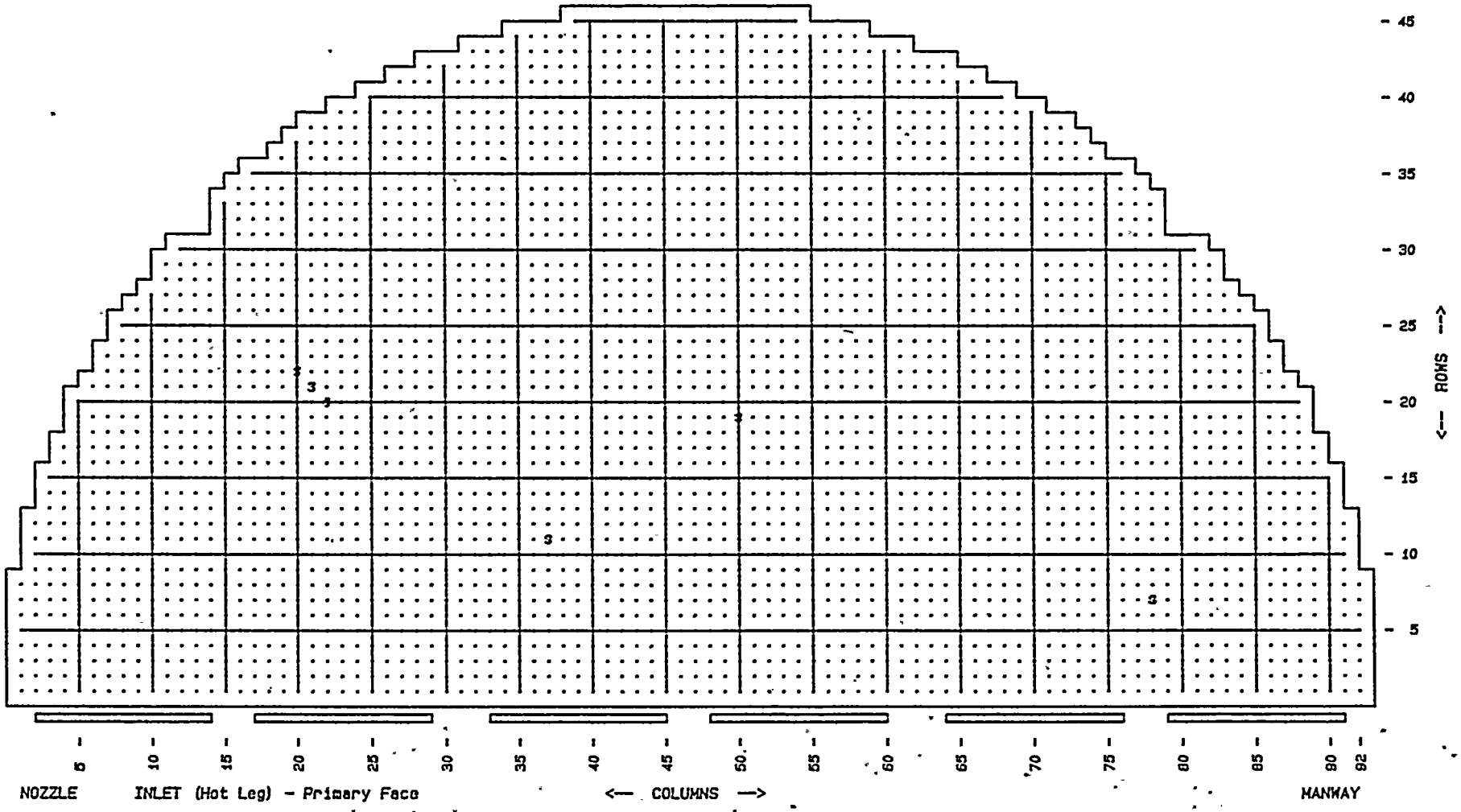
ACT	ROW	COL	VOLTS	DEG	IND	CH		ELEV		INCHES	COMMENTS	EXTENT	REEL	PS	ID
SLV	22	20	1.56	71	UDS	M	2	HTS	-	17.2		IGA #1 TSP H	2	740	HL
SLV	21	21	3.87	89	72		1	HTS	-	18.9		SCC #1 TSP H	2	740	HL
SLV	20	22	4.33	55	UDS	M	2	HTS	-	14.9		IGA #1 TSP H	2	740	HL
SLV	11	37	1.28	165	13		1	HTS	-	16.5		#6 TSP H	6	740	HL
SLV	19	50	5.54	128	46		1	HTS	+	1.8		#1 TSP H	8	720	HL
SLV	7	78	0.60	173	8		1	HTS	-	17.9		SCC #1 TSP H	11	720	HL

