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February 7, 1983

1CAN028306

Director of Nuclear Reactor Regulation
ATTN: Mr. J. F. Stolz, Chief
Operating Reactors Branch #4
Division of Licensing
U. S. Nuclear Regulatory Commission
Washington, DC 20555

SUBJECT: Arkansas Nuclear One - Unit 1
Docket No. 50-313
License No. DPR-51
Steam Generator Inservice Inspections

Gentlemen:

This letter provides an updated status of ongoing steam generator tube inspections at Arkansas Nuclear One - Unit 1 (ANO-1) and also serves to document information which has been provided informally to the NRC staff during the course of the inspections. The planned corrective actions are also discussed.

ANO-1 entered its fifth refueling outage on November 8, 1982. In accordance with the ANO-1 Technical Specifications governing inservice inspection of the steam generators, eddy current inspections of three percent of the tubes in each steam generator were conducted. As allowed by the Technical Specifications, approximately half of these inspections were concentrated in the two "special interest" areas of the steam generators. These areas consist of the tubes on the bundle periphery with drilled vs. broached holes at the fifteenth support plate and those tubes in the first three rows on either side of the open inspection lane. The inspection lane consist of a row of tubes extending from the outer edge of the bundle to the bundle center which were originally deleted from the generator to allow for future inspections.

In the event that defective tubes are identified in these special interest areas, the Technical Specifications allow for increased inspections in the special interest areas without increasing the inspections outside of these areas. This provision is based on the higher probability that defective tubes will occur in the special interest areas.

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The initial inspections during the fifth refueling outage were conducted in the "B" once through steam generator (OTSG). These inspections revealed eleven defective tubes located in the inspection lane area. Additional defects were located in peripheral tubes adjacent to the lane region. These early inspection results indicated the defective tubes to be localized in an area near the bundle periphery adjacent to the defined lane region. At the time it did not appear that a complete inspection of the B OTSG, as specified by the Technical Specifications, was warranted based on the localized nature of the defects. Therefore, based on the initial inspection results, and after discussions with the NRC staff, a proposed change to the Technical Specifications was submitted via letter dated December 17, 1982, (1CAN128207) from Mr. J. M. Griffin to Mr. J. F. Stolz. The early submittal of the proposed change was at the request of the NRC staff in order to allow for appropriate and timely review.

Inspections conducted subsequent to the submittal of the proposed Technical Specification change revealed a substantial number of additional defective tubes. Although these defects continued to be concentrated in the area described above, the number of defects outside of this area resulted in AP&L's decision to proceed with a complete inspection of both OTSGs. Therefore, the Technical Specification change proposed by our December 17, 1982, letter is no longer required.

The inspection of the B OTSG is now complete and the inspection of the A OTSG is also nearing completion. The results of these inspections are discussed below. These preliminary results are not intended to replace the complete report required by the ANO-1 Technical Specifications, but rather represents a summary of the best information available at this time.

The inspection of the OTSG tubes were performed using standard differential eddy current techniques. The results of the inspections as of February 4, 1983, are shown below.

	No. of tubes inspected	No. of defective tubes (≥40% through wall)	No. of degraded tubes (20-39% through wall)
A OTSG	14181	86	56
B OTSG	15528	45*	42

*Two tubes were plugged subsequent to pulling tube samples during January 1983.

The locations of the defective tubes in the A and B OTSG are shown in Attachments 1 and 2. A complete tabulation of defective and degraded tubes is contained in Attachment 3. Attachment 3 also list the through wall percentage and axial location of each indication. As can be seen from these attachments, the defective tubes are concentrated near the peripherial end of the lane region. In addition, with few exceptions, the indications are located in the upper tube sheet crevice region. As discussed in our

December 17, 1982, letter, such a pattern tends to support a failure hypothesis based on transport of contaminants up the open inspection lane. Such contaminants, when combined with exposure to oxygen, could produce the observed tube degradation. A review of the operational history of ANO-1 for the past cycle shows that exposure to oxygen did occur during the Spring 1982 outage. During this outage the secondary side of the steam generators were open and exposed to air during replacement of the main feedwater nozzles. A summary of significant operational events during the previous cycle in presented in Attachment 4. A sketch of the tube sheet crevice region is included as Attachment 5 (the majority of upper tube sheet defects are located within the first 10 inches from the secondary face of the tube sheet).

Although most of the observed defects are located within the upper tube sheet, a few defects are located below the upper tube sheet. In general, these defects are of smaller signal amplitude than those in the upper tube sheet (signal amplitudes are tabulated in Attachment 3) and are randomly located along the tube axis. In addition, historical inspection data (Attachment 6) indicates that few of these tubes have been previously inspected. Therefore, it is not clear whether such defects represent an active degradation mechanism or preservice defects.

In order to provide additional information as to the cause of the defects observed during this inspection AP&L has proceeded with the removal of portions of two tubes from the B OTSG. One tube was chosen to represent the upper tube sheet defects (tube 78-3) and the second to provide information on defects occurring below the upper tube sheet (tube 112-19). These tube samples will be subjected to detailed metallurgical examinations. The results of these inspections are expected to be available by the end of April 1983.

In order to assure that the degradation mechanism was not progressing during the course of the inspections, the defective and degraded tubes in the B OTSG were reinspected following completion of the original inspections. These inspections showed no significant change in the indications. Also, in order to better characterize tubes being considered for removal and examination, a "8x1" eddy current probe was used to inspect a number of tubes. A total of approximately 70 defective tubes in the A and B OTSG were examined with the 8x1 probe. These inspections were conducted primarily to determine the extent of any circumferential cracks. All but two of the tubes examined indicated defects of less than 90° circumferential extent and none indicated greater than 135°.

Following completion of inspections in the A OTSG, tube plugging operations will begin. As a minimum, all tubes with greater than 40% through wall defects will be plugged as required by the Technical Specifications. B&W removable welded plugs will be used in locations where future tube sleeving may be desired. Conventional explosive plugs will be used in other areas of the steam generator. In addition, tubes with defects above the fifteenth (uppermost) support plate will be stabilized with a rigid stabilizer in accordance with B&W recommendations.

Tube plugging operations are scheduled to begin by February 16, 1983, and plant restart is scheduled for early March. The above actions are consistant with ANO-1 Technical Specification 4.18. As noted in Technical Specification Table 4.18-2, NRC approval of the corrective actions is required prior to restart. We therefore request your expeditious review of this matter. We will provide additional information as needed and are prepared to meet with the NRC staff if necessary.

