VIRGINIA ELECTRIC AND POWER COMPANY
RICHMOND, VIRGINIA 23261

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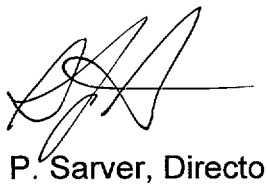
Gentlemen:

VIRGINIA ELECTRIC AND POWER COMPANY (DOMINION)
NORTH ANNA POWER STATION UNITS 1 AND 2
ANNUAL STEAM GENERATOR INSERVICE INSPECTION SUMMARY REPORT

Pursuant to Technical Specification 6.9.1.5.b for North Anna 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 2001. The steam generator tube inspections conducted on Unit 1 during the Fall 2001 refueling outage are included in Attachment 1. The steam generator tube inspections conducted on Unit 2 during the Spring 2001 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
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Attachment

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Mr. M. J. Morgan
NRC Senior Resident Inspector
North Anna Power Station

A047

Virginia Electric & Power Company (Dominion)
North Anna Unit 1
2001 Annual Steam Generator Report

Virginia Electric and Power Company (Dominion)
North Anna Unit 1 Summary
2001 Annual Steam Generator Report

Station	Unit	Outage Date	Generator Examined			Date of Report
North Anna	1	September, 2001	A			01/22/02

Scope of Inspection					
SG	**Inspection Program**	**Planned**	**Inspected**	**Inspection Method**	**Extent**
A	Bobbin	2156	2156	Bobbin	TEC - TEH
A	Row 1 U-Bend RC	98	98	+ Point U-Bend RC	7H – 7C
A	TTSH RC	719	719	+ Point RC	TSH +/- 3"

Indications of Imperfections Detected							
SG	**NDE Method**	**Row**	**Column**	**Indication Code**	**Location**	**Active Yes/No**	**Measured Wall Penetration**
A	N/A	N/A	N/A	N/A	NONE	No	N/A

Tube Plugging		
SG	**Reason/Mechanism**	**Tubes Plugged**
A	NONE	0
Total Tubes Plugged		0

Repair Attributions				
SG	**Row**	**Column**	**Reason/Mechanism**	**Repair Method**
A	N/A	N/A	NONE	N/A

Plugging/Repair Record					
SG	**Tubes Plugged**	**Tubes Repaired (Not Plugged)**	**Percent Plugged**	**Percent Repaired (Not Plugged)**	**Percent Plugged or Repaired**
A	0	0	0	0	0
B	0	0	0	0	0
C	1	0	0.03	0	0.03

Tube Integrity Assessment

1.0 Summary

Overall condition assessments are delineated in the North Anna Power Station 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 North Anna Unit 1 steam generators and to identify the appropriate eddy current inspection scope and probe capabilities to be utilized during the inspection.

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

- Tubing Structural Integrity
- Operational Leakage
- Projected Accident Leakage

The inspection performed on the "A" steam generator 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 of the North Anna steam generator tube bundles is performed to verify that the condition of the tubes, is in compliance with plant licensing basis. Structurally significant indications, are evaluated with a bounding ASME calculation to confirm that the safety margins against leakage and burst are not exceed at the end of the past operating cycle with the bounding ASME calculation. 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 likewise not exceed the performance criteria margins against leakage and tube burst during the ensuing operating period.

No degradation was identified during the inspection program. Hence, acceptable tube integrity at the end of the current operating cycle (Replacement EOC 6) is demonstrated and the Condition Monitoring and Operational Assessment requirements on burst pressure and accident condition leak rates are also satisfied. This assessment of tube integrity follows the requirements of the March 2000 EPRI Steam Generator Integrity Assessment Guidelines: Revision 1 (TR-107621-R1) and the requirements of NEI 97-06.

The condition of the North Anna Unit 1 steam generators, as indicated by the results of the current condition monitoring evaluation and past operational assessments, satisfy the safety margin requirements with respect to structural and leakage integrity. The completed operating interval, i.e., time between the last "A" steam generator inspection, was approximately 48.4 effective full power months (EFPM). The normally scheduled operating interval before the next inspection of "A" Steam Generator is three cycles (Approx. 49.6 EFPM). With no indications identified during the current inspection, there is no known condition in the North Anna Unit 1 steam generators that exists that would

exceed structural and leakage margin requirements before the end of the next planned operating interval. Thus, operational assessment requirements are satisfied.

