

FEB 19 2004

LR-N04-0066



U. S. Nuclear Regulatory Commission
Document Control Desk
Washington, DC 20555

**TECHNICAL SPECIFICATION 6.9.1.5 ANNUAL REPORTS
SALEM AND HOPE CREEK GENERATING STATIONS
DOCKET NOS. 50-272, 50-311, AND 50-354**

PSEG Nuclear LLC hereby submits the enclosed Annual Reports for the Salem and Hope Creek Generating Stations, in accordance with Technical Specifications 6.9.1.5.a and 6.9.1.5.b of Appendix A to Facility Operating Licenses Nos. DPR-70, DPR-75, and NPF-57.

Pursuant to Technical Specification 6.9.1.5.a, Enclosures 1, 2, and 3 are submitted for Salem Unit 1, Salem Unit 2, and Hope Creek, respectively. These enclosures contain 2003 data on the number of station, utility, and other personnel receiving exposures greater than 100 mrem/year and the collective exposures according to work and job function for each unit.

Enclosure 4 provides information pursuant to the requirements of Technical Specification 6.9.1.5.b of Appendix A to Facility Operating Licenses No. DPR-70 and DPR-75. The information pertains to the Salem Unit 1 and Unit 2 steam generator tube inspections completed in 2003.

Pursuant to the requirements of Technical Specification 6.9.1.5.b of Appendix A to Facility Operating License No. NPR-57, the following information is provided concerning the Hope Creek Safety/Relief Valves (SRVs). During 2003, the SRVs were not challenged by any overpressurization events or transients that would have required the valves to respond.

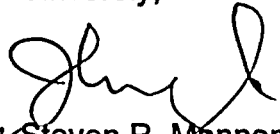
Pursuant to the requirements of Technical Specification 6.9.1.5.c of Appendix A to Facility Operating Licenses No. DPR-70 and DPR-75, the following information is provided concerning specific activity analyses in which the primary coolant exceeded the limits of Technical Specification 3.4.8. During 2003 there were no events in which the primary coolant exceeded the limits of Technical Specification 3.4.8.

JES6

FEB 19 2004

Should you have any questions or comments regarding this submittal, please contact Mr. Michael G. Mosier at 856-339-5434.

Sincerely,


for Steven R. Mannon
Manager -Licensing

Enclosures (4)

FEB 19 2004

C: Mr. H. J. Miller, Administrator - Region I
U. S. Nuclear Regulatory Commission
475 Allendale Road
King of Prussia, PA 19406

Mr. R. Fretz, Licensing Project Manager - Salem
U. S. Nuclear Regulatory Commission
Mail Stop 08B2
Washington, DC 20555

Mr. J. Boska, Licensing Project Manager – Hope Creek
U. S. Nuclear Regulatory Commission
Mail Stop 08B1
Washington, DC 20555

USNRC Senior Resident Inspector Hope Creek (X24)

USNRC Senior Resident Inspector Salem (X24)

Mr. K. Tosch, Manager IV
Bureau of Nuclear Engineering
P. O. Box 415
Trenton, NJ 08625

ENCLOSURE 1

ANNUAL REPORT
Salem 1 – Year of 2003
NUMBER OF PERSONNEL AND MAN-REM
BY
WORK AND JOB FUNCTION

ANNUAL REPORT

Salem 1 - Year of 2003

NUMBER OF PERSONNEL AND MAN-REM BY WORK AND JOB FUNCTION

Work & Job Function	All Personnel (> 100 mrem)			Total Man-Rem		
	Station Employees	Utility Employees	Contractors and Others	Station Employees	Utility Employees	Contractors and Others
RX OPERATION & SURVEILL						
-MAINTENANCE	0	0	3	0.729	0.000	0.592
-OPERATIONS PERSONNEL	0	0	0	1.312	0.000	0.552
-HEALTH PHYSICS	0	0	0	0.968	0.000	0.029
-SUPERVISORY PERSONNEL	1	0	7	3.278	0.019	2.447
-ENGINEERING PERSONNEL	0	0	0	0.000	0.000	0.000
ROUTINE MAINTENANCE						
-MAINTENANCE	0	0	0	0.000	0.000	0.000
-OPERATIONS PERSONNEL	0	0	0	0.000	0.000	0.000
-HEALTH PHYSICS	0	0	0	0.000	0.000	0.000
-SUPERVISORY PERSONNEL	0	0	0	0.000	0.000	0.000
-ENGINEERING PERSONNEL	0	0	0	0.000	0.000	0.000
INSERVICE INSPECTION						
-MAINTENANCE	0	0	0	0.000	0.000	0.000
-OPERATIONS PERSONNEL	0	0	0	0.000	0.000	0.000
-HEALTH PHYSICS	0	0	0	0.000	0.000	0.000
-SUPERVISORY PERSONNEL	0	0	0	0.085	0.002	0.013
-ENGINEERING PERSONNEL	0	0	0	0.000	0.000	0.000
SPECIAL MAINTENANCE						
-MAINTENANCE	0	0	0	0.000	0.000	0.000
-OPERATIONS PERSONNEL	0	0	0	0.000	0.000	0.000
-HEALTH PHYSICS	0	0	0	0.000	0.000	0.000
-SUPERVISORY PERSONNEL	0	0	0	0.000	0.000	0.094
-ENGINEERING PERSONNEL	0	0	0	0.000	0.000	0.000
WASTE PROCESSING						
-MAINTENANCE	0	0	0	0.005	0.000	0.000
-OPERATIONS PERSONNEL	0	0	0	0.006	0.000	0.001
-HEALTH PHYSICS	2	0	0	0.653	0.000	0.000
-SUPERVISORY PERSONNEL	0	0	0	0.076	0.000	0.000
-ENGINEERING PERSONNEL	0	0	0	0.000	0.000	0.000
REFUELING						
-MAINTENANCE	0	0	0	0.000	0.000	0.000
-OPERATIONS PERSONNEL	0	0	0	0.000	0.000	0.000
-HEALTH PHYSICS	0	0	0	0.000	0.000	0.000
-SUPERVISORY PERSONNEL	0	0	0	0.000	0.000	0.000
-ENGINEERING PERSONNEL	0	0	0	0.000	0.000	0.000

ANNUAL REPORT

Salem 1 - Year of 2003

NUMBER OF PERSONNEL AND MAN-REM BY WORK AND JOB FUNCTION

Work & Job Function	All Personnel (> 100 mrem)			Total Man-Rem		
	Station Employees	Utility Employees	Contractors and Others	Station Employees	Utility Employees	Contractors and Others
TOTALS						
-MAINTENANCE	0	0	3	0.733	0.000	0.593
-OPERATIONS PERSONNEL	0	0	0	1.319	0.000	0.552
-HEALTH PHYSICS	2	0	0	1.621	0.000	0.029
-SUPERVISORY PERSONNEL	1	0	7	3.439	0.022	2.555
-ENGINEERING PERSONNEL	0	0	0	0.000	0.000	0.000
GRAND TOTALS	3	0	10	7.111	0.022	3.729
TOTAL DOSE						10.862

ENCLOSURE 2

**ANNUAL REPORT
Salem 2 – Year of 2003
NUMBER OF PERSONNEL AND MAN-REM
BY
WORK AND JOB FUNCTION**

ANNUAL REPORT

Salem 2 - Year of 2003

NUMBER OF PERSONNEL AND MAN-REM BY WORK AND JOB FUNCTION

Work & Job Function	All Personnel (> 100 mrem)			Total Man-Rem		
	Station Employees	Utility Employees	Contractors and Others	Station Employees	Utility Employees	Contractors and Others
RX OPERATION & SURVEILL						
-MAINTENANCE	14	0	14	5.116	0.000	3.737
-OPERATIONS PERSONNEL	10	0	0	4.854	0.000	0.310
-HEALTH PHYSICS	17	0	25	4.331	0.000	6.223
-SUPERVISORY PERSONNEL	45	0	139	14.734	0.098	51.809
-ENGINEERING PERSONNEL	0	0	0	0.000	0.000	0.005
ROUTINE MAINTENANCE						
-MAINTENANCE	0	0	0	0.000	0.000	0.000
-OPERATIONS PERSONNEL	0	0	0	0.000	0.000	0.000
-HEALTH PHYSICS	0	0	0	0.000	0.000	0.000
-SUPERVISORY PERSONNEL	0	0	0	0.000	0.000	0.000
-ENGINEERING PERSONNEL	0	0	0	0.000	0.000	0.000
INSERVICE INSPECTION						
-MAINTENANCE	0	0	0	0.034	0.000	0.086
-OPERATIONS PERSONNEL	0	0	0	0.444	0.000	0.117
-HEALTH PHYSICS	0	0	1	0.089	0.000	0.110
-SUPERVISORY PERSONNEL	6	0	31	1.617	0.114	8.370
-ENGINEERING PERSONNEL	0	0	0	0.000	0.000	0.000
SPECIAL MAINTENANCE						
-MAINTENANCE	0	0	0	0.000	0.000	0.002
-OPERATIONS PERSONNEL	0	0	0	0.000	0.000	0.000
-HEALTH PHYSICS	0	0	0	0.025	0.000	0.000
-SUPERVISORY PERSONNEL	0	0	12	0.013	0.000	3.967
-ENGINEERING PERSONNEL	0	0	0	0.000	0.000	0.003
WASTE PROCESSING						
-MAINTENANCE	0	0	0	0.010	0.000	0.000
-OPERATIONS PERSONNEL	0	0	0	0.033	0.000	0.003
-HEALTH PHYSICS	3	0	3	0.846	0.000	0.826
-SUPERVISORY PERSONNEL	1	0	6	0.343	0.000	1.667
-ENGINEERING PERSONNEL	0	0	0	0.000	0.000	0.000
REFUELING						
-MAINTENANCE	0	0	0	0.000	0.000	0.000
-OPERATIONS PERSONNEL	0	0	0	0.000	0.000	0.000
-HEALTH PHYSICS	0	0	0	0.000	0.000	0.000
-SUPERVISORY PERSONNEL	0	0	0	0.000	0.000	0.000
-ENGINEERING PERSONNEL	0	0	0	0.000	0.000	0.000