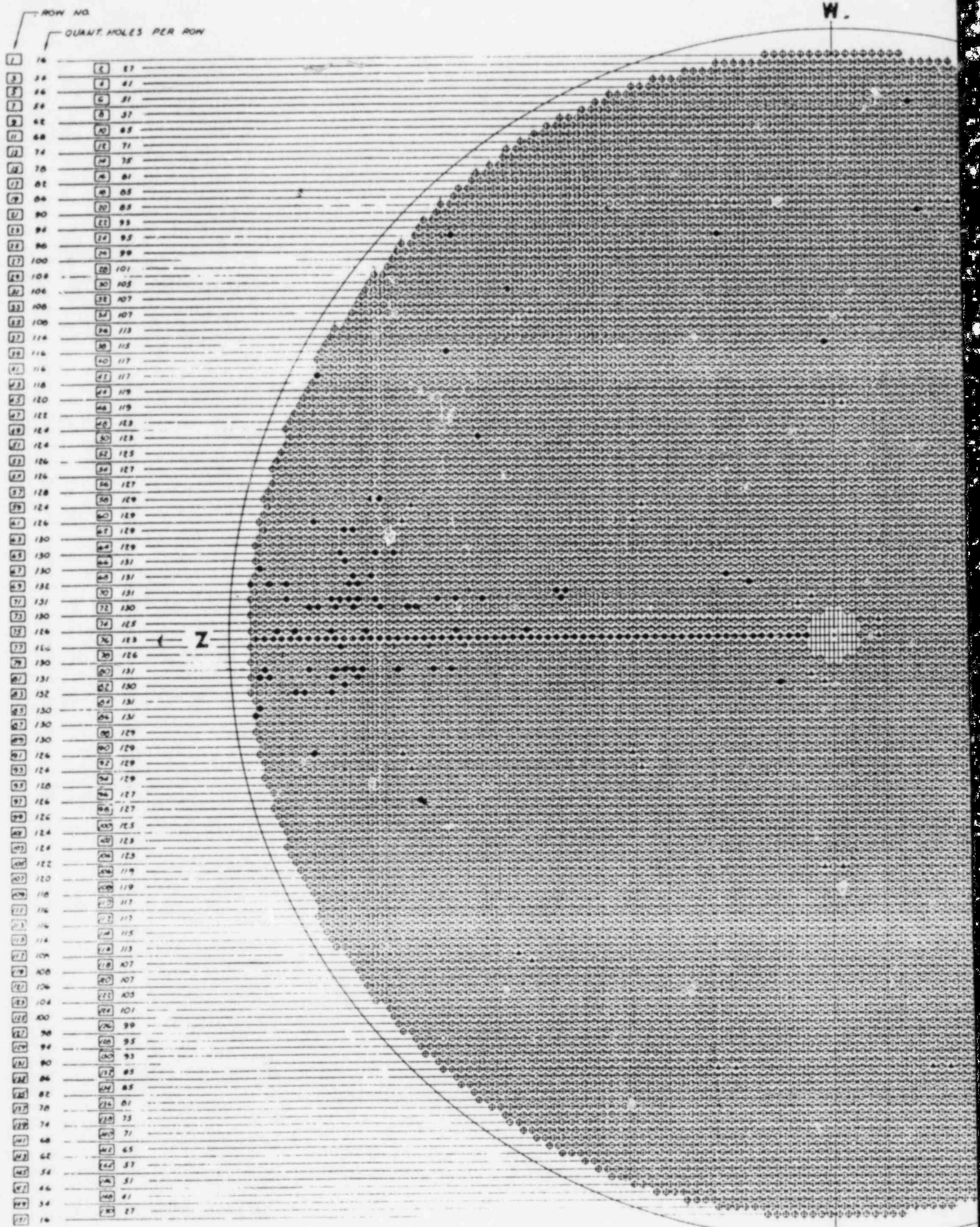
Very truly yours,

John R. Marshall

John R. Marshall
Manager, Licensing

JRM:DRH

Attachments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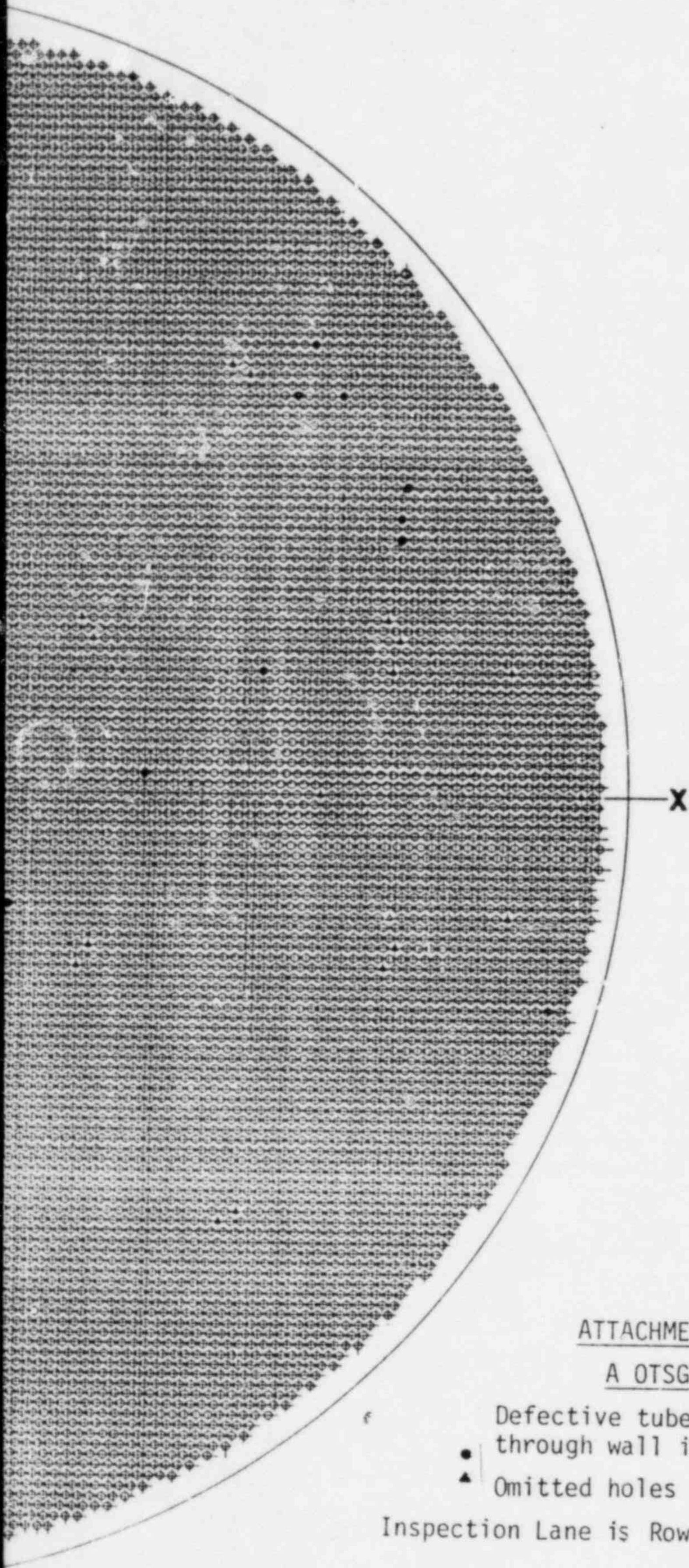


ATTACHMENT 1

A OTSG

● Defective tubes ($\geq$40% through wall indications)

