VIRGINIA ELECTRIC AND POWER COMPANY

RICHMOND, VIRGINIA 23261

February 28, 2001

United States Nuclear Regulatory Commission
Attention: Document Control Desk
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Gentlemen:

VIRGINIA ELECTRIC AND POWER COMPANY
SURRY POWER STATION UNITS 1 AND 2
ANNUAL STEAM GENERATOR INSERVICE INSPECTION SUMMARY REPORT

Pursuant to Technical Specification 4.19.F.b for Surry Power Station Units 1 and 2, Virginia Electric and Power Company (Dominion) is submitting the results of the steam generator tube inservice inspections performed during 2000. The steam generator tube inspections conducted on Unit 1 during the spring 2000 refueling outage are included in Attachment 1. The steam generator tube inspections conducted on Unit 2 during the fall 2000 refueling outage are included in Attachment 2.

This letter does not establish any new commitments. Should you have any questions or require additional information, please contact us.

Very truly yours,

S. P. Sarver, Director
Nuclear Licensing and Operations Support

Attachments

cc: U. S. Nuclear Regulatory Commission
Region II
Sam Nunn Atlanta Federal Center
61 Forsyth Street, SW, Suite 23T85
Atlanta, GA 30303-8931

Mr. R. A. Musser
NRC Senior Resident Inspector
Surry Power Station

A047

Surry Unit 1

2000 Annual Steam Generator Report

Virginia Electric And Power Company
(Dominion)

Virginia Electric and Power Company
(Dominion)
Surry Unit 1 2000
Annual Steam Generator Report

Station	Unit	Outage Date	Generator Examined			Date of Report
Surry	1	April, 2000			C	05/08/00

Scope of Inspection					
SG	**Inspection Program**	**Planned**	**Inspected**	**Inspection Method**	**Extent**
C	Bobbin	3337	3337	Bobbin	*
C	Row 1 U-Bend RPC	94	94	Single Coil RPC	7H – 7C
C	TTSH RPC	669	669	3-Coil RPC	TSH +/- 3"
C	Special Interest Hot Leg	18	18	+Point RPC	N/A
C	Special Interest U-Bend	1	1	Single Coil RPC	N/A

***Note**: 2962 tested TEC-TEH; 182 tested 7C-TEH & 7C – TEC; 1 tested 5C-TEH & 7C- TEC; 80 tested 7H-TEH; 7C-TEC & 7H-7C; 18 tested 7C-TEH, 7C-TEC & 7H-7C; 94 tested 7H-TEH & 7C-TEC

Indications of Imperfections Detected							
SG	**NDE Method**	**Row**	**Column**	**Indication Code**	**Location**	**Active Yes/No**	**Measured Wall Penetration**
C	Bobbin	22	7	11%	AV3	No	11%
C	Bobbin	27	10	13%	AV3	No	13%
C	Bobbin	31	13	19%	AV2	No	19%
C	Bobbin	31	13	26%	AV4	No	26%
C	Bobbin	35	17	20%	AV1	No	20%
C	Bobbin	37	20	14%	AV1	No	14%
C	Bobbin	37	20	22%	AV2	No	22%
C	Bobbin	37	20	16%	AV3	No	16%
C	Bobbin	39	23	13%	AV1	No	13%
C	Bobbin	39	23	18%	AV2	No	18%
C	Bobbin	39	23	21%	AV3	No	21%
C	Bobbin	41	27	22%	AV2	No	22%
C	Bobbin	42	29	30%	AV1	No	30%
C	Bobbin	42	29	23%	AV2	No	23%
C	Bobbin	42	29	12%	AV3	No	12%
C	Bobbin	42	30	20%	AV3	No	20%
C	Bobbin	42	31	15%	AV1	No	15%
C	Bobbin	42	31	17%	AV2	No	17%
C	Bobbin	42	31	14%	AV3	No	14%
C	Bobbin	42	31	14%	AV4	No	14%
C	RPC	11	38	VOL/WEAR	AV2+1.19	No	22% (Bobbin)
C	Bobbin	35	46	17%	AV3	No	17%
C	Bobbin	34	60	19%	AV1	No	19%
C	Bobbin	34	60	24%	AV2	No	24%
C	Bobbin	34	60	33%	AV3	No	33%
C	Bobbin	34	60	16%	AV4	No	16%
C	Bobbin	31	82	24%	AV2	No	24%
C	Bobbin	31	82	20%	AV3	No	20%
C	Bobbin	31	82	19%	AV4	No	19%

Tube Plugging		
SG	Reason/Mechanism	Tubes Plugged
C	AVB Wear	7
C	AVB Wear (VOL)	1
Total Tubes Plugged		8

Repair Attributions				
SG	Row	Column	Reason/Mechanism	Repair Method
C	31	13	AVB Wear	Plug
C	37	20	AVB Wear	Plug
C	41	27	AVB Wear	Plug
C	42	29	AVB Wear	Plug
C	42	30	AVB Wear	Plug
C	34	60	AVB Wear	Plug
C	31	82	AVB Wear	Plug
C	11	38	AVB Wear (VOL)	Plug

Plugging/Repair Record					
SG	Tubes Plugged	Tubes Repaired (Not Plugged)	Percent Plugged	Percent Repaired (Not Plugged)	Percent Plugged or Repaired
A	11	0	0.33	0	0.33
B	14	0	0.42	0	0.42
C	13	0	0.39	0	0.39

TUBE INTEGRITY ASSESSMENT

Overall condition assessments have been delineated in the Surry Steam Generator Monitoring and Inspection Program Plan. Consistent with the NEI 97-06 requirements, a pre-outage assessment was performed to identify any relevant or potential degradation mechanisms to be considered for the Surry Unit 1 steam generators (S/Gs) and to identify the appropriate inspection scope and eddy current probe requirements.

As required by NEI 97-06, performance criteria in this document are established in three areas:

- Tubing Structural Integrity
- Operational Leakage
- Projected Accident Leakage

The inspection performed on the "C" steam generator was consistent with the Program Plan. The results of the inspection formed the basis of the condition monitoring and operational assessment performed for this outage.

Condition monitoring and operational assessment of the steam generator tube bundles are performed to verify that the condition of the tubes, as reflected in the

inspection results, is in compliance with the plant licensing basis. Defects detected are evaluated to confirm that Reg. Guide 1.121 margins against leakage and burst were not exceeded at the end of this operating cycle. The results of the condition monitoring evaluation are used as a basis for an operational assessment, which demonstrates prospectively that the anticipated performance of the steam generators will not exceed the margins against leakage and tube burst specified by Reg. Guide 1.121 during the ensuing operating period.

The inspection of the Surry Unit 1 "C" steam generator was consistent with all current regulatory requirements and the results of this inspection formed the basis for the condition monitoring and operational assessments performed for this outage. Operating conditions over the last cycle or discovery of any industry issue did not warrant any significant change to the previously planned tube inspection scope.

1.0 Summary

Results of the steam generator "C" inspection continue to show that no corrosion related degradation (i.e. primary water stress corrosion cracking (PWSCC), outside diameter stress corrosion cracking (ODSCC), inter-granular attack (IGA), pitting, etc.) is operative in the Surry Unit 1 steam generators. The accumulated operating time on this unit since replacement is approximately 14.0 effective full power years (EFPY). The only indications reported during the inspection of steam generator "C" were tube wear at anti-vibration bar (AVB) contact points and one case of wear adjacent to an AVB contact point associated with the bottom (V-section) of the AVB. All of the indications found were below the bounding structural limits including 3 delta P burst pressure margins for uniform wall thinning. Hence, acceptable tube integrity at the end of the current operating cycle is demonstrated and condition monitoring and operational assessment requirements on burst pressure and accident condition leak rates are satisfied.