ANNUAL REPORT

Salem 2 - Year of 2003

NUMBER OF PERSONNEL AND MAN-REM BY WORK AND JOB FUNCTION

Work & Job Function	All Personnel (> 100 mrem)			Total Man-Rem		
	Station Employees	Utility Employees	Contractors and Others	Station Employees	Utility Employees	Contractors and Others
TOTALS						
-MAINTENANCE	14	0	14	5.160	0.000	3.825
-OPERATIONS PERSONNEL	10	0	0	5.331	0.000	0.430
-HEALTH PHYSICS	20	0	29	5.291	0.000	7.159
-SUPERVISORY PERSONNEL	52	0	188	16.707	0.212	65.812
-ENGINEERING PERSONNEL	0	0	0	0.000	0.000	0.007
GRAND TOTALS	96	0	231	32.488	0.212	77.234
TOTAL DOSE						109.933

ENCLOSURE 3

ANNUAL REPORT
Hope Creek – Year of 2003
NUMBER OF PERSONNEL AND MAN-REM
BY
WORK AND JOB FUNCTION

ANNUAL REPORT

Hope Creek - Year of 2003

NUMBER OF PERSONNEL AND MAN-REM BY WORK AND JOB FUNCTION

Work & Job Function	All Personnel (> 100 mrem)			Total Man-Rem		
	Station Employees	Utility Employees	Contractors and Others	Station Employees	Utility Employees	Contractors and Others
RX OPERATION & SURVEILL						
-MAINTENANCE	13	0	3	4.880	0.030	1.136
-OPERATIONS PERSONNEL	42	0	1	13.532	0.000	1.103
-HEALTH PHYSICS	22	0	32	9.421	0.000	7.985
-SUPERVISORY PERSONNEL	95	6	147	28.452	2.986	45.176
-ENGINEERING PERSONNEL	0	0	1	0.001	0.000	0.293
ROUTINE MAINTENANCE						
-MAINTENANCE	0	0	0	0.000	0.000	0.000
-OPERATIONS PERSONNEL	0	0	0	0.000	0.000	0.000
-HEALTH PHYSICS	0	0	0	0.000	0.000	0.000
-SUPERVISORY PERSONNEL	0	0	0	0.000	0.000	0.000
-ENGINEERING PERSONNEL	0	0	0	0.000	0.000	0.000
INSERVICE INSPECTION						
-MAINTENANCE	0	0	1	0.000	0.000	0.377
-OPERATIONS PERSONNEL	3	0	0	0.869	0.000	0.000
-HEALTH PHYSICS	0	0	0	0.014	0.000	0.138
-SUPERVISORY PERSONNEL	4	0	43	1.114	0.017	15.870
-ENGINEERING PERSONNEL	0	0	0	0.000	0.000	0.000
SPECIAL MAINTENANCE						
-MAINTENANCE	0	0	0	0.000	0.000	0.000
-OPERATIONS PERSONNEL	0	0	0	0.000	0.000	0.000
-HEALTH PHYSICS	0	0	0	0.000	0.000	0.000
-SUPERVISORY PERSONNEL	0	0	0	0.000	0.000	0.000
-ENGINEERING PERSONNEL	0	0	0	0.000	0.000	0.000
WASTE PROCESSING						
-MAINTENANCE	0	0	0	0.012	0.000	0.002
-OPERATIONS PERSONNEL	0	0	0	0.013	0.000	0.003
-HEALTH PHYSICS	3	0	1	0.851	0.000	0.291
-SUPERVISORY PERSONNEL	0	0	0	0.896	0.002	0.184
-ENGINEERING PERSONNEL	0	0	0	0.000	0.000	0.000
REFUELING						
-MAINTENANCE	0	0	0	0.000	0.000	0.000
-OPERATIONS PERSONNEL	0	0	0	0.000	0.000	0.000
-HEALTH PHYSICS	0	0	0	0.000	0.000	0.000
-SUPERVISORY PERSONNEL	0	0	0	0.000	0.000	0.000
-ENGINEERING PERSONNEL	0	0	0	0.000	0.000	0.000

ANNUAL REPORT

Hope Creek - Year of 2003

NUMBER OF PERSONNEL AND MAN-REM BY WORK AND JOB FUNCTION

Work & Job Function	All Personnel (> 100 mrem)			Total Man-Rem		
	Station Employees	Utility Employees	Contractors and Others	Station Employees	Utility Employees	Contractors and Others
TOTALS						
-MAINTENANCE	13	0	4	4.892	0.030	1.516
-OPERATIONS PERSONNEL	45	0	1	14.414	0.000	1.105
-HEALTH PHYSICS	25	0	33	10.286	0.000	8.414
-SUPERVISORY PERSONNEL	99	6	190	30.462	3.005	61.231
-ENGINEERING PERSONNEL	0	0	1	0.001	0.000	0.293
GRAND TOTALS	182	6	229	60.055	3.035	72.558
TOTAL DOSE						135.648

ENCLOSURE 4

**Salem Unit 1 and Unit 2
2003 Steam Generator Tube ISI Report**

Salem Unit 1 and Unit 2 2003 Steam Generator Tube ISI Report

In the fall of 2003 PSEG Nuclear conducted eddy current examinations on the Salem Unit 2 Steam Generators (SG) during the 13th Refueling Outage (2R13). No inspections were performed on Salem Unit 1 during 2003. The next scheduled outage for Unit 1 is in April 2004 therefore; this report only addresses Salem Unit 2.

Overview

Commissioned in October of 1981, Salem Unit Two has four Westinghouse Model 51 series steam generators. Each steam generator contains 3388 NiCrFe alloy (Inconel ASME-SB-163) U-tubes with an outside diameter of 0.875 inches and a nominal wall thickness of 0.050 inches. The tube support structures consist of seven equally spaced 0.750-inch thick carbon steel support plates which are drilled with 0.891 inch holes and two sets of anti-vibration bars (AVB) that are located in the U-bend region of the tubes. The AVB bars are made from 0.387 square cross-section straight length bar material (Nickel-Chromium iron Alloy 600, chrome plated subsequent to bending) that is bent to a vee form with a 5.00-inch radius at the apex. The tube sheet is 21 inches thick ASME-SA508 Class 2 steel forging with Inconel cladding on the primary side. The tube ends are rolled into the tube plate and welded to the tube plate cladding. All tubes are explosively expanded into the tube sheet holes (a.k.a. WEXTEx). The expansion includes the entire depth of the tube sheet for both the hot and cold leg sides.

The steam generator primary side serves as part of the Reactor Coolant Pressure Boundary for containing the reactor coolant and/or emergency core cooling flow and for limiting radiation release to the Reactor Containment (by limiting coolant leakage) during all plant operating conditions. In addition, the steam generators serve as part of the Reactor Coolant Pressure boundary to preclude leakage and radiation release and provide separation between the radioactive primary side and the non-radioactive secondary side/system, Main Steam system, and the outside atmosphere during all plant operating conditions.

Examinations Performed (Scope)

The base eddy current scope was delineated in the Engineering Evaluation No. S-2-RC-MEE-1790 "2R13 Steam Generator Tubing Degradation Assessment". This document identified the active and potential degradation mechanisms affecting the tubing in the Salem Unit 2 Steam Generators, identified the inspection plan and examination techniques to be used, and provided structural limits for each damage mechanism for assessing tube integrity requirements. The eddy current examination scope met Salem Unit 2 Technical Specification 3/4.4.6, "Steam Generators" Surveillance Requirements.