As noted above, satisfactory operation of the "A" steam generator is expected through Replacement EOC9 (Spring 2006). Satisfactory operation of the "B" and "C" steam generators, which were not inspected during EOC6, is expected through EOC7 (Spring 2003) for the "C" steam generator and EOC8 (Fall 2004) for the "B" steam generator. This is based on past satisfactory inspections of these generators and no findings in the current inspection of the "A" steam generator that would compromise these results.

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

Consistent with the Program Plan, no "Existing" degradation is being monitored and no degradation was observed this outage. Based on the assessment of prior inspection results, steam generator design features, and industry experience with similar steam generators, monitoring for the presence of "Relevant" and "Potential" degradation continued.

The inspections conducted this outage were consistent with the North Anna Steam Generator Monitoring and Inspection Program Plan. The pre-outage assessment noted no particular areas of concern. The inspection plan is outlined below:

- Full length bobbin inspection of 60% (2156) of the tubes in the "A" steam generator. All bobbin inspections were 100% full length except Row 1 where only straight lengths were examined. Fifty-percent of the tubes (1796) were previously inspected in 1994. Three hundred and sixty tubes included selected peripheral area tubes, AVB contacted tubes, and Special Interest tubes.
- Focused Plus Point rotating probe inspection of the hot leg top of the tube-sheet (for 719 tubes – 464 tubes in critical areas). This represents a 20% sample of the total tube population in "A" steam generator. The sample included tubes that were previously inspected in 1997 and 255 tubes outside of the critical area that had not previously been examined.
- Single Coil Plus Point rotating probe inspection of 100% of "A" steam generator Row 1 U-bend areas (98 tubes).
- Plus Point rotating probe inspection of bobbin indications in accordance with the Site Specific Analysis Guidelines.

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

3.0 Inspection Results

The inspection was performed in accordance with the requirements of the EPRI PWR S/G Examination Guidelines, Revision 5. All eddy current methods and techniques used for the inspection were qualified in accordance with these guidelines.

3.1 Primary Side Inspection

The overall results of the inspection were as follows:

- No tubing wear at anti-vibration bar (AVB) contact points was observed during this inspection. This result is consistent with past experience for both North Anna units and with industry experience for later generation I-690 Westinghouse F-type units.
- A total of seventy-eight (78) tubes were reported with dent signals (DNT). The reporting threshold for dents prior to this inspection was lowered from 5.0 volts to 2.0 volts resulting in fifty-seven (57) newly reported dents.
- Nineteen (19) tubes were reported with Manufacturing Buff Marks (MBM's).
- One tube (R27, C13) was reported with a non-quantifiable signal (NQN) that was determined to exist on the baseline eddy current data.

All indications were resolved through history review of previous results in accordance with the site specific analysis guidelines.

4.0 Condition Monitoring Assessment

4.1 Tube Integrity Evaluation

The condition of the North Anna Unit 1 steam generators, as indicated by the results of the inspection performed on the "A" steam generator, satisfies the requirements of tube integrity with respect to structural and leakage integrity margin for the recently completed operating period.

As indicated in Section 3.1 above, the bobbin inspection was the initial "re-inspection" of those tubes inspected in 1994. There were no bobbin indications observed during this inspection that required resolution with a rotating pancake probe. The dent (DNT) and manufacturing buff mark (MBM) indications reported as a result of the bobbin inspection were compared to the 1992 baseline and showed no change in the signals. Focused critical area rotating probe inspections of the hot leg top of tube-sheet and of the Row 1 U-bend areas showed no conditions indicative of wear or corrosion degradation.

4.2 Operational Leakage

The primary-to-secondary leakage response limit of 100 GPD/steam generator still exists as the Technical Specifications' limit. Station procedures continue to use a lower administrative limit of 50 GPD/steam generator with a total rate of change limit of 60 GPD within 90 minutes to evaluate shutdown actions. The shutdown value specified in the EPRI Primary-to-Secondary Leak Guidelines is >75 GPD/steam generator and a rate of change leakage limit of > 30 GPD/hour steam generator. The current Technical Specification limits are viewed as adequate considering the age of the replacement steam generators and the fact that no active degradation has been noted in these units.