END OF DATA

STEAM GENERATOR "A" TUBES RECEIVING CORRECTIVE ACTION - FEBRUARY 1986

PLANT: GINNA GENERATOR: A TOTAL TUBES: 3260

S = CE 27° WELDED SLEEVE P = CE MECHANICAL PLUG



** NOCE TUBAN (TN) VER. 3.0 Saturday March 1, 1986 03:58 PM **

PLANT : RG&E - GINNA
OUTAGE : RG&E 1986 SGB

STEAM GENERATOR : B
INSPECTED FROM : BOTH HL&CL

REPORT : TUBES WITH INDICATIONS 20% OR GREATER

ABW - Anti-Vibration Bar Wear
CHT - Chatter
CKS - Cracked Support Plate
DNG - Ding
DTS - Distorted Tube Sheet
FRT - Fretting
IGA - Intergranular Attack
MGV - Machining Groove
NDD - No Detectable Defects
OBS - Obstructed
PRM - Permeability
RPG - Removed Plug
SLG - Sludge
TPG - Template Plug
UBC - U-Bend Crack
WTH - Wall Thinning
1&2 - B&W Sleeve Tapes

BLG - Bulge
CPR - Copper
DNT - Dent
DRT - Distorted Roll Transition
DSP - Distorted Tube Support Plate
INC - Incomplete Test
SCC - Stress Corrosion Crack
MAG - Magnetite
NSY - Noisy Tube
PPG - Permanent Plug
PIT - Pitting
SLV - Sleeved
SQR - Squirrel
TBR - To Be Rerun
UDS - Undefined Signal
WAS - Wastage

ROW	COL	VOLTS	DEG	IND	CH	ELEV	INCHES	COMMENTS	EXTENT	REEL	PS	ID
18	6	2.33	141	35	1	#2 TSP C+	0.0		#6 TSP C	29	720	CL
9	21	6.06	155	20	1	HTS +	1.7		#1 TSP H	8	740	HL
11	22	4.86	153	22	1	HTS +	1.5		#1 TSP H	8	740	HL
20	24	4.00	153	22	1	HTS +	1.6		#6 TSP H	8	740	HL
9	25	3.18	153	26	1	HTS +	1.3	WAS	#6 TSP H	9	740	HL
15	25	3.12	153	26	1	HTS +	2.2	WAS	#6 TSP H	9	740	HL
17	25	5.51	146	32	1	HTS +	1.5	WAS	#6 TSP H	9	740	HL
22	25	0.65	156	23	1	HTS +	2.3	WAS	#6 TSP H	9	740	HL
24	25	5.92	141	37	1	HTS +	1.8		#6 TSP H	9	740	HL
17	26	5.88	147	28	1	HTS +	1.2	WAS	#6 TSP H	4	740	HL
19	26	6.02	145	31	1	HTS +	1.2	WAS	#6 TSP H	4	740	HL
24	26	6.10	149	26	1	HTS +	1.3	WAS	#6 TSP H	4	740	HL
22	27	4.35	153	22	1	HTS +	1.8	WAS	#6 TSP H	4	740	HL
21	28	3.87	155	20	1	HTS +	1.6	WAS	#6 TSP H	4	740	HL
23	28	3.81	153	22	1	HTS +	1.6	WAS	#6 TSP H	4	740	HL
19	29	7.99	155	20	1	HTS +	1.5	WAS	#6 TSP H	4	740	HL
24	30	5.74	155	20	1	HTS +	1.4	WAS	#6 TSP H	5	740	HL
42	31	1.57	144	30	1	CTS +	15.0	CPR	#6 TSP H	16	720	CL
17	33	0.89	160	21	4	TUBE END+	12.1		HTS	1&2	610	HL
24	34	1.56	148	27	1	HTS +	1.5	CPR	#6 TSP H	6	740	HL
22	38	1.36	153	21	1	CTS +	1.1	WAS	#6 TSP H	15	720	CL
41	38	1.01	148	33	4	TUBE END+	5.4		HTS	1&2	610	HL
41	38	1.49	158	23	4	TUBE END+	6.7		HTS	1&2	610	HL
24	41	3.18	144	32	1	HTS +	1.3	WAS CPR	#1 TSP H	7	740	HL
31	43	0.64	153	22	4	HTS -	16.1		HTS	28	610	HL
27	45	4.07	155	20	1	HTS +	1.6	WAS	#1 TSP H	8	740	HL
25	50	2.56	153	26	1	HTS +	3.8	WAS	#1 TSP H	9	740	HL
23	51	1.03	158	21	1	HTS +	6.9	WAS	#1 TSP H	10	740	HL
26	51	1.64	148	31	1	HTS +	0.9	WAS	#1 TSP H	10	740	HL
25	53	0.96	153	26	1	HTS +	4.1	WAS	#1 TSP H	10	740	HL
23	56	1.19	154	27	4	TUBE END+	9.6		HTS	1&2	610	HL
30	56	2.06	158	21	1	HTS +	2.2	WAS	#1 TSP H	10	740	HL
19	62	2.51	149	30	1	HTS +	1.5	CPR WAS	#1 TSP H	10	740	HL
22	62	4.13	161	20	1	HTS +	1.5	WAS	#1 TSP H	11	740	HL
28	62	2.98	158	22	1	HTS +	1.6	WAS	#1 TSP H	11	740	HL
28	62	2.87	153	26	1	HTS +	1.5	CPR WAS	#1 TSP H	10	740	HL
30	62	2.21	158	22	1	HTS +	0.9	WAS	#1 TSP H	11	740	HL
28	63	2.88	147	27	1	HTS +	2.5	WAS	#1 TSP H	11	720	HL
24	64	4.59	155	20	1	HTS +	2.5	WAS	#1 TSP H	11	720	HL
26	64	3.54	149	25	1	HTS +	1.8	WAS	#1 TSP H	11	720	HL
24	65	2.93	155	20	1	HTS +	2.2	WAS	#1 TSP H	11	720	HL