▲ Omitted holes for supports

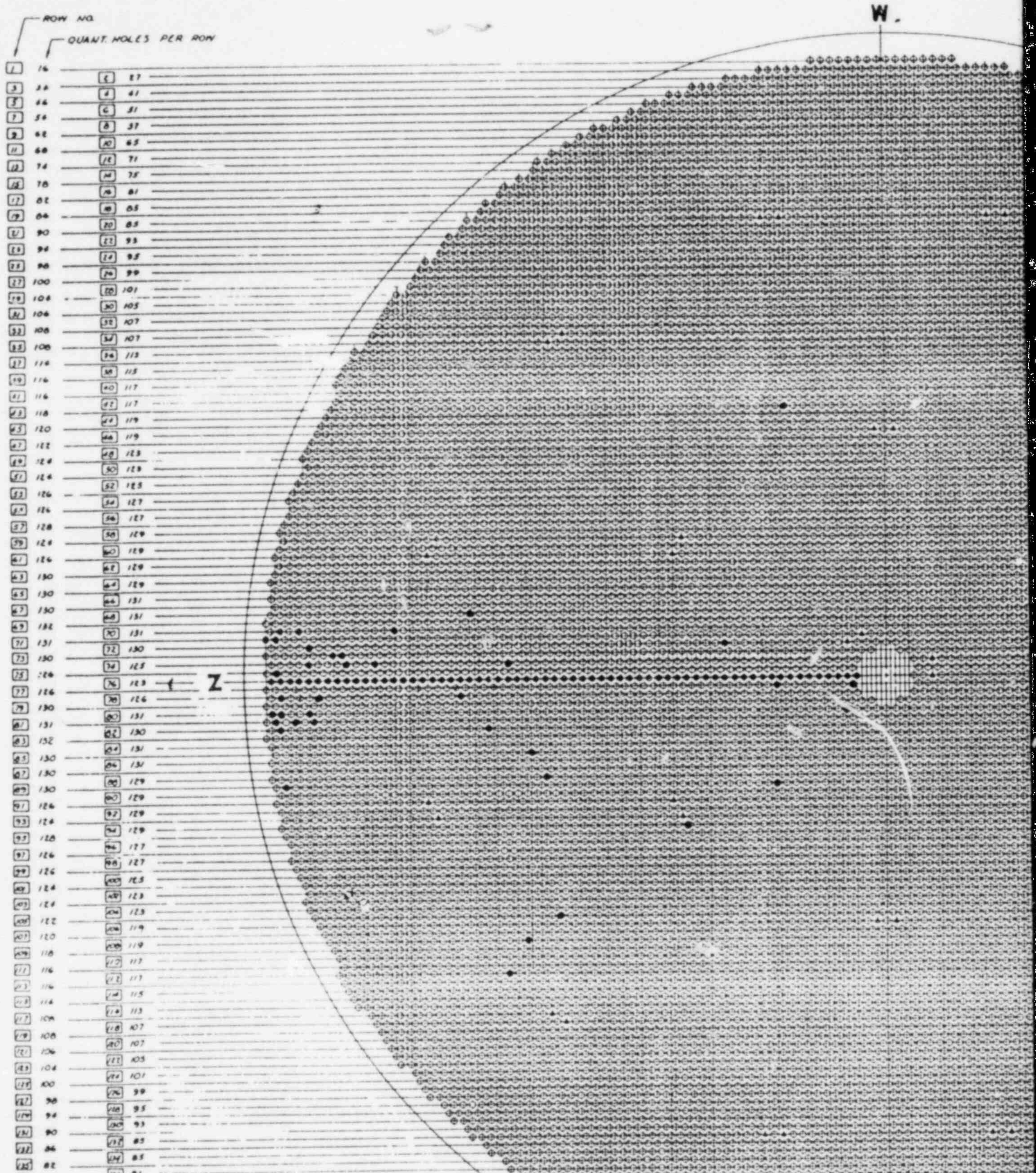
Inspection Lane is Row 76 - Z Axis

ATTACHMENT 1

A OTSG TUBE SHEET MAP

ATTACHMENT 2

B OTSG TUBE SHEET MAP



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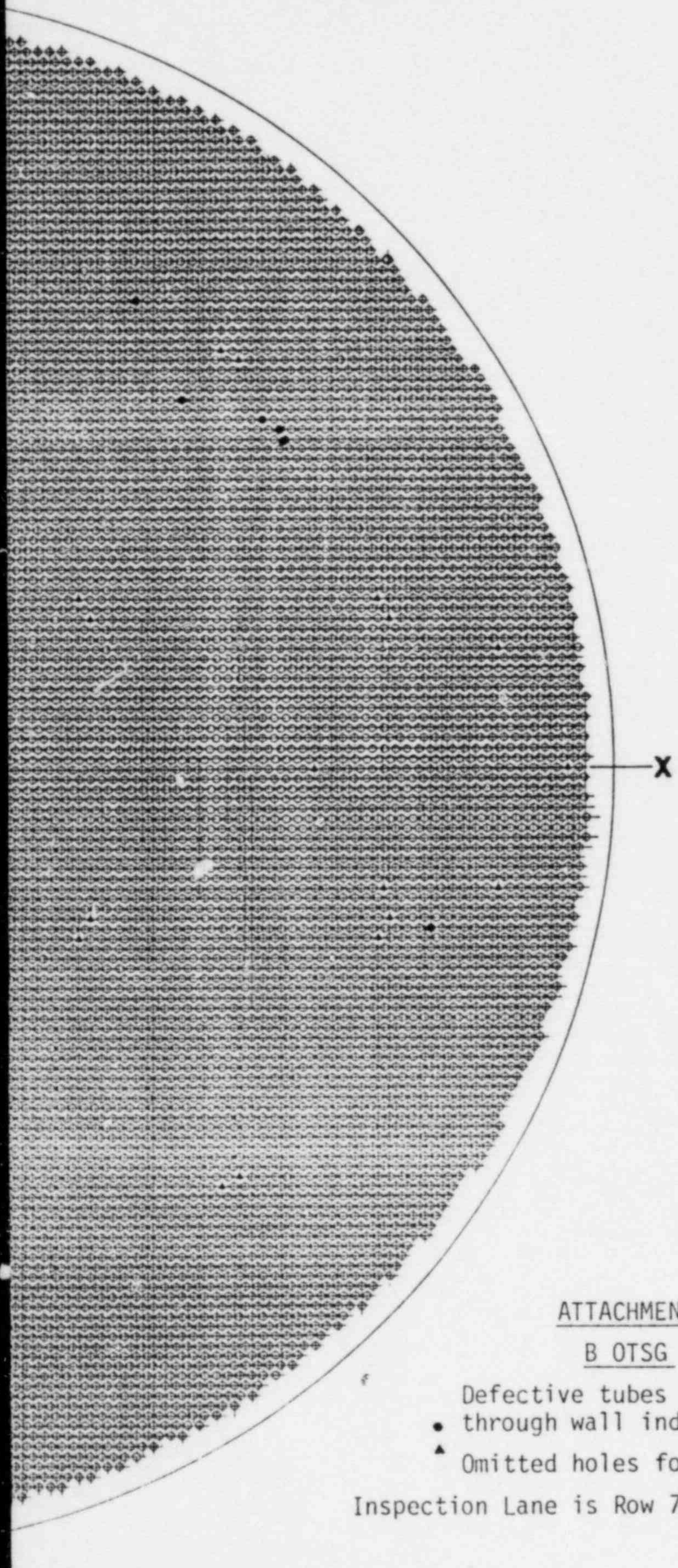


ATTACHMENT 2

B OTSG

• Defective tubes (≥40% through wall indications)

▲ Omitted holes for supports

Inspection Lane is Row 76 - Z Axis

ATTACHMENT 3

DEFECTIVE TUBE SUMMARY FOR A AND B OTSG

Nomenclature:

- 15 - Signifies "15th tube support plate"
- UTS - "upper tube sheet"
- LTS - "lower tube sheet"
- UTSM - "upper tube sheet midspan"
- LTSM - "lower tube sheet midspan"

NOTE: For those measured - Range = 0.5" to 10.25" from secondary (lower) face of the UTS; Span - 75% between 2" and 6" from secondary face of UTS.

10-11 - Signifies "between 10th and 11th tube support plates"

NC - "not called"

%TW = 26,52 - Signifies multiple indications of 26% and 52% through wall.

