UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

October 7, 2014

Vice President, Operations
Entergy Operations, Inc.
Waterford Steam Electric Station, Unit 3
17265 River Road
Killona, LA 70057-3093

SUBJECT: WATERFORD STEAM ELECTRIC STATION, UNIT 3 – SUMMARY OF CONFERENCE CALL REGARDING THE SPRING 2014 STEAM GENERATOR TUBE INSPECTIONS (TAC NO. MF3888)

Dear Sir or Madam:

On April 21, 2014, the U.S. Nuclear Regulatory Commission (NRC) staff participated in a conference call with representatives of Entergy Operations, Inc. (the licensee), regarding the ongoing steam generator (SG) inspection activities at Waterford Steam Electric Station, Unit 3. The purpose of this call and NRC review of the ensuing SG 180-day report is to ensure acceptable tube inspections are being performed and that tube integrity is being maintained. In addition, these conference calls and reviews provide the NRC with information to verify that underlying assumptions made in the licensee's assessments of tube integrity (e.g., growth rates) are consistent with the licensee's original assumptions.

Enclosure 1 is a summary of the April 21, 2014, conference call and Enclosure 2 includes the materials that were provided by the licensee in support of the call. The SG 180-day report is due to the NRC in November 2014.

If you have any questions, please contact me at 301-415-1445 or via e-mail at alan.wang@nrc.gov.

Sincerely,

Alan Wang

Alan B. Wang, Project Manager
Plant Licensing IV-2 and Decommissioning
Transition Branch
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-382

Enclosures:
1. Spring 2014 SG Inspection Conference Call Summary
2. Licensee-provided Information

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ENCLOSURE 1

CONFERENCE CALL SUMMARY REGARDING SPRING 2014
STEAM GENERATOR TUBE INSPECTION ACTIVITIES

ENTERGY OPERATIONS, INC.

WATERFORD STEAM ELECTRIC STATION, UNIT 3

DOCKET NO. 50-382

CONFERENCE CALL SUMMARY REGARDING

SPRING 2014 STEAM GENERATOR TUBE INSPECTION ACTIVITIES

ENTERGY OPERATIONS, INC.

WATERFORD STEAM ELECTRIC STATION, UNIT 3

DOCKET NO. 50-382

On April 21, 2014, the U.S. Nuclear Regulatory Commission staff participated in a conference call with representatives of Entergy Nuclear Operations, Inc. (the licensee) regarding the ongoing steam generator (SG) inspection activities at Waterford Steam Electric Station, Unit 3 (Waterford 3). In support of the conference call, the licensee provided the document in Enclosure 2.

Waterford 3 has two Westinghouse Model Delta 110 replacement SGs. There are 8,968 Alloy 690 thermally treated U-bend tubes in each SG. The tubes have a nominal outside diameter of 0.75 inches and nominal tube wall thicknesses of 0.044 inches (rows 1 and 2) and 0.043 inches (rows 3 through 138).

Additional clarifying information not included in the document, but provided by the licensee, is summarized below.

- This is the first SG inspection following installation of replacement SGs in the fall of 2012.

- In the Primary to Secondary Leakrate graph on page 6 of Enclosure 2, the y-axis units are gallons per day (gpd). Because there was no detectable gamma radiation associated with the tritium leak rate, the licensee concluded there was no primary-to-secondary leakage.

- The inspections at the top of the tubesheet for the detection of possible loose parts (PLPs) were complete and no PLPs had been detected.

- The licensee clarified that there is only one over-expansion above the top of the tubesheet and it was identified during the preservice inspection.

- The acronym "PRX" stands for proximity. Regarding the proximity signals identified on page 1 of Enclosure 2, the licensee clarified that there were 80 identified during the inspections. Overall, the size of these signals is decreasing and they are located in the periphery of the upper tube bundle near the anti-vibration bars. Two new proximity indications were identified, but they matched up with single indications from the preservice inspection and therefore completed two "pairs."