The condition of the Surry Unit 1 steam generators, as indicated by the results of the condition monitoring evaluation, satisfy the requirements of Reg. Guide 1.121 with respect to structural and leakage integrity margin. The completed operating interval, that is time since the last steam generator "C" inspection, was approximately 48.8 effective full power months (EFPM). The cumulative operating period for all of the Unit 1 replacement S/Gs was 168.4 EFPM. The planned operating interval before the next inspection of steam generator "C" is approximately 48.1 EFPM. With only AVB wear being reported following the end of cycle 11 (EOC11) replacement operation and the preventative plugging of eight tubes, no known condition exists that would exceed structural and leakage margin requirements before the end of next planned operating interval for steam generator "C". Thus, the operational assessment requirements are satisfied.

2.0 Surry Unit 1 – Summary of Evaluated Degradation Mechanisms, Inspection Methods, and Plan

No corrosion-related degradation, (i.e., PWSCC, ODSCC, IGA, pitting, etc.) has been identified on this unit to date. Table 1.0 is a summary of the Surry Unit 1 tube plugging attributions. A total of 30 tubes were plugged prior to the April 2000 outage.

A wear indication not associated with AVB contact points was identified on tube R11 C38. This is the first instance of wear at this location in the Surry steam generators. The wear was located between AVB 2 and AVB 3. Since the indication reported by bobbin was not directly at an AVB location, the indication was initially called a non-quantifiable indication (NQI) and examined with a rotating pancake probe (RPC). The RPC inspection confirmed the indication to be one-sided wear. The AVB's are V-shaped bars which extend into the bundle to Row 8 and Row 11. The wear indication seen on R11 C38 appeared to correspond to the bottom of the AVB rather than at the leg of the AVB. Review of 1995 inspection results showed no evidence of the wear at this location. Due to its location, the indication was dispositioned as a volumetric indication (VOL).

Mechanical tube wear at AVB contact points has been observed in the Surry Unit 1 steam generators at very low levels. The data to date indicates it to be "inactive" for all steam generators as defined by the EPRI Rev. 5 Examination Guidelines. One tube was plugged for AVB contact points as a result of the 1995 inspection on the "C" steam generator. Seven AVB locations in five tubes were left in service in accordance with plugging evaluation requirements in place at that time.

As indicated by Table 1, prior to this inspection a total of only seven tubes had been plugged for AVB wear in Unit 1 between the three steam generators. Also as a conservative measure, the past practice has resulted in plugging tubes for this condition that were less than the 40% TW plugging limit.

The inspections conducted during this outage follow the philosophy established in the Surry Station Steam Generator Monitoring and Inspection Program Plan. The pre-outage assessment assumed the possibility of C/L pitting in "C" steam generator since this steam generator had not been previously screened using the current analysis guidelines. However, the current inspection results verified that pitting is not an "existing" mechanism in "C" steam generator.

The pre-outage assessment also covers salient observations of industry experience. In addition, site specific data that were not available at the issuance of the January 1999 Program Plan, such as secondary side deposit characterization and analyses, have been evaluated and, where appropriate, integrated into the inspection process. Details of the current inspection and

results are included in the Steam Generator Services Summary Report provided by Westinghouse Electric Company. Hence, only the specific results relating to the condition evaluation will be covered in this document.

Table 1.0 Surry Unit 1 Tube Plugging Attributions

Date	AVB Wear	Freespan	Tube Pull	Foreign Object	Pitting	Anomalies	Other	Total
Pre Srv (S/G A, B, C)	0	0	0	0	0	0	2	2
Mar – 83 (S/G B, C)	0	0	0	0	0	0	0	0
Nov – 84 (S/G A, B)	0	0	0	0	0	0	3 – S/G A 1 – S/G B	4
Jun – 86 (S/G A, B, C)	0	0	1 – S/G C	0	0	0	2 – S/G B 1 – S/G C	4
Apr – 88 (S/G B, C)	0	0	0	0	0	0	0	0
Oct – 90 S/G A, B, C)	0	0	2 – S/G C	0	0	0	0	2
Mar – 92 (S/G A)	1 – S/G A	1 – S/G A	0	0	0	0	0	2
Feb – 94 (S/G B)	4 – S/G B	0	0	0	0	0	0	4
Oct – 95 (S/G C)	1 – S/G C	0	0	0	0	0	0	1
Mar – 97 (S/G A)	1 – S/G A	0	0	0	0	0	4	5
Oct – 98 (S/G B)	0	0	0	3	0	0	3	6
Apr – 00 (S/G C)	8 – S/G C	0	0	0	0	0	0	8
							Cumulative Total: 38	

3.0 Condition Monitoring Assessment – Tube Integrity Evaluation

The condition monitoring assessment is an evaluation of the past operating cycle relative to the structural and leakage integrity margin based upon current inspection results. The condition of the Surry Unit 1 steam generators, as indicated by the results of the inspection performed on "C" steam generator, satisfies the requirements of Reg. Guide 1.121 with respect to structural and leakage integrity margin for the recently completed operating period. The following is a discussion of the inspection results and the evaluations performed.

3.1 Primary Side Inspection

No findings corresponding to crack-like indications were observed on the inspection conducted on "C" steam generator. The April 2000 inspection plan included:

1. Full length bobbin inspection of 3337 tubes, which is 100% of the tubes in the "C" steam generator. This equates to a 33% sample of the total tube population in all three steam generators.

2 Focused RPC inspections at the H/L top of tubesheet of 669 tubes. This equates to a 60% tube sample of the Critical Area population of all three steam generators as defined for the Surry steam generators. This population is a 20% sample of the H/L top of tubesheet in "C" steam generator.

3. U-bend inspection of 94 tubes, which is 100% of the Row 1 tubes in the Critical Area of the "C" steam generator. This equates to a 33% sample of Row 1 U-bends in all three steam generators.

No conditions indicative of corrosion degradation were noted from these eddy current programs.

During the bobbin inspection of steam generator C, 46 Dent (DNT) signals were reported at the 6th tube support plate location and 20 DNT signals were reported at the 7th tube support plate location. Four tubes contained DNT signals at both the 6th and 7th support locations. As specified in the Surry Site Specific Eddy Current Analysis Guidelines "SRY-SGPMS-002 Rev. 4", dents or bulges greater than or equal to 5 volts must be re-inspected with a rotating surface riding coil unless they can be confirmed as unchanged based upon a review of historical data. Seventeen DNT indications at the 6th support were greater than 5 volts and did not appear on previous inspection data, therefore, these locations were inspected with the Plus Point RPC Probe. The DNT signals at the 6th and 7th supports are located at or near the edges of the support plate and do not represent the same denting issue associated with drilled carbon steel support plates. Since this was the first application of the Plus Point for resolution of

bobbin findings, a summary of this effort was documented and presented to station management.

Plus point inspection of the seventeen "DNT" indications at 6H confirmed the tube support plate related signals to be low-level dents corresponding to the edge of the tube support plate. No crack-like or other forms of tube degradation were noted. Some locations exhibited multiple dent indications corresponding to the quatrefoil lands.

RPC inspection of the top of the hot leg tubesheet location was performed for 669 tubes. This program focused primarily on the low velocity region in the middle of the bundle. These inspections revealed no evidence of degradation.

Ninety-four Row 1 U-bends were inspected with single coil RPC probes. No indications or anomalies were noted.

