TVA

Tennessee Valley Authority, Post Office Box 2000, Spring City, Tennessee 37381-2000

NOV 0 1 2002

10 CFR 50.4

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D. C. 20555

Gentlemen:

In the Matter of	)	Docket No.50-390
Tennessee Valley Authority	)	

WATTS BAR NUCLEAR PLANT (WBN) UNIT 1 - STEAM GENERATOR INSERVICE INSPECTION - CYCLE 4 TWELVE MONTH REPORT

In accordance with the requirements in WBN Technical Specification 5.9.9, *SG Tube Inspection Report*, the enclosure provides the Steam Generator Inservice Inspection Report for Cycle 4. This report is required to be submitted within twelve months following the refueling outage and provides the complete results of the tube inspections. Other reports required by Technical Specification 5.9.9 were previously submitted on March 12, 2002, use of F* alternate repair criteria, and March 14, 2002, 15-day report. TVA also submitted a 90-day report concerning the use of an alternate repair criteria for outside diameter stress corrosion cracking on June 14, 2002. TVA committed to provide this information in TVA's letter dated April 10, 2000, concerning the license amendment request for use of this repair criteria. The enclosed report completes the reporting requirements for the steam generator inspections during Unit 1 Cycle 4 outage.

A047
IE24

No commitments are identified in this letter. If you have any questions about this report, please contact me at (423) 365-1824.

Sincerely,

P. L. Pace
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Watts Bar Nuclear Plant

Unit 1 Cycle 4 Refueling Outage
March 2002

12 Month Report

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INTRODUCTION

During the scheduled Watts Bar Nuclear Plant (WBN) Unit 1 End of Cycle 4 (EOC-4) refueling outage, extensive inservice inspections were conducted in all four steam generators (SGs). The WBN Unit 1 Cycle 4 Degradation Assessment projected the extent of the various active and potential degradation mechanisms based on industry experience of plants with Westinghouse Model D3 SGs. The inspection was focused on the detection and evaluation of the active and potential degradation mechanisms.

The results of the inspections were classified as follows:

	SG1	SG2	SG3	SG4
Full-Length Bobbin Coil	C-2	C-2	C-2	C-2
U-Bend Plus Point	C-1	C-1	C-1	C-1
Top of Tubesheet Plus Point	C-2	C-2	C-2	C-3
Dented TSP Plus Point	C-1	C-1	C-1	C-1
Freespan Ding Plus Point	C-1	C-1	C-1	C-1

The Alternate Repair Criteria (ARC) for axial outside diameter stress corrosion cracking (ODSCC) at tube support plates (TSPs) was implemented during this inspection. The report required within 90 days by Generic Letter 95-05, Attachment 1, Section 6.b. was transmitted to NRC by a separate transmittal.

The F* ARC was continued during the Cycle 4 RFO. This ARC is for degradation mechanisms in the tubesheet region of the tubing The report required by Technical Specification 5.9.9 was transmitted to NRC by a separate transmittal.

This report fulfills the reporting requirements of WBN Technical Specification Section 5.9.9 for reporting results of SG inservice inspection within 12 months.

SG TUBE INSERVICE INSPECTION SCOPE

The WBN SG tube inservice inspection (ISI) initial sample and expansions for all SGs and all damage mechanisms was as follows:

100% full-length bobbin examination in all 4 SGs

100% hot leg top of tubesheet (HTS) expansion-transition region examination in all 4 SGs with +Point probe.

20% cold leg top-of-tubesheet (CTS) expansion-transition region examination in SG4 with +Point probe.

100% Row 1 and 20% of Row 2 U-Bend examinations in all 4 SGs with magnetic biased ZETEC +Point LowRow U-Bend probe.

100% of hot leg TSP intersections dented ≥2 volts in all 4 SGs with +Point probe.

100% of mechanically-induced freespan dents ≥2 volts between the HTS and H02 with a Plus Point probe.

100% of mechanically-induced freespan dents ≥2 volts between the CTS and C02 with a Plus Point probe.

100% of <2 volt dented TSP intersections were examined during the bobbin coil examination utilizing the qualified technique for detection of PWSCC. This required extensive analyst training and testing.

100% of ≥5 volt freespan dents in the preheater regions with +Point probe.

All test techniques used for detection were EPRI Appendix H qualified examination techniques and validated for use at WBN. NDE uncertainties were quantified for analysts and techniques utilized for sizing.

Refer to Attachment 1 for the quantity of the above examinations.

SG TUBE INSPECTION RESULTS

As a result of plugging 186 tubes EOC-4, Unit 1 SGs are 1.4% plugged. WBN Unit 1 is analyzed for up to 10% tube plugging. WBN Unit 1 utilized the Westinghouse rolled plugs during Cycle 4 RFO. Refer to Attachment 2 for a summary of tubes plugged and Attachment 3 for the identification of tubes plugged by damage mechanism.