The final scope performed (including expansions) is outlined below:

- With the exception of those row 2 and row 3 u-bends inspected under rotating coil inspection program, a full-length bobbin coil inspection was performed on 100% of the in-service tubes in each steam generator.
- 100% Rotating Coil (+ Point) exam of the rows 2 through 10 U-bends and 20% of the rows 13 through 17 U-bends (07C-07H or 07H – 07C) in steam generators 21, 22 and 24. In steam generator 23, 100% of rows 2 thru 20 were inspected with Rotating Coil (+ Point).
- 100% Rotating Coil (+ Point) exam of the Hot Leg (HL) WEXTEx Top of Tubesheet (TTS) transition regions in each steam generator at an extent of +3 inches above/-8 inches below
- 100% Rotating Coil (+ Point) exam of the ≥ 1 -volt dented HL Tube Support Plate (TSP) intersections at 01H, 02H and 03H AND 20% of the ≥ 1 -volt dented HL Tube Support Plate (TSP) intersections at 04H in each steam generator. In addition, any new dents ≥ 1 volt dented TSP locations at 01H, 02H, 03H or 04H were inspected with rotating coil.
- 25% Rotating Coil (+ Point) exam of the ≥ 5 -volt dented HL TSP population at 04H, 05H, 06H and 07H in each steam generator.
- 25% Rotating Coil (+ Point) exam of the ≥ 2 volt HL free span dings (TSH +0.5 inches to 07H +2.0 inches).
- Rotating Coil (+ Point) examination of previous TSP ligament Indications identified from the 2R12 bobbin coil data and any new TSP ligament indications identified during 2R13.
- 100% Rotating Coil (+ Point) of ≥ 2 volt U-bends dings (07H to 07C) identified in 2R12 AND any new ≥ 2 volt U-bend dings reported during the 2R13 inspection
- 100% Rotating Coil (+Point) of ≥ 1.0 volt dented Anti-Vibration Bar (AVB's) locations in each steam generator AND any new ≥ 1 volt dented AVBs reported during 2R13.
- 100% Rotating Coil (+ Point) of the freespan indications that were dispositioned in 2R12 as historical bobbin coil signals not related to in-service degradation when compared to the first In-service Inspection (ISI) bobbin coil data. In addition, all bobbin coil freespan indications identified during 2R13 that were dispositioned as historical bobbin coil signals not related to in-service degradation when compared to the first ISI bobbin coil data were inspected with rotating coil.
- 100% Rotating Coil (+ Point) of Cold Leg Thinning (CLT) Indications in each steam generator excluding those inspected during 2R11 and 2R12. In addition, new Cold Leg Thinning indications found in 2R13 were inspected with rotating coil.

Examination Results and Technical Specification Classification

Consistent with the requirements specified in NEI 97-06, Steam Generator Program Guidelines, the Unit 2 steam generators met the structural integrity, accident induced leakage and operational leakage performance criteria specified in site procedure SC.SG-AP.ZZ-0001(Q), Steam Generator Management Program for 2R13. The following table summarizes the number of tubes repaired in each steam generator by degradation mechanism. Framatome designed Alloy 690 rolled plugs were used for these repairs. The table also provides the total number and percentage of tubes repaired to date and cumulative steam generator tube plugging levels:

Modes of Degradation	SG21	SG22	SG23	SG24	TOTAL
Axial Primary Water Stress Corrosion Cracking (PWSCC) @ TTS	3	1	1	10	15
Volumetric Outside Diameter (OD) Indication @TTS Cold leg (Historical volumetric loose part wear indication that was preventatively plugged)	0	2	0	0	2
New volumetric indications associated with Loose Part Wear	0	0	0	3	3
Preventatively plugged based on loose part engineering analysis	0	0	0	3	3
Volumetric PWSCC @TTS	1	0	0	0	1
Circumferential PWSCC @TTS	0	0	0	0	0
Axial Outside Diameter Stress Corrosion Cracking (ODSCC) @ TTS	0	0	0	1	1
Volumetric ODSCC at HL TSP	0	0	0	1	1
Axial ODSCC @ TSP	0	0	0	0	0
Axial PWSCC @ TSP	1*	1	0	0	2*
Circ PWSCC @ TSP	1*	0	0	0	1*
Axial PWSCC (Low Row Bends)	0	0	0	0	0
Circ PWSCC (Low Row Bends)	0	0	0	0	0
Axial PWSCC (High Row Bends)	0	0	0	0	0
Circ PWSCC (High Row Bends)	0	0	46	0	46
Preventive Plug for U-bend anomalous Signals	0	0	9	0	9
Unacceptable Data Quality (PVN and Ubend Stall)	5	3	0	0	8
Axial Freespan Anomalies	1	1	0	0	2
Volumetric Freespan Anomalies	0	1	0	2	3
Anti-Vibration Bar Wear	1	0	0	1	2
Cold Leg Thinning Indications	1	2	6	3	12
TOTAL TUBES PLUGGED	13	11	62	24	110*
TOTAL TUBES PLUGGED CUMULATIVE	224	235	233	330	1022
CUMULATIVE TUBE PLUGGING %	6.61	6.94	6.88	9.74	7.54

* One tube in 21 SG has an Axial and Circumferential PWSCC indication at the same TSP. Although both indications are reported, the tube is only counted once for the purposes of reporting total tubes plugged.

The Technical Specification categorization of each steam generator is listed in the table below and takes into consideration both the bobbin coil and Rotating Coil inspection results.

	21 SG	22 SG	23 SG	24 SG
Technical Specification Category	C-2	C-2	C-3	C-2

WEXTEx Tubesheet Inspections

The WEXTEx transition is the region of the tube where the tube transitions from the expanded tube diameter to the nominal tube diameter and is typically located near the top of the tubesheet. The bottom of the WEXTEx transition is the first point of contact between the tube and the tubesheet. In this region, both PWSCC and ODSCC have been observed with PWSCC being the prominent damage mechanism at Salem Unit 2.

During 2R13, 100% rotating coil (+ Point) inspections of the HL TTS WEXTEx transition region were performed in each steam generator at an extent of +3 inches above TTS to - 8 inches below the TTS. The table below lists all tubesheet indications repaired during 2R13. All indications were sized for tube integrity assessment. Sixteen tubes were plugged for axial PWSCC located below the TTS. One axial ODSCC indication was detected at the TTS region in steam generator 24.

SG	Tube ID	Indication	Location	Damage Mechanism
21	R2C20	SAI	TSH -2.22"	PWSCC
21	R15C27	SAI	TSH - 9.88"	PWSCC
21	R6C70	SAI	TSH - 0.70"	PWSCC
21	R30C79	SVI	TSH - 0.65"	PWSCC
22	R25C72	SAI	TSH -1.53"	PWSCC
23	R25C61	SAI	TSH -8.44"	PWSCC
24	R3C51	SAI	TSH -0.90"	PWSCC
24	R9C36	SAI	TSH -1.32"	PWSCC
24	R14C17	SAI	TSH -0.37"	PWSCC
24	R14C41	SAI	TSH -1.01"	PWSCC
24	R16C39	SAI	TSH -0.28"	ODSCC
24	R20C35	SAI	TSH -2.22"	PWSCC
24	R24C52	SAI	TSH -0.16	PWSCC
24	R31C52	SAI	TSH -0.29	PWSCC
24	R31C54	SAI	TSH -0.34	PWSCC
24	R31C58	SAI	TSH -0.24	PWSCC
24	R33C44	SAI	TSH -0.41	PWSCC

Dented Hot Leg (HL) Tube Support Plate (TSP) Intersection Inspections

About 6259 \geq 1 volt dented TSP's intersections were inspected as part of the base scope rotating coil inspection program. In addition, approximately 286 newly reported dents were examined with a rotating coil technique. A total of 2 axial PWSCC indications and 1 circumferential indication were detected at the hot leg dented TSP intersections, affecting 2 of the steam generators (SG 21 and 22). The location in SG 21 (R19C18) had the axial and circumferential indication at the same TSP; 02H TSP. The flaws were approximately 120 to 180 degrees apart on the tube wall (opposite sides of tube) and separated axially within the TSP, thus flaw interaction is not probable and burst capability is not reduced. All indications were within the TSP.

The tubes repaired for PWSCC at dented HL TSP locations are shown in the table below: These indications were not detected during the bobbin coil examination.

SG	Tube ID	Indication	TSP Location	2R13 Bobbin Dent Voltage	Damage Mechanism
21	R19C18	SAI/SCI	02H	4.74	PWSCC
22	R4C77	SAI	01H	2.49	PWSCC

ODSCC at the Tube Support Plate (TSP) Intersections

One Outside Diameter Single Volumetric Indication was detected in SG 24 at the 01H TSP in tube R35C18. This indication was identified during the bobbin coil examination and reported as a non-quantifiable indication. Subsequent rotating coil examination sized the volumetric indication with a maximum depth of approximately 22% through-wall (TW), 0.4 volts, and is possibly attributed to intergranular attack corrosion (IGA). This tube was removed from service (plugged).

Anti-vibration Bar (AVB) Wear

AVB wear indications are plugged if bobbin indicates a depth $\geq 40\%$ TW. Tubes with degradation less than 40% TW may be left in service or removed from service depending on the observed growth rate of the degradation. A population of bobbin coil AVB wear indications were inspected with rotating coil that verified the reported indications displayed a volumetric response and were not crack like.

A total of two tubes were repaired for this damage mechanism. The table below lists the tubes plugged for AVB wear during 2R13:

SG	Tube ID	Indication	TSP Location
21	R27C47	40%	AV3
24	R33C47	46%	AV3
		42%	AV4

Appendix 1 provides a listing of the AVB percent through-wall indications reported during 2R13.