END OF DATA

PLANT : RG&E - GINNA
OUTAGE : RG&E 1986 SGB

STEAM GENERATOR : B
INSPECTED FROM : HOT LEG

REPORT : TUBES REQUIRING CORRECTIVE ACTION

ABW - Anti-Vibration Bar Wear
CHT - Chatter
CKS - Cracked Support Plate
DNG - Ding
DTS - Distorted Tube Sheet
FRT - Fretting
IGA - Intergranular Attack
MGV - Machining Groove
NDD - No Detectable Defects
OBS - Obstructed
PRM - Permeability
RPG - Removed Plug
SLG - Sludge
TPG - Template Plug
UBC - U-Bend Crack
WTH - Wall Thinning
1&2 - B&W Sleeve Tapes

BLG - Bulge
CPR - Copper
DNT - Dent
DRT - Distorted Roll Transition
DSP - Distorted Tube Support Plate
INC - Incomplete Test
SCC - Stress Corrosion Crack
MAG - Magnetite
NSY - Noisy Tube
PPG - Permanent Plug
PIT - Pitting
SLV - Sleeved
SQR - Squirrel
TBR - To Be Rerun
UDS - Undefined Signal
WAS - Wastage

ACT	ROW	COL	VOLTS	DEG	IND	CH		ELEV		INCHES	COMMENTS	EXTENT	REEL	PS	ID
PLG	3	4	0.96	102	62		1	HTS	-	17.5		SCC #1 TSP H	1	740	HL
	3	4	1.00	67	83	M	1	HTS	-	18.0		SCC #1 TSP H	1	740	HL
PLG	2	6	3.54	70	56	M	2	HTS	-	17.3		SCC #1 TSP H	1	740	HL
PLG	11	6	0.52	45	97		1	HTS	-	16.7		SCC #1 TSP H	1	740	HL
PLG	9	9	0.58	68	84		1	HTS	-	18.3		SCC #1 TSP H	1	740	HL
PLG	18	10	4.89	68	59	M	2	HTS	-	16.9		SCC #1 TSP H	1	740	HL
PLG	8	11	0.85	31	UDS			HTS	-	19.1	PDRT	SCC #1 TSP H	2	740	HL
SLV	7	13	0.72	97	65	M	1	HTS	-	17.3		#1 TSP H	2	740	HL
SLV	8	15	1.31	57	72	M	2	HTS	-	7.1		#1 TSP H	2	740	HL
PLG	29	15	0.81	23	71	M	2	HTS	-	19.2	PDRT	SCC #1 TSP H	2	740	HL
SLV	16	17	2.36	052	78	M	2	HTS	-	15.3		#1 TSP H	2	740	HL
SLV	18	19	0.69	157	19		1	HTS	-	17.5		SCC #1 TSP H	8	740	HL
PLG	30	21	1.14	60	88		1	HTS	-	17.3		SCC #1 TSP H	8	740	HL
SLV	9	23	0.93	92	SQR	M	2	HTS	-	16.0		#1 TSP H	8	740	HL
	9	23	1.58	88	27	M	2	HTS	-	14.1		#1 TSP H	8	740	HL
PLG	32	23	3.06	22	64	M	2	HTS	-	16.2		IGA #1 TSP H	8	740	HL
SLV	23	24	0.42	135	42		1	HTS	+	2.3		WAS #6 TSP H	9	740	HL
PLG	2	27	0.36	43	UDS	M	2	HTS	-	18.5	PNDD	IGA #6 TSP H	4	740	HL
SLV	22	29	2.34	163	49		1	HTS	+	1.4	P 10%	WAS #6 TSP H	4	740	HL
SLV	29	33	0.40	99	69		1	HTS	-	18.5	CPR	SCC #6 TSP H	5	740	HL
SLV	19	34	1.82	93	72		1	HTS	-	8.3	RPG	SLV #4 TSP C	27	720	HL
SLV	29	34	1.26	72	83		1	HTS	-	18.2	SCC	CPR #6 TSP H	6	740	HL
PLG	38	36	0.95	33	UDS		1	HTS	-	18.1		IGA #6 TSP H	6	740	HL
SLV	5	37	0.50	60	UDS		1	HTS	-	18.4		IGA #6 TSP H	7	740	HL
SLV	6	37	0.91	68	85		1	HTS	-	17.9		SCC #6 TSP H	7	740	HL
PLG	35	37	4.03	47	84	M	2	HTS	-	18.4	SCC	CPR #6 TSP H	6	740	HL
PLG	35	38	1.37	168	SQR		1	HTS	-	18.3		SCC #6 TSP H	7	740	HL
PLG	36	38			UDS			HTS	-	17.0		IGA #6 TSP H	7	740	HL
	36	38	0.79	56	92		1	HTS	-	19.2		SCC #6 TSP H	7	740	HL
PLG	38	38	2.55	85	UDS		1	HTS	-	18.9		DRT #6 TSP H	7	740	HL
SLV	31	39	0.52	47	UDS		1	HTS	-	17.2		IGA #6 TSP H	7	740	HL
PLG	42	39	3.70	63	UDS	M	2	HTS	-	16.0		IGA #6 TSP H	7	740	HL
SLV	19	42	5.62	63	UDS	M	2	HTS	-	7.9		IGA #1 TSP H	7	740	HL
SLV	21	42	1.58	86	77		1	HTS	-	9.9	RPG	SLV #6 TSP C	27	720	HL
PLG	1	43	0.63	115	56		1	HTS	-	16.6	SCC	CPR #1 TSP H	7	740	HL
SLV	23	46	0.59	113	55		1	HTS	-	18.2		SCC #1 TSP H	8	740	HL
SLV	27	47	2.12	56	73	M	2	HTS	-	18.0		SCC #1 TSP H	9	740	HL
SLV	9	48	0.41	86	77		1	HTS	-	17.3		SCC #1 TSP H	9	740	HL
SLV	11	49	0.30	52	91	M	1	HTS	-	16.7		SCC #1 TSP H	9	740	HL
SLV	21	49	0.43	75	76	M	1	HTS	-	8.2		SCC #1 TSP H	9	740	HL
SLV	26	49	0.23	55	89	M	1	HTS	-	18.2		SCC #1 TSP H	9	740	HL
SLV	31	49	2.56	15	SQR	M	2	HTS	-	18.6		SCC #1 TSP H	9	740	HL
SLV	32	49	0.40	60	90		1	HTS	-	17.1		SCC #1 TSP H	9	740	HL