DEFECTS IN "A" OTSG

(as of 5:00 p.m., 2/4/83)

Tube	Axial Location	% TW	Amplitude (Volts, Peak-To-Peak	Axial Length
75-4	15	41,27	41%-2.0, 27%-10	NC
75-6	15	52	4.5	NC
75-14	UTSM	56,54	56%-6.5, 54%-6.0	NC
75-24	10-11	46	1.0	NC
75-32	UTSM	51	2.5	NC
77-11	UTSM	48, <20	48%-1.5	NC
86-1	UTSM	73	3.0	NC
85-1	UTSM	60,56,42	60%-4.5, 56%-6.2	NC
83-10	UTSM	42	2.0	NC
83-6	UTSM	68	1.7	NC
80-23	UTSM	54,37	54%-1.2, 37%-1.2	NC
81-13	UTSM	59,20	59%-1.7	NC
80-21	UTSM	40		NC
81-10	UTSM	24,51,27,30	51%-3.7, 30%-2.7	NC
80-17	UTSM	70	>16	NC
81-3	UTSM	44	1.5	NC
81-2	UTSM	47	3.0	NC
80-13	UTSM	33,54	54%-5.5	NC
80-12	UTSM	44,50	50%-2.5, 44%-6.0	NC
82-11	UTSM	57	>16	NC
72-8	UTSM	48	5.2	NC
72-7	UTSM	47	1.0	NC
80-11	UTSM	28,66,72	72%-5.2, 66%-5.5	NC
80-10	UTSM	47	2.2	NC
80-7	UTSM	59	2.7	NC
80-2	UTSM	51	1.2	NC
72-10	UTSM	49	2.2	NC
72-12	UTSM	45,55	55%-0.7, 45%-2.0	NC
72-15	UTSM	58,64	64%-1.5, 58%-2.5	NC
71-5	UTSM	43	2.0	NC
72-18	UTSM	46	2.2	NC
72-19	UTSM	47	8.0	NC
71-10	UTSM	59	1.5	NC
71-11	UTSM	41	4.2	NC
71-13	UTSM	45	1.2	NC
71-15	UTSM	51	1.2	NC
69-1	UTSM	41,80	80%-7.5, 41%-5.5	NC
69-3	UTSM	46	1.0	NC
71-22	UTSM	71,35,<20	71%-5.2	NC
69-5	UTSM	46	1.0	NC
71-24	UTSM	51,53,79	79%-6.5, 53%-4.2	NC
71-27	UTSM	44	4.5	NC
69-12	UTSM	53,66	66%-6.0, 53%-1.7	NC
69-13	UTSM	45	1.5	NC
67-1	UTSM	62,39	67%-5.2, 39%-3.0	NC

DEFECTS IN "A" OTSG (Continued)

(as of 5:00 p.m., 2/4/83)

Tube	Axial Location	% TW	Amplitude (Volts, Peak-To-Peak	Axial Length
68-12	UTSM	57	4.7	NC
68-14	UTSM	50	5.5	NC
97-125	15-UTS	69	1.0	NC
87-81	12-13	47	1.5	NC
38-57	8-9	75	1.0	NC
64-103	13-14	64	2.5	NC
83-7	UTSM	67	1.2	NC
71-12	UTSM	40	1.5	NC
37-97	15-UTS	56,35	56%-2.2, 35%-1.2	NC
51-111	1-2	44	1.5	NC
21-55	UTSM	41	3.5	NC
24-5	14-15	51	0.7	NC
6-51	4-5	53	0.7	NC
32-95	UTSM	57	4.2	NC
75-10	15	53	1.2	NC
50-22	UTSM	48	1.7	NC
49-111	UTSM	49,32	49%-1.2	NC
97-17	UTSM	41	1.0	NC
66-11	UTSM	44,30	44%-3.0	NC
70-36	UTSM	59	5.5	NC
65-14	UTSM	43	3.0	NC
65-16	UTSM	46,25	40%-1.5	NC
70-35	UTSM	52	4.0	NC
62-10	UTSM	63	5.5	NC
61-7	UTSM	52	2.5	NC
62-11	UTSM	53	3.2	NC
58-13	UTSM	47,32	47%-5.2	NC
82-60	1-2	83	1.5	NC
91-7	UTSM	44	3.0	NC
71-36	UTSM	43,27	43%-2.5	NC
68-54	UTSM	47	5.5	NC
69-57	14-15	65,34	65%-1.0	NC
24-35	UTSM	42	3.0	NC
31-17	UTSM	59	>16.0	NC
37-101	LTSM	67	8.0	NC
39-15	UTSM	42	6.5	NC
42-1	UTSM	53	6.2	NC
46-108	UTSM	44	3.2	NC
58-14	UTSM	52	6.0	NC
65-10	UTSM	70	>16.0	NC
74-87	UTSM	41	2.5	NC

DEFECTS IN "B" OTSG

(as of 5:00 p.m., 2/4/83)

Tube	Axial Location	% TW	Amplitude (Volts, Peak-To-Peak	Axial Length
80-1	UTSM	80,68,56 63,22	80%->16, 68%->16	NC
73-8	UTSM	84,84,84, 76,60	84%->16, 84%-3.25	NC
73-9	UTSM	52	6.5	NC
74-5	UTSM	64	>16	NC
74-9	UTSM	57,62	57 & 62%-2.5	NC
74-12	7-8	43	1.5	NC
75-2	UTSM	56,<20,46	56 & 46%-2.5	NC
74-26	UTSM	76	1.5	NC
78-2	UTSM	80,40,74,47	80%-5.2, 74%-7.7	NC
78-6	UTSM	54	1.7	NC
78-21	UTSM	51	3.0	NC
82-2	UTSM	80	6.5	NC
70-2	UTSM	42,36,41,41	42%-3.7, 36%-2.0	NC
71-1	UTSM	50,25,42	42%-7.2, 25%-2.0	NC
70-4	UTSM	50	5.0	NC
71-2	UTSM	69,28,54,29	69%-2.5, 54%-4.5	NC
72-5	UTSM	43	1.5	NC
80-2	UTSM	42,46	42%-2.5, 46%-2.0	NC
80-5	UTSM	41	2.2	NC
81-2	UTSM	46,96,69 69,etc.	96%->16, 69%->16	NC
81-6	UTSM	57,76	76%-6.2, 57%-5.2	NC
81-4	UTSM	71	2.0	NC
77-55	UTSM	52	3.5	NC
138-37	UTSM	43	1.2	NC
70-14	UTSM	59	3.5	NC
68-22	UTSM	45	6.2	NC
89-2	UTSM	48	2.2	NC
85-28	UTSM	45	2.7	NC
82-24	UTSM	42	3.5	NC
72-49	UTSM	41	2.7	NC
80-62	UTSM	63	1.5	NC
108-22	UTSM	43,32,30	43%-1.2	NC
105-27	UTSM	20,22,30,43	43%-1.5	NC
41-96	UTSM	43	1.0	NC
88-30	UTSM	36,48,40	48%-1.7, 40%-1.5	NC
89-54	LTS-1	48	1.2	NC
112-19	14-15	63	1.2	NC
44-49	3-4	64	1.2	NC
29-79	5-6	40	1.0	NC
39-89	5-6	57,22	57%-1.2	NC
42-98	12-13	63	1.2	NC
43-99	2-3	57	1.0	NC
92-117	8-9	53,<20,<20	53%-1.0	NC
94-44	7-8	51	2.0	NC
77-63	UTSM	20,40	20%-3.2, 40%-3.2	NC

ATTACHMENT 4

SUMMARY OF OPERATIONAL HISTORY FOR PREVIOUS CYCLE

1R4 Refueling Outage

The following is a summary of work performed on the steam generators during the forth refueling outage (1R4):

During fuel shuffle, a hole was drilled in "A" OTSG shell between the fifth and sixth tube support plates. The hole drilling location was provided by eddy current data. An inspection of the tube support plate revealed fouled broach holes. The area was water lanced and subsequent inspection revealed the water lancing effective where it could reach. Eddy current data indicates the fouling material is concentrated toward the center of the fifth tube support plate. This problem continues under evaluation and is suspected to be associated with our current power controlling OTSG level problems. Following refueling canal draindown, the lower primary manway of "A" OTSG was removed for profilometery and tube plugging. Seven tubes were plugged, three for defect size, and four for defect growth since last inspection.

