Tennessee Valley Authority, 1101 Market Street, Chattancoga, Tennessee 37402-2801

March 30, 1998

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

10 CFR 50.54(f)

Gentlemen:

In the Matter of)
Tennessee Valley Authority)

Docket Nos. 50-327 50-390
50-328

SEQUOYAH NUCLEAR PLANT (SQN) AND WATTS BAR NUCLEAR PLANT (WBN) UNIT 1 90-DAY RESPONSE TO NRC GENERIC LETTER (GL) 97-06, "DEGRADATION OF STEAM GENERATOR INTERNALS," DATED DECEMBER 30, 1997

This letter provides TVA's 90-day response to the subject GL. In accordance with the GL, TVA has performed the requested actions for SQN and WBN Unit 1. This letter summarizes the actions taken, conclusions reached, and provides a summary description of the program that has been implemented for each site.

Enclosures 1 and 2 provide TVA's response for SQN and WBN Unit 1, respectively. If you have questions regarding this response, please contact Terry Knuettel at (423) 751-6673.

Sincerely,

Mark J. Burzynski
Manager
Nuclear Licensing

Subscribed and sworn to before me
this 30th day of March 1998

Annalee Petty
Notary Public

My Commission Expires March 2, 2001

Enclosure
cc: See page 2

cc (Enclosures):
Mr. Mark S. Lesser, Chief
U.S. Nuclear Regulatory Commission
Region II
Atlanta Federal Center
61 Forsyth Street, SW, Suite 23T85
Atlanta, Georgia 30303

Mr. R. W. Hernan, Senior Project Manager
U.S. Nuclear Regulatory Commission
One White Flint, North
11555 Rockville Pike
Rockville, Maryland 20852

Mr. R. E. Martin, Senior Project Manager
U.S. Nuclear Regulatory Commission
One White Flint, North
11555 Rockville Pike
Rockville, Maryland 20852

NRC Senior Resident Inspector
Sequoyah Nuclear Plant
2600 Igou Ferry Road
Soddy Daisy, Tennessee 37379

NRC Senior Resident Inspector
Watts Bar Nuclear Plant
1260 Nuclear Plant Road
Spring City, Tennessee 37381

ENCLOSURE 1

TENNESSEE VALLEY AUTHORITY
SEQUOYAH NUCLEAR PLANT (SQN)
UNITS 1 AND 2

90-DAY RESPONSE TO NRC GENERIC LETTER (GL) 97-06,
"DEGRADATION OF STEAM GENERATOR (SG) INTERNALS,"
DATED DECEMBER 30, 1997

NRC Required Actions

GL 97-06, "Degradation of Steam Generator Internals," was issued to: (1) again alert addressees to the previously communicated findings of damage to SG internals, namely, tube support plates (TSPs) and tube bundle wrappers, at foreign PWR facilities; (2) alert addressees to recent findings of damage to SG TSPs at a U.S. PWR facility; (3) emphasize to addressees the importance of performing comprehensive examinations of SG internals to ensure SG tube structural integrity is maintained in accordance with the requirements of Appendix B to 10 CFR Part 50; and (4) require all addressees to submit information that will enable the NRC staff to verify whether addressees' SG internals comply with and conform to the current licensing bases for their respective facilities.

This response provides information for SQN (Westinghouse Model 51 SGs) requested by the GL. The information requested includes:

(1) A discussion of any program in place to detect degradation of SG internals and descriptive inspection plans, including the inspection scope, frequency, methods, and equipment. The GL requires discussions to include the following information for each facility:

   (a) Whether inspection records at the facility have been reviewed for indications of TSP signal anomalies from eddy current testing of the SG tubes that may be indicative of support plate damage or ligament cracking
   (b) Whether visual or video camera inspections on the secondary side of the SGs have been performed at the facility to gain information on the condition of the SG internals (e.g., support plates, tube bundle wrappers, or other components)
   (c) Whether degradation of SG internals has been detected at the facility and how the degradation was assessed and dispositioned.

(2) If the addressee currently has no program in place to detect degradation of SG internals, include a discussion and justification of the plans and schedule for establishing such a program, or why no program is needed.