PLANT : RG&E - GINNA
OUTAGE : RG&E 1986 SGB

STEAM GENERATOR : B
INSPECTED FROM : HOT LEG

REPORT : TUBES REQUIRING CORRECTIVE ACTION

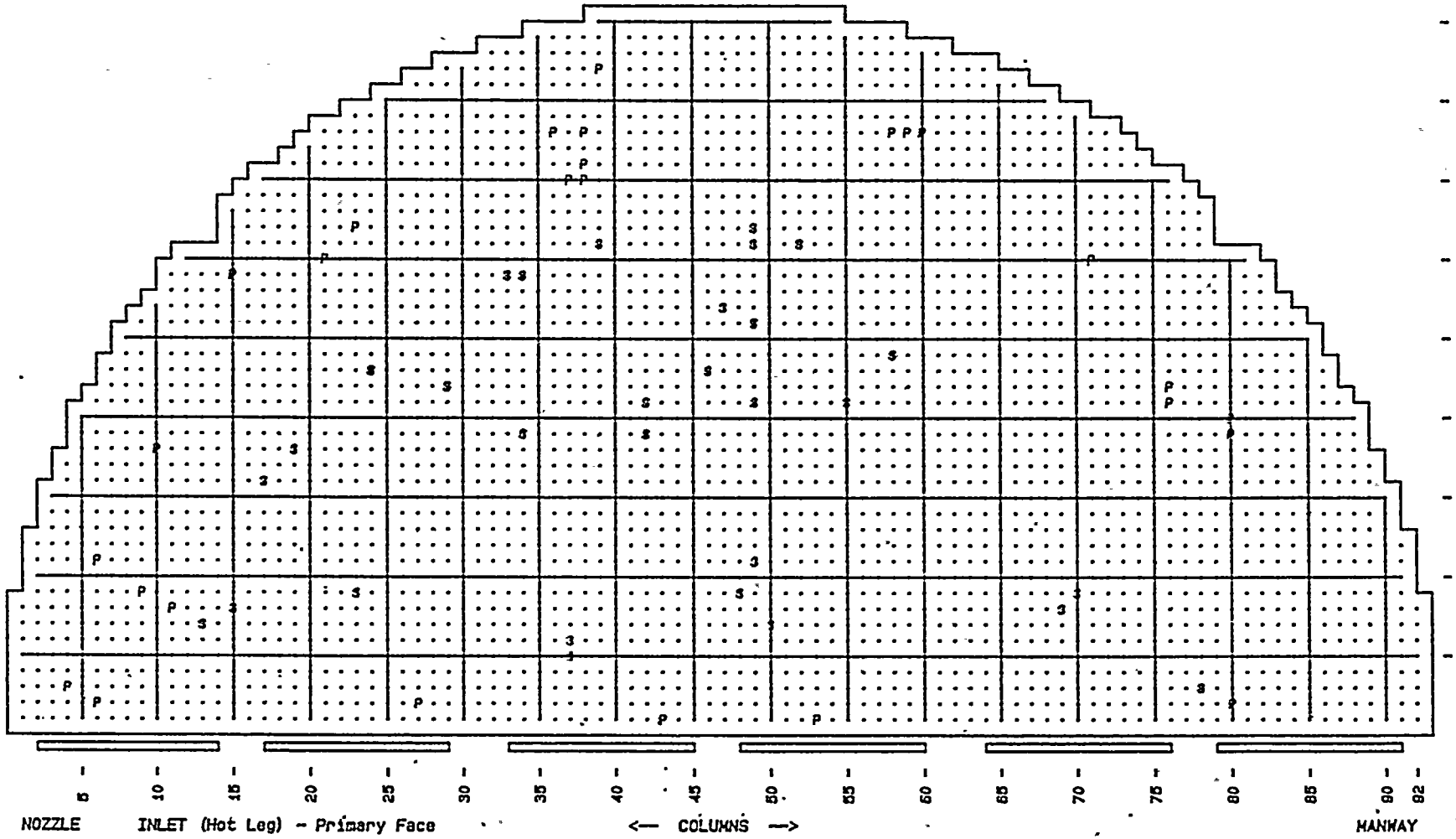
ACT	ROW	COL	VOLTS	DEG	IND	CH		ELEV		INCHES	COMMENTS	EXTENT	REEL	PS	ID
SLV	7	50	0.73	53	90	M	1	HTS	-	17.4		SCC #1 TSP H	9	740	HL
SLV	31	52	0.96	70	85		1	HTS	-	16.3		SCC #1 TSP H	10	740	HL
PLG	1	53	2.07	30	SQR	M	1	HTS	-	17.5	CHT	SCC #1 TSP H	11	720	HL
SLV	21	55	1.32	74	83		1	HTS	-	5.6	RPG	SLV #6 TSP C	27	720	HL
SLV	24	58	0.58	58	91		1	HTS	-	13.8		SCC #1 TSP H	10	740	HL
PLG	38	58	3.23	51	79	M	2	HTS	-	16.9		SCC #1 TSP H	10	740	HL
PLG	38	59	1.08	88	75		1	HTS	-	18.0		SCC #1 TSP H	10	740	HL
PLG	38	60	0.95	77	81		1	HTS	-	17.4		SCC #1 TSP H	10	740	HL
SLV	8	69	1.03	88	61	M	1	HTS	-	17.7		SCC #1 TSP H	11	720	HL
SLV	9	70	0.70	72	75	M	1	HTS	-	14.6		SCC #1 TSP H	11	720	HL
PLG	30	71	1.90	77	79		1	HTS	-	17.6	CPR	SCC #1 TSP H	12	720	HL
PLG	21	76	1.04	58	90		1	HTS	-	17.4		SCC #1 TSP H	12	720	HL
PLG	22	76	1.15	92	70		1	HTS	-	17.3		SCC #1 TSP H	12	720	HL
SLV	3	78	1.76	72	82		1	HTS	-	17.6		SCC #1 TSP H	12	720	HL
PLG	2	80	6.69	38	89	M	2	HTS	-	17.9		SCC #1 TSP H	12	720	HL
PLG	19	80	0.61	56	91		1	HTS	-	16.7		SCC #1 TSP H	12	720	HL
PLG	20	80	0.75	42	94	M	1	HTS	-	16.8		SCC #1 TSP H	12	720	HL