In preparation for "A" OTSG shell hole drilling, a feedwater riser was removed to provide reference datums. The feedwater spray nozzle had severe erosion. Other feedwater spray nozzles were removed for inspection, four from "A" OTSG and two from "B" OTSG. This allowed twenty nozzles in "A" OTSG and eight nozzles in "B" OTSG to be inspected by fiberscope. Nozzle erosion is occurring in both generators, but "A" OTSG was much more severe. A sample nozzle was cut out for further evaluation and a blank installed on the feed riser.

Operations performed a flash boiling of water at various levels within the "A" OTSG. This was an attempt to remove the fouling at the tube support plate broached holes and upper tube sheet crevice. This proved to be effective when the plant was brought back to power.

DCP801167, Rerouting of "B" Heater Drain Pump Discharge to "B" MFWP Suction, was installed. The preferential feed of pumped forward drains to the "A" OTSG was eliminated by rerouting the heater drain pump discharge piping.

Rerouting of the "B" Heater Drain Pump Discharge was done to alleviate debris accumulation in the "A" OTSG. This discharge had previously been routed to the side of the common header where the "A" main feedwater pump takes suction. The discharge of the heater drain pumps is not filtered or deionized before it is sent to the generators.

DCP801061, Steam Generator Layup Level Transmitter, was installed. The lower level taps for the wide range level transmitters were relocated and condensate pots were added.

The generators remained in wet layup conditions on the secondary side except during those times when they were open for inspection or design changes. A nitrogen blanket was maintained when the secondary side was open to atmosphere. For purposes of this and subsequent discussion, wet layup (WLU) consists of filling the generators with deoxygenated feedwater from the condenser hotwells. Oxygen is removed with hydrazine addition to the feedwater or to the generators directly.

March 1981

The unit was in the shutdown mode for the refueling outage for the first 16 days of March. The reactor was brought critical on the 16th and was inadvertently tripped when a trip circuit was being reset on the 18th. The unit was returned to power and reached 100% power operation on the 25th. The unit finished the month at 100%.

The generators remained in hot standby (HSB) during the above trip and return to power.

April 1981

The unit began the month at 100% full power and continued there until 4/8/81. On 4/8/81, the reactor tripped on high reactor coolant system (RCS) pressure during an attempted runback caused by a false power signal being sent to the integrated control system (ICS). The unit returned to 100% on 4/10/81 and continued normal operation through the end of the month.

The generators remained in HSB during the above trip and return to power.

May 1981

The unit operated at 100% full power and continued there until 5/13/81. On this date, the reactor tripped on the anticipatory trip circuitry for loss of feedwater pumps. The feedwater pumps tripped on low suction pressure when the condensate pumps tripped on a false condenser hotwell low level signal. The unit returned to 100% power operation on 5/15/81 and continued operation there through the remainder of the month.

The generators remained in HSB during the above trip and return to power.

June 1981

The unit began the month at 100% full power and continued there until June 3, 1981. On this date, the reactor tripped on the anticipatory trip circuitry for loss of main turbine bearing oil pressure. A malfunction of the low oil pressure trip mechanism initiated the trip. The unit resumed 100% full power operations June 4, 1981, and continued there until June 10, 1981.

Continued fouling of the "A" OTSG required a unit power reduction to reduce the water level in the downcomer region of the "A" OTSG. On June 10, 1981, the unit began a gradual power reduction, with power limited by the downcomer water level of the "A" OTSG. The "A" OTSG downcomer water level stabilized June 18, 1981, with the reactor at 96.7% full power. The unit continued to operate at 96.7% full power through the end of the month.

The generators remained in HSB during the above trip and return to power.

July 1981

The unit began the month at 96.7% full power in a power limited condition due to the downcomer water level of the "A" OTSG. A gradual reduction in the "A" OTSG downcomer water level allowed power to be increased to 99.24% on July 7, 1981. On July 8, 1981, the reactor tripped on high RCS pressure when the "A" MFW pump tripped on low suction pressure. The unit resumed 100% full power operations on July 9, 1981, and continued there until July 15, 1981. On July 15, the unit was brought to cold shutdown to repair a leaking manway on the primary side of the "A" OTSG. Heatup of Unit One began on July 27, 1981, after repair of the "A" OTSG and 100% full power was attained July 29, 1981. The unit continued to operate at 100% full power through the end of the month.

For the trip outage describe above, the generators were in HSB. For the extended shutdown (7/15 to 7/27), the generators were placed in WLU.

August 1981

The unit began the month at 100% power and continued there until August 15, 1981. As in the previous months, fouling of the tube sheet support plates in the "A" OTSG, with the resulting increase in downcomer level required a reduction in unit power. A gradual reduction of power was begun on August 15 and by August 20 a steady state condition at 97% full power was achieved. On August 21, Unit 1 tripped on the power/pump circuit when power was temporarily lost to the "A" and "C" RCP's. A bolt in a diode heat sink on the diode wheel of the Main Generator Exciter had worked loose causing a short to ground of the Generator Exciter field. The resulting turbine trip and load shed caused a temporary loss of power to "A" and "C" RCP's. The unit was brought to cold shutdown and remained down until August 30, to affect repairs on the Main Generator Exciter and "A" and "B" RCP seals. The unit went critical at 1200 hours on August 30, and the generator was placed on line at 0340 hours August 31. At 0411 hours on August 31 with the reactor at approximately 9% full power the Main Turbine tripped when a diaphragm between the lubrication oil and the electrohydraulic control fluid in the turbine auto stop valve ruptured. The diaphragm was replaced and the generator was back on line at 1028 hours, August 31. The unit ended the month at approximately 26% full power in transit to 100% full power.

During the extended shutdown (8/21 to 8/31), the generators were in WLU. The generators remained in HSB for the 8/31 trip and return to power.

September 1981

Having gone critical on August 30, 1981, the unit began September in a hold at 75% full power to allow the core to reach Xenon equilibrium. At 0329 hours on September 1, 1981, while at the 75% power hold, Loop "B" T_h failed high causing the ICS to runback reactor power and increase feedwater flow. Loop "A" T_{AVE} was selected for ICS control and the ICS sensed an immediate reduction in T_{AVE} from 578°F to 560°F. This caused the unit to exceed BTU limits and rods to be continuously withdrawn. The reactor tripped on high reactor coolant pressure. The Loop "B" T_h instrumentation was repaired and the reactor went critical at 0612 hours September 1. The unit generator was on line at 0812 hours September 1 and 100% full power was attained by 1630 hours September 2. As in the previous months, fouling of the "A" OTSG and the resulting increase in downcomer water level has required a reduction in unit power. On September 13, 1981, a gradual power reduction was begun to reduce downcomer water level and prevent flooding of the feedwater nozzles.