The plugging status of each SG is described in Table 1 below:

Table 1

	SG1	SG2	SG3	SG4	Total
Previously Plugged	21	20	14	11	66
Plugged EOC-4	28	37	34	87	186
Total Tubes Plugged	49	57	48	98	252
Percent Plugged	1.0%	1.2%	1.0%	2.1%	1.4%

WBN Technical Specification Change WBN-TS-99-014 allows for the main steam line break accident differential pressure to be defined as 2405 psi (Pressurizer PORV setpoint), and 1.43 times this value provides the accident structural pressure lower limit of 3439 psi. The Steam Generator tubing operating pressure differential during fuel cycle 11 was 1269 psi (2235 psi RCS pressure minus 966 psi Main Steam pressure) Three times the normal differential pressure provides the normal operating structural pressure lower limit of 3807 psi.

Calculation for tube lower limit burst pressures were performed using TubeWorks Version 1.10 by E-Mech Technology, Inc.

Degradation Mechanisms

The following discussions contain quantities of indications for the various degradation mechanisms. Experience has shown that multiple indications of a degradation mechanism may be found at a particular location and force the tube to be plugged. Also, multiple degradation mechanisms may be found in a particular tube and force the tube to be plugged. In Attachment 2 and 3, only the most significant degradation mechanism was identified as the reason for plugging a particular tube when multiple degradation mechanisms were found. Therefore, a one-to-one relation between the quantity of indications found and quantity of tubes plugged can not be made In all cases, each tube with an indication which exceeded the plugging criteria was removed from service by plugging.

U-Bend PWSCC Axial and Circumferential

The U1C4 Degradation Assessment predicted zero tubes to be plugged due to U-bend PWSCC axial or circumferential indications. Row 1 and 2 U-Bends were heat treated In-Situ prior to start-up. No PWSCC indications were identified in Row 1 or 2 during the EOC-4 inspection.

TTS PWSCC Axial

The U1C4 Degradation Assessment predicted twenty-five tubes to be plugged due to TTS PWSCC axial indications. All PWSCC TTS axial indications identified were plugged on detection and sized using the +Point probe.

A total of 38 TTS PWSCC axial indications were identified. The most limiting PWSCC TTS axial indication was in SG2 R25 C38 at HTS+0.12 which had NDE indicated values for average depth of 77.12%, maximum depth of 97%, length of 0.25 inches and Max. Volts of 1.21. Condition Monitoring assumed this indication was free-span and calculated a lower limit burst pressure of 4040 psi.

All PWSCC TTS axial indications were below the In-Situ Guideline voltage criteria for performing In-Situ pressure testing for leakage. All TTS PWSCC Axial indications met condition monitoring performance criteria. All TTS PWSCC Axial indications were plugged.

TTS PWSCC Circ

The U1C4 Degradation Assessment predicted five tubes to be plugged due to TTS PWSCC Circ indications. Only one TTS PWSCC circumferential indication was detected and plugged on detection and sized using the +Point probe.

This TTS PWSCC Circumferential indication (SG1 R19 C66 at HTS-0.05) was below the top-of-tubesheet, however it was analyzed as if it was freespan. The NDE indicated values were 8.08% PDA, 74% maximum depth, 75 degrees circumferential extent, and 1.01 Max. Volts. Condition Monitoring assumed this indication was free span and calculated a lower limit burst pressure of 8901 psi

The PWSCC TTS circumferential indication was below the In-Situ Guideline voltage criteria for performing In-Situ pressure testing for leakage. The TTS PWSCC Circ indication met condition monitoring performance criteria. This PWSCC circumferential indication was plugged.

TTS ODSCC Axial

The U1C4 Degradation Assessment predicted zero tubes to be plugged for TTS ODSCC axial indications (TVA's SG Strategic Plan had predicted EOC-5 before detecting this degradation mechanism). Two indications were identified and were plugged on detection and sized using the +Point probe.

The most limiting TTS ODSCC axial indication is SG4 R23 C69 located at HTS +0.23. This indication had values of 0.17 inches long 59.62% average depth, 95% maximum depth, and 0.12 Max Volts. Condition Monitoring calculated a lower limit burst pressure of 4845 psi

Both ODSCC TTS axial indications were below the In-Situ Guideline voltage criteria for performing In-Situ pressure testing for leakage. Both TTS ODSCC axial indications met condition monitoring performance criteria. Both TTS ODSCC indications were plugged.

TTS ODSCC Circumferential

The U1C4 Degradation Assessment predicted thirty tubes to be plugged for TTS ODSCC Circumferential indications. All identified TTS ODSCC Circumferential indications were plugged on detection and sized using the +Point probe.

A total of 151 circumferential indications were identified. Every tube with a circumferential crack greater than 180 degrees in extent was In-Situ Pressure tested. Fifteen tubes (i.e. 3 tubes in SG1, 1 tube in SG3, and 11 tubes in SG4) were conservatively identified for In-Situ Pressure Testing to confirm both structural and leakage integrity. All of the tubes withstood 3 times normal operating pressure with zero leakage detected.