- For note (2) on page 2 of Enclosure 2, the licensee clarified that while stress corrosion cracking at freespan dings and freespan wear in the absence of foreign objects are judged non-relevant, their inspection methods would be able to identify these mechanisms if they exist in the SGs.

- At the time of the call, the licensee stated that approximately 50 percent of its inspections were complete and there were no indications of wear.

- Regarding the central tube void area referenced on page 3 of Enclosure 2, the licensee clarified that this is in the central region of the SG. In the original SGs this area contained a stay cylinder but in the replacement SGs, the stay cylinder was removed and this area was partially filled with tubes. In the initial design of the replacement SGs, the licensee assessed completely tubing this area, but thermal hydraulic analyses showed that dry out would potentially occur in the upper portion of the tube bundle. As a result, some rows do not have tubes in this region, to allow increased moisture levels in the upper bundle and prevent dry-out conditions from occurring. Subsequent to the outage call, the licensee provided a SG tubesheet map. The tubesheet map is provided at the end of Enclosure 2. At the time of the call, about 25 percent of the tubes in this region had been inspected and no indications had been detected.

- Inspections of the secondary side upper bundle region were also scheduled for this outage. These inspections were to include the steam drum, feedring, and the feedring supports.

The following abbreviations are used in Enclosure 2:

+Pt = +Point™
AVB = anti-vibration bars
BLG = bulge
CL = cold leg
DTI = distorted tubesheet indication
ETSS = examination technique specification sheet
FOSAR = foreign object search and retrieval
H-3 = Tritium
HL = hot leg
IPS = inch per seconds
kHz = kilohertz
MBI = manufacturing buff mark with an indication
MBM = manufacturing buff mark
N/A = Not applicable
NDE = non-destructive evaluation
NSAL-12-1 = Nuclear Safety Advisory Letter
ODSCC = outside diameter stress corrosion cracking
PLP = possible loose part
PRX = proximity
PSI = pre-service inspection
PVN = permeability variation
RPC = rotating pancake coil
SCC = stress corrosion cracking
SG = steam generator
TEC = tube end cold
TEH = tube end hot
TSP = tube support plate
TTS = top of tubesheet
TW = through wall

The NRC staff did not identify any issues that required follow-up action at this time; however, the staff asked to be notified in the event that any unusual conditions were detected during the remainder of the outage.

ENCLOSURE 2

LICENSEE-PROVIDED STEAM GENERATOR
TUBE INSPECTION INFORMATION

ENTERGY OPERATIONS, INC.

WATERFORD STEAM ELECTRIC STATION, UNIT 3

DOCKET NO. 50-382

STEAM GENERATOR TUBE INSPECTION DISCUSSION DURING WATERFORD 3's 2014 (1R19) OUTAGE

Currently Waterford 3 is 46% through the base scope eddy current inspection and 0% through special interest as of 4/21/2014 at ~ 0430 hours

1. **Discuss any trends in the amount of primary-to-secondary leakage observed during the recently completed cycle.**

Refer to attached Primary to Secondary Leak Rate for Operational Cycle 19 Primary to Secondary Leak Rate graph. Leakage has been minimal all cycle.

2. **Discuss whether any secondary side pressure tests were performed during the outage and the associated results.**

No secondary side pressure tests are planned for the 2014 refueling outage (1R19).

3. **Discuss any exceptions taken to the industry guidelines.**

No exception taken to industry guidelines for the 2014 refueling outage (1R19) steam generator inspection.