Cold Leg Thinning (CLT)

Cold leg thinning (CLT) is caused by surface wastage (corrosion) and occurs principally within the confines of the lower cold leg tube support plates on the periphery of the tube bundle. CLT indications are plugged if bobbin indicates a depth of $\geq 40\%$ TW. Tubes with degradation less than 40% TW may be left in service or removed from service depending on the observed growth rate of the degradation. A population of bobbin coil CLT indications were inspected with rotating coil and the results of those inspections verified the indications displayed a volumetric response and were not crack like.

A total of eleven tubes were plugged for this damage mechanism as shown in the table below:

SG	Tube ID	Indication	TSP Location
21	R43C31	19%*	01C
22	R33C16	43%	03C
22	R33C77	55%	01C
23	R9C3	43%	01C
23	R12C3	53%	01C
23	R25C8	48%	01C
23	R29C12	51%	02C
23	R31C15	46%	01C
23	R44C33	48%	01C
24	R42C33	43%	02C
24	R43C35	42%	02C
24	R33C79	46%	01C

* Low voltage (0.35 volts) bobbin coil DSI that via rotating coil produces a volumetric response typical of cold leg thinning. The percent through wall depth could not be accurately determined with the bobbin coil technique due to the influence of tube support plate residual on the signal. The indication was sized with a rotating coil technique using an ASME calibration standard. This sizing technique was judged to be more representative of the actual depth based on indication voltage.

Appendix 2 provides a listing of the CLT percent through-wall indications reported during 2R13.

Rotating Coil Inspection of U-bends

100 % of the Row 2 and Row 3 (Row 1 plugged) low row u-bend in each SG were inspected with either a dual coil + Point probe (The probe contained both mid frequency and high frequency coils spaced 18 inches apart) or a single coil + Point probe. No degradation was reported during this inspection.

In response to operating experience from Diablo Canyon and Beaver Valley, additional u-bend inspections were performed following the guidance provided in Westinghouse report SG-SGDA-03-33, "Generic Evaluation of U-Bend PWSCC Susceptibility for Model 51 SGs with Mill Annealed Alloy 600 Tubing". The inspections performed are outlined below:

- 100% of the Row 4 thru Row 10 tubes in each steam generator were inspected with a single coil + Point probe in the u-bend region.
- 20% of Row 13 through Row 17 tubes each steam generator were inspected with a single coil +Point probe in the u-bend region.

Additional inspections were performed in 23 SG due to indications reported during the base scope inspections as outlined in the previous two bullets. PSEG followed the

recommendations provided in Westinghouse report SG-SGDA-03-33 for this expansion. In summary, for 23 SG, 100% of the Row 2 through Row 20 tubes were inspected with a +Point probe in the u-bend region. No additional indications were reported.

One ID axial anomaly was reported in the apex (extrados) area of tube SG 21, R14C90 that appeared to be axial PWSCC based on phase angle, phase relationship (rotation) between the frequencies and the voltage drop across those frequencies. PSEG concluded that this indication was not PWSCC, rather some sort of manufacturing anomaly in the tube. The specifics for reaching this conclusion are discussed in the "Freespan Indications" section of this report.

46 tubes were repaired (plugged and stabilized) in 23 SG attributed to circumferentially oriented PWSCC in the flank area of the tube, that were determined to be similar to those reported during the Diablo Canyon 2R11 outage. 7 of the 46 tubes were in-situ pressure tested (proof and leak tested). No burst or leakage was observed during the test. Therefore both structural and leakage performance criteria were demonstrated for this degradation at end of cycle (EOC) 13.

A listing of the tubes repaired (plugged and stabilized) is shown in the table below:

SG	Tube ID	Indication	U-bend Location
23	R6C14	SCI	7H + 28.89
23	R5C17	SCI	7H + 24.82
23	R6C18	SCI	7H + 29.02
23	R9C19	MULT SCI	7H + 41.25
23	R9C20	MULT SCI	7H + 41.14
23	R9C21	MULT SCI	7H + 41.25
23	R9C22	MULT SCI	7H + 41.23
23	R9C23	MULT SCI	7H + 39.93
23	R5C26	SCI	7H + 25.79
23	R6C26	SCI	7H + 29.25
23	R5C27	SCI	7H + 25.39
23	R5C28	SCI	7H + 25.95
23	R5C29	SCI	7H + 25.60
23	R5C32	SCI	7H + 25.73
23	R5C33	SCI	7H + 25.80
23	R5C34	SCI	7H + 25.40
23	R5C38	SCI	7H + 25.56
23	R5C40	SCI	7H + 25.83
23	R5C41	SCI	7H + 25.90
23	R5C42	SCI	7H + 25.90
23	R5C47	SCI	7H + 25.96
23	R6C48	SCI	7H + 4.92
23	R6C49	SCI	7H + 4.56
23	R9C49	SCI	7H + 4.36
23	R6C54	SCI	7H + 4.77

SG	Tube ID	Indication	U-bend Location
23	R5C59	SCI	7H + 4.67
23	R5C65	SCI	7H + 4.57
23	R5C68	SCI	7H + 4.48
23	R5C69	SCI	7H + 4.37
23	R5C71	SCI	7H + 4.46
23	R5C73	SCI	7H + 4.49
23	R5C74	SCI	7H + 4.67
23	R5C75	SCI	7H + 4.59
23	R5C78	SCI	7H + 4.43
23	R5C80	SCI	7H + 4.55
23	R8C80	SCI	7H + 4.22
23	R5C81	SCI	7H + 4.56
23	R5C83	SCI	7H + 4.54
23	R5C87	SCI	7H + 4.55
23	R5C88	SCI	7H + 4.73
23	R5C89	SCI	7H + 4.44
23	R5C91	SCI	7H + 4.81
23	R6C92	SCI	7H + 5.08
23	R8C92	SCI	7H + 4.54
23	R5C93	SCI	7H + 4.65
23	R6C94	SCI	7H + 5.15

Nine additional tubes in 23 SG were preventatively plugged due to small anomalous signals that were difficult to discern from the ridge lift-off signals present in the tubes. It was not clear that these signals were truly flaw-like therefore PSEG preventatively plugged and stabilized these tubes. These locations are listed below:

SG	Tube ID	Indication	Location
24	R9C52	Preventatively plugged	Ubend
23	R6C56	Preventatively plugged	Ubend
23	R6C61	Preventatively plugged	Ubend
23	R6C62	Preventatively plugged	Ubend
23	R7C63	Preventatively plugged	Ubend
23	R6C65	Preventatively plugged	Ubend
23	R6C66	Preventatively plugged	Ubend
23	R6C74	Preventatively plugged	Ubend
23	R9C74	Preventatively plugged	Ubend

Loose Parts

During outage 2R13, 100% of the bobbin and rotating coil data was reviewed for possible loose part indications. A total of eight tubes were repaired for suspected loose part indications, wear associated with loose parts and/or preventatively plugged based on engineering evaluations performed.

SG 24 tube locations R39C52 (21% TW wear, 43 degree arc, 0.14 inch axial extent), R40C51 (30% TW wear, 64 degree arc, 0.37 inch axial extent), and R41C50 (21% TW wear, 56 degree arc, 0.26 inch axial extent); had indications of wear (PLI). These tubes were plugged and stabilized. SG 24 tube locations R40C52, R39C51, and R40C50 were also preventatively plugged and stabilized in accordance with engineering evaluations performed.

In addition, two tubes in 22 SG, R45C53 and R46C53, were plugged for loose part wear (less than 25% TW) indications at the cold leg TTS. These indications were originally identified during 2R9. During 2R13, these locations were preventatively plugged even though there was no change in the reported through-wall depth since 2R9.

Data Quality

Data quality is an important parameter influencing the overall performance of a steam generator tube examination system as it has an effect on probability of detection and sizing uncertainties. The following list reflects the tubes repaired for Data Quality Concerns:

SG	Tube ID	Indication
21	R13C44	Permeability Variation
21	R19C47	Permeability Variation
21	R10C56	Permeability Variation
21	R28C57	Permeability Variation
21	R27C80	Permeability Variation
22	R21C15	Permeability Variation
22	R5C73	Ubend - Probe Stalled
22	R4C84	Ubend - Probe Stalled

Freespan Indications

When reported during the outage inspection, freespan bobbin coil indications are compared to the 1983 first ISI data to determine if change has occurred. As documented in the bobbin coil Examination Technique Specification Sheet (ETSS), change was defined as 10 degrees towards the flaw plane, or greater than 0.5-volt difference when compared to historical (1983) data, new indications, or the indication exhibits a distinctive change in shape or character. In response to the Comanche Peak Operating Experience, during 2R13 a rotating coil inspection was performed on all freespan indications that were dispositioned during 2R12 as not meeting the bobbin coil change criterion. These inspections were performed in an effort to quantify the source of the bobbin coil signals and in an attempt to validate the stations change criterion.