During the past operating cycle, no primary-to-secondary leakage was observed. Monitoring continues in accordance with station performance testing procedures. N-16 monitors continue to be used to provide fast response trending of any potential leakage.

4.3 Projected Accident Leakage

No inspection findings were indicative that leakage would have occurred since the findings confirm the lack of operative degradation mechanisms since unit replacement.

5.0 Operational Assessment

5.1 Discussion

The past operating interval between inspections of the "A" steam generator was 48.4 EFPM. The projected next operating interval is approximately 49.6 EFPM. Since no indications were identified during the current inspection, there is no existing condition that has been identified in "A" steam generator that would exceed structural and leakage margin requirements before the end of next planned operating interval. Thus, the operational assessment requirements are satisfied. In accordance with the referenced 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 this planned frequency of inspection.

AVB wear is the only degradation mechanism that is expected to occur in the North Anna steam generators over the long term. AVB wear can be reliably detected during the bobbin inspection program. Typically, indications begin to be reported at approximately 10% through-wall and, in general, are slow growing. Industry experience, to date, on similar design steam generators have reported no appreciable AVB wear. Typical wear growth rates of 2% to 5% through-wall per operating cycle have been experienced at Surry. The performance of the North Anna generators is expected to at least equal that of Surry since the close gap AVB tolerance techniques were used during manufacturing.

The following conservative evaluation was performed to evaluate a potential existing 10% through wall AVB wear condition relative to tube integrity requirements at the end of the next planned operating interval (3 Cycles – 49.6 EFPM) for the "A" steam generator. The projection is based on 5 % / cycle wear growth rate and a total NDE uncertainty of 10.3% at a 90% confidence level.

$$\% \text{ TW (2006)} = 10\% \text{ TW (2001)} + [(5\ \% \text{ Growth}) \times 3 \text{ Cycles}] + 10.3\ \%$$

$$\% \text{ TW (2006)} = 35.3\ \%$$

This projected tube wear depth of any potentially undetected AVB wear indication is well below the bounding structural limit depth of 58.8% based on the uniform wall thinning degradation model. Therefore the potential exists that the operating interval may be extended, if deemed appropriate.

No structural integrity concern is identified for the next planned operating interval (49.6 EFPM's) of the North Anna Unit 1 "A" steam generator. No inspection findings were noted for the "A" steam generator that would not support satisfactory operation of the "B" and "C" and steam generators through their next scheduled inspections.

Although there are no findings indicative of a concern, monitoring for primary-to-secondary leakage events will continue. In addition, industry recommended action level values, as identified in Revision 2 of the EPRI Primary-to-Secondary Leakage Guideline, have been implemented in procedures at North Anna since the completion of this inspection.

Similar chemistry controls are expected to be maintained throughout the next cycle. Chemistry excursions or significant changes to treatment programs will be evaluated on a case by case basis relative to impact on planned inspection cycles and scopes. Due to low amounts of sludge being removed and continued low corrosion product transport, sludge lancing or other enhanced methods will continue to be planned on an every other outage basis pending the laboratory analysis of scale samples and subsequent review of results. Supplemental inspections and enhanced cleaning methods will be pursued consistent with the program plan requirements and modified as necessary.

5.2 Conclusion

The results of the operational assessment for the next operating cycle (Replacement EOC 07) of the Unit 1 steam generators indicate continued compliance to structural integrity and leakage performance criteria. Previous operational assessment results for the "B" and "C" steam generators in conjunction with the present results for the steam generators indicate continued compliance to structural integrity and leakage performance criteria.

If other issues are identified on other North Anna steam generators in ensuing inspections or other relevant industry findings are noted during the inspection of similar model steam generators, review of planned inspection intervals will be conducted per Program Plan requirements.