4. **For each steam generator, provide a description of the inspections performed including the areas examined and the probes used (e.g., dents/dings, sleeves, expansion-transition, U-bends with a rotating probe), the scope of the inspection (e.g., 100% of dents/dings greater than 5 volts and a 20% sample between 2 and 5 volts), and the expansion criteria.**

- 100% 0.610 inch bobbin coil inspection full length Rows 3and above; 100% Rows 1 and 2 straight legs only
- 100% 0.590 inch mid-range +Pt Rows 1 and 2 U-bends from top TSP to top TSP
- 100% bobbin coil inspection Rows 1 and 2 U-bends from top TSP to top TSP at 12 ips (1)
- +Pt inspection of hot and cold leg TTS +/- 3 inches for detection of PLPs (periphery, tube lane, central tube void region)
- +Pt special interest testing as necessary including:
  - Any freespan bobbin I-code
  - Any bobbin I-code at a TSP intersection
  - Any AVB wear indication >15%TW based on bobbin coil analysis
  - Possible loose parts/foreign object (PLP) signals including all immediately surrounding tubes until PLP signals are no longer reported (i.e., "boxing")
  - Freespan dings >5V (2)
  - TSP dents >2V (3)
  - Bulge (BLG) with preferential selection based on bobbin coil 600 kHz signal amplitude >18V
  - Over-expansions (OXP) above the TTS

- Pancake coil RPC special interest testing of bobbin PRX signals >1V
- Tube plug visual inspection (if present)

- Channelhead bowl visual inspection per NSAL-12-1 including divider plate to channelhead juncture

(1): The 0.610 inch diameter bobbin probe will be attempted first. If tangent point noise levels are judged excessive, the 0.600 inch diameter bobbin probe can be utilized.

(2): SCC at freespan dings is judged non-relevant, similarly, freespan wear is judged non-relevant in the absence of foreign objects. The recommended +Pt inspection of >5V dings is performed to satisfy the full length testing requirement and to establish that foreign objects are not present.

(3): As no industry qualification for the detection of wear in dented TSP intersections is available, the +Pt inspection of dented TSP intersections is performed to establish that no wear is present.

5. **For each area examined (e.g., tube supports, dent/dings, sleeves, etc), provide a summary of the number of indications identified to-date of each degradation mode (e.g., number of circumferential primary water stress corrosion cracking indications at the expansion transition). For the most significant indications in each area, provide an estimate of the severity of the indication (e.g., provide the voltage, depth, and length of the indication). In particular, address whether tube integrity (structural and accident induced leakage integrity) was maintained during the previous operating cycle. In addition, discuss whether any location exhibited a degradation mode that had not previously been observed at this location at this unit (e.g., observed circumferential primary water stress corrosion cracking at the expansion transition for the first time at this unit).**

As of 4/21/2014 @ 0430 hours

SG	Location	Type	Number Indications*	Number Tubes	Integrity Acceptable
1	N/A	N/A			
1	TEC to TEH	Wear > 40	0	0	N/A
2	N/A	N/A			
2	TEH to TEC	Wear > 40	0	0	N/A
1	Tube Supports	Axial ODSCC	0	0	N/A
1	Freespan	Axial ODSCC	0	0	N/A
2	Tube Supports	Axial ODSCC	0	0	N/A
2	Freespan	Axial ODSCC	0	0	N/A
	Total*		0	0	

* Some tubes have multiple indications

Worst Flaws to Date

Non-Service Induced AVB Wear

Voltage 0.10
Length = AVB width
Max Depth 6%TW
Calculated Burst Pressure – not relevant for a 6%TW AVB wear

Tubesheet and Sludge Pile

None

Supports

None (with the exception of the non-service related volumetric-like indications <6%TW in the PSI 19 AVB's)

Freespan

None

U-Bends

None

6. Describe repair/plugging plans.

Currently there are **0** potential tubes requiring tube plugging in SG1 and **0** potential tubes in SG2.

All wear indications (at support structures) greater than or equal to 40%TW will be plugged.

7. Describe in-situ pressure test and tube pull plans and results (as applicable and if available).

Based on the available data to date, no tubes will require in-situ pressure testing.

8. Discuss the following regarding loose parts:

- **What inspections are performed to detect loose parts?**

  FOSAR of secondary side TTS annulus and tube lane, +Pt of HL and CL TTS periphery (4 tube deep along any pitch diagonal), tube lane, and central tube void area.