Based on In-Situ Pressure Testing, all TTS ODSCC Circumferential indications met condition monitoring performance criteria. All TTS ODSCC circumferential indications were plugged.

ODSCC TSP

The U1C4 Degradation Assessment predicted 250 indications of TSP ODSCC axial would be detected. WBN implemented Technical Specification Change WBN-TS-99-014 allowing an Alternate Repair Criteria which provides for leaving TSP ODSCC axial indications inservice if they are within the TSP and less than 1 volt by bobbin coil examination. A detailed report on Condition Monitoring and Operational Assessment for this Degradation Mechanism has been transmitted to the NRC separately.

AVB WEAR

The U1C4 Degradation Assessment predicted, based on past indications and growth rate data, that two tubes would be plugged for AVB wear. A total of 41 indications were detected. None exceeded the 40% repair limit. The 40% repair limit is conservative for WBN Unit 1 SGs for structural and leakage performance criteria. Condition Monitoring assumed the axial length of the AVB Wear indications to be the width of the AVB (0.375"). Therefore, the most limiting indication of 29% maximum depth had a calculated lower limit burst pressure of 6046 psi.

No indication exceeded structural or leakage screening criteria. All AVB Wear indications met condition monitoring performance criteria.

Volumetric Indications

One volumetric indication was identified during the U1C4 inspection in SG2 R34 C32 at H02+16.00. A +Point probe examination and bobbin coil examination was performed. The best available sizing technique used a combination of two examinations. The sizing qualification for ODSCC HTS +Point was utilized to obtain axial length. Cold Leg Thinning maximum depth sizing (determined by bobbin coil - ETSS 96001.1 Rev 6 Jan 2001) was utilized. Condition Monitoring was performed on the indication. This indication had an NDE indicated axial length of 0.15 inches, a maximum depth of 77% and +Point voltage of 0.19 (indications with low voltage such as this one are very likely to have the phase angle pulled by other signals such as deposit or sludge and therefore it is very unlikely that this flaw is as severe as the depth indicates). The calculated lower limit burst pressure was 4015 psi. This indication was in past history with no real increase in voltage amplitude and therefore was characterized as a manufacturing flaw.

The volumetric indications met condition monitoring performance criteria. This indication was plugged.

Preventive Plugging

During the WBN Unit 1 Cycle 4 refuel outage, TVA took a very conservative approach to disposition several issues which arose. Three tubes (2 tubes in SG1 and 1 tube in SG4) had noise near the hot leg top of tubesheet which could have obscured a small indication and were therefore plugged. One row 2 tube in SG2 and two row 1 tubes in SG 4 created difficulty in being examined by the Low Row U-bend +Point probe and were conservatively plugged. One tube in SG 2 had difficulty in passing a bobbin coil through the U-bend region where a large dent was located (during past outages a down sized bobbin exam had been successfully performed but this outage TVA conservatively decided to plug the tube). One additional tube had a freespan dent of 2.15 volts in amplitude for which the bobbin exam called a Distorted Dent Indication (the subsequent +Point exam did not detect a defect) and TVA conservatively decided to plug the tube. No indications were found in these tubes but TVA conservatively decided to plug these tubes to eliminate the possibility of an indication being present but un-detected.

SECONDARY SIDE INSPECTION SCOPE AND RESULTS

Cracked Support Plate Indications

Cracked tube support plate indications (CSIs) are indications of cracks in the tube support plates and not necessarily indicative of tube degradation. These are detected during 100% automated analysis of bobbin data.

WBN unit 1 SGs do not have extensive support plate cracking. Cracked TSPs were evaluated for potential star drop-out conditions and none were identified. Therefore, design basis function of the support plate has not been lost. There is also no evidence of wrapper drop or wrapper degradation.

Upper Internals Inspection

Upper internals inspections were performed in two SGs during this inspection. The inspections were for evidence of erosion/corrosion, cracked welds, deposit buildup, or any other service-induced degradation. No abnormal conditions were discovered.

Steam Generator Blowdown Elbow Degradation

During the Unit 1 Cycle 1 Refuel Outage routine foreign object search and retrieval (FOSAR) inspection of the secondary side of the tubesheet, cracked blowdown elbows were identified in SGs 2 and 3. A safety evaluation and operational evaluation were completed and determined that the operation of the Watts Bar Nuclear Plant Unit 1 with one of two blowdown elbows cracked at the interface between the elbow and elbow-to-tubesheet weld in SG 2 and 3 did not pose an unreviewed safety question. These evaluations utilized computer models to determined the cross flow and excitation to the blowdown piping in the SG and determined that the piping even when restrained at only one end would not have enough movement (even when multiplied by a significant factor of safety) to strike SG tubing during normal operation or during the most limiting postulated accident scenario. As a defense in depth, the eddy current examination of 100% of the Row 1 tubes near the Blowdown piping was recommended to be performed each outage. It was determined that SG operability was demonstrated and could continue to be demonstrated during future cycles by continued visual inspections of the region and by eddy current inspection of the Row 1 tubes in the vicinity of the elbows.