A total of 5 tubes were repaired due to freespan anomalies reported during the outage as described below:

Axial Anomalies

- One ID axial anomaly was reported in the apex (extrados) area of tube SG 21, R14C90 that appeared to be axial PWSCC based on phase angle, phase relationship (rotation) between the frequencies and the voltage drop across those frequencies. The indication was very uniform along its length of 1.47 inches, approximately 40% deep from end to end and was very similar to that reported by another utility (series 51 SG) in a higher row u-bend during the spring 2003 outage season. Based on the length of this indication, in-situ pressure testing (proof and leak test) was performed. The testing, while demonstrating that tube integrity was met at EOC 13, was also used to verify that this indication is not actual tube degradation. The length of the indications is such that an in-situ pressure test would be expected to open up true PWSCC degradation. The tube was in-situ pressure tested and then re-inspected with the Plus-point probe afterwards with no significant changes detected in the Non Destructive Examination (NDE) characteristics.

The bobbin coil data was reviewed for this area in the current outage and previous outages, including the first ISI. It was determined that the indication although present in the 2R13 data, could not be expected to be reliably detected with the bobbin coil. The historical review revealed that the indication was present in the first ISI and had not changed significantly in 13 cycles of operation. Based on the NDE data after in-situ pressure testing and the historical review of the bobbin coil data, PSEG concluded that this indication is not PWSCC, rather appears to be some sort of manufacturing anomaly in the tube. This tube was removed from service (plugged).

- The other axial indication, SG 22 (R19C71), was detected during the Plus-Point inspection of the historical freespan indications from 2R12. Location R19C71 was determined to have an axial indication approximately 8 inches below the 5th TSP on the cold leg side. The indication was somewhat similar to the indication in the u-bend but was not as consistent in depth across its ~1 inch length. Based on the length of this indication, in-situ pressure testing (proof and leak test) was performed. The testing, while demonstrating that tube integrity was met at EOC 13, was also used to verify that this indication is not actual tube degradation. The length of the indications is such that an in-situ pressure test would be expected to open up true PWSCC degradation. The tube was in-situ pressure tested and then re-inspected with the Plus-point probe afterwards with no significant changes detected in the NDE characteristics.

Based on the NDE data after in-situ pressure testing and the historical review of the bobbin coil data, PSEG concluded that this indication is not PWSCC, rather appears to be some sort of manufacturing anomaly in the tube. This tube was removed from service (plugged).

The table below lists the specifics associated with the axial anomalies reported:

2R13 DATA								2R13 POST INSITU DATA			Change		
SG	R	C	IND	TSP/INCH	LEN.	MD %	+PT VOLTS	LEN.	MD %	+PT VOLTS	LEN.	MD %	V
21	14	90	SAI	7H + 36.26	1.47	41	2.01	1.45	41	2.01	-0.02	0	0
22	19	71	SAI	5C - 8.28	0.92	38	1.38	0.8	35	1.43	-0.12	-3	0.05

Volumetric Anomalies

As a result of the axial anomalies that were found during the base scope examination (discussed above), the rotating coil inspection program was conservatively expanded to include 100% of the current outage freespan indications that were dispositioned as not meeting the 2R13 change criterion. Therefore, regardless if change was apparent (or not) when compared to the first ISI, these locations were inspected with a rotating coil. This resulted in another 156 indications being inspected with rotating coil. Three additional indications (all volumetric) were reported during this inspection. The details are provided in the table below. The fact that these indications are present in the first ISI inspection provides the basis that they are not active degradation, but likely manufacturing related. These indications were not significant as shown by their Plus-point responses (voltage) and comparison to the stations in-situ pressure testing screening document. These tubes were removed from service (plugged).

SG	R	C	IND	ID/OD	TSP/INCH	ARC	LEN.	MD %	+PT VOLTS	BOBBIN CALL	BOB VOLTS
22	40	52	SVI	OD	TSC + 2.02	44	0.29	13	0.22	FSH	0.50
24	3	75	SVI	OD (4)	4H - 5H	42	0.16	6	0.12	FSH	0.33
24	27	80	SVI	OD	2H + 24.96	39	0.18	5	0.11	FSH	0.32

Tube Support Plate Integrity Inspections

During outage 2R13 approximately 40 tube support plate ligament (TSP) indications were detected. All previously identified indications, and any new suspected TSP ligament indications that were detected during 2R13 bobbin coil inspection, were Plus-point inspected. Data for TSP ligament indications is presented in the table below:

SG	Tube ID	CHN	IND	LOCATION	SIZING INFORMATION
21	R14C6	7	SLC	06H +0.04	SINGLE
21	R20C53	7	SLC	05H +0.03	SINGLE
21	R31C79	7	SLC	06H +0.00	SINGLE
21	R36C40	7	SLC	06H -0.02	SINGLE
21	R37C40	7	SLC	06H +0.08	SINGLE
		7	SLC	05H +0.18	SINGLE
21	R42C34	7	SLC	06H -0.22	SINGLE
21	R42C36	7	SLC	06H -0.15	SINGLE
21	R43C40	7	SLC	06H -0.03	SINGLE
21	R45C41	7	SLC	06H -0.16	SINGLE
22	R37C54	7	SLC	03H +0.01	SINGLE
22	R41C54	7	SLC	03H +0.00	SINGLE
23	R3C56	7	SLC	06C +0.01	55DEG
23	R6C27	7	SLC	04H +0.00	47DEG
23	R9C40	7	SLC	06C +0.00	46DEG
23	R9C55	7	SLC	02H -0.02	56DEG
		7	SLC	03H -0.09	116DEG
23	R14C37	7	SLC	04H +0.01	32DEG
23	R14C38	7	SLC	04H +0.00	56DEG
23	R14C57	7	SLC	05C +0.20	58DEG
23	R17C27	7	SLC	04H +0.01	70DEG
23	R22C75	7	SLC	01H +0.00	43DEG
		7	SLC	07H +0.00	104DEG
23	R25C87	7	SLC	07C -0.12	SINGLE
23	R29C81	7	SLC	07C -0.02	64DEG
		7	SLC	01C +0.00	50DEG
23	R39C56	7	SLC	07H -0.22	SINGLE
23	R42C59	7	SLC	04H -0.18	SINGLE
23	R45C54	7	SLC	07H -0.01	SINGLE
23	R46C54	7	SLC	07H -0.19	SINGLE
24	R20C29	7	SLC	07C -0.09	SINGLE
24	R26C9	7	SLC	05C +0.36	SINGLE
24	R34C46	7	SLC	02C -0.06	SINGLE
24	R41C39	7	SLC	02C -0.04	SINGLE
24	R45C41	7	SLC	07H +0.13	SINGLE

SG	Tube ID	CHN	IND	LOCATION	SIZING INFORMATION
24	R45C57	7	SLC	01H +0.14	32DEG
24	R46C41	7	SLC	07H -0.17	SINGLE
		7	SLC	01H -0.01	SINGLE
24	R46C54	7	SLC	07H +0.24	DOUBLE

Only 1 "new" indication of ligament cracking was identified, which was detected via bobbin. As with the previously detected ligament indications, this indication is not necessarily new, but most likely a result of bobbin coil POD. However, the TSP locations that have been visually verified and are in fact missing a piece of ligament (gap), have been demonstrated as readily detectable via the bobbin technique. In addition no significant growth or change could be inferred in the data considering analyst variability and technique utilized. Visual inspections of historical ligament gap locations were performed following chemical cleaning in 2R10 and it was determined that the flow hole and tube holes intersected as a result of misdrilling during manufacture. No indication of true service induced TSP degradation has been detected or visually verified in the Salem 2 SGs.

One indication from 2R12 was determined as NDD by Plus-point in 2R13, and is likely a result of a conservative analyst call in 2R12. All indications were returned to service since the criteria of ligament cracking below 145 degree threshold gap was not exceeded.

Free Span Ding Inspections

Rotating Coil inspections were performed on a 25% sample of the HL \geq 2-volt free span dings to identify potential PWSCC and/or ODSKC. The 25% sample included free span dings reported from the TSH +0.5 inches to 07H +2.0 inches. In addition to this scope and in response to Comanche Peak Operating Experience, 100% of then U-bend \geq 2-volt dings in each steam generator were inspected with rotating coil. Approximately 271 dings were inspected as part of the base scope and 104 new dings were examined. No degradation was reported.