TVA Response

Introduction

Prior to issuance of the GL, the Westinghouse Owners Group (WOG), Electric Power Research Institute (EPRI), and Nuclear Energy Institute (NEI) developed an action plan to assess the susceptibility to secondary side degradation. SQN intends to follow the industry action plan. Included in the action plan is a requirement to understand the causal factors involved in the degradation

experienced in the Electricite de France (EDF) units. This information is captured in EPRI report GC-109558, "Steam Generator Internals Degradation: Modes of Degradation Detected in EDF Units." This report was submitted to the NRC via NEI letter dated December 19, 1997.

The WOG has reviewed EPRI GC-109558 relative to the design of Series 51 SGs and determined limited potential susceptibility. For plants with Series 51 SGs, this conclusion is documented in report WCAP-15002, Revision 1, "Evaluation of EDF Steam Generator Internals Degradation - Impact of Causal Factors on Westinghouse 51 Series Steam Generators," dated December 1997. The 51 Series SGs include Westinghouse model designations 51, 51M, 51F, and 54F. Because of a similarity in design, this report also covers any implication of susceptibility for two replacement SG designs, the Delta 47 and Delta 75. The 51 Series designs are the most similar to the EDF units.

Revision 1 of WCAP-15002 documents visual inspections of the plants with 51 series SG designs. It is concluded that the number of plants that have been inspected and the inspection results demonstrate that the causal factors identified by EDF do not jeopardize the continued operability of Westinghouse Series 51 SGs. Eddy current inspection of the tubes would detect any detrimental effects on the tubing due to wear caused by TSP ligament degradation, loose parts, and secondary side flow distribution changes. Foreign object search and retrieval (FOSAR) efforts are conducted to discover loose parts.

A similar detailed evaluation is planned for the remaining types of SGs (Model F, D3, D4, D5, and E1/E2) to be the subject of later reports.

SQN's implementing procedures for secondary side inspections are consistent with the WOG Interim Inspection Guidelines referenced in WCAP-15002, Revision 1.

Response to GL, Item 1, for SQN Series 51 SGs

Item 1

(1) A discussion of any program in place to detect degradation of SG internals and descriptive inspection plans, including the inspection scope, frequency, methods, and equipment.

As discussed in WCAP-15002, Revision 1, surveys were sent to WOG utilities requesting the results of SGs secondary side inspections and relevant tube inspections for TSP conditions. Completed surveys were received for 37 of 49 plants. For the 51 Series SGs, responses were received for 18 plants. Sixteen of these plants responded as having inspected or reviewed inspection data for TSP ligament indications and 11 having performed SG secondary side entries that give confidence of not having wrapper drop. TSP ligament indications are reported for 468 ligaments in TSPs made of carbon steel with round tube holes and flow holes. The total number of tubes involved is on the order of 129,000 tubes with roughly 3.6 million ligaments. There is no report of any ligament damage indications in TSPs made of stainless steel.

The modes of degradation detected include many cases of flow-assisted corrosion or erosion-corrosion of upper internals components and of premature cracking of shell welds that results from either surface fatigue or from corrosion cracking that is associated with surface conditions such as pitting or geometric concentrations. For the most part, however, the surveys do not report detection of several modes of degradation experienced in the EDF units. There is no evidence of post-chemical cleaning inspections discovering any significant material losses. There is no evidence of any wrapper having dropped. There is

no evidence of TSP ligament cracking or thinning that is progressive and continuing. TSP ligament cracking or missing pieces of ligaments have been observed, but only in units with carbon steel support plates with drilled round tube holes and flow holes. These conditions are generally traceable to initial inspections and are not progressing based on sequential inspection data. Many of the conditions are probably related to original TSP drilling alignment. Cases of TSPs with indications have been identified which have been linked to patch plate welds.

Plants with significant hour-glassing of the TSPs as a result of the denting process have exhibited ligament cracking throughout the thickness of the support plate between the flow holes in the plate or the flow holes in the tube lane. If denting remained uncontrolled, as subsequent support plate corrosion occurs, the potential exists for fragments of the support plate material to become completely free of the main TSP structure. However, these plate segments generally remain locked in place because of the in-plane forces that give rise to denting, as well as the deformation that contains the individual piece. Operating plants with active denting are under periodic monitoring by the utility and have long-standing criteria and review by the NRC. In addition, the EDF experiences reported are not related to support plate degradation that has progressed to the tube denting stage. Therefore, these plants are not included in this response to GL 97-06.