During the Unit 1 Cycle 2 Refuel Outage, a remote visual of the region was performed in all four SGs and eddy current examinations performed on both hot and cold leg of row 1 tubes adjacent to the blowdown piping without any change or problems discovered.

During U1C3 Refuel Outage, a special inspection with high resolution cameras and cleaning of blowdown pipe in SG 2 and 3 verified that the blowdown elbows were in the same condition after the third cycle of operation. During this inspection, a similar crack was identified in SG 1, which had not been identified in previous inspections. The crack was approximately 140 degrees in circumferential extent and located just above the piping-to-tubesheet weld. Improvements in the remote cameras resolution, lighting, and evaluation technique made the crack evident. The other SG 1 elbow showed no evidence of cracking. The Cycle 2 outage video was reviewed with enhanced techniques and the crack (which was identified during the last inspection as weld undercut) had not changed. The safety evaluation and operational evaluation performed during the Cycle 1 inspection was reviewed and found to also bound the SG 1 cracks.

During the Unit 1 Cycle 4 Refuel Outage, remote visual examinations were performed in all four SGs and verified that the blowdown elbows were unchanged. Eddy current examinations were performed in all four SGs during the Unit 1 Cycle 4 refuel outage and no tube degradation was identified.

Sludge Lancing

Sludge lancing was performed in all four SG this outage. 22.5 pounds of sludge was removed from SG1, 14 pounds was removed from SG2, 19 pounds was removed from SG3, and 21 pounds was removed from SG4. A post-lance in bundle inspection confirmed that the top of the tubesheet on all generators was clean.

Foreign Object Search and Retrieval (FOSAR)

Foreign object search and retrieval was completed on all four SGs prior to closure. All identified foreign objects were retrieved except for one item which was first discovered during a mid-cycle outage in the fall of 1996 (prior to RFO 1). The object is a small cylindrical object firmly lodged at the top-of-tubesheet between R1C47 and R1C48 in the hot leg portion just off the tube lane in SG3. Attempts were made to retrieve the object but it remained tenaciously unmoved. Special tooling was developed for the Unit 1 Cycle 1 RFO FOSAR inspection in order to retrieve the object, but again the object remained unmoved. Removal was again attempted with specially developed tooling during Unit 1 Cycle 2, Cycle 3, and again in Cycle 4 with out any success. Eddy Current has been performed on these tubes each RFO without any degradation detected. Evaluations were performed each outage to ensure a high confidence that tube integrity would be maintained.

CONCLUSIONS

The NDE examinations completed on the WBN Unit 1 SGs and plugging of defective tubes met the Technical Specification and ASME Section XI code requirements for inservice inspection and structural and leakage integrity has been demonstrated, therefore, each SG has been demonstrated operable.

Utilization of two Alternate Repair Criteria continued in accordance with the Unit 1 Technical Specification.

Based on the criteria of 10 CFR 50.59, TVA concludes that the integrity of the WBN Unit 1 SGs was maintained during Cycle 4 operation and will be maintained through fuel Cycle 5 and does not require a license amendment.

REFERENCES

1. WCAP-15579, "Burst Pressure Data for Steam Generator Tubes with Combined Axial and Circumferential Cracks", Westinghouse Proprietary Class 2, Westinghouse Electric Company LLC, September, 2000.

2. WCAP-15128, Rev. 3, "Depth-Based SG Tube Repair Criteria for Axial PWSCC at Dented TSP Intersections", Westinghouse Proprietary Class 2, Westinghouse Electric Company LLC, June, 2000.

3. Keating, R. F., and Begley, J. A , "Steam Generator Tubing Flaw Handbook", EPRI Report TR-1001191-L, EPRI, Palo Alto, CA, January 2001

4. "PWR Steam Generator Examination Guidelines", Performance Demonstration Database, Appendix A, Technique Specification Sheets, ETSS 96702, EPRI, Palo Alto, CA, January, 1999.

5. EPRI TR-107197, "Depth Based Structural Analysis Methods for SG Circumferential Indications, EPRI, Palo Alto, CA, November, 1997.

DEFINITIONS

+Point - An RPC eddy current probe in which two coils are placed against the same contact surface with their axis 90 degrees apart. When the probe face is viewed, the coils create the appearance of a '+'. This configuration minimizes the eddy current response to tubing geometry changes or support structures and is presently considered the probe with the best overall crack detection capabilities.