END OF DATA

STEAM GENERATOR "B" TUBES RECEIVING CORRECTIVE ACTION - FEBRUARY 1986

PLANT: GINNA GENERATOR: B TOTAL TUBES: 3260

S = CE 27" WELDED SLEEVE P = CE MECHANICAL PLUG



** ROSE TUBAN (TM) VER. 3.0 Saturday March 1, 1986 04:11 PM **

4.0 OBSERVATIONS

The results of the examination indicates that intergranular attack and stress corrosion cracking is still active within the tubesheet crevice regions on the inlet side of each steam generator. The IGA/SCC is primarily located in the "B" steam generator with 52 total indications detected, only 5 indications were detected in the "A" steam generator. Table III shows the steam generator IGA history.

GINNA'S STEAM GENERATORS
CREVICE CORROSION INDICATION HISTORY
B-Steam Generator (A-Steam Generator)

	Not Sizeable	0-25%	26-50%	51-75%	76-100%	A-S/G TOTAL	B-S/G TOTAL
March 1979	0	0	0	2	0	(0)	2
December 1979	0	0	6	5	0	(0)	11
April 1980	19	1	2	7	2	(0)	31
November 1980	2	0	0	1	0	(0)	3
April 1981	0	5	4	5	0	(0)	14
February 1982	1	0	1	6	5	(0)	13
October 1982	27	4	5	7(1)	16	(1)	59
April 1983	11(3)	3(1)	15	7	15	(4)	51
March 1984	5	0	0(1)	1	2	(1)	8
March 1985	23	4	6	9(1)	27(1)	(2)	69
February 1986	3(2)	9(2)	1	14(1)	25	(5)	52
Totals	91(5)	26(3)	40(1)	64(3)	92(1)	(13)	313

TABLE III

The cause of the inlet tubesheet crevice corrosion indication is intergranular attack and stress corrosion cracking of the mil-annealed Inconel 600. This form of corrosion is the result of the tubesheet crevices having an alkaline environment. This crevice environment has developed over the years as deposits and active species like sodium and phosphate, have reacted, changing a neutral or inhibited crevice into the aggressive environment that presently exist.

A large volume, typically <<20% TWD (Through Wall Dimension) wastage type condition exists just above the tubesheet secondary face. A small percentage of the tubes, generally toward the center of the bundle, have this condition. Several of these tubes did have penetrations >20% TWD and 2 tubes in the "B" steam generator and 1 tube in the "A" steam generator had a potential >40% TWD as interpreted from the signal. Therefore these three tubes were sleeved. These tubes were affected by the original water chemistry conditions when phosphate was used as a buffering medium and have not seen further degradation since 1975.