Results of secondary side inspections continue to demonstrate reliable operation. Continued diligence in chemistry and FME control will support long term performance. Evaluation and monitoring will continue as planned and further detailed in the Monitoring and Inspection Program Plan. Continued 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

Virginia Electric and Power Company (Dominion)
North Anna Unit 2
2001 Annual Steam Generator Report

Virginia Electric and Power Company (Dominion)
North Anna Unit 2 Summary
2001 Annual Steam Generator Report

Station	Unit	Outage Date	Generator Examined			Date of Report
North Anna	2	March, 2001			C	01/22/2002

Scope of Inspection					
SG	**Inspection Program**	**Planned**	**Inspected**	**Inspection Method**	**Extent**
C	Bobbin	2156	2159*	Bobbin	TSH-TSC
C	Row 1 U-Bend RC	98	98	+Point Rotating Coil	7H – 7C
C	TTSH RC	719	719	+Point Rotating Coil	TSH +/- 3"
C	Special Interest Hot Leg	0	0	NA	N/A
C	Special Interest Cold Leg	1	1	+Point Rotating Coil	5C –5C

***Three additional tubes were inspected to complete the box-in of tube R43, C56.**

Indications of Imperfections Detected							
SG	**NDE Method**	**Row**	**Column**	**Indication Code**	**Location**	**Active Yes/No**	**Measured Wall Penetration**
C	Bobbin Eddy Current	43	56	SVI	5th CL Support	No	30%

Tube Plugging		
SG	**Reason/Mechanism**	**Tubes Plugged**
C	Mechanical Wear	1
Total Tubes Plugged		1

Repair Attributions				
SG	**Row**	**Column**	**Reason/Mechanism**	**Repair Method**
C	43	56	Mechanical Wear	Plug

Plugging/Repair Record					
SG	**Tubes Plugged**	**Tubes Repaired (Not Plugged)**	**Percent Plugged**	**Percent Repaired (Not Plugged)**	**Percent Plugged or Repaired**
A	0	0	0%	0%	0%
B	0	0	0%	0%	0%
C	1	0	.03%	0%	.03%

Tube Integrity Assessment

1.0 Summary

This assessment correlates the inspection results for North Anna Unit 2 "C" steam generator to structural and leakage integrity requirements based upon the current Steam Generator Integrity Assessment Guidelines. Overall condition assessments are delineated in the North Anna Power Station Steam Generator Monitoring and Inspection Program Plan. This assessment is consistent with the requirements of the Nuclear Energy Institute (NEI) Guideline NEI 97-06. An assessment was performed prior to this outage (pre-outage assessment) to identify any relevant or potential degradation mechanisms to be considered and to identify the appropriate eddy current inspection scope and probe capabilities to be utilized during the inspection. The pre-outage assessment noted no particular areas of concern. The inspection performed on "C" steam generator during the March 2001 outage was in accordance with the program plan developed for the inspection.

Performance criteria are established in this document in three areas:

- Tubing Structural Integrity
- Operational Leakage
- Projected Accident Leakage

Condition monitoring of the North Anna steam generator tube bundles is performed to verify that the condition of the tubes is in compliance with the licensing basis for the plant. Structurally significant indications are evaluated with a bounding ASME calculation to confirm that margins against leakage and burst are not exceeded at the end of the current operating cycle. 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.

No defective tubes (T.W. depth > 40%) were identified during this inspection. One degraded tube was identified and was plugged. A tube integrity evaluation was performed for this condition in accordance with Revision 1 of the March 2000 Steam Generator Integrity Assessment Guidelines (TR-107621-R1). Relevant condition assessment information is provided below. The evaluation determined that acceptable tube integrity margins would exist at the end of the current operating cycle (Replacement EOC4) and that condition monitoring and operational assessment requirements for burst pressure and accident condition leak rates are satisfied.

The condition of the North Anna Unit 2 steam generators, as indicated by the results of the condition monitoring evaluation and past operational assessments, satisfy the safety margin requirements with respect to structural and leakage integrity margins. The operating interval since the last steam generator "C" inspection, was approximately 49.2 EFPM. The planned operating interval before the next inspection of steam generator "C" is 50.2 EFPM. Satisfactory operation of "A" and "B" steam generators, which were not inspected during EOC4, is expected through EOC5 for steam generator "A" and EOC6 for steam generator "B". Based upon this condition monitoring evaluation, there is no condition that exists in the North Anna Unit 2 steam

generators that would exceed structural and leakage margin requirements before the end of the next planned operating interval. Thus, operational assessment requirements are satisfied.