ARC - Alternate Repair Criteria

C01 - First cold leg tube support plate intersection

C02 - Second cold leg tube support plate intersection

C03 - Third cold leg tube support plate intersection

C04 - Fourth cold leg tube support plate intersection

C05 - Fifth cold leg tube support plate intersection

C06 - Sixth cold leg tube support plate intersection

C07 - Seventh cold tube support plate intersection

C08 - Eighth cold leg tube support plate intersection

C09 - Ninth cold leg tube support plate intersection

C10 - Ten cold leg tube support plate intersection

C11 - Eleventh cold leg tube support plate intersection

C12 - Twelfth cold leg tube support plate intersection

C13 - Thirteenth cold leg cold support plate intersection

C14 - Fourteenth cold leg cold support plate intersection

CTE - Cold leg tube end. (Primary side cold leg face of tubesheet)

CTS - Cold leg top-of-tubesheet. (Secondary side cold leg face of tubesheet)

EOC - End of Cycle

EPRI - Electric Power Research Institute

H01 - First hot leg tube support plate intersection

H02 - Second hot leg tube support plate intersection

H03 - Third hot leg tube support plate intersection

H04 - Fourth hot leg tube support plate intersection

H05 - Fifth hot leg tube support plate intersection

H06 - Sixth hot leg tube support plate intersection

H07 - Seventh hot leg tube support plate intersection

H08 - Eighth hot leg tube support plate intersection

HTE - Hot leg tube end. (Primary side hot leg face of tubesheet)

HTS - Hot leg top-of-tubesheet. (Secondary side cold leg face of tubesheet)

ODSCC - Outside Diameter Stress Corrosion Cracking

PDA - Percent Degraded Area

PWSCC - Primary Water Stress Corrosion Cracking

RFO - Refuel Outage

RPC - Literally 'Rotating Pancake Coil' eddy current probe. This term is also used to describe eddy current probes in which the coil face contacts the tube wall while rotating and being pulled through the tube axially such that the examination path is helical.

TSP - Tube Support Plate

TTS - Top of Tubesheet

WBN - Watts Bar Nuclear Plant

ATTACHMENT 1
WBN UNIT 1
CYCLE 4 RFO
NUMBER AND EXTENT OF TUBES EXAMINED

SUMMARY OF WATTS BAR UNIT 1 CYCLE 4
SG EDDY CURRENT INSPECTION/TUBE PLUGGING RESULTS

EDDY CURRENT EXAM TYPE	S/G 1	S/G 2	S/G 3	S/G 4	Totals
Full-Length Bobbin Coil	4516	4517	4523	4526	18082
Partial Bobbin Exam	136	137	137	137	547
CTE+2" - HTE Bobbin Coil	1	0	0	0	1
U-Bend Plus Point	137	137	137	137	548
HL Top of Tubesheet Plus Point	4653	4654	4660	4663	18630
CL Top of Tubesheet Plus Point	0	0	0	937	937
Dented TSP Plus Point	25	65	37	83	210
Freespan Ding Plus Point	19	11	27	42	99
Diagnostic Plus Point	28	27	18	16	89
Total Exams Completed	9515	9548	9539	10541	39143

ATTACHMENT 2
WBN UNIT 1 CYCLE 4 RFO
SUMMARY OF SG TUBE PLUGGING

PLUGGING STATUS	S/G 1	S/G 2	S/G 3	S/G 4	Totals
Previously Plugged Tubes	21	20	14	11	66
Plugged Cycle 4					
Damage Mechanism					
PWSCC HTS Axial	3	6	17	1	27
PWSCC HTS Circ	1	0	0	0	1
ODSCC HTS Axial	0	1	0	1	2
ODSCC HTS Circ	15	25	16	82	138
ODSCC TSP Axial	7	1	1	0	9
Preventive	0	1	0	2	3
Volumetric Indication	0	1	0	0	1
Obstructed Tube	0	2	0	0	2
Noisy Data	2	0	0	1	3
TOTAL TUBES PLUGGED	49	57	48	98	252

Effective Plugging Percentages	
SG 1	1.05%
SG 2	1.22%
SG 3	1.03%
SG 4	2.97%

ATTACHMENT 3
WBN UNIT 1 CYCLE 4 RFO
STEAM GENERATOR 1
TUBES PLUGGED BY DAMAGE MECHANISM

	SG	ROW	COL	INDICATION	LOCATION	CHARACTERIZATION
	1	5	41	SCI	HTS- 08	ODSCC HTS CIRC
	1	9	22	SCI	HTS- 02	ODSCC HTS CIRC
	1	9	25	SCI	HTS- 08	ODSCC HTS CIRC
	1	10	37	SCI	HTS+ 00	ODSCC HTS CIRC
	1	10	45	SCI	HTS- 07	ODSCC HTS CIRC
	1	11	36	SCI	HTS- 08	ODSCC HTS CIRC
	1	19	13	SCI	HTS- 05	ODSCC HTS CIRC
	1	24	68	SCI	HTS- 09	ODSCC HTS CIRC
	1	27	12	SCI	HTS-.08	ODSCC HTS CIRC
	1	29	44	SCI	HTS- 06	ODSCC HTS CIRC
	1	35	21	SCI	HTS- 01	ODSCC HTS CIRC
	1	35	50	SCI	HTS-.12	ODSCC HTS CIRC
	1	36	50	SCI	HTS- 11	ODSCC HTS CIRC
	1	36	52	SCI	HTS- 13	ODSCC HTS CIRC
	1	44	29	SCI	HTS- 13	ODSCC HTS CIRC
Total	15					
	1	5	95	DSI	H02+.13	ODSCC TSP AXIAL
	1	6	20	DSI	H02- 02	ODSCC TSP AXIAL
	1	6	42	DSI	H03+.07	ODSCC TSP AXIAL
	1	6	68	DSI	H03- 04	ODSCC TSP AXIAL
	1	11	47	DSI	H03+.11	ODSCC TSP AXIAL
	1	11	52	DSI	H03+.07	ODSCC TSP AXIAL
	1	30	41	DSI	H03-.13	ODSCC TSP AXIAL
Total	7					
	1	9	19	PVN	HTS-.16	PREVENTIVE-NOISE
	1	19	21	PVN	HTS- 11	PREVENTIVE-NOISE
Total	2					
	1	17	68	SAI	HTS-.11	PWSCC HTS AXIAL
	1	45	32	SAI	HTS-.04	PWSCC HTS AXIAL
	1	46	44	SAI	HTS- 15	PWSCC HTS AXIAL
Total	3					
	1	19	66	SCI	HTS- 05	PWSCC HTS CIRC
Total	1					
GrandTotal SG#1:	28					