Small indications of probable copper deposits were also found in the tubesheet crevice region randomly located throughout each steam generator. Based on studies performed with copper plated on Inconel tubing and the phase relationships of these signal responses at the different inspection frequencies the indications can be attributed to copper deposits and not a defect condition.

A more extensive condition noted in the steam generators, primarily on the inlet side, is the minor denting at the tubesheet secondary face. Denting was also detected at the 1st, 2nd and 6th tube support plates randomly throughout the generator and in most cases was of greater magnitude in size. No tubes were found which obstructed the passage of a 0.720" O.D. probe. In general, minor distortions of most of the tube support plate signals were seen. The denting phenomenon and minor distortions at the tubesheet and support plates can be attributed to

secondary side corrosion product build-up in the annular region between the tube O.D. and the carbon steel support member. Comparisons with previous data does not indicate any change in the extent or magnitude of denting from what has been detected by previous inspections.

Several indications were detected in the cold legs of the "A" & "B" steam generators in and around tube R23-C46. A review of previous years data revealed these indications to be present. They appear as a shallow ID indication <20% which were confirmed visually to be an expansion of diameter within the tubesheet. This was caused by a cam-lock expansion device which was used in earlier years to suspend lead blankets from the tubesheet primary face.

In summary, the "A" Steam Generator had five (5) tubes that were found to have tubesheet crevice indications and one (1) tube had an area of previously detected wastage that exceeded the repair limit in the inlet. The "B" Steam Generator had fifty-two (52) tubesheet crevice indications and two (2) tubes had areas of previously detected wastage that exceeded the repair limit in the inlet.

One tube in the "A" Steam Generator had two (2) indications at the third and fourth anti-vibration bar intersections. These indications were greater than 20% but less than the repair limit. This tube will be re-examined at the next inspection to determine if there is an active fretting wear damage mechanism going on. In light of the fact that only this tube is exhibiting these indications, it is unlikely that fretting should be of a great concern.

5.0 CORRECTIVE ACTION

Table IV has been generated to identify the tubes with crevice indications or with indications which exceed the repair criteria. This table also shows the location and axial extent of the indication and what corrective action was taken on these tubes. Other than crevice indications, only three tubes exceeded the repair criteria. One 46% TWD indication was found 1.8" above the secondary side face of the hot leg tubesheet of the "A" steam generator tube R19-C50. A 42% TWD indication was found 2.3" above the secondary side face of the hot leg tubesheet, along with a 49% TWD indication was found 1.4" above the secondary side face of the hot leg tube sheet of the "B" steam generator, tubes R23-C24 and R22-C29, respectively. Three CE mechanical plugs which were installed in B-S/G in 1985 were pulled and inspected full length with the following results: R19-C34 revealed a 72% TWD - 8.3" from the top of the secondary side tubesheet face, R21-C42 revealed a 77% TWD - 9.9" from the top of the secondary side tubesheet face, R21-C55 revealed an 83% TWD - 5.6" from the top of the secondary side tube sheet. All six of the above-mentioned tubes were sleeved with Combustion Engineering 27" Sleeves and will remain in service.

Table V has been generated to maintain a complete history of total tubes inspected, total defects detected, and number of tubes requiring repair.

TABLE 4

1986 CORRECTIVE ACTIONS

"A" S/G INLET

ROW	COL	1986%	LOCATION	CORRECTIVE ACTION
22	20	UDS (IGA)	HTS - 17.2	CE SLEEVE
21	21	72	HTS - 18.9	CE SLEEVE
20	22	UDS (IGA)	HTS - 14.9	CE SLEEVE
11	37	13	HTS - 16.5	CE SLEEVE
19	50	46	HTS + 1.8	CE SLEEVE
7	78	8 (SCC)	HTS - 17.9	CE SLEEVE

"B" S/G INLET

ROW	COL	1986%	LOCATION	CORRECTIVE ACTION
3	4	62	HTS - 17.5	CE MECH PLUG
3	4	83	HTS - 18.0	
2	6	56	HTS - 17.3	CE MECH PLUG
11	6	97	HTS - 16.7	CE MECH PLUG
9	9	84	HTS - 18.3	CE MECH PLUG
18	10	59	HTS - 16.9	CE MECH PLUG
8	11	UDS (SCC)	HTS - 19.1	CE MECH PLUG
7	13	65	HTS - 17.3	CE SLEEVE
8	15	72	HTS - 7.1	CE SLEEVE
29	15	71	HTS - 19.2	CE MECH PLUG
16	17	78	HTS - 15.3	CE SLEEVE
18	19	19 (SCC)	HTS - 17.5	CE SLEEVE
30	21	88	HTS - 17.3	CE MECH PLUG
9	23	SQR	HTS - 16.0	CE SLEEVE
9	23	27	HTS - 14.1	
32	23	64	HTS - 16.2	CE MECH PLUG
23	24	42	HTS + 2.3	CE SLEEVE