As previously indicated no PIT indications were found during the current inspection.

Twenty-eight AVB intersections, in 13 tubes, were identified with tube wear in the "C" steam generator. The maximum indicated wear depth (33%) was reported at R34 C60. The wear indications reported are below the tube repair limit and well below the structural limit, therefore, tube integrity for the "C" steam generator for the last operating interval was clearly not challenged. The average growth rate per cycle since the last inspection was 4.1%, and the maximum growth rate per cycle was 8.0%. These growth rates are approximately twice the values observed following prior inspections.

Table 2 lists all tubes with AVB wear "calls" reported during the current inspection, along with their associated "growth" rates. As referenced in the Surry site specific Steam Generator Program Plan, the structural limit bounding analysis for uniform wear of a 7/8" diameter x 0.050" thick tube is 60% through wall, that is 0.020 inch remaining wall. None of the AVB indications identified at this inspection approached the structural limit. The detailed plugging evaluation is contained in the post outage plugging evaluation.

During this examination, the Dominion NDE Level III performed random data checks as well as a final verification of the planned versus completed inspection program.

TABLE 2
SURRY UNIT 1 – APRIL 2000
STEAM GENERATOR EDDY CURRENT INSPECTION SUMMARY – AVB PERCENT SIGNALS

Row / Column	Indication	AVB Loc.	VOLTAGE	% TW 2000 Outage	% TW 1995 Outage (Based on Review of 1995 Data)	% TW Change	Growth Rate (%/Cycle)
R22 C7	PCT	AV3	0.21	11	3	8	2.67
R27 C10	PCT	AV3	0.26	13	9	4	1.33
R31 C13	PCT	AV2	0.51	19	7	12	4
R31 C13	PCT	AV4	0.96	26	10	16	5.33
R35 C17	PCT	AV1	0.55	20	10	10	3.33
R37 C20	PCT	AV1	0.32	14	NDD	14	4.67
R37 C20	PCT	AV2	0.7	22	NDD	22	7.33
R37 C20	PCT	AV3	0.39	16	NDD	16	5.33
R39 C23	PCT	AV1	0.28	13	NDD	13	4.67
R39 C23	PCT	AV2	0.5	18	8	10	3.33
R39 C23	PCT	AV3	0.67	21	7	14	4.67
R41 C27	PCT	AV2	0.7	22	NDD	22	7.33
R42 C29	PCT	AV1	1.49	30	20	10	3.33
R42 C29	PCT	AV2	0.79	23	9	14	4.67
R42 C29	PCT	AV3	0.26	12	NDD	12	4
R42 C30	PCT	AV3	0.61	20	NDD	20	6.67
R42 C31	PCT	AV1	0.38	15	9	6	2
R42 C31	PCT	AV2	0.43	17	7	10	3.33
R42 C31	PCT	AV3	0.33	14	6	8	2.67
R42 C31	PCT	AV4	0.32	14	12	2	0.67
R35 C46*	PCT	AV3	0.38	17	13	4	1.33
R34 C60	PCT	AV1	0.51	19	16	3	1
R34 C60	PCT	AV2	0.81	24	11	13	4.33
R34 C60	PCT	AV3	1.84	33	14	19	6.33
R34 C60	PCT	AV4	0.39	16	NDD	16	5.33
R31 C82	PCT	AV2	0.86	24	NDD	24	8
R31 C82	PCT	AV3	0.6	20	NDD	20	6.67
R31 C82	PCT	AV4	0.52	19	14	5	1.67

Notes: Average Wall Loss Rate = 4.1425 % / Cycle. Maximum Wall Loss Rate = 8.0 % / Cycle

3.2 Secondary Side Inspections

Consistent with the Surry Station Steam Generator Program Plan, NEI 97-06, and GL 97-06, secondary side inspections were performed to confirm that no secondary condition existed that would impact tube integrity. No integrity issues were noted.

3.3 Operational Leakage

Routine primary-to-secondary leak monitoring is conducted in accordance with station procedure 0-HSP-LKRATE-001. The critical leakage value requiring unit shutdown is 150 GPD/steam generator and/or a rate of change leakage limit of > 60 GPD/hour/steam generator. During the past operating cycle, no appreciable (i.e., < 1 GPD total) primary-to-secondary leakage was observed during plant operation.

3.4 Projected Accident Leakage

Inspection findings do not indicate that leakage would have occurred since the previous inspection findings have not identified any operative degradation mechanisms since the Unit 1 S/G replacement.

3.5 Conclusion

The condition of the Surry Unit 1 steam generators, as indicated by the results of the inspection performed on the "C" steam generator, satisfy the requirements of Reg. Guide 1.121 with respect to structural and leakage integrity margin for the recently completed operating period.

4.0 Operational Assessment: Tube Integrity and Leakage

4.1 Discussion

Based upon information contained in Technical Report NE-1214, Rev. 0 "Fuel Management Scheme 1999-B," the past operating interval between inspections of the "C" steam generator was 48.8 EFPM. This steam generator has operated for 11 fuel cycles since installation. The projected operating interval until the next inspection of S/G C is approximately 48.1 EFPM. No conditions were identified during the current completed inspection efforts that would impact the structural and leakage performance of the Unit 1 steam generators through the next planned operating interval. The findings of this inspection support maintaining general and focused tubing inspections on one steam generator per refueling cycle as currently specified in the Surry Steam Generator Monitoring and Inspection Program.

The only degradation that is expected over the long term is wear at AVB locations. AVB wear, if present, is reported during bobbin testing. Typically, indications begin to be reported at approximately 10% through wall and, in general, are slow growing. As shown in Table 2, the average AVB wear seen this outage for the "C" steam generator was 4.1% with a maximum of 8%. These values are higher than seen previously. Typical growth rates of 2% to 5% throughwall per cycle have been experienced in the past at Surry.

The following evaluation was performed to evaluate the projected AVB wear depths for locations exhibiting AVB wear signals that will remain in service following the April 2000 inspection. This evaluation will address all AVB wear conditions relative to tube integrity requirements at the end of the next planned operating interval (3 Cycles – 48.1 EFPM) for the "C" steam generator. The projection is based on 8% / cycle growth rate and a total NDE uncertainty of 8.58%.

The appropriate NDE technique performance data for the bobbin probe for detection and sizing of AVB wear is based on the EPRI database (ETSS # 96004). Using the EPRI database, a technique uncertainty of 4.956% at a 90% confidence interval is obtained. The analyst uncertainty for wear measurements is obtained from the "Capabilities of Eddy Current Data Analysts to Detect and Characterize Defects in SG Tubes" by D. H. Harris, 15th Steam Generator NDE Workshop, Long Beach, CA, July 1996. The value obtained for analyst variability is 7.04%. As discussed in EPRI Report TR-107621, R1, "Steam Generator Integrity Assessment Guidelines", dated March 2000, the total NDE uncertainty is equal to the square root of the sum of the squares of measuring uncertainty and the analyst uncertainty. These values result in a total NDE uncertainty associated with AVB sizing of 8.58%. Projected throughwall depths for indications left in-service are shown in Table 3.