ATTACHMENT 3
WBN UNIT 1 CYCLE 4 RFO
STEAM GENERATOR 2
PLUGGED TUBES BY DAMAGE MECHANISM

	SG	ROW	COL	INDICATION	LOCATION	CHARACTERIZATION
	2	2	48	OBS	+0 00	OBSTRUCTED TUBE
	2	5	112	OBS	+0 00	OBSTRUCTED TUBE
Total	2					
	2	3	76	SAI	HTS+.31	ODSCC HTS AXIAL
Total	1					
	2	2	32	SCI	HTS- 06	ODSCC HTS CIRC
	2	5	12	SCI	HTS-.08	ODSCC HTS CIRC
	2	6	57	SCI	HTS-.14	ODSCC HTS CIRC
	2	14	44	SCI	HTS+.04	ODSCC HTS CIRC
	2	15	48	SCI	HTS-.01	ODSCC HTS CIRC
	2	15	53	SCI	HTS-.01	ODSCC HTS CIRC
	2	15	54	SCI	HTS-.16	ODSCC HTS CIRC
	2	16	90	SCI	HTS-.07	ODSCC HTS CIRC
	2	22	48	SCI	HTS+.05	ODSCC HTS CIRC
	2	26	77	SCI	HTS-.03	ODSCC HTS CIRC
	2	27	66	SCI	HTS- 04	ODSCC HTS CIRC
	2	27	79	SCI	HTS- 06	ODSCC HTS CIRC
	2	31	25	SCI	HTS-.10	ODSCC HTS CIRC
	2	33	67	SCI	HTS- 11	ODSCC HTS CIRC
	2	34	26	SCI	HTS- 06	ODSCC HTS CIRC
	2	34	66	SCI	HTS+ 00	ODSCC HTS CIRC
	2	35	16	SCI	HTS- 10	ODSCC HTS CIRC
	2	38	21	SCI	HTS-.11	ODSCC HTS CIRC
	2	39	24	SCI	HTS- 06	ODSCC HTS CIRC
	2	40	25	SCI	HTS-.02	ODSCC HTS CIRC
	2	41	58	SCI	HTS- 09	ODSCC HTS CIRC
	2	43	32	SCI	HTS- 03	ODSCC HTS CIRC
	2	45	35	SCI	HTS- 07	ODSCC HTS CIRC
	2	46	26	SCI	HTS-.10	ODSCC HTS CIRC
	2	47	36	SCI	HTS- 03	ODSCC HTS CIRC
Total	25					
	2	11	57	SAI	H02+.06	ODSCC TSP AXIAL
Total	1					
	2	34	73	DDI	C10+7.36	PREVENTIVE
Total	1					
	2	2	51	SAI	HTS- 10	PWSCC HTS AXIAL
	2	13	55	SAI	HTS- 05	PWSCC HTS AXIAL
	2	21	57	SAI	HTS- 02	PWSCC HTS AXIAL
	2	25	37	SAI	HTS- 05	PWSCC HTS AXIAL
	2	25	38	SAI	HTS+.08	PWSCC HTS AXIAL
	2	27	57	SAI	HTS+ 09	PWSCC HTS AXIAL
Total	6					
	2	34	32	SVI	H02+16 00	VOLUMETRIC
Total	1					
GrandTotal SG#2	37					