The unit ended the month at 96.19% full power with further power reductions anticipated due to "A" OTSG fouling.

The generators remained in HSB during the above trip and return to power.

October 1981

The unit began the month at 96.19% full power. The unit was in a power limited condition due to fouling of the "A" Steam Generator. Periodic power reductions were required throughout the month to prevent flooding of the feedwater nozzles. The unit ended the month at 91.18% full power with further power reductions anticipated.

November 1981

The unit began the month at 91.03% full power. The unit was in a power limited condition due to the fouling of the "A" Steam Generator. Periodic power adjustments were required throughout the month to prevent flooding of the feedwater nozzles. The unit ended the month at 87.81% full power with further power reductions anticipated.

December 1981

The unit began the month at 85.97% full power. The unit was in a power limited condition due to the fouling of the "A" Steam Generator. Periodic power adjustments were required throughout the month to prevent flooding of the feedwater nozzles. The unit ended the month at 88.30% full power with further power reductions anticipated.

January 1982

The unit began the month at 88.14% full power. The unit is in a power limited condition due to the fouling of the "A" Steam Generator. Periodic power adjustments have been required throughout the month to prevent flooding of the feedwater nozzles. The unit ended the month at 83.9% full power with further power reductions anticipated.

February 1982

The unit began the month at 82.89% full power. The unit was in a power limited condition due to the fouling of the "A" Steam Generator. Periodic power adjustments were required throughout the month to prevent flooding of the feedwater nozzles. The unit ended the month at 83.52% full power with further power reductions anticipated.

March 1982

Unit One began the month of March at 83.21% full power. The unit was in a power limited condition due to fouling of the "A" Steam Generator. Operations at reduced power were required to prevent flooding of the "A" OTSG feedwater nozzles. On March 17, high seal bleedoff temperature on the "D" reactor coolant pump prompted shutdown of the pump. At 1307 with the reactor at 62% full power, "D" RCP was secured. Power was later increased to approximately 72% where it remained until March 26. On March

26, Unit One was brought to cold shutdown to replace the "A" OTSG feedwater nozzles. Unit One remained in cold shutdown through the end of the month.

The outage to replace the feedwater nozzles in the "A" OTSG lasted ~ 37 days. Both generators were in WLU until April 4. On April 4, the 'A' OTSG was drained to permit opening the secondary side of the generator. The 'B' OTSG was left on chemical recirculation. On April 26, the 'A' OTSG was refilled. Both generators were flushed (drained and refilled) on April 27 returning them to WLU condition.

While returning to power after this outage, the flash boiling procedure referenced in the startup after 1R4 was again used to loosen and remove debris in the tube support plates and tube sheets.

April 1982

Unit One remained in the cold shutdown mode during the month of April for replacement of the "A" OTSG feedwater nozzles.

May 1982

The spring outage for replacement of the "A" OTSG feedwater nozzles was extended into the first 10 days of May when a radiography inspection of the high pressure injection (HPI) nozzles revealed potential problems in all but the "C" nozzle. "A" and "B" nozzles were replaced and the "D" nozzle was resized, a leaking seal on the "A" Decay Heat Pump required replacement of the pump seals and bearings, and Generator Hydrogen Seal Oil leaks required replacement of the hydrogen seal rings.

Unit One began heatup May 3, and the reactor was brought critical at 0720 hours May 9. The generator was subsequently brought on line at 0715 hours May 10. High level indications and the possibility of tube leaks in the E-1A, E3A, and E4A feedwater heaters delayed power escalation as the cause of the high levels was investigated. Failure of the E5A, E6A, and E8A feedwater bypass valve in the bypass position had caused the high levels in E3A and E4A. Following repair of the bypass valve and tube leaks in the E1A feedwater heater, Unit One resumed power escalation on May 22. The unit achieved 97.17 percent full power May 24. Power was limited due to high "A" OTSG level and low feedwater pump suction pressure. At 0540 hours May 25, high radiation alarms on the condenser offgas and the "A" OTSG N16 monitors alerted operators of a possible steam generator tube leak. At 1213 hours May 25, Unit One was brought to cold shutdown for repair of a tube leak in the "A" OTSG. Reactor Coolant System leak rate was determined to be less than 1 gpm. Unit One remained in a cold shutdown through the end of May for repair of the "A" OTSG tube leak.

During the shutdown for the tube leak outage, the flash boiling procedure was used to loosen and remove debris in the tube support plates and tube sheets.

The generators were placed in WLU during the tube leak inspection and repair outage.

June 1982

Unit One began June in the cold shutdown mode for repair of a tube leak in the "A" Steam Generator. Following repairs to the "A" OTSG heatup of Unit One was begun June 8. The reactor was brought critical at 0904 hours June 10 and the generator was placed on line at 1333 hours June 10. Unit One achieved 100 percent full power June 15, where it remained through the end of the month.

July 1982

Unit One began July at 99.10 percent full power. Reactor power was reduced to 91.1 percent full power July 19, for approximately 14 hours to facilitate repairs to the "A" Heater Drain Tank Pump. On July 22 failure of the No. 4 Governor Valve required reactor power to be reduced to 90.0 percent full power. Repairs were affected within 15 hours and full power operations were resumed. Unit One ended July at 99.98 percent full power.

August 1982

Unit One began the month of August at 99.82% full power. At 0602 hours on August 5, the reactor/turbine tripped on a RPS anticipatory trip based upon a false indication of loss of both main feedwater pumps. The trip occurred as reactor power was being reduced for recovery of a dropped control rod. The RPS sensed failure of both main feedwater pumps as the "B" pump was tripped off line. Checks of the main feedwater pump anticipatory trip system have not identified the cause of the trip. On August 18, as the unit was returning to power, the reactor was manually tripped from 13% full power following auto actuation of SLBIC. Failure of the #3 governor valve limiter circuit prevented the valve from fully closing causing header pressure to decrease uncontrollably. Repairs to the governor valve were effected and Unit 1 returned to 100% full power August 21. On August 22, Unit 1 tripped on high reactor power following a malfunction of the main turbine overspeed protection circuit. Header pressure oscillations induced by the erroneous speed condition caused the ICS to overcorrect reactor power. The Unit tripped on the high power setpoint of "B" and "D" RPS channels. On August 23, Unit 1 returned to power operations and achieved 100% full power August 27. August 29, reactor power was reduced to approximately 91% full power following failure of the expansion joint in the extraction line to the E4A feedwater heater. Unit 1 ended August at 92.34% full power.

For all trips described above, the generators remained in HSB. The flash boiling procedure was used again on return to power after the main feedwater pump anticipatory trip.

September 1982

Unit One began the month of September at 92.21% full power. Reduced power operations have been required since August 29, following failure of an expansion joint in the extraction line to the E4A feedwater heater. Subsequently, failure of an expansion joint in the extraction line to the E-3A feedwater heater caused reactor power to be reduced to approximately 87% full power. At 1705 hours September 26, the unit was manually tripped.

Failure of the Group 6 Control Rod Drive programmer caused Group 6 control rods to insert uncontrollably. The reactor was manually tripped to prevent exceeding rod index and imbalance limits. Following repair of the programmer, the unit was brought on line at 1440 hours September 27. Unit One ended the month at 87.44% full power.

October 1982

Unit 1 began the month of October at 76.69% full power. The unit was in a power coastdown for the fifth refueling outage (1R5) scheduled November 26. On October 26, 1982, reactor power was reduced to approximately 65% as the "B" Reactor Coolant Pump was secured for a seal leak. The unit operated the remainder of the month with only three reactor coolant pumps. By the end of October, reactor power had been reduced to approximately 68.48%.