KEY

HTS - HOT LEG TUBESHEET SECONDARY FACE
CE MECH PLUG - COMBUSTION ENGINEERING MECHANICAL PLUG (REMOVABLE)
CE SLEEVE - COMBUSTION ENGINEERING 27" WELDED SLEEVE
SQR - MULTIPLE STRESS CORROSION CRACKS (SQUIRRELS) - NOT QUANTIFIABLE
UDS - UNDEFINED SIGNAL
IGA - INTERGRANULAR ATTACK DEFECT
SCC - STRESS CORROSION CRACK DEFECT
DRT - DISTORTED ROLL TRANSITION SIGNAL
* - ASTERISK DENOTES TUBE PLACED BACK IN SERVICE BY REMOVAL OF PREVIOUSLY INSTALLED CE MECH PLUGS AND THE INSTALLATION OF A CE SLEEVE

TABLE 4 (CON'T)

1986 CORRECTIVE ACTIONS

"B" S/G INLET

	ROW	COL	1986%	LOCATION	CORRECTIVE ACTION
	2	27	UDS (IGA)	HTS - 18.5	CE MECH PLUG
	22	29	49	HTS + 1.4	CE SLEEVE
	29	33	69	HTS - 18.5	CE SLEEVE
*	19	34	72	HTS - 8.3	CE SLEEVE
	29	34	83	HTS - 18.2	CE SLEEVE
	38	36	UDS (IGA)	HTS - 18.1	CE MECH PLUG
	5	37	UDS (IGA)	HTS - 18.4	CE SLEEVE
	6	37	85	HTS - 17.9	CE SLEEVE
	35	37	84	HTS - 18.4	CE MECH PLUG
	35	38	SQR	HTS - 18.3	CE MECH PLUG
	36	38	UDS (IGA)	HTS - 17.0	CE MECH PLUG
	36	38	92	HTS - 19.2	
	38	38	UDS (DRT)	HTS - 18.9	CE MECH PLUG
	31	39	UDS (IGA)	HTS - 17.2	CE SLEEVE
	42	39	UDS (IGA)	HTS - 16.0	CE MECH PLUG
	19	42	UDS (IGA)	HTS - 7.9	CE SLEEVE
*	21	42	77	HTS - 9.9	CE SLEEVE
	1	43	56	HTS - 16.6	CE MECH PLUG
	23	46	55	HTS - 18.2	CE SLEEVE
	27	47	73	HTS - 18.0	CE SLEEVE
	9	48	77	HTS - 17.3	CE SLEEVE
	11	49	91	HTS - 16.7	CE SLEEVE
	21	49	76	HTS - 8.2	CE SLEEVE
	26	49	89	HTS - 18.2	CE SLEEVE
	31	49	SQR	HTS - 18.6	CE SLEEVE
	32	49	90	HTS - 17.1	CE SLEEVE
	7	50	90	HTS - 17.4	CE SLEEVE
	31	52	85	HTS - 16.3	CE SLEEVE
	1	53	SQR	HTS - 17.5	CE MECH PLUG
*	21	55	83	HTS - 5.6	CE SLEEVE
	24	58	91	HTS - 13.8	CE SLEEVE
	38	58	79	HTS - 16.9	CE MECH PLUG
	38	59	75	HTS - 18.0	CE MECH PLUG
	38	60	81	HTS - 17.4	CE MECH PLUG
	8	69	61	HTS - 17.7	CE SLEEVE
	9	70	75	HTS - 14.6	CE SLEEVE
	30	71	79	HTS - 17.6	CE MECH PLUG
	21	76	90	HTS - 17.4	CE MECH PLUG
	22	76	70	HTS - 17.3	CE MECH PLUG
	3	78	82	HTS - 17.6	CE SLEEVE
	2	80	89	HTS - 17.9	CE MECH PLUG
	19	80	91	HTS - 16.7	CE MECH PLUG
	20	80	94	HTS - 16.8	CE MECH PLUG