- **A description of any loose parts detected and their location within the SG**

  As of 4/21/2014 at 0430 hours, the following are the number of potential loose parts identified with the plus point inspection:

  SG1 0 PLP Calls in 0 Tube Locations
  SG2 0 PLP Calls in 0 Tube Locations

  Visual inspection with FOSAR will be performed in both generators.

- **If the loose parts were removed from the SG**

  SG1

  It is anticipated that FOSAR will start in SG1 on 4/26/2014 on night shift.

  SG2

  It is anticipated that FOSAR will start in SG2 on 5/01/2014 on day shift.

  The visual inspection will be performed around the periphery of both the hot leg and cold leg and along both sides of the tube lane approximately 4 tubes deep.

- **Indications of tube damage associated with the loose parts**

  Currently there are 0 locations in SG1 and 0 in SG2 that have wear associated with the part. If any are discovered, an attempt will be made to remove the parts and retest with a volumetric standard. If unable to remove, the affected tube and surrounding tubes will be removed from service.

9. Discuss the scope and results of any secondary side inspection and maintenance activities (e.g., in-bundle visual inspections, feedring inspections, sludge lancing, assessment deposit loading, etc.).

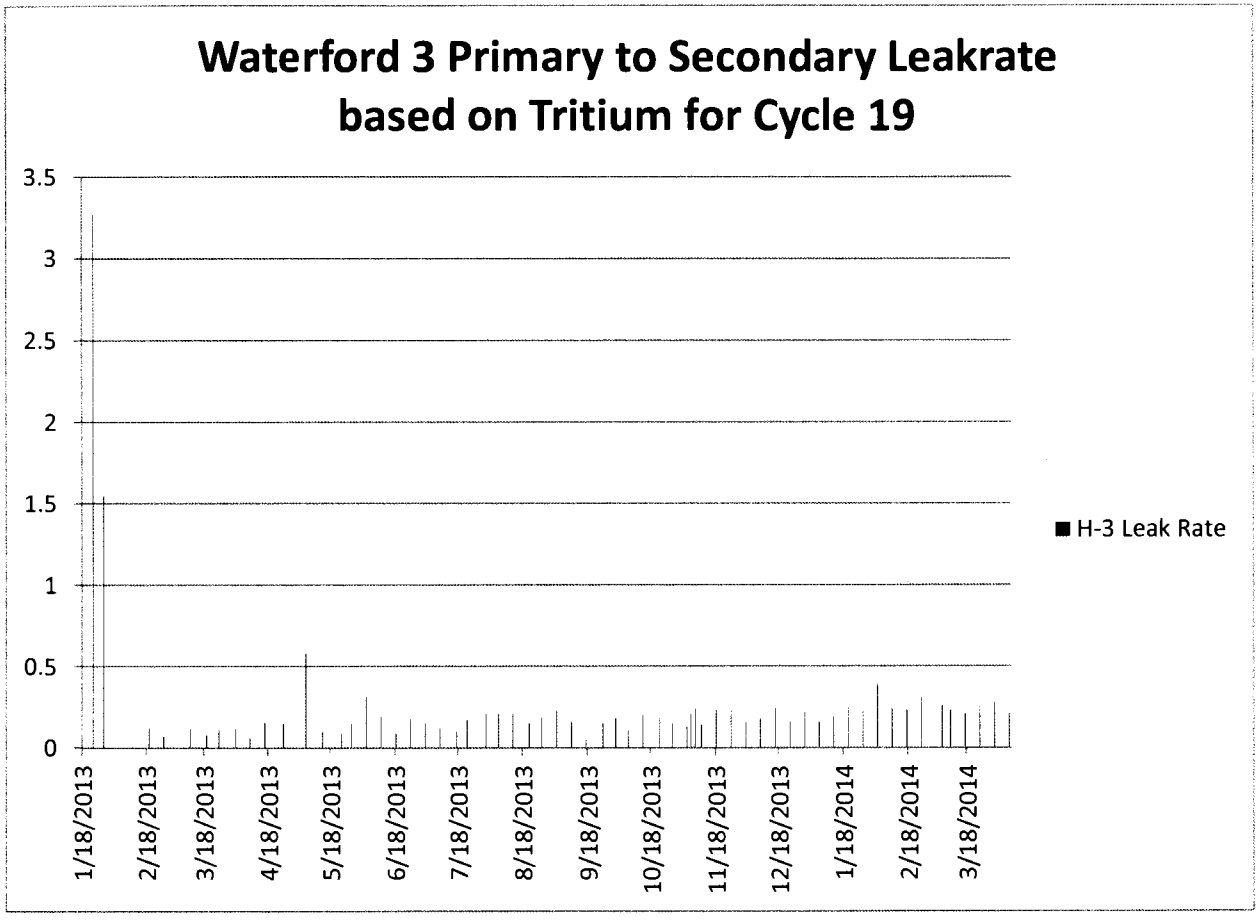
Visual inspections are scheduled for both SG1 and SG2 tubesheet periphery regions and foreign object search and retrieval (FOSAR) of the top of cold and hot leg tubesheets.