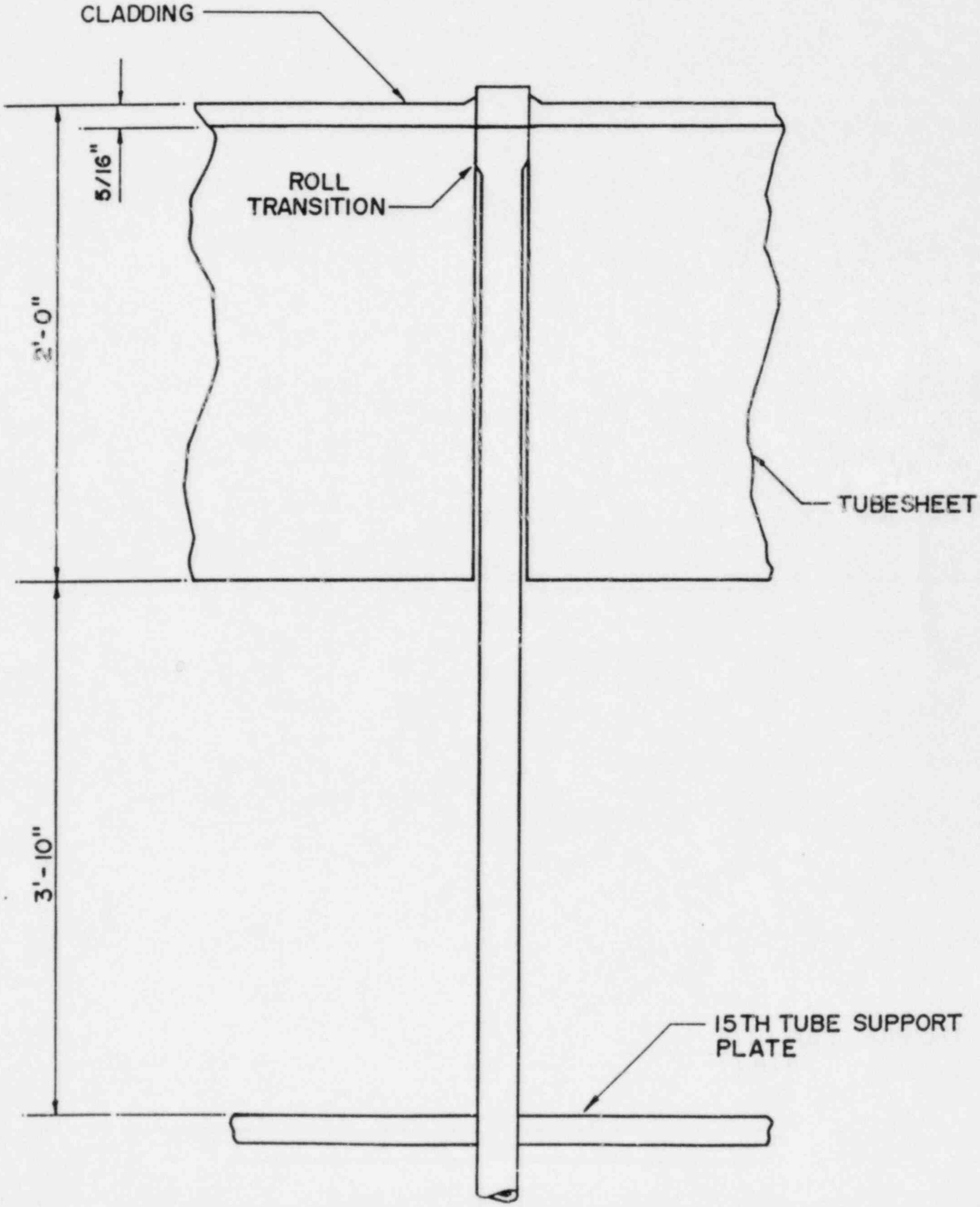
November 1982

Unit 1 began the month of November at 67.66% full power. The unit was in a power coastdown for the 1R5 refueling outage. On November 8, a seal leak in the "B" Reactor Coolant Pump exceeded technical specifications and Unit 1 was required to shutdown. The reactor was tripped at 0912 hours November 9 and the 1R5 refueling outage was begun.

ATTACHMENT 5

TUBE SHEET CROSS SECTION DRAWING

UPPER TUBESHEET



ATTACHMENT 6

HISTORICAL INSPECTION DATA

FOR DEFECTIVE TUBES

Nomenclature:

C = Clean
NI = Not Inspected
N = Noisy/Chatter
D = Distorted

'A' OTSG INSPECTION HISTORY FOR DEFECTIVE TUBES

(as of 5:00 p.m., 1/14/83)

Tube	Axial Location	Inservice Inspection History (% TW)					Leaker Inspection History (% TW)		
		12/82	1/81	4/79	2/78	2/77	7/80	9/80	5/82
75-4	15	41,27	15- <20%OD	C	C	C	15-<20% OD N	15-<20% OD N	15-22% OD
75-6	15	52	15 - 20% Wear	15 - <20% Wear	15-20% OD	C	15-28% OD	15-28% OD	15-25% OD
75-14	UTSM	56,54	C	C	C	C	C	UTS <20%OD	C
75-24	10-11	46	N	C	C	N	N	C	C
75-32	UTSM	51	N	C	C	UTS = N,D	N	N	C
77-11	UTSM	48, <20	N	C	C	C	N	N	C
86-1	UTSM	73	NI	NI	NI	NI	NI	NI	NI
85-1	UTSM	60,56 [illegible]	NI	NI	C	NI	NI	NI	NI
83-10	UTSM	42	NI	NI	NI	NI	NI	NI	NI
83-6	UTSM	68	NI	NI	NI	NI	NI	NI	NI
80-23	UTSM	54,37	NI	NI	NI	NI	NI	C	NI
81-13	UTSM	59,20	NI	NI	NI	NI	NI	NI	NI
80-21	UTSM	40	NI	NI	NI	NI	NI	UTS<20% N	NI
81-10	UTSM	51,30,27,24	C	NI	NI	NI	NI	NI	NI
80-17	UTSM	70	N	NI	NI	NI	NI	N	NI
81-3	UTSM	44	NI	NI	NI	NI	NI	NI	NI
81-2	UTSM	47	NI	NI	NI	NI	NI	NI	NI
80-13	UTSM	54,33	NI	NI	NI	NI	NI	UTS <20%OD	NI
80-12	UTSM	50,44	NI	NI	C	NI	NI	UTS <20%OD	NI
82-11	UTSM	57	NI	NI	NI	NI	NI	NI	NI
72-8	UTSM	48	NI	NI	C	NI	NI	C	NI
72-7	UTSM	47	NI	NI	NI	NI	NI	UTS <20%OD	NI
80-11	UTSM	72,66,28	NI	NI	NI	NI	NI	C	NI
80-10	UTSM	47	C	NI	NI	NI	NI	C	NI
80-7	UTSM	59	NI	NI	NI	NI	NI	UTS <20%OD	NI

'A' OTSG INSPECTION HISTORY FOR DEFECTIVE TUBES (Continued)

(as of 5:00 p.m., 1/14/83)