Appendix 1

Anti-Vibration Bar Wear Percent Through-Wall Indications

SG	Row	Column	%TW	Location
21	16	24	11	AV1 -0.04
21	16	66	15	AV4 -0.42
21	17	25	13	AV3 +0.04
21	17	35	9	AV1 +0.12
21	17	37	13	AV4 -0.59
21	17	39	18	AV1 -0.23
21	17	39	16	AV2 +0.03
21	17	39	17	AV3 -0.09
21	17	52	12	AV1 +0.17
21	17	52	9	AV2 -0.83
21	17	52	8	AV2 +0.97
21	17	52	9	AV3 -0.85
21	17	52	12	AV3 +0.95
21	17	52	13	AV4 -0.34
21	17	56	19	AV2 +0.07
21	17	56	11	AV3 +0.26
21	17	63	14	AV2 +0.09
21	17	63	11	AV3 -0.23
21	17	63	12	AV3 +0.31
21	18	67	12	AV1 -1.10
21	18	67	10	AV4 +0.78
21	19	30	18	AV1 +0.08
21	19	30	22	AV2 +0.30
21	19	30	30	AV3 -0.08
21	19	30	14	AV2 -0.26
21	19	58	26	AV2 +0.51
21	19	58	19	AV4 +0.51
21	19	66	17	AV1 -0.45
21	19	66	25	AV2 +0.23
21	19	66	27	AV3 +0.23
21	19	66	5	AV4 -0.96
21	21	29	11	AV3 +0.24
21	21	29	19	AV4 -0.49
21	21	60	16	AV2 -0.21
21	21	60	20	AV3 -0.43
21	22	60	17	AV2 -0.15
21	23	64	15	AV2 +0.06
21	23	64	18	AV3 +0.16
21	23	67	21	AV1 -0.96
21	23	67	26	AV2 -0.31
21	23	67	23	AV3 -0.11
21	23	68	15	AV4 -0.13
21	23	68	25	AV3 -0.02
21	23	68	39	AV2 -0.45
21	23	70	13	AV4 +1.26
21	24	41	6	AV1 -1.64
21	24	52	12	AV1 -1.99

SG	Row	Column	%TW	Location
21	24	52	20	AV2 +1.25
21	24	52	8	AV3 +1.16
21	24	52	16	AV4 +0.49
21	24	67	19	AV2 -0.27
21	24	68	29	AV2 +0.81
21	24	68	29	AV3 +0.13
21	24	70	9	AV1 +0.40
21	26	46	11	AV2 +0.36
21	26	56	26	AV1 +0.32
21	26	56	22	AV2 +0.06
21	26	56	28	AV3 +0.15
21	26	56	32	AV4 -0.78
21	26	58	15	AV2 -0.59
21	26	58	24	AV3 -0.72
21	26	59	12	AV2 +0.11
21	26	59	15	AV3 +0.42
21	26	59	12	AV4 -0.38
21	26	63	12	AV4 -0.59
21	26	64	22	AV1 -0.16
21	26	64	12	AV2 +0.11
21	26	64	13	AV3 +0.21
21	26	67	25	AV1 -0.75
21	26	67	12	AV2 -0.23
21	27	44	16	AV1 -0.51
21	27	44	32	AV2 -0.06
21	27	44	32	AV3 +0.25
21	27	44	25	AV4 +0.83
21	27	45	18	AV4 +0.55
21	27	46	25	AV4 -0.41
21	27	46	33	AV2 +0.28
21	27	46	15	AV2 -0.24
21	27	46	34	AV3 +0.30
21	27	47	32	AV4 -1.40
21	27	47	18	AV2 -0.88
21	27	47	40	AV3 -0.75
21	27	50	11	AV2 -1.31
21	27	50	22	AV3 -1.58
21	27	56	23	AV1 +0.32
21	27	56	30	AV2 +0.04
21	27	56	33	AV3 +0.06
21	27	56	25	AV4 -0.64
21	27	56	12	AV4 +0.49
21	27	59	21	AV4 -0.38
21	27	64	37	AV3 +0.19
21	27	64	27	AV2 +0.13
21	27	64	21	AV1 -0.02
21	29	46	10	AV4 -0.17

SG	Row	Column	%TW	Location
21	29	46	38	AV3 +0.35
21	29	46	25	AV2 +0.37
21	29	46	16	AV1 -0.57
21	29	57	21	AV2 +0.02
21	29	57	22	AV3 -0.11
21	29	57	20	AV4 -0.08
21	29	65	15	AV3 +0.59
21	29	65	28	AV4 -0.38
21	31	64	27	AV2 -0.04
21	31	67	19	AV2 +0.51
21	32	39	11	AV4 +0.02
21	32	48	24	AV2 -0.08
21	32	48	30	AV3 +0.17
21	32	49	14	AV3 +1.29
21	32	49	12	AV4 -0.42
21	32	51	12	AV2 +1.35
21	32	51	25	AV3 -1.20
21	32	51	27	AV3 +1.49
21	32	51	19	AV4 +1.75
21	32	54	12	AV3 -0.21
21	33	41	9	AV2 -0.04
21	33	41	7	AV3 -0.11
21	33	41	14	AV4 +0.75
21	33	55	14	AV3 +0.19
21	33	60	27	AV1 +0.30
21	33	60	29	AV3 +0.42
21	34	36	14	AV1 -0.33
21	34	36	14	AV1 +0.28
21	34	36	29	AV2 -0.45
21	34	36	16	AV3 -0.27
21	34	37	10	AV1 +0.32
21	34	37	21	AV3 +0.24
21	34	37	10	AV4 +0.06
21	34	37	25	AV2 +0.26
21	34	44	36	AV3 +0.11
21	34	44	24	AV2 -0.15
21	34	44	10	AV1 +0.30
21	34	45	12	AV1 +0.19
21	34	45	15	AV2 -0.02
21	34	45	27	AV3 -0.49
21	34	45	20	AV4 -0.24
21	34	49	11	AV2 +1.25
21	34	49	13	AV3 +1.41
21	34	51	22	AV2 +1.23
21	34	51	21	AV3 +1.20
21	34	51	25	AV1 -0.26
21	34	52	14	AV2 +0.95

SG	Row	Column	%TW	Location
21	34	65	29	AV3 -0.15
21	34	65	27	AV4 -0.40
21	35	63	12	AV1 +0.04
21	35	63	16	AV2 +0.01
21	35	68	17	AV1 -0.51
21	35	68	18	AV2 -0.10
21	35	68	11	AV3 +0.04
21	36	41	24	AV3 +0.06
21	36	43	16	AV3 -0.28
21	36	43	10	AV4 +0.21
21	36	50	10	AV2 +0.94
21	36	52	37	AV2 -0.82
21	36	53	13	AV2 +0.55
21	36	53	11	AV1 -0.56
21	36	56	24	AV2 +0.02
21	36	58	22	AV1 +0.32
21	36	58	28	AV2 -0.42
21	36	58	13	AV2 +0.49
21	36	58	29	AV3 -0.32
21	39	37	32	AV2 +0.02
21	39	37	17	AV1 +0.30
21	39	37	12	AV1 -0.19
21	39	54	14	AV1 -0.19
21	39	61	24	AV1 -0.64
21	39	61	30	AV2 -0.45
21	40	58	17	AV2 -0.31
21	41	50	12	AV1 +0.04
21	41	53	11	AV1 +0.34
21	41	53	17	AV2 -0.19
21	41	58	13	AV1 +0.15
21	41	58	11	AV4 +0.06
21	42	31	11	AV3 -0.02
21	42	34	10	AV4 -0.26
22	16	68	12	AV4 +0.64
22	16	68	16	AV3 +0.30
22	16	68	19	AV2 -0.26
22	18	65	21	AV4 -0.83
22	18	65	11	AV4 +0.77
22	18	65	30	AV3 +0.06
22	18	65	20	AV2 -0.62
22	18	65	25	AV2 +0.85
22	18	65	24	AV1 -1.17
22	18	65	15	AV1 +1.69
22	22	62	25	AV3 -0.19
22	22	62	11	AV2 -0.17
22	23	71	13	AV4 +0.28
22	23	71	18	AV3 +0.30

SG	Row	Column	%TW	Location
22	23	71	9	AV2 +0.11
22	23	71	16	AV1 -0.91
22	23	74	13	AV2 -0.10
22	23	74	14	AV4 -0.40
22	25	9	10	AV2 +0.38
22	25	9	17	AV3 +0.04
22	25	30	19	AV1 +1.72
22	25	30	22	AV2 +0.06
22	25	30	30	AV3 +0.23
22	25	55	14	AV1 +0.86
22	25	63	13	AV3 -0.38
22	25	69	31	AV3 +0.15
22	25	69	18	AV2 +0.41
22	25	69	17	AV2 -0.38
22	25	71	19	AV3 +0.36
22	26	23	15	AV3 -0.02
22	26	62	9	AV4 +0.41
22	26	62	24	AV3 -0.15
22	26	62	26	AV2 +0.15
22	26	62	28	AV1 +0.62
22	27	28	14	AV2 -0.12
22	27	28	12	AV3 +0.21
22	31	27	21	AV2 -0.02
22	31	28	23	AV2 +0.25
22	31	28	15	AV1 +0.59
22	32	52	14	AV3 -0.21
22	33	67	15	AV2 +0.34
22	33	67	13	AV2 -0.21
22	34	32	28	AV1 +0.04
22	34	32	31	AV2 +0.39
22	34	32	28	AV3 +0.04
22	34	39	13	AV3 -0.15
22	34	41	11	AV3 +0.06
22	34	46	13	AV3 -0.02
22	34	47	13	AV3 -0.04
22	34	49	34	AV4 -0.56
22	34	50	18	AV4 +0.82
22	34	50	28	AV3 +0.24
22	34	50	15	AV2 -0.07
22	34	50	8	AV1 +0.95
22	34	58	18	AV2 +0.06
22	34	70	13	AV4 -0.06
22	35	26	10	AV1 +0.10
22	35	26	10	AV2 +0.08
22	35	53	11	AV3 -0.09
22	35	53	15	AV2 +0.02
22	36	34	27	AV3 +0.19