Table 3
Surry Unit 1 "C" Steam Generator
Projected Through Wall % Depths for AVB Indications
Left In-Service at the End of the Next Planned Inspection

Row / Column	Wear Location	% TW 2000 Inspection (A)	*Projected %TW after 48.1 EFPM (B)
R22 C7	AV3	11	43
R27 C10	AV3	13	45
R35 C17	AV1	20	52
R39 C23	AV1	13	45
	AV2	18	50
	AV3	21	53
R42 C31	AV1	15	47
	AV2	17	49
	AV3	14	44
	AV4	14	44
R35 C46	AV3	17	49

*Projected % TW = % TW 2000 inspection + [(8% Growth / cycle) x 48.1/48.8 Cycles x 3 Cycles] + 8.58%

The above projections indicate that no structural integrity concerns exist for the planned operating interval of Surry Unit 1 "C" steam generator. As discussed earlier, the structural limit bounding analysis for uniform wall of a 7/8" diameter x 0.050" thick tube is 60% through wall.

Although there are no findings of concern, primary-to-secondary leakage events will continue to be conservatively handled based upon site monitoring procedures. Industry recommended action levels and shutdown limits as specified in Revision 2 to the EPRI Primary-to-Secondary Leakage Guideline are currently being incorporated.

Chemistry controls similar to those that were maintained in the last cycle are expected to be maintained throughout the next cycle. The impact on planned inspection cycles and scopes due to chemistry excursions or significant changes to treatment programs will be evaluated on a case-by-case basis. Due to the low amount of sludge being removed and the continued low corrosion product transport, planning for sludge lancing or other enhanced cleaning methods will continue to be based upon a frequency of every other outage. The laboratory analysis and review of scale samples will be evaluated with respect to the frequency that sludge lancing is performed. Supplemental inspections and enhanced cleaning methods will be pursued consistent with the Steam Generator

Advisory Committee recommendations from the October 1999 meeting. Subsequent Program Plan requirements will be modified and approved as necessary.

4.2 Conclusion

Based on the results of this eddy current inspection, past inspections, and current chemistry operating practices, "C" steam generator meets the performance criteria to operate for at least three cycles before the next planned tubing inspection. A review of the planned inspection interval will be conducted if other issues are identified during the intervening inspection of the other Surry steam generators or if relevant industry findings are noted during the inspection of similar model steam generators. Results to date indicate that the currently planned tubing inspection interval on Unit 1 S/G "A" and S/G "B" can remain as planned. S/G "A" is currently scheduled for inspection during the Fall of 2001 and S/G "B" for the Spring of 2003.

Results of secondary side inspections continue to demonstrate reliable operation. Continuing diligence on chemistry and Foreign Material Exclusion (FME) control will support long term performance. Evaluation and monitoring will continue as planned and described in the Monitoring and Inspection Program Plan. Continuing awareness of any related industry issues will be considered when planning future inspections.

Corrective Actions Planned

None

Evaluation (If SG condition does not meet previous cycle operational assessment)

Not Applicable

Surry Unit 2

2000 Annual Steam Generator Report

Virginia Electric And Power Company
(Dominion)

Virginia Electric and Power Company
(Dominion)
Surry Unit 2
Annual Steam Generator Report

Station	Unit	Outage Date	Generator Examined			Date of Report
Surry	2	October, 2000			C	10/30/00

Scope of Inspection					
SG	**Inspection Program**	**Planned**	**Inspected**	**Inspection Method**	**Extent**
C	Bobbin	3332	3332	Bobbin	TSH-TSC
C	Row 1 U-Bend RPC	92	92	+Point RPC	7H – 7C
C	TTSH RPC	669	669	3-Coil RPC	TSH +/- 3"
C	Special Interest Hot Leg	98	98	+Point/3-Coil RPC	N/A
C	Special Interest Cold Leg	229	229	+Point/3-Coil RPC	N/A

Indications of Imperfections Detected							
SG	**NDE Method**	**Row**	**Column**	**Indication Code**	**Location**	**Active Yes/No**	**Measured Wall Penetration**
C	Bobbin	24	8	13%	AV2	No	13%
C	Bobbin	24	8	13%	AV4	No	13%
C	Bobbin	25	9	13%	AV3	No	13%
C	Bobbin	38	21	12%	AV2	No	12%
C	Bobbin	26	26	16%	AV3	No	16%
C	Bobbin	26	26	15%	AV4	No	15%
C	Bobbin	25	27	13%	AV2	No	13%
C	Bobbin	38	28	13%	AV1	No	13%
C	Bobbin	38	28	11%	AV3	No	11%
C	Bobbin	25	29	18%	AV3	No	18%
C	Bobbin	34	29	13%	AV4	No	13%
C	Bobbin	40	33	12%	AV1	No	12%
C	Bobbin	40	33	19%	AV2	No	19%
C	Bobbin	40	33	23%	AV3	No	23%
C	Bobbin	42	33	13%	AV2	No	13%
C	Bobbin	26	39	15%	AV3	No	15%
C	Bobbin	43	39	19%	AV2	No	19%
C	Bobbin	39	53	24%	AV3	No	24%
C	Bobbin	39	55	22%	AV3	No	22%
C	Bobbin	39	55	19%	AV4	No	19%
C	Bobbin	43	61	18%	AV1	No	18%
C	Bobbin	44	61	10%	AV1	No	10%
C	Bobbin	37	63	12%	AV2	No	12%
C	Bobbin	40	63	17%	AV3	No	17%
C	Bobbin	40	63	18%	AV4	No	18%
C	Bobbin	31	65	15%	AV2	No	15%
C	Bobbin	40	65	10%	AV3	No	10%
C	Bobbin	41	66	14%	AV3	No	14%
C	Bobbin	41	67	11%	AV2	No	11%
C	Bobbin	33	68	16%	AV1	No	16%
C	Bobbin	33	68	16%	AV2	No	16%

Indications of Imperfections Detected (continued)							
SG	NDE Method	Row	Column	Indication Code	Location	Active Yes/No	Measured Wall Penetration
C	Bobbin	41	68	10%	AV2	No	10%
C	Bobbin	31	69	15%	AV2	No	15%
C	Bobbin	33	70	11%	AV1	No	11%
C	Bobbin	33	70	9%	AV2	No	9%
C	Bobbin	33	70	15%	AV3	No	15%
C	Bobbin	40	70	12%	AV1	No	12%
C	Bobbin	40	70	10%	AV3	No	10%
C	Bobbin	37	73	16%	AV3	No	16%
C	Bobbin	38	73	12%	AV1	No	12%
C	Bobbin	38	73	14%	AV2	No	14%
C	Bobbin	31	75	14%	AV3	No	14%
C	Bobbin	31	75	16%	AV4	No	16%
C	Bobbin	35	77	14%	AV2	No	14%
C	Bobbin	35	77	13%	AV2	No	13%
C	Bobbin	27	84	11%	AV4	No	11%
C	Bobbin	37	30	36%	AV2	No	36%
C	Bobbin	37	30	41%	AV3	No	41%
C	Bobbin	37	30	19%	AV4	No	19%
C	Bobbin	38	34	16%	AV1	No	16%
C	Bobbin	38	34	37%	AV2	No	37%
C	Bobbin	38	34	43%	AV3	No	43%
C	Bobbin	38	34	35%	AV4	No	35%
C	Bobbin	43	40	29%	AV2	No	29%
C	Bobbin	43	40	16%	AV3	No	16%
C	Bobbin	28	49	27%	AV4	No	27%
C	Bobbin	35	54	20%	AV1	No	20%
C	Bobbin	35	54	28%	AV2	No	28%
C	Bobbin	40	54	28%	AV3	No	28%
C	Bobbin	40	54	21%	AV4	No	21%
C	Bobbin	40	57	29%	AV1	No	29%
C	Bobbin	40	57	16%	AV2	No	16%

Tube Plugging		
SG	Reason/Mechanism	Tubes Plugged
C	AVB Wear	7
Total Tubes Plugged		7