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

The inspections conducted during this outage were consistent with the North Anna Steam Generator Monitoring and Inspection Program Plan. At the start of the inspection, sixty seven percent of the tubes in the Unit 2 steam generators had been inspected. No existing degradation had previously been reported in the North Anna Unit 2 steam generators. The eddy current inspection scope planned for this outage included:

- Full length bobbin inspection of 60% (2156) of the tubes in "C" generator.
- Plus Point rotating probe inspection of the hot-leg top of tube-sheet area on 20% (719) of the tubes in "C" generator which included 100% of the critical area.
- Plus Point rotating probe inspection on 100% (98 tubes) of "C" generator Row 1 U-bend areas.
- Plus Point rotating probe inspection of bobbin indications detected in "C" generator per the Site Specific Analysis Guidelines.

A single incidence of low-level wear at a cold-leg support plate edge was observed during this inspection. The indication was measured with a qualified eddy current technique and determined not to constitute a condition that would require expansion of the inspection plan.

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

3.0 Inspection Results

The inspection was performed in accordance with the requirements of the EPRI PWR S/G Examination Guidelines, Revision 5. All eddy current methods and techniques used for the inspection were qualified in accordance with these guidelines.

3.1 Primary Side Inspection

The inspection program for this outage was completed as planned. An additional 3 tubes were also inspected with a bobbin probe to completely box-in a tube R43, C56 that contained a volumetric indication to ensure that the condition did not result from a loose part, since the indication was apparently mechanically induced.

During the bobbin inspection program, an indication measuring 1.61 volts was identified in tube R43, C56. The indication was located on the cold leg side of the generator near the upper edge of the 5th tube support. No evidence of a foreign object was noted near this tube or the tubes surrounding this location. The previous bobbin data for tube R43, C56 (1995 baseline) revealed no indication at the 5th support plate location. The indication was initially classified as a non-quantifiable indication (NQI) in accordance with the North Anna Site Specific Eddy Current Analysis Guidelines. The NQI classification required that the area containing the indication be inspected with a rotating plus-point probe in order to characterize the indication. The plus-point examination revealed a volumetric indication with no crack-like features that coincided with one

of the lands on the quatrefoil tube support plate. The condition did not extend outside of the support plate. Based upon the plus-point characterization and the location of the indication, it was determined to use sizing techniques for both wear and pitting to measure the depth of the indication. Using the bobbin coil sizing technique (ETSS 96004.2) the depth of the indication was measured at 27% on the absolute mix channel. The absolute mix is considered the most accurate bobbin technique for measuring this condition. Using a rotating pancake coil sizing technique (ETSS 99998.1) the depth of the indication was measured at 30%. Based upon the location of the indication and its eddy current characteristics, the indication in R43, C56 appears to be mechanically induced. The rotating probe eddy current data showed no evidence of a dent or anomalous condition associated with indication. The plus-point inspection confirmed the indication to be non-crack like and volumetric in nature. The inspection results for the rest of "C" steam generator showed this indication to be an isolated occurrence confined to this single location. No similar findings have been observed in the North Anna Unit 1 or Unit 2 steam generators. The findings that were observed during this outage would not affect the proposed inspection plans for North Anna Units 1 and 2.

No tubing wear at anti-vibration bar (AVB) contact points was observed during this inspection. This result is consistent with past experience for both North Anna units and with industry experience for later generation I-690 Westinghouse F-type units.

Nine (9) Manufacturing Buff Mark (MBM) and seven (7) dent (DNT) signals were identified. All of the signals were resolved by comparing them with the baseline eddy current results.

4.0 Condition Monitoring Assessment

4.1 Tube Integrity Evaluation

The indication detected in tube R43, C56 appears to be mechanically induced based upon its location and eddy current characteristics. A condition assessment evaluation was performed for this indication based upon the current Steam Generator Integrity Assessment Guidelines. In this case a probability of 0.90 at 50% confidence (90/50) condition monitoring limit was determined for the indication. The condition assessment evaluation considered the uncertainty of the eddy current technique and the uncertainty introduced by variability among analysts. The combined uncertainty was calculated as the square root of the sum of the squares of the individual uncertainties.

Using the values from the EPRI database for ETSS 96004.2 for wear at tube supports, a technique uncertainty was calculated. The analyst variability for wear with a bobbin probe was determined to be 7.04%.