10. Discuss any unexpected or unusual results.

Currently there are no unexpected or unusual results. There are no tubes that have failed the screening criteria requiring in-situ pressure testing

11. Provide the schedule for steam generator-related activities during the remainder of the current outage.

Currently bobbin and top of tubesheet +Pt RPC are approximately 46% complete. Special interest will complete by ~ 4/24/2014 in both steam generators (this includes dings/dents, u-bend, cold leg top of tubesheet, TSPs etc.). Tube plugging (if required) will start as early as 4/24/2014.


Waterford 3 Primary to Secondary Leakrate based on Tritium for Cycle 19
3.5
3
2.5
2
1.5
1
0.5
0
1/18/2013
2/18/2013
3/18/2013
4/18/2013
5/18/2013
6/18/2013
7/18/2013
8/18/2013
9/18/2013
10/18/2013
11/18/2013
12/18/2013
1/18/2014
2/18/2014
3/18/2014
H-3 Leak Rate

2014 Steam Generator Degradation Assessment Summary Table

Summary of SG Tube Degradation Mechanisms and Inspection Requirements: Detection Information: Waterford RF19							
Degradation Mechanism	**Location**	**Probe Type**	**EPRI Technique Sheet (1)**	**Detection Variable**	**Appendix H or I Qualified?**	**Inspection Sample Plan**	**Expansion Plan**
Existing Degradation Mechanisms:							
Wear (not service induced)	AVBs	0.610 inch Bobbin	ETSS 96004.1	Phase	Yes	100% full length	No Expansion
Potential Degradation Mechanisms							
Wear (service induced)	AVBs, TSPs	0.610 inch Bobbin (detection)	ETSS 96004.1	Phase	Yes	100% full length, both SGs	No Expansion
		+Pt (confirmation)	ETSS 21998.1	Phase	Yes	100% bobbin indications	No Expansion
Volumetric Degradation (not corrosion related) and General Tube Signal Identification	Freespan	0.610 inch Mag Bias Bobbin	ETSS I28413	Phase	Yes	100% full length, both SGs	+Point boxing-in to bound PLPs
		0.610 inch +Pt	ETSS 21998.1, ETSS I28425	Phase	Yes	Any freespan bobbin I-code, any I-code at tube supports	No expansion
PLP Identification and General Tube Signal Identification	TTS (both legs)	0.610 inch 3-coil +Pt	ETSS 21409.1	Phase	Yes	Sampling of peripheral tubes, Hot and Cold Leg TTS +/- 3 inches	+Point boxing-in to bound PLPs and indications
	Freespan, including U-bends	0.600 inch or 0.610 Bobbin	ETSS I28413	Phase	Yes (2)	100% full length, both SGs	No Expansion
General Signal Identification	Row 1 and 2 U-bends	0.580 inch U-bend +Pt	ETSS 96511.2	Phase	Yes	100% Row 1 and 2 from 08H to 08C	No Expansion
Potential Manufacturing Buff Marks	All	0.610 inch Mag Bias Bobbin	ETSS 96010.1	Phase	Yes	100% full length, 3 SGs	No Expansion
		0.580 or 0.610 inch +Pt	ETSS 21998.1	Phase	Yes	+Point MBIs	No Expansion

(1): The Acquisition and Analysis Technique Sheets (ACTS and ANTS) detail the plant specific guidelines for application of the EPRI ETSSs.
(2): Existing bobbin coil qualification database does not include U-bend regions. This program is performed to establish a baseline condition for future bobbin inspection of Row 1 and 2 U-bends.

