

NRC Staff Feedback on TSTF-577 Reporting Requirements

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Public Meeting
March 6, 2025**

Background

- It was requested that the NRC staff provide feedback on the information being provided by licensees in Steam Generator Tube Inspection Reports.
- New reporting requirements were approved in April 2021.
- The NRC previously provided feedback on September 8, 2022 (ML22277A798), and February 23, 2023 (ML23067A054), at meetings with the Steam Generator Task Force.

Steam Generator Tube Inspection Reports

- The Standard Technical Specifications (STS) require reports be submitted within 180 days after initial entry into hot shutdown (Mode 4), following completion of Steam Generator (SG) inspections.
- Technical Specifications Task Force (TSTF)-577 implemented changes to the reporting requirements.
- Appendix G of the EPRI Integrity Assessment Guidelines provides a template that all licensees are encouraged to follow.
 - While all licensees can follow the template, each plant must meet its plant-specific reporting requirements.
- The NRC staff is providing feedback to hopefully increase report information clarity and review efficiency.

STS 5.6.7 Steam Generator Tube Inspection Report

A report shall be submitted within 180 days after the initial entry into MODE 4 following completion of an inspection performed in accordance with the Specification 5.5.9, "Steam Generator (SG) Program." The report shall include:

- a. The scope of inspections performed on each SG;
- b. The nondestructive examination techniques utilized for tubes with increased degradation susceptibility;
- c. For each degradation mechanism found:
 1. The nondestructive examination techniques utilized;
 2. The location, orientation (if linear), measured size (if available), and voltage response for each indication. For tube wear at support structures less than 20 percent through-wall, only the total number of indications needs to be reported;
 3. A description of the condition monitoring assessment and results, including the margin to the tube integrity performance criteria and comparison with the margin predicted to exist at the inspection by the previous forward-looking tube integrity assessment;
 4. The number of tubes plugged [or repaired] during the inspection outage; and
 5. [The repair methods utilized and the number of tubes repaired by each repair method.]
- d. An analysis summary of the tube integrity conditions predicted to exist at the next scheduled inspection (the forward-looking tube integrity assessment) relative to the applicable performance criteria, including the analysis methodology, inputs, and results;
- e. The number and percentage of tubes plugged [or repaired] to date, and the effective plugging percentage in each SG;
- f. The results of any SG secondary side inspections; and
- [g. Insert any plant-specific reporting requirements, if applicable.]

Examination Techniques Used

- c. For each degradation mechanism found:
 - 1. The nondestructive examination techniques utilized;
- The NRC staff finds the following information makes for the most efficient reviews:
 - The Examination Technique Specification Sheet (ETSS) used.
 - Whether the ETSS was used for detection or sizing, or both.
 - Whether technique extension was used on the ETSS parameters to classify degradation outside the bounds of the ETSS.

Examination Techniques Used – Example #1

A unit with B&W
Once Through
SGs with Alloy
690 tubing

NDE Techniques			
Degradation Mechanism	Applicability	Probe Type	Industry Qualification
Wear	Broached TSP	Bobbin	I-96043.4 Rev. 1
Wear	Drilled TSP	Bobbin	I-96042.1 Rev. 4
Wear	Broached and Drilled TSP	Array	I-11956.3 Rev. 3 I-11956.4 Rev. 3

The eddy current examinations were performed utilizing various eddy current probes. All examination techniques utilized were qualified for detection of the relevant degradation mechanisms. This qualification is in accordance with the EPRI SG Examination Guidelines, Revision 8. The applicable Examination Technique Specification Sheets (ETSS) are listed for reference only. Site-specific examination technique sheets are developed prior to each steam generator inspection in accordance with Appendix H or I (as applicable) of the EPRI SG Examination Guidelines, Revision 8.

Examination Techniques Used – Example #2

A unit with Combustion Engineering SGs with Alloy 690 tubing

Bobbin Examinations								
Damage Mechanism	Location	ETSS No.	Qual Status	Extended Applicability	Detection	Sizing	Tech	Comment
Wear	BWs, VSs, ECs (not dented)	96004.1 R14	Site Validated	Tube Proximity	Y	Y	Volt Diff	Note
Wear	Loose Part	27091.2 R2	Qualified	Tubesheet Transition	Y	N	Volt Diff	Note

Note: The Degradation Assessment and associated site validation provides details for the qualification and use of the above techniques.

Examination Techniques Used – Example #3

A unit with Combustion Engineering SGs with Alloy 600 mill annealed tubing

(Partial) ECT Technique Table – Bobbin Probe

Degradation Mechanism	Probe Type	EPRI ETSS	Demonstrated Applicability	Extended Applicability	Detection?	Sizing?
Foreign Object Wear	Bobbin	27091.2 Rev. 2	Foreign Object Wear (part not present); I-690 tubing	Extended for I-600 tubing with part present	Yes	Yes (Note 1)

(Partial) ECT Technique Table – Circumferential ODSCC

Circ ODSCC	+Point™	21410.1 Rev. 6 (Note 2)	Expansion Transition	U-bends, Freespan dings, dented supports	Yes	Depth: Info PDA: Yes
Circ ODSCC	+Point™	22842.1 Rev. 4	Dented Supports	Freespan dings, U-bends	Yes	Length: Yes

Notes:

- Multiple ETSSs were available for depth sizing of foreign object wear, each depending on the shape of the wear scar and the coil being used.
- The sizing performance of ETSS H-21410.1 with respect to circ depth profiling of ODSCC is described by EPRI TR-107197-P1, which utilized the same sizing methodology as ETSS H-21410.1. The performance parameters are as follows: Depth = 1.0*NDE, Sv,x = 13.8; PDA = 1.05*NDE - 0.011, Sv,x = 13.43.