ATTACHMENT 3
WBN UNIT 1 CYCLE 4 RFO
STEAM GENERATOR 3
TUBES PLUGGED BY DAMAGE MECHANISM

	SG	ROW	COL	INDICATION	LOCATION	CHARACTERIZATION
	3	4	41	SCI	HTS-.09	ODSCC HTS CIRC
	3	5	76	SCI	HTS+.08	ODSCC HTS CIRC
	3	7	112	SCI	HTS+.00	ODSCC HTS CIRC
	3	16	52	SCI	HTS+.12	ODSCC HTS CIRC
	3	17	65	SCI	HTS- 08	ODSCC HTS CIRC
	3	18	65	SCI	HTS- 06	ODSCC HTS CIRC
	3	19	71	SCI	HTS- 06	ODSCC HTS CIRC
	3	22	79	SCI	HTS- 08	ODSCC HTS CIRC
	3	25	66	SCI	HTS- 09	ODSCC HTS CIRC
	3	30	51	SCI	HTS- 09	ODSCC HTS CIRC
	3	34	32	SCI	HTS- 04	ODSCC HTS CIRC
	3	35	31	SCI	HTS+ 04	ODSCC HTS CIRC
	3	39	40	SCI	HTS- 10	ODSCC HTS CIRC
	3	40	82	SCI	HTS- 09	ODSCC HTS CIRC
	3	42	64	SCI	HTS- 09	ODSCC HTS CIRC
	3	43	73	SCI	HTS- 07	ODSCC HTS CIRC
Total	16					
	3	11	99	DSI	H03+ 04	ODSCC TSP AXIAL
Total	1					
	3	14	71	SAI	HTS+ 04	PWSCC HTS AXIAL
	3	14	72	SAI	HTS+ 07	PWSCC HTS AXIAL
	3	14	73	SAI	HTS+ 05	PWSCC HTS AXIAL
	3	14	75	SAI	HTS+.08	PWSCC HTS AXIAL
	3	14	82	SAI	HTS+ 10	PWSCC HTS AXIAL
	3	15	83	SAI	HTS+.04	PWSCC HTS AXIAL
	3	18	67	SAI	HTS+.05	PWSCC HTS AXIAL
	3	18	69	SAI	HTS+ 06	PWSCC HTS AXIAL
	3	18	70	SAI	HTS+.12	PWSCC HTS AXIAL
	3	18	83	SAI	HTS+ 05	PWSCC HTS AXIAL
	3	18	85	SAI	HTS+ 03	PWSCC HTS AXIAL
	3	19	70	SAI	HTS+ 03	PWSCC HTS AXIAL
	3	19	73	SAI	HTS+.11	PWSCC HTS AXIAL
	3	22	70	SAI	HTS+.10	PWSCC HTS AXIAL
	3	23	78	SAI	HTS+.05	PWSCC HTS AXIAL
	3	26	35	SAI	HTS+.06	PWSCC HTS AXIAL
	3	35	73	SAI	HTS+ 02	PWSCC HTS AXIAL
Total	17					
GrandTotal SG#3.	34					

ATTACHMENT 3
WBN UNIT 1 CYCLE 4 RFO
STEAM GENERATOR 4
TUBES PLUGGED BY DAMAGE MECHANISM

	SG	ROW	COL	INDICATION	LOCATION	CHARACTERIZATION
	4	23	69	SAI	HTS+.22	ODSCC HTS AXIAL
Total	1					
	4	4	55	SCI	HTS-.15	ODSCC HTS CIRC
	4	4	95	SCI	HTS-.06	ODSCC HTS CIRC
	4	5	19	SCI	HTS-.11	ODSCC HTS CIRC
	4	5	27	SCI	HTS-.12	ODSCC HTS CIRC
	4	5	59	SCI	HTS-.16	ODSCC HTS CIRC
	4	6	80	SCI	HTS-.03	ODSCC HTS CIRC
	4	7	66	SCI	HTS-.07	ODSCC HTS CIRC
	4	8	75	SCI	HTS-.11	ODSCC HTS CIRC
	4	9	42	SCI	HTS-.09	ODSCC HTS CIRC
	4	11	70	SCI	HTS-.05	ODSCC HTS CIRC
	4	11	79	SCI	HTS-.09	ODSCC HTS CIRC
	4	12	22	SCI	HTS-.13	ODSCC HTS CIRC
	4	12	26	SCI	HTS-.09	ODSCC HTS CIRC
	4	12	41	SCI	HTS+.02	ODSCC HTS CIRC
	4	12	73	SCI	HTS-.07	ODSCC HTS CIRC
	4	12	76	SCI	HTS-.09	ODSCC HTS CIRC
	4	12	88	SCI	HTS-.16	ODSCC HTS CIRC
	4	12	92	SCI	HTS-.16	ODSCC HTS CIRC
	4	14	76	SCI	HTS-.13	ODSCC HTS CIRC
	4	16	36	SCI	HTS-.04	ODSCC HTS CIRC
	4	17	25	SCI	HTS-.11	ODSCC HTS CIRC
	4	17	27	SCI	HTS-.10	ODSCC HTS CIRC
	4	17	30	SCI	HTS-.12	ODSCC HTS CIRC
	4	18	29	SCI	HTS-.08	ODSCC HTS CIRC
	4	18	32	SCI	HTS-.06	ODSCC HTS CIRC
	4	18	69	SCI	HTS-.02	ODSCC HTS CIRC
	4	18	76	SCI	HTS-.12	ODSCC HTS CIRC
	4	19	16	SCI	HTS-.06	ODSCC HTS CIRC
	4	19	25	SCI	HTS-.07	ODSCC HTS CIRC
	4	19	31	SCI	HTS-.09	ODSCC HTS CIRC
	4	19	57	SCI	HTS- 13	ODSCC HTS CIRC
	4	20	34	SCI	HTS- 11	ODSCC HTS CIRC
	4	20	57	SCI	HTS-.11	ODSCC HTS CIRC
	4	22	24	SCI	HTS- 10	ODSCC HTS CIRC
	4	22	30	SCI	HTS- 11	ODSCC HTS CIRC
	4	22	67	SCI	HTS- 04	ODSCC HTS CIRC