Repair Attributions				
SG	Row	Column	Reason/Mechanism	Repair Method
C	37	30	AVB Wear	Plug
C	38	34	AVB Wear	Plug
C	43	40	AVB Wear	Plug
C	28	49	AVB Wear	Plug
C	35	54	AVB Wear	Plug
C	40	54	AVB Wear	Plug
C	40	57	AVB Wear	Plug

Plugging/Repair Record					
SG	Tubes Plugged	Tubes Repaired (Not Plugged)	Percent Plugged	Percent Repaired (Not Plugged)	Percent Plugged or Repaired
A	15	0	0.45	0	0.45
B	7	0	0.21	0	0.21
C	17	0	0.51	0	0.51

TUBE INTEGRITY ASSESSMENT

Overall condition assessments have been delineated in the Surry Steam Generator Monitoring and Inspection Program Plan (SPS-SGMIPP-001), Rev. 2. These assessments are consistent with the requirements of the Nuclear Energy Institute (NEI) Guideline NEI 97-06. A pre-outage assessment was performed to identify any relevant or potential degradation mechanisms to be considered for the Surry Unit 2 steam generators and to identify the appropriate eddy current inspection scope and probe capabilities.

Performance criteria are established in this document in three areas:

- Structural Integrity – Margin of 3.0 against burst under normal steady state power operation and a margin of 1.4 against burst under the most limiting design basis accident concurrent with a safe shutdown earthquake.

- Operational Leakage – RCS operational primary-to-secondary leakage through one steam generator shall not exceed 150 GPD.

- Accident Induced Leakage – Leakage shall not exceed 1 GPM per steam generator during Main Steam Line Break (MSLB).

The inspection performed on "C" steam generator during the October 2000 outage was consistent with the Program Plan and the results formed the basis of the Condition Monitoring and Operational Assessment performed for this outage.

Condition monitoring and operational assessment of the steam generator tube bundles is performed to verify that the condition of the tubes, as reflected in the inspection results, is in compliance with the plant licensing basis. Defects detected are evaluated to confirm that margins against leakage and burst were not exceeded at the end of the current operating cycle in accordance with the bounding ASME calculation. The results of the condition monitoring evaluation are used as a basis for an operational assessment, which demonstrates that the anticipated performance of the steam generators will not exceed the performance criteria margins against leakage and tube burst during the ensuing operating period.

Condition monitoring is "backward looking" and compares the currently observed inspection results for "C" steam generator against the structural and leakage integrity requirements. Additionally, an operational assessment, or "forward looking" evaluation is required to determine, primarily, if tube structural or leakage integrity will be challenged prior to the next scheduled inspection of "C" steam generator. In addition, an assessment is made to verify the continued structural and leakage integrity of "A" and "B" steam generators based upon the inspection findings from "C" steam generator.

This report documents the condition monitoring and operational assessment based upon the inspection results from Surry Unit 2 "C" steam generator. The inspections were performed in October 2000. The Surry Unit 2 replacement steam generators are Westinghouse Model 51F units. These steam generator units contain thermally treated Alloy 600 tubing, full depth hydraulic expanded tube to tubesheet joints, and broached Type 405 stainless steel tube support plates.

1.0 Summary

The only degradation mechanism identified during the inspection of "C" steam generator was tube wear due to contact with anti-vibration bars (AVB's). Two (2) tubes (R37, C30 and R38, C34) were plugged due to wear depths exceeding the 40% Technical Specification Plugging Limit. Five tubes (R43; C40; R28, C49; R35, C54; R40, C54; and R40, C57) were administratively plugged based on the projected AVB wear depth. Calculations predicted that AVB wear for the five tubes would approach the ASME structural limit prior to the next inspection of "C" steam generator (scheduled for the Spring of 2005). All of the AVB indications found were below the ASME Code calculated structural limit including 3 delta P burst pressure margins for uniform wall thinning.

The condition of Surry Unit 2 "C" steam generator, as indicated by the results of the Condition Monitoring evaluation, satisfy the requirements for structural and leakage integrity margins. These conclusions are further confirmed by the lack of appreciable primary-to-secondary leakage during the last operating cycle as determined by routine testing. Evaluation of the AVB wear degradation mechanism showed no unusual progression of wear rates since the May 1996 inspection (approximately 48.4 EFPM). Projection of degradation rates for the next planned operating interval of 49.4 EFPM for "C" steam generator does not indicate that conditions exceeding structural and leakage margin requirements will occur before the end of that next planned operating interval. Thus, the operational assessment requirements are satisfied.

The inspection results for "C" steam generator were consistent with prior operational assessments and did not require any expansion of testing to other steam generators. No indications were detected that exceeded the structural integrity limits or could potentially challenge tube integrity margins for burst and leakage. All operational assessment structural and leakage integrity requirements continue to be met for the Surry Unit 2 "A", "B" and "C" steam generators. It is expected that structural and leakage integrity requirements will be met at the end of the next operating interval.

The next operating interval for "C" steam generator is planned to be 49.4 EFPM (Spring of 2005) compared with 48.4 EFPM for the past interval. Based upon the inspection results for "C" steam generator, no changes to the inspection intervals are planned for Unit 2 "A" or "B" steam generators. Inspection of Surry Unit 2 "B" steam generator is scheduled for Spring 2002 and inspection of "A" steam generator is scheduled for the Fall of 2003.

2.0 Surry Unit 2 – Summary of Evaluated Degradation Mechanisms, Inspection Methods, and Plan

Table 1.0 is a summary of the Surry Unit 2 tube plugging attributions prior to the Fall 2000 outage. A total of 32 tubes were plugged in this unit prior to the Fall 2000 outage . Mechanical wear at AVB contact points and pitting were the primary degradation related cause of tube plugging. Both of the preceding modes of degradation are classified as "inactive" for all steam generators as defined by Rev. 5 of the EPRI Examination Guidelines. No corrosion related cracking degradation has been identified in Surry Unit 2.

Prior to the current outage (EOC16), ten (10) tubes were plugged in "C" steam generator. Three tubes were plugged due to tube wear at AVB contact points and one tube was plugged due to C/L pitting degradation in the free-span above the cold leg tubesheet. Past practice has resulted in plugging of tubes with AVB contact wear that was less than the 40% TW plugging limit. This practice was taken as a conservative measure. As indicated in the Pre-outage Assessment, a number of tubes were left in service following the 1996 inspection (EOC13) with tube wear at AVB contact points in accordance with the plugging evaluation requirements in place at that time.

As noted in Table 1.0, 12 tubes have been plugged in the Surry Unit 2 steam generators due to pitting. Only one of the plugged tubes was in "C" steam generator. This pit indication was left in service following the EOC13 inspection but was subsequently plugged during the EOC15 inspection of "A" steam generator. Unit 2 "C" steam generator was re-evaluated for this condition during the October 2000 outage with no additional findings.

The inspection plans for Surry Unit 2 "C" steam generator follow the philosophy established in the Surry Station Steam Generator Monitoring and Inspection Program Plan as augmented by the Pre-Outage Assessment. The inspection plans for the October 2000 outage are outlined below:

- 100% full length bobbin inspection of 3332 tubes which equates to a 33% sample of the total tube population in all three steam generators.

- Focused 3-coil rotating probe inspections at the H/L top of tubesheet of 667 tubes which is a 20% sample of all of the tubes in "C" steam generator. This inspection scope equates to a 60% sample of the of the Critical Area population in "C" steam generator as defined by the Surry Station Steam Generator Monitoring and Inspection Program.