The secondary side internal degradation types found in Westinghouse 51 Series SGs are identified in Table 1.0. SQN has Model 51 SGs with feedring carbon steel TSPs. Refer to Table 2.0 for SQN's secondary side inspection results and the disposition of identified degradation.

Table 1.0
Susceptibility to Secondary Side Internals Degradation in Westinghouse 51 Series SG Designs

Degradation Type	Level of Susceptibility
• **Erosion Corrosion:**	
Moisture Separator	X
TSP Quatrefoil Ligaments	N
TSP Flow Hole/Ligaments	L
Feed Ring/J-Tubes	X
• **Cracking:**	
TSP Ligaments Near Wedges[2]	N
TSP Ligaments Near Patch Plates	X[1]
Carbon Steel TSP Ligaments (Random Areas)	X[1]
Wrapper Near Supports[2]	N
Transition Cone Girth Weld	X
• **Other:**	
Wrapper Drop[2]	N

X = Observed in some SGs
N = Not Susceptible to EDF Causal Factors
L = Low Susceptibility to EDF Causal Factors

---

(1) Various indications of degradation may be artifacts of manufacturing related to patch plate plug welds and/or drilling alignment.
(2) Various Westinghouse design features are beneficial relative to some of the SG design features of foreign manufacturers.

Table 2.0

In Service Inspection Results

A SG inspection summary for SQN is included in Table 2.0 below.

SG Inspection Summary for SQN						
	Location			Condition		
Component	**Row**	**Column**	**Zlev**	**Cracked**	**Missing**	**E/C**	**Type of Inspection**
Tube Support Plates							
Unit 1 SG 1	14	91	C03	Crack			Bobbin Coil and Plus point
	14	91	H06	Crack			
	37	19	H05	Crack			
	42	40	H07	Patch plate			
	42	66	H02	Crack			Cracks have been tracked since 1990. No tube repair has been necessary. Extensive cracking has not been observed. Therefore, design basis function of the support plates has not been lost.
	45	37	C07	Patch plate			
	45	41	H05	Patch plate			
	45	41	C07	Patch plate			
	46	48	H02	Crack			
Unit 1 SG 2	5	2	H05	Crack			
	28	85	H03	Crack			
	34	55	C05	Patch plate			
	34	55	C06	Patch plate			
	37	76	H04	Crack			
	38	61	C05	Crack			
	41	41	C01	Patch plate			
	46	49	H03	Crack			
	46	54	C01	Patch plate			
Unit 1 SG 3	38	40	C07	Patch plate			
	41	56	C06	Crack			
	42	41	C07	Patch plate			
	42	54	C06	Patch plate			
	42	55	C06	Patch plate			
	42	56	C06	Crack			
	44	55	C06	Patch plate			
	45	55	C06	Patch plate			
	45	57	C06	Crack			
	46	54	C06	Patch plate			
Unit 1 SG 4	36	41	H07	Patch plate			
	37	41	H04	Patch plate			
	38	40	H07	Patch plate			
	42	40	H07	Patch pate			
Unit 2 SG 1	45	37	H07	Crack			
	45	41	H07	Patch plate			
	46	41	H07	Patch plate			
Unit 2 SG 2	8	40	C06	Crack			
	14	44	C06	Crack			
	45	37	C06	Crack			
	46	54	C06	Patch plate			
Unit 2 SG 3	13	92	H04	Crack			
	46	41	H05	Patch plate			
Unit 2 SG 4	24	87	H06	Crack			
	45	41	C07	Patch plate			
	46	54	C05	Patch plate			
No TSP Flow Hole/Ligament erosion-corrosion has been identified in either unit.							