SG	Row	Column	%TW	Location
22	36	51	12	AV2 +0.08
22	40	36	28	AV4 -0.12
22	40	37	17	AV1 +0.09
22	40	37	22	AV2 +0.11
22	40	44	20	AV1 +0.43
22	40	44	31	AV2 +0.02
22	40	52	13	AV1 -0.19
22	40	52	17	AV2 -0.08
22	41	32	11	AV3 -0.02
23	15	77	15	AV2 +0.38
23	16	57	22	AV1 +0.49
23	16	57	15	AV2 -0.16
23	16	57	23	AV3 -0.41
23	16	57	19	AV4 -1.05
23	20	31	14	AV1 +1.18
23	20	56	10	AV4 -1.62
23	20	58	14	AV1 +0.20
23	20	64	12	AV4 +0.06
23	20	67	15	AV1 -0.94
23	20	67	12	AV2 -0.12
23	21	22	10	AV2 +0.03
23	21	32	13	AV1 -0.06
23	21	44	17	AV2 +0.06
23	21	44	12	AV1 +0.60
23	23	40	15	AV3 +0.25
23	23	44	10	AV2 +0.10
23	23	49	11	AV1 -0.81
23	23	53	12	AV1 +0.60
23	23	53	18	AV2 -0.17
23	23	53	15	AV2 +0.27
23	23	53	27	AV3 -0.06
23	23	53	10	AV4 -0.17
23	23	58	9	AV1 -0.16
23	23	58	19	AV2 -0.16
23	23	58	9	AV2 +0.39
23	23	58	30	AV3 +0.02
23	23	58	8	AV4 +0.31
23	24	46	15	AV3 +0.48
23	24	48	19	AV2 -0.51
23	24	48	16	AV1 -0.47
23	24	53	10	AV3 +0.12
23	24	55	18	AV1 +1.11
23	24	55	10	AV1 -1.01
23	24	55	11	AV4 -3.30
23	24	56	17	AV4 -1.63
23	24	56	27	AV3 +0.73
23	24	56	24	AV3 -0.89

SG	Row	Column	%TW	Location
23	24	56	18	AV2 +1.26
23	24	56	20	AV2 -1.24
23	24	56	24	AV1 -0.76
23	24	60	12	AV2 +0.26
23	25	44	10	AV2 +0.11
23	25	57	13	AV2 -0.16
23	25	57	12	AV1 +0.30
23	26	44	16	AV4 -0.02
23	26	44	23	AV3 +0.10
23	26	44	25	AV2 +0.10
23	26	45	26	AV1 -0.14
23	26	45	24	AV2 -0.04
23	26	45	16	AV4 +0.67
23	26	55	15	AV3 +0.04
23	26	55	22	AV1 -1.11
23	26	55	26	AV2 +0.57
23	26	63	12	AV2 -0.04
23	26	63	11	AV1 -1.03
23	27	49	16	AV3 -0.10
23	27	49	14	AV2 -0.21
23	27	51	20	AV1 -0.96
23	27	51	36	AV2 +0.04
23	27	51	31	AV3 +0.02
23	27	51	27	AV4 -0.23
23	27	59	16	AV4 +0.43
23	27	59	17	AV3 +0.34
23	27	59	19	AV2 +0.39
23	27	59	27	AV1 +0.39
23	27	63	34	AV2 +0.21
23	27	63	19	AV3 +0.35
23	27	63	14	AV4 -0.64
23	27	63	22	AV1 +1.48
23	27	64	9	AV2 +0.08
23	27	64	14	AV1 -0.76
23	27	65	19	AV4 +1.13
23	27	65	17	AV2 +0.01
23	27	65	18	AV3 -0.08
23	27	65	14	AV3 +0.42
23	28	45	19	AV2 -0.08
23	30	27	15	AV4 +0.02
23	30	35	37	AV2 -0.08
23	30	35	13	AV3 -0.29
23	30	35	19	AV4 +0.92
23	30	57	15	AV1 +0.04
23	30	57	14	AV2 -0.14
23	31	63	14	AV2 -0.06
23	32	41	33	AV3 -0.19

SG	Row	Column	%TW	Location
23	32	41	16	AV2 +0.13
23	32	45	27	AV4 +0.59
23	32	45	37	AV3 +0.06
23	32	45	35	AV2 -0.13
23	32	45	26	AV1 -0.04
23	32	45	8	AV4 -0.54
23	32	59	20	AV4 +0.34
23	32	59	28	AV3 +0.13
23	32	61	22	AV3 -0.22
23	32	61	17	AV1 +0.34
23	33	26	20	AV3 -0.32
23	33	26	20	AV2 -0.04
23	33	26	11	AV1 +0.06
23	33	50	14	AV1 +0.31
23	33	51	10	AV2 +0.08
23	33	51	10	AV3 -0.02
23	33	52	16	AV1 +0.08
23	34	38	12	AV3 -0.02
23	34	38	10	AV4 -0.02
23	34	41	13	AV3 -0.16
23	34	52	18	AV4 +0.08
23	34	54	13	AV4 +2.00
23	35	53	20	AV4 +0.06
23	35	53	16	AV3 -0.06
23	35	54	17	AV4 +0.06
23	36	44	22	AV4 -0.10
23	36	45	16	AV3 +0.11
23	36	45	17	AV4 -0.40
23	36	45	12	AV4 +0.63
23	36	58	22	AV4 +0.02
23	36	63	20	AV2 +0.02
23	36	63	17	AV1 -0.63
23	36	63	11	AV1 +0.80
23	36	66	12	AV4 -0.57
23	36	71	12	AV2 +0.16
23	37	42	19	AV3 +0.25
23	37	42	21	AV4 -0.35
23	37	45	26	AV4 -0.31
23	37	45	18	AV3 +0.08
23	37	52	32	AV4 +0.10
23	38	41	13	AV2 +0.06
23	38	46	13	AV3 +0.29
23	38	46	14	AV4 -0.06
23	38	47	25	AV3 +0.10
23	38	47	22	AV4 -0.02
23	38	48	32	AV3 -0.40
23	39	50	18	AV1 -0.08

SG	Row	Column	%TW	Location
23	39	50	20	AV2 +0.34
23	39	51	13	AV3 +0.02
23	39	51	18	AV1 +0.24
23	39	52	27	AV1 +0.10
23	39	52	24	AV2 +0.02
23	39	58	26	AV1 +0.06
23	39	58	30	AV2 +0.22
23	39	60	18	AV4 -0.46
23	39	60	11	AV3 +0.24
23	39	60	12	AV4 +0.10
23	40	42	33	AV2 +0.29
23	40	42	10	AV1 +0.06
23	40	43	14	AV2 -0.18
23	40	43	17	AV3 +0.08
23	40	50	28	AV2 +0.12
23	40	50	13	AV3 +0.06
23	40	51	20	AV1 -0.37
23	40	51	31	AV2 +0.06
23	40	51	15	AV3 +0.02
23	40	54	37	AV1 +0.06
23	40	54	33	AV2 +0.10
23	40	54	18	AV3 +0.12
23	40	54	35	AV4 -1.19
23	40	56	16	AV1 -0.12
23	40	56	12	AV1 +0.34
23	40	62	12	AV1 +0.08
23	40	66	23	AV2 +0.14
23	41	29	10	AV3 -0.24
23	41	52	22	AV3 -0.10
23	41	52	18	AV2 +0.02
23	41	55	29	AV1 -0.63
23	41	55	13	AV1 +0.59
23	41	55	9	AV2 -0.20
23	41	55	21	AV2 +0.21
23	41	60	17	AV2 +0.02
23	41	61	15	AV1 +0.02
23	41	63	10	AV3 +0.04
23	41	65	16	AV2 +0.14
23	42	52	15	AV1 +0.18
23	42	60	11	AV3 -0.04
23	42	65	22	AV2 +0.04
23	42	66	7	AV3 -0.04
23	42	66	6	AV2 +0.18
23	42	67	27	AV1 +0.03
23	42	67	21	AV2 +0.22
23	42	67	35	AV3 -0.13
23	43	34	15	AV4 +0.04

SG	Row	Column	%TW	Location
23	43	63	18	AV2 +0.02
23	44	40	13	AV4 -0.04
23	45	58	21	AV4 -0.02
23	45	58	11	AV3 +0.02
24	15	33	15	AV3 -0.02
24	17	32	12	AV2 +0.12
24	17	32	18	AV3 -0.29
24	17	65	28	AV2 -0.14
24	17	65	10	AV3 -0.17
24	17	65	19	AV4 -1.31
24	17	78	13	AV2 +0.34
24	18	23	26	AV4 -0.21
24	18	55	14	AV1 +0.14
24	18	55	15	AV2 +0.12
24	18	55	16	AV3 +0.18
24	18	55	12	AV4 +0.69
24	21	28	16	AV1 -0.47
24	21	28	21	AV2 +0.10
24	21	28	25	AV3 -0.16
24	21	28	13	AV4 +0.52
24	21	30	11	AV1 -0.07
24	21	30	19	AV2 +0.31
24	21	30	11	AV3 -0.86
24	21	30	16	AV3 +0.86
24	21	72	25	AV4 -0.59
24	22	72	32	AV2 +0.22
24	23	28	37	AV3 +0.16
24	23	33	16	AV1 -0.03
24	23	33	29	AV2 -0.15
24	23	33	14	AV2 +0.22
24	23	33	28	AV3 +0.12
24	23	33	11	AV4 +0.20
24	23	53	19	AV4 -0.03
24	23	56	13	AV3 +0.46
24	23	56	21	AV4 +0.34
24	23	57	7	AV1 +0.19
24	23	57	11	AV2 -0.38
24	23	57	10	AV2 +0.36
24	23	57	30	AV3 -0.58
24	23	57	33	AV4 -0.12
24	23	59	24	AV1 +1.08
24	23	59	29	AV2 +0.33
24	23	59	16	AV3 -0.31
24	23	59	17	AV3 +0.35
24	23	62	12	AV1 +0.87
24	23	62	21	AV2 -0.17
24	23	62	29	AV3 -0.14