Tube	Axial Location	Inservice Inspection History (% TW)					Leaker Inspection History (% TW)		
		12/82	1/81	4/79	2/78	2/77	7/80	9/80	5/82
80-2	UTSM	51	NI	C	C	NI	NI	UTS<20% OD	NI
72-10	UTSM	49	NI	NI	NI	NI	NI	UTS<20% OD	NI
72-12	UTSM	55,45	NI	NI	C	NI	NI	UTS <20%OD	NI
72-15	UTSM	64,58	NI	NI	NI	NI	NI	N	NI
71-5	UTSM	43	NI	NI	NI	NI	NI	C	UTSM<20% OD
72-18	UTSM	46	NI	NI	NI	NI	NI	N	NI
72-19	UTSM	47	NI	NI	NI	NI	NI	C	NI
71-10	UTSM	59	NI	NI	NI	NI	NI	NI	NI
71-11	UTSM	41	NI	NI	NI	NI	NI	NI	NI
71-13	UTSM	45	NI	NI	NI	NI	NI	NI	NI
71-15	UTSM	51	NI	NI	NI	NI	NI	NI	NI
69-1	UTSM	80,41	C	NI	NI	NI	NI	NI	NI
69-3	UTSM	46	NI	NI	NI	NI	NI	UTS<20% OD	NI
71-22	UTSM	71,35,<20	NI	NI	NI	NI	NI	NI	NI
69-5	UTSM	46	NI	NI	NI	NI	NI	NI	NI
71-24	UTSM	79,53,51	NI	NI	NI	NI	NI	NI	NI
71-27	UTSM	44	NI	NI	NI	NI	NI	NI	NI
69-12	UTSM	66,53	NI	NI	NI	NI	NI	NI	NI
69-13	UTSM	45	NI	NI	NI	NI	NI	NI	NI
67-1	UTSM	62,39	N	NI	C	NI	NI	NI	NI
68-12	UTSM	57	NI	NI	NI	NI	NI	NI	NI
68-14	UTSM	50	XL-Ding	NI	NI	NI	NI	NI	NI
97-125	15-UTS	69	<20% OD	20% OD	20% OD	NI	20% OD	20% OD	NI
87-81	12-13	47	<20% OD	NI	15-20% OD	NI	NI	NI	NI
38-57	8-9	75	<20% OD	NI	NI	NI	NI	NI	NI
64-103	13-14	64	<20% OD	NI	NI	NI	NI	NI	NI
83-7	UTSM	67	NI	NI	NI	NI	NI	NI	NI

'A' OTSG INSPECTION HISTORY FOR DEFECTIVE TUBES (Continued)

(as of 5:00 p.m., 1/14/83)

Tube	Axial Location	Inservice Inspection History (% TW)					Leaker Inspection History (% TW)		
		12/82	1/81	4/79	2/78	2/77	7/80	9/80	5/82
71-12	UTSM	40	NI	NI	NI	NI	NI	NI	NI
37-97	15-UTS	56,35	20-35%	NI	NI	NI	NI	NI	NI
51-111	1-2	44	20%	NI	NI	NI	NI	NI	NI
21-55	UTSM	41	NI	NI	NI	C	NI	NI	NI
24-5	14-15	51	<20	<10	NI	NI	NI	NI	NI
6-51	4-5	53	20	35	NI	NI	35	NI	NI
32-95	UTSM	57	C	NI	NI	NI	NI	NI	NI
75-10	15	53	C	C	C	C	C	C	C
50-22	UTSM	48	NI	NI	NI	NI	NI	NI	NI
49-111	UTSM	49,32	NI	NI	NI	NI	NI	NI	NI
97-17	UTSM	41	NI	NI	NI	NI	NI	NI	NI
66-11	UTSM	44,30	NI	NI	NI	NI	NI	NI	NI
70-36	UTSM	59	NI	NI	NI	NI	NI	NI	NI
65-14	UTSM	43	NI	NI	NI	NI	NI	NI	NI
65-16	UTSM	46,25	NI	NI	NI	NI	NI	NI	NI
70-35	UTSM	52	NI	NI	NI	NI	NI	NI	NI
62-10	UTSM	63	NI	NI	NI	NI	NI	NI	NI
61-7	UTSM	52	NI	C	C	NI	NI	NI	NI
62-11	UTSM	53	NI	NI	NI	NI	NI	NI	NI
58-13	UTSM	47,32	NI	NI	NI	NI	NI	NI	NI
82-60	1-2	83	NI	NI	NI	NI	NI	NI	NI
91-7	UTSM	44	NI	NI	C	NI	NI	NI	NI
71-36	UTSM	43,27	NI	NI	NI	NI	NI	NI	NI
68-54	UTSM	47	NI	NI	NI	NI	NI	NI	NI
69-57	14-15	65,34	NI	NI	NI	NI	NI	NI	NI

'B' OTSG INSPECTION HISTORY FOR DEFECTIVE TUBES

(as of 5:00 p.m., 1/14/83)

Tube	Axial Location	Inservice Inspection History (% TW)				
		12/82	1/81	4/79	2/78	2/77
80-1	UTSM	80,68,63,etc.	C	C	C	NI
73-8	UTSM	84,84,84,etc.	C	C	C	C
73-9	UTSM	52	C	C	C	C
74-5	UTSM	64	C	C	C	C
74-9	UTSM	57,62	C	C	C	C
74-12	7-8	43	<20	25	30	15
75-2	UTSM	56,46,etc.	C	C	C	C
74-26	UTSM	76	C	C	C	C
78-2	UTSM	80,74,47,etc.	C	C	C	C
78-6	UTSM	54	C	C	C	C
78-21	UTSM	51	C	C	C	C
82-2	UTSM	80	NI	NI	NI	NI
70-2	UTSM	42,41,41,etc.	NI	NI	NI	NI
71-1	UTSM	50,42,etc.	C	NI	NI	NI
70-4	UTSM	50	NI	NI	NI	NI
71-2	UTSM	69,54,etc.	NI	NI	NI	NI
72-5	UTSM	43	NI	NI	NI	NI
80-2	UTSM	46,42	NI	NI	C	NI
80-5	UTSM	41	NI	NI	NI	NI
81-2	UTSM	96,69,69,etc.	NI	NI	NI	NI
81-6	UTSM	76,57	NI	NI	NI	NI
81-4	UTSM	71	NI	NI	NI	NI
77-55	UTSM	52	C	C	C	C
138-37	LTS-1	43	NI	NI	NI	NI
70-14	UTSM	59	NI	NI	NI	NI
68-22	UTSM	45	NI	NI	NI	NI
89-2	UTSM	48	NI	NI	NI	NI
85-28	UTSM	45	NI	NI	NI	NI
82-24	UTSM	42	NI	NI	NI	NI
72-49	UTSM	41	NI	NI	NI	NI
80-62	UTSM	63	NI	NI	NI	NI
108-22	UTSM	43,32,30	NI	NI	NI	NI
105-27	UTSM	43,30,22	NI	NI	NI	NI
103-7	13-14	69	NI	NI	C	NI
102-5	13-14	44	NI	NI	NI	NI
41-96	UTSM	43	NI	NI	NI	NI
88-30	UTSM	48,40,36	NI	C	NI	NI
89-54	LTS-1	48	NI	NI	NI	NI
112-19	14-15	63	NI	NI	NI	NI
44-49	3-4	64	NI	NI	NI	NI
29-79	5-6	40	NI	NI	NI	NI
39-89	5-6	57,22	NI	NI	NI	NI
42-98	12-13	63	NI	NI	NI	NI
43-99	2-3	57	NI	NI	NI	NI
92-117	8-9	53,<20,<20	NI	NI	NI	NI