Summary of SG Tube Non-flaw Signal Disposition Categories Applicable Inspection: Waterford 3 RF19						
Degradation Mechanism	**Location**	**Probe Type & No.**	**EPRI Technique Sheet**	**Detection Variable**	**Inspection Sample Plan**	**Expansion Plan**
Resolution for Classification of Extraneous Indications						
Dings, Dents, PVN	All	0.610 inch Mag Bias Bobbin Coil	ETSS I28413	Phase	100% full length, both SGs	Expansion according to degradation mechanism confirmed
		0.610 inch +Pt; 0.610 inch Mag Bias +Pt for PVN as needed	ETSS 22401.1	Phase	100% Dings >5V, Dents, 2V, PVN >1V	
Anomalous Tubesheet Signals	Tubesheet expansion joint	0.610 inch 3-coil +Pt	ETSS 20511.1	Phase	BLG above TTS, DTI in tubesheet	
Tube-to-Tube Proximity	U-bends	0.610 inch Mag Bias Bobbin Coil	N/A, see Reference 19	Vertical maximum voltage and phase	100% full length, both SGs	None
		0.580 inch pancake coil	N/A, see Reference 19	Vertical maximum voltage and phase	Bobbin PRX >1V	None
Tube-to-AVB Proximity	U-bends	0.580 inch pancake coil	N/A, see Reference 19	Peak-to-Peak voltage	None	Sampling may be performed based on inspection results