SG	Row	Column	%TW	Location
24	23	62	18	AV4 +0.99
24	23	72	13	AV2 +0.20
24	23	72	30	AV4 -0.50
24	24	34	27	AV2 -0.02
24	24	34	25	AV3 +0.07
24	24	34	21	AV4 -0.73
24	24	35	18	AV3 +0.05
24	26	34	21	AV1 +0.38
24	26	34	23	AV2 -0.04
24	26	34	20	AV3 +0.03
24	26	34	12	AV4 +0.51
24	26	58	22	AV1 -0.30
24	26	58	29	AV2 +0.67
24	26	58	30	AV3 +0.43
24	26	58	18	AV4 +1.37
24	26	62	20	AV4 +0.89
24	26	67	20	AV2 +0.03
24	26	67	19	AV1 +0.14
24	27	62	12	AV1 +0.84
24	27	62	14	AV2 -0.63
24	27	68	34	AV3 -0.21
24	27	68	28	AV4 -0.07
24	28	59	23	AV2 +0.54
24	28	59	16	AV1 +0.87
24	31	31	35	AV3 -0.02
24	31	48	7	AV3 +0.09
24	32	64	17	AV2 -0.05
24	33	29	19	AV2 +0.07
24	33	29	19	AV1 +0.17
24	33	41	16	AV1 -0.16
24	33	47	13	AV2 +0.76
24	33	47	46	AV3 -0.63
24	33	47	42	AV4 +0.13
24	33	48	12	AV2 +0.05
24	33	48	10	AV1 +0.53
24	33	50	11	AV4 +0.16
24	33	50	6	AV3 +0.09
24	33	51	6	AV1 -0.39
24	33	51	29	AV2 -0.47
24	33	51	6	AV3 -0.49
24	33	57	13	AV1 +0.23
24	33	57	11	AV2 -0.14
24	33	57	17	AV3 +0.48
24	33	57	24	AV4 -0.02
24	33	58	26	AV3 -0.34
24	33	58	12	AV4 -0.69
24	33	65	13	AV3 -0.38

SG	Row	Column	%TW	Location
24	33	66	31	AV2 -0.05
24	33	66	7	AV3 -0.02
24	33	67	23	AV1 +0.12
24	34	63	18	AV4 +0.36
24	34	63	32	AV3 +0.02
24	34	63	31	AV2 -0.02
24	34	65	27	AV4 +0.43
24	34	65	34	AV3 -0.34
24	36	63	26	AV3 -0.05
24	38	39	16	AV3 -0.22
24	38	39	23	AV4 -0.24
24	38	52	29	AV4 +0.31
24	38	52	16	AV3 -0.33
24	38	67	25	AV2 +0.07
24	38	67	34	AV3 -0.27
24	38	68	29	AV2 +0.14
24	38	68	36	AV3 -0.04
24	38	68	35	AV4 -0.04
24	39	42	13	AV4 +0.30
24	39	42	11	AV3 +0.21
24	39	49	10	AV3 +0.19
24	39	49	33	AV4 -0.28
24	39	65	34	AV1 -0.04
24	39	65	19	AV2 +0.05
24	40	37	25	AV2 -0.22
24	40	37	31	AV1 +0.15
24	40	56	24	AV1 +0.17
24	40	56	19	AV2 -0.15
24	40	57	14	AV4 +0.12
24	41	35	13	AV1 -0.02
24	41	35	12	AV2 -0.02
24	41	53	18	AV1 -0.16
24	41	53	32	AV2 -0.02
24	41	53	31	AV3 -0.26
24	41	53	25	AV3 +0.29
24	41	53	26	AV4 +0.12
24	41	57	10	AV1 +0.03
24	41	59	24	AV4 +0.22
24	42	53	16	AV2 +0.19
24	42	53	15	AV1 +0.07
24	42	55	37	AV1 -0.03
24	42	55	14	AV2 +0.07
24	44	35	6	AV2 +0.05
24	44	35	10	AV3 -0.04
24	44	35	27	AV1 +0.11
24	44	55	11	AV4 +0.21
24	45	54	18	AV1 +0.03

Appendix 2

Cold Leg Thinning Percent through-wall Indications

SG	Row	Column	%TW	Location
21	43	31	19	01C +0.30
21	34	79	13	01C -0.12
21	35	76	30	02C -0.06
21	44	59	3	03C -0.30
21	45	58	13	04C -0.25
21	46	48	28	01C +0.36
22	6	2	6	01C +0.00
22	22	87	9	01C +0.13
22	32	78	22	02C +0.02
22	32	79	18	02C -0.06
22	32	79	16	03C -0.16
22	33	16	43	03C +0.04
22	33	76	1	01C -0.22
22	33	77	55	01C -0.04
22	34	17	33	01C +0.34
22	34	18	9	03C -0.20
22	36	18	5	01C -0.11
22	36	18	12	02C -0.22
22	37	19	8	01C -0.04
22	40	67	1	02C +0.19
22	41	62	25	02C +0.15
22	41	67	1	02C -0.09
22	42	41	38	02C +0.00
22	42	61	19	02C -0.09
22	42	62	19	02C -0.04
22	42	65	25	01C +0.38
22	42	67	8	01C +0.12
22	43	37	23	02C -0.06
22	43	58	13	02C +0.00
22	43	60	31	02C -0.08
22	43	61	7	02C -0.08
22	43	64	25	02C +0.04
22	43	65	27	02C +0.06
22	44	37	1	02C -0.15
22	44	38	16	01C +0.04
22	44	39	10	01C +0.15
22	44	46	9	02C +0.18
22	44	47	1	02C +0.18
22	44	56	35	02C +0.10
22	44	58	10	02C -0.17
22	44	59	15	02C -0.09
22	44	60	19	02C +0.06
22	45	41	2	02C +0.17
22	45	48	15	01C -0.09
22	45	50	17	02C +0.22
22	45	52	1	02C +0.20
22	45	53	6	02C +0.21

SG	Row	Column	%TW	Location
22	45	55	18	02C +0.15
22	45	56	1	02C +0.15
22	45	58	5	01C +0.17
22	46	47	11	02C +0.06
22	46	51	1	02C +0.14
22	46	52	24	02C +0.23
22	46	53	12	02C -0.11
22	46	54	1	01C +0.19
23	3	1	21	01C -0.04
23	5	3	19	01C +0.22
23	6	3	19	01C +0.23
23	8	3	22	01C +0.06
23	9	3	43	01C +0.09
23	11	2	29	01C +0.14
23	11	3	14	01C -0.05
23	12	3	53	01C +0.00
23	12	4	25	01C -0.05
23	25	8	48	01C +0.04
23	25	9	26	01C +0.22
23	29	12	51	01C +0.21
23	31	14	30	01C -0.02
23	31	15	46	01C -0.14
23	34	17	30	01C +0.00
23	34	18	27	01C +0.05
23	37	19	34	02C -0.14
23	44	33	48	01C -0.06
23	44	36	17	01C -0.17
24	2	94	13	01C +0.12
24	25	87	19	01C +0.02
24	27	83	1	01C -0.19
24	28	83	8	01C -0.12
24	28	85	21	01C +0.18
24	29	82	37	01C -0.06
24	30	83	25	01C -0.16
24	31	78	1	02C +0.18
24	31	79	20	02C +0.16
24	31	82	23	01C -0.02
24	33	78	33	02C +0.08
24	33	79	19	03C -0.18
24	33	79	46	01C +0.06
24	33	79	15	01C +0.34
24	36	76	5	01C -0.04
24	37	75	9	01C -0.08
24	38	23	26	02C +0.02
24	38	73	9	01C -0.08
24	39	71	21	01C -0.15
24	41	59	19	01C -0.07

SG	Row	Column	%TW	Location
24	42	33	43	02C -0.16
24	42	59	19	02C -0.05
24	43	34	29	03C -0.09
24	43	34	26	02C +0.02
24	43	35	43	02C +0.05
24	43	58	17	02C +0.26
24	43	59	19	02C +0.10
24	43	59	16	01C -0.03
24	43	62	3	02C +0.21
24	43	62	12	01C +0.16
24	44	36	3	03C +0.05
24	44	58	8	02C -0.24
24	44	58	32	01C -0.02
24	44	59	21	02C +0.21
24	44	59	8	01C -0.12
24	44	62	21	02C +0.00
24	45	57	18	01C -0.23
24	45	59	3	02C -0.24