Component	Location	Condition	
	Lower Upper Seam	**Cracked Deform Drop**	**Type or Inspection**
Wrapper		No evidence of wrapper drop	Sludge lance equipment installs successfully in the handholes
	Shell TSPs Other	**Pitting Wastage Crack**	
Chemical Cleaning		No degradation detected. No evidence of post chemical cleaning material losses	FOSAR, eddy current, and SID inspections
		Pitting Wastage Crack	
Other Secondary Side Moisture Separator		No degradation detected.	Visual inspections
Girth Welds		No degradation detected.	UT during Section XI 10-year ISI also visual (internal)
Feed Ring/J-Tube		Feedring backing bar erosion was identified on Unit 2. SQN removed the backing rings that could become potential loose parts. J-tube erosion was identified in the late 80's and replaced with Inconel 600 J-tubes.	Visual inspection and UT, remote visual of feedring internals During feedwater elbow replacement, thermal sleeve was visually inspected with no erosion or degradation detected.
Riser Barrels		No degradation detected.	Visual inspection
Transition Cone		No degradation detected.	Visual inspection
Tangential Nozzle		No degradation detected.	Visual inspection

Safety Assessment

Refer to WCAP 15002, Revision 1.

In-Service Inspection Plan

Based on the above, the following inspection plan has been implemented at SQN. Except where noted, these inspections are performed during each refueling outage.

Tube Support Plate Erosion-Corrosion and Cracking:

1. As the TSPs in SQN SGs are made of carbon steel, a baseline has been established employing a low frequency bobbin inspection technique and has been employed since 1987 to monitor the integrity of TSPs. The technique is defined in the EPRI Report, SG-96-05-003, "Investigation of Applicability of Eddy Current to the Detection of Potentially Degraded Support Structures," dated May 1996. Qualification of this eddy current technique to Appendix H of the EPRI Steam Generator Examination Guidelines is not required since this technique is not examining tube integrity. If indications are found, the history is reviewed to establish if this is an active degradation mechanism, and an evaluation is performed to determine structural significance.

2. In-service inspection is conducted in accordance with Revision 5 of the EPRI PWR SG Examination Guidelines

   The critical area for mechanical or thermally induced support plate cracking is defined as three tubes around the periphery and two rows around the patch plate regions in each support plate. The critical area for ligament erosion/corrosion is the entire bundle. A one hundred percent tube inspection is completed each refueling outage.

Historically, 100 percent of bobbin coil eddy current data acquired is evaluated for indications of TSP degradation. One hundred percent of bobbin coil exams are conducted at SQN based on GL 95-05 requirements.

Wrapper Drop:

1. A determination is made that the sludge lance equipment can be inserted without interference. SQN performs sludge lancing each outage.

2. A visual inspection is conducted on the lower wrapper support block, if interference with the sludge lance equipment is detected.

Wrapper Cracking:

No inspection is recommended unless evidence of wrapper misposition or tube damage in the periphery of the first TSP is detected. A visual inspection is conducted on the lower wrapper support blocks, if degradation is detected.

Upper Package: [Primary and secondary moisture separators, feed ring (J-tube, carbon steel feed ring adjacent to J-tubes, T-section, reducer, backing ring, and thermal sleeve)]

Upper internals visual inspections are performed on a frequency that ensures each SG is inspected in six years. This inspection is included in site maintenance procedures. FOSAR is performed each outage.

Transition Cone Girth Weld:

Inspections are performed in accordance with the SG shell, Section XI in-service inspection requirements. Also, visual inspections are required during SG upper internals inspections.

Feed-Water Nozzle:

Degradation of the thermal sleeve may affect the feed-water nozzle. Loose parts monitoring and in-service inspection requirements for the feed-water nozzle is performed.

Reference

1. WCAP-15002, Revision 1, "Evaluation of EDF Steam Generator Internals Degradation - Impact of Causal Factors on Westinghouse Series 51 Steam Generators"

Item 2

(2) If the addressee currently has no program in place to detect degradation of SG internals, include a discussion and justification of the plans and schedule for establishing such a program, or why no program is needed.

Item 2 of the GL does not apply to SQN.