- 100% single coil Plus Point rotating probe inspection of 92 tubes in the Row 1 tube U-bend areas which equates to a 33% sample of Row 1 U-bends in all three Unit 2 steam generators.

- Rotating probe confirmation of bobbin indications per the Surry Site Specific Analysis Guidelines.

Table 1.0 Surry Power Station Unit 2

SURRY POWER STATION UNIT #2
PLUGGING ATTRIBUTES

DATE	Preservice			Dec-81			Jun-83			Apr-85			Jun-86			Oct-86			Oct-88			Mar-91			Mar-93		
EFPY	0.0			1.1			2.4			3.6			3.8			4.7			5.9			7.2			8.7		
S/G	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
AVB																										2	
Freespan																											
Tube Pulls																											
Foreign Object													1														
Pitting																											
Anomalies																											
Other	1		1																								
Sub-Total	1	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	2	0
TOTAL	2			0			0			0			1			0			0			0			2		

DATE	Feb-95			Apr-96			Oct-97			Apr-99			Total per S/G		
EFPY	10.2			11.2			12.5			13.9					
S/G	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
AVB						3		3					0	5	3
Freespan													0	0	0
Tube Pulls													0	0	0
Foreign Object													1	0	0
Pitting	4									7		1	11	0	1
Anomalies						3							0	0	3
Other	1					2		2		1			3	2	3
Sub-Total	5	0	0	0	0	8	0	5	0	8	0	1	15	7	10
TOTAL	5			8			5			9			32		

Total tubes plugged by category

- **8 AVB**
- **0 Freespan**
- **0 Tube Pulls**
- **1 Foreign Objects**
- **12 Pitting**
- **3 Anomalies**
- **8 Other**

S/G Inspected

3.0 Condition Monitoring Assessment – Tube Integrity Evaluation

The condition monitoring assessment is an evaluation of the past operating cycle (EOC16) performance relative to structural and leakage integrity margins as compared to current inspection results. The condition of the Surry Unit 2 steam generators, as indicated by the results of the inspection performed on the "C" steam generator, satisfy the structural and leakage integrity margin for the recently completed operating period. A discussion of the inspection results and the evaluations performed is provided in the following sections.

3.1 Primary Side Inspection

No conditions indicative of corrosion degradation were noted during the eddy current inspection of Unit 2 "C" steam generator.

During the bobbin inspection, Dent (DNT) signals were reported at the 6th and 7th tube support plates. These "DNT" signals appear to be associated with contact of the tubes against the quatrefoil land and do not represent the denting issue and resultant corrosion degradation associated with drilled carbon steel support plates. A total of 251 dented locations were identified with voltages $\geq$ 2.0 volts. An increase in the number of reported "DNT" indications was experienced during this inspection. The increase resulted because the reporting threshold for "DNT" calls was changed to $\geq$ 2.0 volts as compared to a reporting threshold of $\geq$ 5.0 volts during the EOC13 inspection. As specified in the Surry Site Specific Eddy Current Analysis Guidelines "SRY-SGPMS-002 Rev. 4, dents or bulges $\geq$ 5 volts must be re-inspected with a rotating surface riding coil unless a review of historical data confirms that the signal voltage and phase attributes are essentially unchanged from previous inspections. A total of 74 dent locations (28 hot leg and 46 cold leg) required resolution using the Plus Point probe. These inspections confirmed the "DNT" signals to result from small dents. Most of the "DNT" signals corresponded to the edge of the tube support plate and were in line with the quatrefoil lands. No crack-like or other forms of tube degradation were noted at any of the dent locations. Some support plate locations exhibited two or more dents that corresponded with the quatrefoil lands.

Other free-span bobbin signals required supplemental rotating probe examination due to insufficient history data or changes in the signal attributes relative to the previous inspection data. These were typically low voltage signals associated with manufacturing burnish marks (MBM's), local geometric variations (LGV's), or local inward displacements of the tube caused by a manufacturing impact (DNG). The signals associated with these categories do not represent in-service degradation. Nevertheless, these signals were carefully monitored for change relative to previous inspection results. If an indication had changed more than specified by the Analysis Guidelines or could not be identified in the history review, it was designated for rotating probe testing. Rotating probe inspections were performed on a total of 253 free-span

locations (70 H/L and 183 C/L). None of the locations tested exhibited signs of in-service degradation.

RPC inspection of the top of the hot leg tubesheet (HL-TTS) region was performed on 667 tubes. This program focused primarily on the low velocity region in the middle of the bundle. All HL-TTS signals were resolved in accordance with the analysis guidelines and no degradation was identified.

Ninety-one of the scheduled 92 Row 1 U-bends were inspected with a 0.680" diameter plus-point U-Bend probe. No corrosion related degradation was identified in any of the tubes. The U-Bend of tube R1, C4 could not be inspected with the 0.680" diameter plus-point U-Bend probe due to a restriction at the U-bend. A 0.620" diameter high frequency plus-point probe was used to accomplish the inspection and no degradation was identified in the tube.

During the U-bend inspection effort, signal-to-noise (S/N) measurements were made on a sample of 20 tubes at both 300 and 400 kHz. The results of the sample were compared to the EPRI qualification data used in developing ETSS #96511. These comparisons were made to determine if a high frequency plus-point probe was required at Surry to improve the S/N ratio in the U-Bend area. As is shown by Table 2.0, the average S/N values obtained at Surry are below the values reported by EPRI in developing the qualification for ETSS #96511. Therefore, no testing with the high frequency plus-point probe was deemed necessary for "C" steam generator.

Table 2.0 Signal-to-Noise Row 1 U-bend Study

			300 KHZ			
			Apex	**Apex**	**Tangent**	**Tangent**
			Vp-p	**Vv-m**	**Vp-p**	**Vv-m**
SITE	**AVG.**		0.83	0.26	1.30	0.60
EPRI - ETSS 96511		**AVG.**	1.08	0.40	1.49	0.65
			400 KHZ			
			Apex	**Apex**	**Tangent**	**Tangent**
			Vp-p	**Vv-m**	**Vp-p**	**Vv-m**
SITE	**AVG.**		0.94	0.28	1.38	0.61
EPRI - ETSS 96511		**AVG.**	1.20	0.40	1.62	0.62

Tube wear was identified in "C" steam generator at 62 AVB intersections involving 39 tubes. The maximum measured depth for an AVB indication was 43% through-wall (TW) which was reported on tube R38, C34 at AV3. The indication on tube R38, C34 at

AV3 was reported as 24% TW during the May 1996 inspection of "C" steam generator. Of the 62 AVB indications reported in "C" steam generator, 41 indications were not reported in 1996. The largest newly reported indication was 24% TW on tube R39, C53 at AV3. The minimum reporting criteria for AVB wear in 1996 was 10% TW. In order to establish growth rates for nine of the largest new indications, previous inspection data was re-evaluated to determine if the indications were present in 1996 at levels below 10% TW. The review indicated that all nine of the AVB areas exhibited wear in 1996 with measured depths ranging from 2% TW to 10% TW. For the purpose of growth rate statistics, the remaining 32 new AVB areas with wear indications were assumed to contain no wear in 1996. Table 3.0 lists all tubes with AVB wear indications as well as the associated growth rate for each location. The average growth rate per cycle for the reported indications since the last inspection (1996 – 48.4 EFPM) was 3.8%; the maximum growth rate being 7.0% TW per cycle. This growth rate is approximately twice the value documented for AVB indications in the Surry Site Specific Steam Generator Program Plan as derived from prior inspections.