Bobbin Absolute Mix

Uncertainty Value	ETSS # 96004.2
Technique	8.43%
Analyst	7.04%
Total NDE	10.98%

Based upon the total NDE uncertainty of 10.98% determined above and the reported through wall depth of 27% for the absolute mix, the adjusted flaw depth for the indication in tube R43, C56 is 37.98%.

Using the EPRI database for ETSS 99998.1 for pitting, a technique uncertainty for pitting was calculated. A conservative default value of 10% was applied for analyst variability with the pancake probe.

Rotating Pancake Probe

Uncertainty Value	ETSS # 99998.1
Technique	6.03%
Analyst	10.00%
Total NDE	11.28%

Based upon the total NDE uncertainty of 11.28% determined above and a reported through-wall depth of 30% for the rotating pancake probe, the adjusted flaw depth for the indication in tube R43, C56 is 41.28%.

The structural limit bounding analysis for uniform wear of a 7/8" diameter x 0.050" thick tube is 58% through-wall. The calculated EOC04 depth for the as found indication in tube R43, C56, based upon the above NDE uncertainties does not exceed the bounding structural limit. Therefore, the EOC04 condition monitoring performance criteria for steam generator "C" has been satisfied.

Referring to Section 5.3.3 of the EPRI Steam Generator Flaw Handbook provides further confirmation that structural integrity considerations would be met. For axial thinning with limited circumferential extent, Figure 5.3.3 –1 from that handbook shows that the indication identified in tube R43, C56 (0.27" in axial extent and approximately 30% TW) is well below the 90/50 condition monitoring limit curve.

4.2 Operational Leakage

The primary-to-secondary leakage response limit of 100 GPD/steam generator still exists as the Technical Specification limit. Station procedures continue to use a lower administrative limit of 50 GPD per steam generator with a total rate of change limit of 60 GPD within 90 minutes to evaluate shutdown actions. The shutdown value specified in the EPRI Primary-to-Secondary Leak Guidelines is > 75 GPD/steam generator and a rate of change leakage limit of > 30 GPD/hour/steam generator. The current Technical Specification limits are viewed as adequate considering the age of the replacement steam generators and that fact that no active degradation mechanism has been identified in the North Anna replacement units.

During the past operating cycle, no primary-to-secondary leakage was observed. Monitoring of leakage continues in accordance with station performance testing procedures. N-16 leak rate monitors continue to be used to provide fast response trending of any potential leakage.

4.3 Projected Accident Leakage

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

5.0 Operational Assessment

5.1 Discussion

Based upon the location of the indication detected in tube R43, C56 and its eddy current characteristics, the indication appears to be mechanically induced and not related to corrosion. The location of the indication corresponded to the upper edge of one of the quatrefoil lands. No foreign object, dent or MBM signals were reported to be associated with indication. The supplemental Plus Point inspection confirmed the indication was volumetric in nature. It is believed that the indication was caused by a burr or some other small discrete particle located at the edge of one of the quatrefoil lands. The relative movement of the tube and tube support plate during operation resulted in the localized tube wall loss. It is likely this indication initiated during the first cycle of operation. There have not been any similar findings observed in the Unit 1 generators after complete re-inspection of all the tubes with a bobbin probe. The indication in tube R43, C56 is the only indication that has been reported in the Unit 2 generators after 83% re-inspection of all the tubes with a bobbin probe.

As noted above, all the tubes in "B" and "C" steam generators have been re-inspected since baseline. Fifty percent of the tubes in "A" steam generator were inspected in 1998 and the remaining fifty percent are scheduled for inspection in the fall of 2002. The indication that was reported in "C" steam generator this outage appears to be an isolated incident that is not related to an active wear mechanism. As noted earlier, no signal was identified during the baseline inspection, therefore the indication apparently developed during subsequent inservice operation. The operating period since the baseline inspection of "C" steam generator was 5.3 EFPY.

Since the rotating probe signal attributes were closer to the signal from a flat bottom hole in the calibration standard than to an AVB wear scar, EPRI technique ETSS 99998.1 was used for determining the percent wall loss. With this technique, the indication was sized at 30% TW. Based upon an operating interval of 5.3 EFPY, the average growth rate for the indication in tube R43, C56 was calculated to be 5.66% / EFPY.