ENCLOSURE 2

TENNESSEE VALLEY AUTHORITY
WATTS BAR NUCLEAR PLANT (WBN)
UNIT 1

90-DAY RESPONSE TO NRC GENERIC LETTER (GL) 97-06,
"DEGRADATION OF STEAM GENERATOR (SG) INTERNALS,"
DATED DECEMBER 30, 1997

NRC Required Action:

GL 97-06, "Degradation of Steam Generator Internals," was issued to: (1) again alert addressees to the previously communicated findings of damage to SG internals, namely, tube support plates (TSPs) and tube bundle wrappers, at foreign PWR facilities; (2) alert addressees to recent findings of damage to SG TSPs at a U.S. PWR facility; (3) emphasize to addressees the importance of performing comprehensive examinations of SG internals to ensure SG tube structural integrity is maintained in accordance with the requirements of Appendix B to 10 CFR Part 50; and (4) require all addressees to submit information that will enable the NRC staff to verify whether addressees' SG internals comply with and conform to the current licensing bases for their respective facilities.

This response provides information for WBN (Westinghouse Model D-3 SGs) requested by the GL. The information requested includes:

(1) A discussion of any program in place to detect degradation of SG internals and descriptive inspection plans, including the inspection scope, frequency, methods, and equipment. The GL requires discussions to include the following information for each facility:

   (a) Whether inspection records at the facility have been reviewed for indications of TSP signal anomalies from eddy current testing of the SG tubes that may be indicative of support plate damage or ligament cracking
   (b) Whether visual or video camera inspections on the secondary side of the SGs have been performed at the facility to gain information on the condition of the SG internals (e.g., support plates, tube bundle wrappers, or other components)
   (c) Whether degradation of SG internals has been detected at the facility and how the degradation was assessed and dispositioned.

(2) If the addressee currently has no program in place to detect degradation of SG internals, include a discussion and justification of the plans and schedule for establishing such a program, or why no program is needed.

TVA Response

Introduction

Prior to issuance of the GL, the Westinghouse Owners Group (WOG), Electric Power Research Institute (EPRI), and Nuclear Energy Institute (NEI) developed an action plan to assess the susceptibility to secondary side degradation. WBN intends to follow the industry action plan. Included in the action plan is a

requirement to understand the causal factors involved in the degradation experienced in the Electricite de France (EDF) units. This information is captured in EPRI report GC-109558, "Steam Generator Internals Degradation: Modes of Degradation Detected in EDF Units." This report was submitted to the NRC via NEI letter dated December 19, 1997.

The WOG has reviewed EPRI GC-109558 relative to the design of Series 51 SGs and determined limited potential susceptibility. For plants with Series 51 SGs, this conclusion is documented in report WCAP-15002, Revision 1, "Evaluation of EDF Steam Generator Internals Degradation - Impact of Causal Factors on Westinghouse 51 Series Steam Generators," December 1997. The 51 Series SGs include Westinghouse model designations 51, 51M, 51F, and 54F. Because of a similarity in design, this report also covers any implication of susceptibility for two replacement SG designs, the Delta 47 and Delta 75. The 51 Series designs are the most similar to the EDF units.

Revision 1 of WCAP-15002 documents visual inspections of the plants with 51 series plants. It is concluded that the number of plants that have been inspected and the inspection results demonstrate that the causal factors identified by EDF do not jeopardize the continued operability of Westinghouse Series 51 SGs. Eddy current inspection of the tubes would detect any detrimental effects on the tubing due to wear caused by TSP ligament degradation, loose parts, and secondary side flow distribution changes. Foreign object search and retrieval (FOSAR) efforts are conducted to discover loose parts.

A similar detailed evaluation is planned for the remaining types of SGs (Model F, D3, D4, D5, and E1/E2) to be the subject of later reports.

WBN's implementing procedures for secondary side inspections are consistent with the WOG Interim Inspection Guidelines referenced in WCAP-15002, Revision 1.

Since a detailed evaluation has not been completed for the Model D3 SGs installed in WBN, inspection recommendations, have been defined on an interim basis. The WOG plans to complete a more detailed evaluation for this type of SG by May 1998.

Response to GL, Item 1, for WBN Model D SGs

Item 1

(1) A discussion of any program in place to detect degradation of SG internals and descriptive inspection plans, including the inspection scope, frequency, methods, and equipment.