During the October 2000 examination of Unit 2 "C" steam generator, the Dominion ET Level III served as the independent Qualified Data Analyst. The Dominion ET Level III performed random data checks as well as a final verification of the planned versus completed inspection program. No issues were noted.

TABLE 3.0

SURRY UNIT 2 – October 2000
STEAM GENERATOR EDDY CURRENT INSPECTION SUMMARY – AVB PERCENT SIGNALS

Row	Column	AVB Location	Voltage (Fall 2000)	% TW (Fall 2000)	% TW (Spring 1996) (Less than 10% Not Reported)	% Change (% TW in 2000 - %TW in 1996)	% TW Change per Cycle based on 1996 data
24	8	AV2	0.25	13	<10	13	4.33
		AV4	0.27	13	<10	13	4.33
25	9	AV3	0.29	13	<10	13	4.33
38	21	AV2	0.27	12	<10	12	4
26	26	AV3	0.37	16	<10 (2)**	14	4.67
		AV4	0.31	15	<10 (5)**	10	3.33
25	27	AV2	0.29	13	<10	13	4.33
38	28	AV1	0.27	13	<10	13	4.33
		AV3	0.22	11	14	0	0
25	29	AV3	0.47	18	<10 (8)**	10	3.33
34	29	AV4	0.31	13	<10	13	4.33
*37**	*30 **	*AV2*	*2.05*	*36*	*20*	*16*	*5.33*
		AV3	*3.17*	*41*	*21*	*20*	*6.67*
		AV4	*0.51*	*19*	*<10*	*19*	*6.33*
40	33	AV1	0.27	12	<10	12	4
		AV2	0.53	19	16	3	1
		AV3	0.79	23	17	6	2
42	33	AV2	0.28	13	<10	13	4.33
*38**	*34**	*AV1*	*0.38*	*16*	*12*	*4*	*1.33*
		AV2	*2.26*	*37*	*21*	*16*	*5.33*
		AV3	*3.51*	*43*	*24*	*21*	*7*
		AV4	*1.88*	*35*	*18*	*17*	*5.67*
26	39	AV3	0.34	15	<10 (4)**	11	3.67
43	39	AV2	0.49	19	<10(10)**	9	3
*43**	*40**	*AV2*	*1.25*	*29*	*22*	*7*	*2.33*
		AV3	*0.38*	*16*	*<10*	*16*	*5.33*
*28**	*49**	*AV4*	*1.05*	*27*	*19*	*8*	*2.67*
39	53	AV3	0.84	24	<10 (8)**	16	5.33
*35**	*54**	*AV1*	*0.64*	*20*	*<10*	*20*	*6.67*
		AV2	*1.26*	*28*	*14*	*14*	*4.67*
*40**	*54**	*AV3*	*1.27*	*28*	*23*	*5*	*1.67*
		AV4	*0.67*	*21*	*11*	*10*	*3.33*
39	55	AV3	0.67	22	14	8	2.67
		AV4	0.52	19	10	9	3
*40**	*57**	*AV1*	*1.27*	*29*	*16*	*13*	*4.33*
		AV2	*0.38*	*16*	*<10*	*16*	*5.33*

TABLE 3.0 (Continued)

Row	Column	AVB Location	Voltage (Fall 2000)	% TW (Fall 2000)	% TW (Spring 1996) (Less than 10% Not Reported)	% Change (% TW in 2000 - %TW in 1996)	% TW Change per Cycle based on 1996 data
43	61	AV1	0.47	18	<10 (8)**	10	3.33
44	61	AV1	0.19	10	<10	10	3.33
37	63	AV2	0.27	12	<10	12	3
40	63	AV3	0.46	17	14	3	1
		AV4	0.49	18	13	5	1.67
31	65	AV2	0.34	15	<10 (8) **	7	2.33
40	65	AV3	0.2	10	<10	10	3.33
41	66	AV3	0.32	14	<10	14	4.67
41	67	AV2	0.22	11	<10	11	3.67
33	68	AV1	0.42	16	<10	16	5.33
		AV2	0.4	16	<10 (9)**	7	2.33
41	68	AV2	0.2	10	<10	10	3.33
31	69	AV2	0.35	15	<10	15	5
33	70	AV1	0.22	11	<10	11	3.67
		AV2	0.19	9	<10	9	3
		AV3	0.38	15	<10	15	5
40	70	AV1	0.25	12	<10	12	4
		AV3	0.2	10	<10	10	3.33
37	73	AV3	0.4	16	<10	16	5.33
38	73	AV1	0.25	12	<10	12	4
		AV2	0.32	14	<10	14	4.67
31	75	AV3	0.33	14	11	3	1
		AV4	0.38	16	11	5	1.67
35	77	AV2	0.33	14	<10	14	4.67
		AV2	0.3	13	<10	13	4.33
27	84	AV4	0.22	11	<10	11	3.67
						Max:	7
						Mean:	3.789677419
						StdDev	1.496919205
					90% Value = Mean +1.28*StdDev		5.705734002
					95% Value = Mean +1.65*StdDev:		6.304501684

Notes:

* Location Plugged – Fall 2000

** %TW based on 1996 data "Lookup Review"

3.2 Operational Leakage

Routine primary-to-secondary leak monitoring is conducted in accordance with station procedure 0-HSP-LKRATE-001. The critical leakage value requiring unit shutdown is 150 GPD/steam generator and/or a rate of change leakage limit of > 60 GPD/hour/steam generator. During the past operating cycle, no primary-to-secondary leakage was observed during plant operation.

3.3 Projected Accident Leakage

Based on the fact that no through-wall indications or indications approaching the structural limit have been reported in the Surry station steam generators, no appreciable primary-to-secondary leakage would be expected under accident induced loadings.

3.4 Condition Monitoring Conclusion

In order to demonstrate condition monitoring structural integrity, it is necessary to account for various uncertainties, which are subtracted from the structural limit. The result is then compared with the largest flaw measured. The largest measured flaw reported during the current inspection effort was a 43% TW wear indication at R38, C34. As indicated in the Surry Site Specific Steam Generator Program Plan, the structural limit using the ASME Code equation for uniform wear in a 7/8" diameter tube with a 0.050" wall thickness is 60% through-wall (i.e., 0.020 inch remaining wall). When the total NDE uncertainty of 8.58% is added to the measured value of 43%, a Condition Monitoring limit of 51.6% is obtained. This value is well below the structural limit of 60%. Since there is no uncertainty in the ASME Code equation itself, there is no relational uncertainty that must be considered in determining the condition monitoring limit. Therefore, the condition of the Surry Unit 2 steam generators, as indicated by the results of the inspection performed on "C" steam generator, satisfy condition monitoring requirements for structural and leakage integrity margin for the recently completed operating period.

4.0 Operational Assessment: Tube Integrity and Leakage

4.1 Discussion

NEI 97-06 requires that a "forward looking" operational assessment be performed to assess degradation mechanisms. The assessment must determine if the degradation mechanisms observed in a plant will continue to meet tube structural and leakage integrity requirements at the end of the upcoming cycle when degradation mechanism growth rates and NDE uncertainty are added to the largest flaw remaining in service. The only degradation mechanism observed is Surry Unit 2 "C" steam generator during the October 2000 inspection was AVB wear. The following sections summarize the

growth rate evaluation and the NDE sizing uncertainty evaluations performed for AVB wear to support the operational assessment.