STEAM GENERATOR TUBE INSPECTION AND CORRECTIVE ACTION HISTORY

TABLE V

DATE	NO. TUBES INSPECTED A Hot	A Cold	B Hot	B Cold	PRIMARY TO SECONDARY LEAKAGE, gpm	TOTAL TUBES REQUIRING CORRECTIVE ACTION A	B	NO. DEFECTS TYPE OF DETERIORATION	REQUIRING REPAIR >40% A	B	NO. TUBES PLUGGED A	B	NO. TUBES SLEEVED A	B	NO. TUBES PULLED A	B	COMMENT A	B
IN FACTORY					--------	1	---	-----	1	--	1	--	--	--	--	--	--	--
APRIL 1972	1050				--------	0	0	-----	0	0	0	0	--	--	--	--	--	--
MARCH 1974	3259	516	1098	516	--------	19	0	WASTAGE	19	0	19	0	--	--	2	--	--	--
NOV. 1974	1701	430	672	39	--------	2	0	WASTAGE	2	0	2	0	--	--	--	--	--	--
MARCH 1975	2174	442	1931	442	0.005 A S/G	46	11	CRACKING/WASTAGE	46	11	46	11	--	--	2	--	--	--
JAN. 1976	----	---	53	---	0.091 B S/G	0	2	WASTAGE	0	2	0	2	--	--	--	--	--	--
FEB. 1976	3192	3192	3247	3247	--------	39	2	WASTAGE	39	2	39	2	--	--	--	--	--	--
APRIL 1976	100	---	1025	75	0.099 B S/G	0	15	CRACKING	0	15	0	15	--	--	--	--	--	--
APRIL 1977	2003	268	1525	268	--------	13	1	WASTAGE	13	1	13	1	--	--	--	--	--	--
JULY 1977	----	---	300	---	0.012 B S/G	--	5	ID CRACKING	--	5	--	5	--	--	--	--	--	--
JAN. 1978	----	---	----	---	0.060 B S/G	--	8	CRACKING/WASTAGE	--	8	--	8	--	--	--	--	--	--
APRIL 1978	2049	325	1714	375	--------	1	15	ID CRACKING	1	15	1	15	--	--	--	1	--	--
FEB. 1979	2049	325	1714	375	--------	--	6	CRACKING/WASTAGE 2-IGA	--	6	--	6	--	--	--	--	--	--
DEC. 1979	----	---	----	---	0.007 B S/G	--	13	11-IGA, 2-WASTAGE	--	13	--	13	--	--	--	--	--	--
APRIL 1980	3139	325	3182	375	--------	1	31	"A" PITTING/ "B" IGA	1	13	1	31	--	--	--	3	--	(1)
NOV. 1980	3138	325	3151	375	--------	--	3	IGA	--	2	--	0	--	5	--	--	--	(2)
MAY 1981	3138	325	3141	400	--------	--	15	IGA, WASTAGE	--	8	--	7	--	16	--	3	--	(3)
FEB. 1982	3137	526	3140	526	∿ 700 B S/G	--	16	IGA, MECH. DAM	--	16	--	19	--	--	--	1	--	(4)
SEP. 1982	3138	382	3129	893	--------	1	32	IGA	1	28	1	33	--	--	--	--	--	--
APRIL 1983	3137	633	3098	832	--------	4	78	IGA, SCC	--	23	--	4	4	74	--	1	--	(5)
MARCH 1984	3137	717	3093	963	--------	1	10	IGA, SCC	--	5	1	1	--	9	--	--	--	--
MARCH 1985	3135	3135	3087	3087	--------	3	67	IGA, SCC, WASTAGE	3	70	2	4	2	67	--	--	--	(6)
FEB. 1986	3134	623	3083	770	--------	6	54	IGA, SCC, WASTAGE	2	49	--	27	6	30	--	--	--	(7)
	TOTALS					137	384		128	290	126	201*	12	201	4	9		
	PERCENTAGES					4.2	11.7		3.9	8.8	3.8	6.1	.3	6.1	.1	.3		

*SEE NOTE 7

STEAM GENERATOR TUBE INSPECTION AND CORRECTIVE ACTION HISTORY COMMENTS

(1) Pulled R15 C55 and R17 C41 from the hot leg and R17 C40 from the cold leg to determine IGA conditions in the "B" steam generator. R17 C41 and ECT indications at all frequencies, R15 C44 had just 100 kHz Absolute ECT indication and R17 C40 had no ECT indication. Both hot leg tubes has approximately 50% IGA, R17 C41 had a 60% SCC indication associated with the IGA.

(2) Manually sleeved five (5) tubes with nickel plated - Inconel 600 thermally treated sleeves. Three tubes had IGA indications, two others were preventatively sleeved.

(3) Sleeved 16 tubes with co-extruded sleeves, 13 with defects with 3 preventatively. Pulled R21 C46 with a 100 kHz ECT indication, R7 C45 and R28 C45 which were clean. All tubes pulled were from the hot leg.

(4) Recovery from the January 25, 1982 Tube Rupture Event included removing 26 tube sections by EDM and ID Cutters along with the one tube pulled from the secondary side.

(5) The four tubes identified with IGA in the "A" steam generator were sleeved with 22" tubesheet sleeves. The 78 tubes identified in the "B" steam generator with IGA and/or SCC in the crevice were repaired as follows:

41 tubes were sleeved with 36" brazed sleeves
9 tubes were sleeved with 28" brazed sleeves
24 tubes were sleeved with 22" tubesheet sleeves
1 tube and 2 sleeves were plugged
1 tube R34 C54 was pulled for metallurgical analysis.

STEAM GENERATOR TUBE INSPECTION AND CORRECTIVE ACTION HISTORY COMMENTS

(6) The two tubes identified with IGA in the crevice in the "A" steam generator inlet were sleeved with 20" tubesheet sleeves. One indication >40% TWD in the U-bend was permanently plugged. The 70 tubes identified in the "B" steam generator were repaired as follows:

56 tubes were sleeved with 20" tubesheet sleeves
10 tubes were sleeved with 36" brazed sleeves
3 tubes were mechanically plugged (CE removeable)
1 tube was explosively plugged
1 tube was sleeved with a 36" brazed sleeve due to the domino effect.

(7) The five tubes identified with crevice indications in the "A" steam generator inlet were sleeved with 27" Combustion Engineering Sleeves (CE). One tube identified with general O.D. indication above the secondary side tubesheet was also sleeved with a CE 27" sleeve. The 57 tubes identified in the "B" steam generator were repaired as follows:

27 tubes were sleeved with CE 27" Sleeves
27 tubes were mechanically plugged (CE removable)
3 CE Mechanical Plugs installed in 1985 were removed and sleeved with 27" sleeves

The present sleeve installation status is 83 brazed sleeves, 88 tube sheet sleeves, 30 welded CE sleeves in the "B" steam generator with 6 tubesheet sleeves and 6 welded CE sleeves in the "A" steam generator.