As discussed in WCAP-15002, Revision 1, surveys were sent to WOG utilities requesting the results of SGs secondary side inspections and relevant tube inspections for TSP conditions. Completed surveys were received for 37 of 49 plants. For the Model D, E and F SGs, responses were received for 12 plants. Eleven of these plants responded as having inspected or reviewed inspection data for TSP ligament indications and 8 having performed SG secondary side entries that give confidence of not having wrapper drop. TSP ligament indications were not found in either SGs with carbon steel or with stainless steel support plates.

The modes of degradation detected include many cases of flow-assisted corrosion or erosion-corrosion of upper internals components and of premature cracking of shell welds that results from either surface fatigue or from corrosion cracking that is associated with surface conditions such as pitting or geometric

concentrations. For the most part, however, the surveys do not report detection of several modes of degradation experienced in the EDF units. There is no evidence of post-chemical cleaning inspections discovering any significant material losses. There is no evidence of any wrapper having dropped. There is no evidence of TSP ligament cracking or thinning that is progressive and continuing. TSP ligament cracking or missing pieces of ligaments have been observed, but only in units with carbon steel support plates with drilled round tube holes and flow holes. These conditions are generally traceable to initial inspections and are not progressing based on sequential inspection data. Many of the conditions are probably related to original TSP drilling alignment. Cases of TSPs with indications have been identified which have been linked to patch plate welds.

Plants with significant hour-glassing of the TSPs as a result of the denting process have exhibited ligament cracking throughout the thickness of the support plate between the flow holes in the plate or the flow holes in the tube lane. If denting remained uncontrolled, as subsequent support plate corrosion occurs, the potential exists for fragments of the support plate material to become completely free of the main TSP structure. However, these plate segments generally remain locked in place because of the in-plane forces that give rise to denting, as well as the deformation that contains the individual piece. Operating plants with active denting are under periodic monitoring by the utility and have long-standing criteria and review by the NRC. In addition, the EDF experiences reported are not related to support plate degradation that has progressed to the tube denting stage. Therefore, these plants are not included in this response to GL 97-06.

The secondary side internal degradation types found in Westinghouse SGs are identified in Table 1.0. Model D-3 SGs have a significantly different design preheater that is constructed of Inconel 600 and is not susceptible to preheater erosion/corrosion observed in other Model Ds.

During the first WBN refueling outage, visual inspection of the secondary tube sheet region in two SGs showed that one end of the blow down pipe was severed. The separation occurred at the upper edge of the elbow to fillet weld on one of the two forged elbows located at the ends of the blow down pipe in each of the two SGs. Analysis was performed that indicates loads in excess of yield may have occurred during the manufacture and hydro testing of the SGs. (These loads are not considered to be uniquely responsible for the observed separation; however, the material ductility would have accommodated the failure.) The loads develop as a result of one end of the blow down pipe being loaded against the other end. Separation completely relieves the loads and precludes the continuation of the degradation mechanism. Evaluation of the clearance and flow conditions show that consequential damage to adjacent tubes are not expected since the flow velocities in this region are low and the clearances are large. The design of the blow down pipe for the Model D3 SG is unique. Other preheat SG designs do not utilize a continuous blow down pipe that extends the length of the tube lane. WBN performed an operability evaluation for one cycle of operation and revised the inspection procedure to inspect the blow down pipe during the next refueling outage.

Table 1.0
Secondary Side Internal Degradation Types In Westinghouse Design SGs

SG Category: / Degradation Type	Feed Ring Carbon Steel TSPs	Preheat Carbon Steel TSPs	Feed Ring Stainless Steel TSPs	Preheat Stainless Steel TSPs
• **Erosion-Corrosion:**				
Moisture Separator	X	S	X[3]	S
Water Box	NA	X[4]	NA	S
TSP Flow Hole/ Ligaments	S	S	NA	NA
Feed Ring/J-Tubes	X	NA	X[3]	NA
• **Cracking**				
TSP Ligaments[1],[2]	X	S	L	L
Wrapper Near Supports[2]	L	L	L	L
Transition Cone Girth Weld	X	L	X[3]	L
• **Other**				
Wrapper Drop[2]	L	L	L	L

X= *Observed in some SGs*
S = *Susceptible*
L = *Low Susceptibility*
NA = *Not Applicable*

(1) *Various indications of possible tube degradation may be artifacts of manufacturing anomalies related to patch plate welds and drilling alignment.*

(2) *Various Westinghouse design features are beneficial relative to some SG design features of foreign manufacturers.*

(3) *In SG replacements with the original shell and/or upper internals not replaced.*

(4) Model D3 SGs are not susceptible to preheater erosion/corrosion due to Inconel 600 water box.