Based on information contained in Technical Report NE-1214, Rev. 0 "Fuel Management Scheme 1999-B," the past operating interval between inspections of "C" steam generator was 48.4 EFPM and the cumulative operating period for the replacement steam generators was 182.4 EFPM. The projected operating interval until the next inspection of "C" steam generator is approximately 49.4 EFPM.

The only degradation that is expected over the long term is wear at anti-vibration bar locations. AVB wear, if present, is reported during bobbin testing. Typically, indications begin to be reported at approximately 10% through wall and, in general, are slow growing. As was shown in Table 3.0, the average AVB wear rate per cycle was 3.8% with a maximum of 7%. These tube wear rates are similar to those seen for the Surry Unit 1 "C" steam generator during the Spring 2000 outage and are higher than those seen previously for Surry station steam generators (i.e., 2% to 5% per cycle).

An evaluation was performed to determine the AVB wear depths for locations exhibiting wear in "C" steam generator that will remain in service following the October 2000 inspection. This evaluation addressed all AVB wear conditions relative to tube integrity requirements at the end of the next planned operating interval (3 Cycles – 49.4 EFPM). Table 4.0 lists the projected through wall depths for all AVB wear sites left in service for "C" steam generator.

The appropriate NDE technique performance data for bobbin probe detection and sizing of AVB wear is based upon EPRI ETSS # 96004.1. Using the EPRI database, a technique uncertainty of 4.956% at a 90% confidence interval is obtained. The analyst uncertainty for wear measurements is obtained from the document "Capabilities of Eddy Current Data Analysts to Detect and Characterize Defects in SG Tubes" D. H. Harris, 15th Steam Generator NDE Workshop, Long Beach, CA, July 1996. The value obtained for analyst variability is 7.04%. As discussed in EPRI Report TR-107621, R1, "Steam Generator Integrity Assessment Guidelines", dated March 2000, the total NDE uncertainty is equal to the square root of the sum of the squares of the measurement uncertainty and the analyst uncertainty. The total NDE uncertainty associated with AVB sizing is 8.58%. Since there is no uncertainty in the ASME Code equation itself, there is no relational uncertainty that must be considered in determining the operational assessment limit.

4.2 AVB Wear Depth Projections

As discussed earlier, the AVB wear growth rates were evaluated based upon the final field data from the EOC16 inspection. The growth rate from 1996 to 2000 for each AVB wear site is detailed in Table 3.0. A summary of the information is shown below:

Maximum:	7.00% / Cycle
Mean Growth Rate:	3.79% / Cycle
Standard Deviation:	1.50% / Cycle
Number of Data Points:	62
90% CL:	5.71% / Cycle
95% CL:	6.30% / Cycle

For this Operational Assessment, the maximum individual growth seen (i.e., 7% / cycle) will be utilized as the conservative growth rate basis.

The guidance provided in the EPRI Steam Generator Integrity Assessment Guidelines: Revision 1 (TR-107621-R1) states that structural integrity should be demonstrated at the next inspection by showing that the tube meets the performance criteria with an overall uncertainty based on a probability of 0.90, evaluated at 50% confidence. Application of the maximum observed growth rate from EOC16 (R38, C34 at AV3) for the last 3 cycles results in the following projected maximum depth at the next inspection (Spring of 2005) for "C" steam generator:

Maximum AVB Wear Site Left in Service: (R39C54 – AV3)	24 %
Max Growth Adjusted for Cycle Length: (7 % x 49.4/48.4 x 3)	21.4 %
NDE Sizing at 90% CL	8.58%
Projected EOC19 (3 cycles) Condition	54%

This evaluation is conservative for the following reasons:

a) The largest growth rate from the prior inspection data is utilized. This value is greater than the 95% CL and the industry experience is that growth rates decline with increasing operating time.

b) Generally, the largest growth rates do not occur at the largest BOC indications retained in service. Thus, the combination of the largest individual growth rate and the largest indication kept in service is conservative.

4.3 Operational and Accident Leakage

Although there are no findings that would indicate a concern, sensitivity to primary-to-secondary leakage events will continue to be monitored with conservatively based monitoring procedures. Industry recommended action levels and shutdown limits as indicated in Revision 2 to the EPRI Primary-to-Secondary Leakage Guideline are currently being incorporated.

It is expected that chemistry controls similar to the past cycle will be maintained throughout the next cycle. Chemistry excursions or significant changes to treatment programs will be evaluated on a case by case basis. Evaluations will include the impact on planned steam generator inspection cycles and scopes.

4.4 Conclusion

Based upon the results of this eddy current inspection, past inspections, and current chemistry operating practices, "C" steam generator meets the performance criteria to operate for at least three cycles before the next planned tubing inspection. No conditions were identified during the recently completed inspection that would impact the structural and leakage performance of the Unit 2 steam generators through the next planned operating interval, thereby satisfying the operational assessment.

In accordance with the Program Plan logic of general and focused tubing inspections on one steam generator per refueling cycle, the findings of this inspection are consistent with maintaining the currently planned frequency of inspection. If other issues are identified during ensuing inspections of other Surry steam generators or relevant industry findings are reported during the inspection of similar model steam generators, a review of the planned inspection intervals will be conducted. Results to date indicate that inspection intervals for Unit 2 "A" and "B" steam generators may remain as planned. Surry Unit 2 "B" steam generator is scheduled for inspection in Spring 2002 and Surry Unit 2 "A" steam generator is scheduled for inspection in Fall 2003.

Results of secondary side inspections continue to demonstrate reliable operation. Continuing diligence on chemistry and FME control issues will support long term performance. Evaluation and monitoring will continue as planned. Continued awareness of any related industry issues will be observed when planning future inspections.

Table 4.0

End Of Cycle 19 (EOC19) % TW Depths At AVB Location Left In Service
For the "C" Steam Generator

Row	Column	AVB Location	% Call (Fall 2000)	Projected % Call - Spring 2005
24	8	AV2	13	43
		AV4	13	43
25	9	AV3	13	43
38	21	AV2	12	42
26	26	AV3	16	46
		AV4	15	45
25	27	AV2	13	43
38	28	AV1	13	43
		AV3	11	41
25	29	AV3	18	48
34	29	AV4	13	43
		AV4	19	49
40	33	AV1	12	42
		AV2	19	49
		AV3	23	53
42	33	AV2	13	43
26	39	AV3	15	45
43	39	AV2	19	49
39	53	AV3	24	54
39	55	AV3	22	52
		AV4	19	49
43	61	AV1	18	48
44	61	AV1	10	40
37	63	AV2	12	42
40	63	AV3	17	47
		AV4	18	48
31	65	AV2	15	45
40	65	AV3	10	40
41	66	AV3	14	44
41	67	AV2	11	41
33	68	AV1	16	46
		AV2	16	46
41	68	AV2	10	40

Table 4.0 (Cont'd)

End Of Cycle 19 (EOC19) % TW Depths At AVB Location Left In Service
For the "C" Steam Generator

Row	Column	AVB Location	% Call (Fall 2000)	Projected % Call - Spring 2005
31	69	AV2	15	45
33	70	AV1	11	41
		AV2	9	39
		AV3	15	45
40	70	AV1	12	42
		AV3	10	40
37	73	AV3	16	46
38	73	AV1	12	42
		AV2	14	44
31	75	AV3	14	44
		AV4	16	46
35	77	AV2	14	44
		AV2	13	43
27	84	AV4	11	41

Note: % TW (2005) = % TW (2000) + [(7% Growth / cycle) x 49.4. / 48.4 Cycles x 3 Cycles] + 8.58%

Corrective Actions Planned

None

Evaluation (If SG condition does not meet previous cycle operational assessment)

Not Applicable