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ATTACHMENT 3
WBN UNIT 1 CYCLE 4 RFO
STEAM GENERATOR 4
TUBES PLUGGED BY DAMAGE MECHANISM
(Continued)

SG	ROW	COL	INDICATION	LOCATION	CHARACTERIZATION
4	23	14	SCI	HTS-.03	ODSCC HTS CIRC
4	23	29	SCI	HTS-.08	ODSCC HTS CIRC
4	24	20	SCI	HTS+.07	ODSCC HTS CIRC
4	24	21	SCI	HTS-.09	ODSCC HTS CIRC
4	24	26	SCI	HTS-.11	ODSCC HTS CIRC
4	25	28	SCI	HTS-.13	ODSCC HTS CIRC
4	25	71	SCI	HTS-.07	ODSCC HTS CIRC
4	25	76	SCI	HTS-.12	ODSCC HTS CIRC
4	26	21	SCI	HTS-.06	ODSCC HTS CIRC
4	26	24	SCI	HTS-.14	ODSCC HTS CIRC
4	27	25	SCI	HTS-.11	ODSCC HTS CIRC
4	27	28	SCI	HTS-.11	ODSCC HTS CIRC
4	27	56	SCI	HTS-.10	ODSCC HTS CIRC
4	28	67	SCI	HTS-.05	ODSCC HTS CIRC
4	31	20	SCI	HTS-.06	ODSCC HTS CIRC
4	31	39	SCI	HTS-.07	ODSCC HTS CIRC
4	31	67	SCI	HTS-.13	ODSCC HTS CIRC
4	31	70	SCI	HTS+.02	ODSCC HTS CIRC
4	31	83	SCI	HTS-.09	ODSCC HTS CIRC
4	32	25	SCI	HTS-.10	ODSCC HTS CIRC
4	32	26	SCI	HTS-.11	ODSCC HTS CIRC
4	32	31	SCI	HTS-.06	ODSCC HTS CIRC
4	33	22	SCI	HTS+.01	ODSCC HTS CIRC
4	33	25	SCI	HTS-.10	ODSCC HTS CIRC
4	33	26	SCI	HTS-.09	ODSCC HTS CIRC
4	33	27	SCI	HTS-.06	ODSCC HTS CIRC
4	33	81	SCI	HTS-.02	ODSCC HTS CIRC
4	34	26	SCI	HTS-.07	ODSCC HTS CIRC
4	34	30	SCI	HTS-.11	ODSCC HTS CIRC
4	34	81	SCI	HTS-.05	ODSCC HTS CIRC
4	34	86	SCI	HTS-.08	ODSCC HTS CIRC
4	35	31	SCI	HTS-.12	ODSCC HTS CIRC
4	35	34	SCI	HTS-.09	ODSCC HTS CIRC
4	35	35	SCI	HTS-.13	ODSCC HTS CIRC
4	35	42	SCI	HTS-.08	ODSCC HTS CIRC
4	35	83	SCI	HTS-.17	ODSCC HTS CIRC
4	37	93	SCI	HTS-.06	ODSCC HTS CIRC
4	38	78	SCI	HTS+.00	ODSCC HTS CIRC

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ATTACHMENT 3
WBN UNIT 1 CYCLE 4 RFO
STEAM GENERATOR 4
TUBES PLUGGED BY DAMAGE MECHANISM
(Continued)

	SG	ROW	COL	INDICATION	LOCATION	CHARACTERIZATION
	4	39	35	SCI	HTS-.12	ODSCC HTS CIRC
	4	39	78	SCI	HTS-.12	ODSCC HTS CIRC
	4	41	31	SCI	HTS-.07	ODSCC HTS CIRC
	4	43	92	SCI	HTS-.13	ODSCC HTS CIRC
	4	44	69	SCI	HTS-.06	ODSCC HTS CIRC
	4	45	37	SCI	HTS-.13	ODSCC HTS CIRC
	4	46	42	SCI	HTS-.06	ODSCC HTS CIRC
	4	46	65	SCI	HTS-.03	ODSCC HTS CIRC
Total	82					
	4	6	66	PVN	HTS+.02	PREVENTIVE-NOISE
Total	1					
	4	1	12	TBP	+0.00	PREVENTIVE/Probe Hang
	4	1	78	TBP	+0.00	PREVENTIVE/Probe Hang
Total	2					
	4	19	15	SAI	HTS+.04	PWSCC HTS AXIAL
Total	1					
GrandTotal SG#4.	87					