Table 2.0

SG Inspection Summary for WBN

A SG inspection summary for WBN is included in Table 2.0 below.

SG Inspection Summary for WBN			
	Location	**Condition**	
Component	**Row Column Elev**	**Cracked Missing E/C**	**Type of Inspection**
Tube Support Plates		No tube support plate cracking has been identified	Bobbin Coil
	Lower Upper Seam	**Cracked Deform Drop**	
Wrapper		No evidence of wrapper drop has been identified	Causal factors analysis concluded wrapper drop could not occur in Model D SGs. Sludge lancing equipment was successfully installed during U1C1 outage.
	Shell TSPs Other	**Pitting Wastage Crack**	
Chemical Cleaning			N/A
		Pitting Wastage Crack	
Other Secondary Side Moisture Separator Girth Welds Water Box Riser Barrels Tangential Nozzle		No degradation detected	Visual inspections of one SG have been performed

Safety Assessment

Refer to WCAP-15002, Revision 1.

In-Service Inspection Plan

Based on the above, the following inspection plan has been implemented at WBN. Except where noted, these inspections are performed during each refueling outage.

Tube Support Plate Erosion-Corrosion and Cracking:

1. As the TSPs in WBN SGs are made of carbon steel, a baseline was established employing a low frequency bobbin inspection technique from the first pre-service inspection and is used each outage. The technique to be employed is defined in the EPRI Report, SG-96-05-003, "Investigation of Applicability of Eddy Current to the Detection of Potentially Degraded Support Structures," dated May 1996. Qualification of this eddy current technique to Appendix H of the EPRI Steam Generator Examination Guidelines is not required since this technique is not examining tube integrity. If indications are found, the history is reviewed to establish if this is an active degradation mechanism and an evaluation is performed to determine structural significance.

2. In-service inspection is conducted in accordance with Revision 5 of the EPRI PWR SG Examination Guidelines.

   The critical area for mechanical or thermally induced support plate cracking is tentatively defined as three tubes around the periphery and two rows around the patch plate regions in each support plate. The critical area for ligament erosion/corrosion is the entire bundle. An initial sample of 60 percent of the tubes was completed during WBN's first outage.

During eddy current inspections, the bobbin coil data acquired during examination is evaluated for indications of TSP degradation. At WBN Unit 1 Cycle 1, 69 percent of the bobbin coil exams were conducted, and no degradation was detected.

Wrapper Drop:

Design differences between EDF plants and Model D plants preclude wrapper drop.

1. A determination is made that the sludge lance equipment can be inserted without interference. WBN performs sludge lancing each outage.

2. A visual inspection is conducted on the lower wrapper support blocks, if interference with the sludge lance equipment is detected.

Wrapper Cracking:

No inspection is recommended unless evidence of wrapper misposition or tube damage in the periphery of the first TSP is detected. A visual inspection is conducted on the lower wrapper support blocks, if degradation is detected.

Upper Package:

Upper internals visual inspections are performed on a frequency that ensures each SG is inspected in six years. This inspection is included in site maintenance procedures. FOSAR is performed each outage.

Transition Cone Girth Weld:

Inspections are performed in accordance with the SG shell, Section XI in-service inspection requirements. Visual inspections are required during SG upper internals inspections.

References

1. WCAP-15002, Revision 1, "Evaluation of EDF Steam Generator Internals Degradation - Impact of Causal Factors on Westinghouse Series 51 Steam Generators"

Item 2

(2) If the addressee currently has no program in place to detect degradation of SG internals, include a discussion and justification of the plans and schedule for establishing such a program, or why no program is needed.

Item 2 of the GL does not apply to WBN.