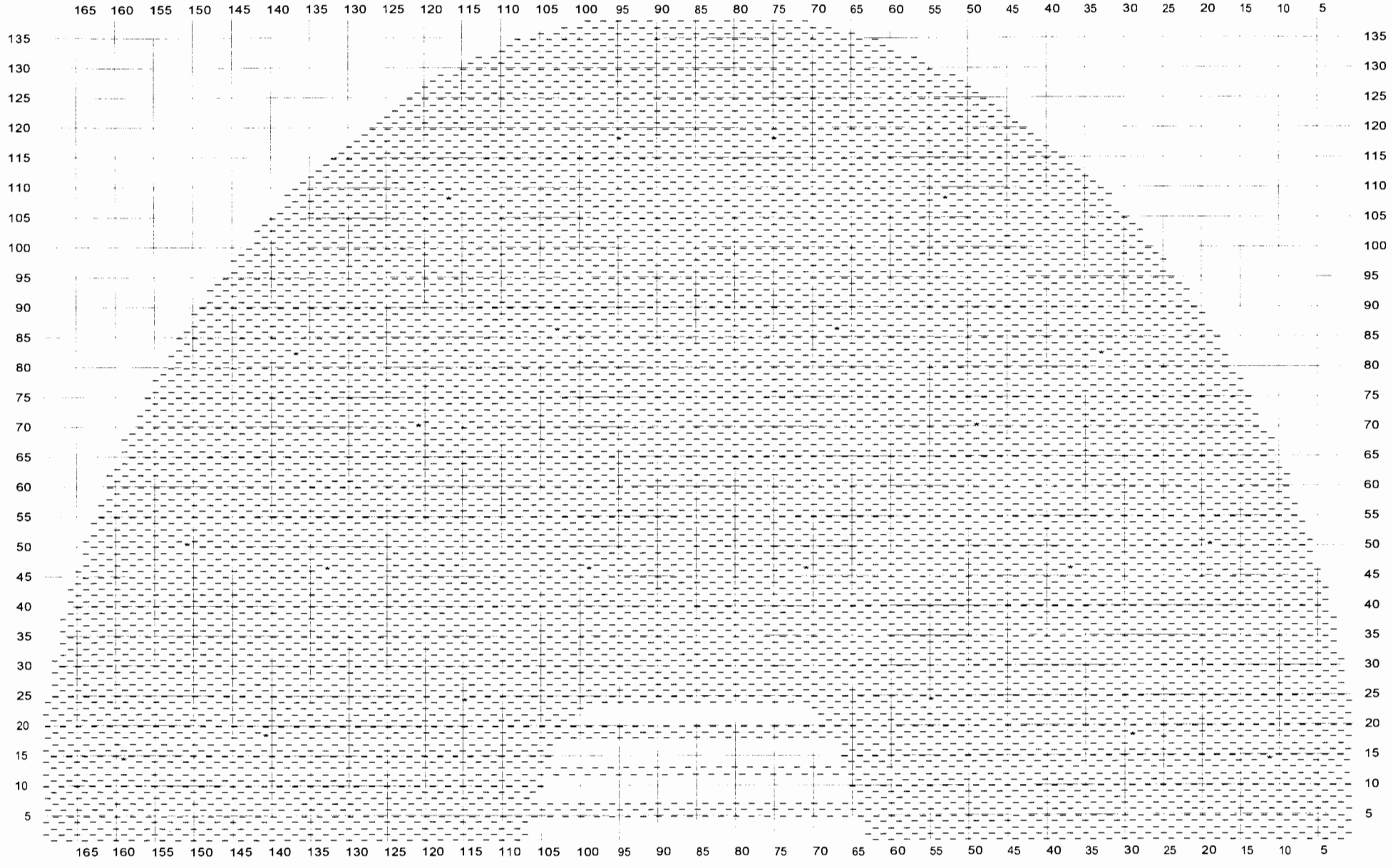
Summary of SG Tube Degradation Mechanisms and Tube Integrity Parameters: Structural and Repair Limits: Waterford RF19				
Degradation Mechanism	**Location**	**Probe Type**	**Condition Monitoring Limit**	**Repair Limit**
Existing Degradation Mechanisms:				
Wear (non-service induced)	AVBs	Bobbin	54.15% at AVBs	40%TW by NDE unless growth rates do not support operation to next scheduled inspection
Potential Damage Mechanisms				
Wear (service induced)	AVB, TSPs	Bobbin	54.15% at AVBs 49.14% at TSPs	40%TW by NDE unless growth rates do not support operation to next scheduled inspection
Tube Wear (loose parts)	TTS periphery	0.610 inch Mag Bias Bobbin Coil;0.610 inch +Pt	Depends on geometry; (Refer to Appendix A)	40% based on bobbin voltage calibration curve, or plug on detection if sizing is not reliable, based on shape and history.
Potential MBMs (Thinning)	All	0.610 inch Mag Bias Bobbin Coil; 0.610 inch +Pt 0.580 inch U-bend Mid-range +Pt	Depends on geometry; (Refer to Appendix A)	40% based on bobbin phase calibration curve.
Fabrication Flaws - Laps	Any Location	0.610 inch Mag Bias Bobbin Coil; 0.610 inch +Pt 0.580 inch U-bend +Pt	Depends on geometry; (Refer to Appendix A)	Repair on detection based on lack of quantifiable sizing data.
Flaws detected and/or confirmed by +Point examination are evaluated based on the structural limits and repair limits applicable to the type of flaw.				

WATERFORD 3 D110 SG TEMPLATE

Waterford RFO19 WTR3
D110

– 8968 OPEN TUBE

* 22 Stay Rod



Westinghouse Electric Company LLC - ST Max 04/21/2014 13:49:51

October 7, 2014

Vice President, Operations
Entergy Operations, Inc.
Waterford Steam Electric Station, Unit 3
17265 River Road
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Sincerely,
/RA/

Alan B. Wang, Project Manager
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Docket No. 50-382

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