Even though it is believed that the indication is not related to an active wear mechanism, a growth rate evaluation was performed to support the operational assessment. The bobbin inspection history and scheduled inspections for the Unit 2 steam generators are shown below:

Inspection Date	S/G A	S/G B	S/G C	Comment
1994 - RSG Baseline	100%	100%	100%	
Fall 1996 - REOC 01	0%	50%	50%	No tubes plugged
Spring 1998 - REOC 02	50%	0%	0%	No tubes plugged
Fall 1999 - REOC 03	0%	50%	0%	No tubes plugged
Spring 2001 - REOC 04	0%	0%	60%	One tube plugged R43, C56
Fall 2002 - REOC 05 (Scheduled)	60%	0%	0%	N/a
Spring 2004 – REOC 06 (Scheduled)	0%	60%	0%	N/a
Fall 2005 – REOC 07 (Scheduled)	0%	0%	60%	N/a
Spring 2007 – REOC 08 (Scheduled)	60%	0%	0%	N/a

As can be seen from the above, "A" steam generator will not be completely re-inspected with a bobbin probe until the Fall of 2002.

Steam Generator "A"

(Tubes not inspected since baseline)

- Total operating interval for steam generator "A" until next scheduled inspection (Fall 2002) = 6.7 EFPY
- Average growth rate for R43C56 indication = 5.66%
- Technique Uncertainty (ETSS 99998.1) = 6.03%
- Analyst Uncertainty = 10%
- Total NDE Uncertainty = 11.28%

- % TW (REOC05) = [5.66% Growth x 6.7 EFPY] + 11.28% = 49.2%

The projected depth of a potential indication in "A" steam generator would be below the bounding structural limit of 58%, thereby satisfying the performance criteria for structural integrity through the next operating cycle. The above evaluation can also be applied to Unit 2 "B" and "C" steam generators at REOC05 since the case assumes that the indication initiates during the first cycle of operation. Therefore, the performance criteria for structural integrity have been satisfied for all NAPS Unit 2 generators through the next operating cycle.

AVB wear is the only degradation mechanism that is expected to occur in the North Anna steam generators over the long term. AVB wear can be reliably detected during the bobbin inspection program. Typically, indications begin to be reported at approximately 10% through-wall and, in general, are slow growing. Industry experience, to date, on similar design steam generators have reported no appreciable AVB wear. Typical wear growth rates of 2% to 5% through-wall per operating cycle have been experienced at Surry. The performance of the North Anna generators

is expected to at least equal that of Surry since the close gap AVB tolerance techniques were used during manufacturing.

No structural integrity concern is identified for the next planned operating interval. No inspection findings were noted for the "C" steam generator that would not support satisfactory operation of the "A" and "B" and steam generators through their next scheduled inspections.

Although there are no findings indicative of a concern, monitoring for primary-to-secondary leakage events will continue. In addition, of industry recommended action level values, as identified in Revision 2 of the EPRI Primary-to-Secondary Leakage Guideline, have been implemented in procedures at North Anna since the completion of this inspection.

Similar chemistry controls are expected to be maintained throughout the next cycle. Chemistry excursions or significant changes to treatment programs will be evaluated on a case by case basis relative to impact on planned inspection cycles and scopes. Due to low amounts of sludge being removed and continued low corrosion product transport, sludge lancing or other enhanced methods will continue to be planned on an every other outage basis pending the laboratory analysis of scale samples and subsequent review of results. Supplemental inspections and enhanced cleaning methods will be pursued consistent with the program plan requirements and modified as necessary.

5.2 Conclusion

The condition monitoring assessment is an evaluation of the past operating cycle relative to structural and leakage integrity margin based on current inspection results. The condition of the North Anna Unit 2 steam generators, as indicated by the results of the inspection performed on "C" steam generator, satisfy the requirements for safety margins with respect to structural and leakage integrity margin for the recently completed operating period.

If other issues are identified on other North Anna steam generators in ensuing inspections or other relevant industry findings are noted during the inspection of similar model steam generators, a review of planned inspection intervals will be conducted in accordance with requirements of the Program Plan. Inspection results to date indicate that the current inspection interval planned for the next cycle at NAPS is appropriate. Steam generator "A" is the next generator currently scheduled for inspection at NAPS. The inspection is planned to be conducted in the Fall of 2002.

Corrective Actions Planned

None

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

NA