Reporting Wear at Support Structures

c. For each degradation mechanism found:

2. The location, orientation (if linear), measured size (if available), and voltage response for each indication. For tube wear at support structures less than 20 percent through-wall, only the total number of indications needs to be reported.

Note: This reporting requirement only applies to units with TSTF-577.

STS 5.6.9. Steam Generator Tube Inspection Report

- d. Location, orientation (if linear), and measured sizes (if available) of service induced indications.

Note: Units with TSTF-449 and -510 must report all indications.

Reporting Wear at Support Structures – Example #1

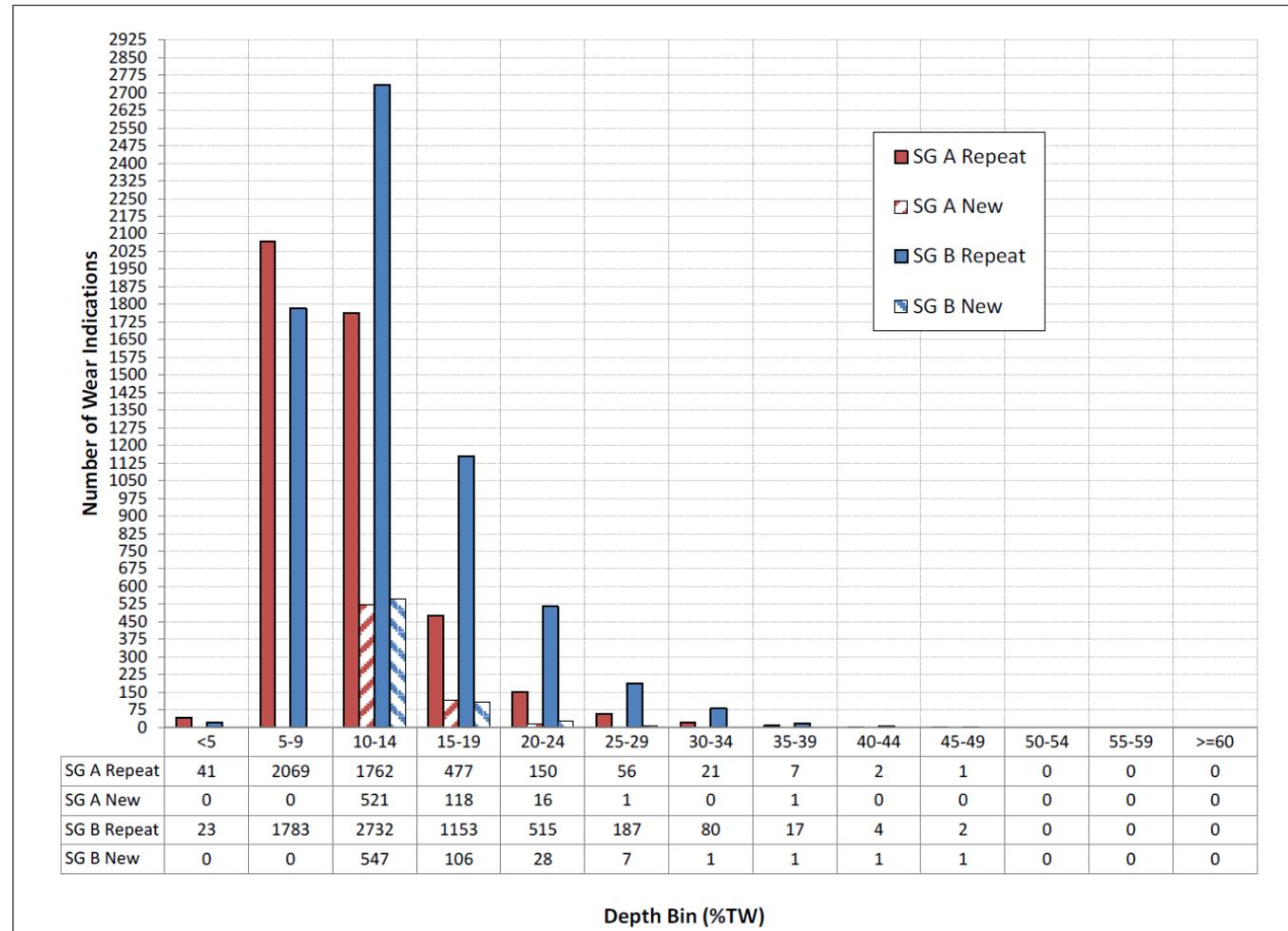
- A total of 1,616 AVB wear indications, 21 TSP wear indications, 9 FBP wear indications, and 1 loose part wear indication from eddy current inspections in all 4 steam generators. None of the wear indications exceeded 39% through-wall (TW), and only AVB wear was 20% TW or greater. See Attachment 7 for AVB wear equal to or greater than 20% TW.
 - Question: How many wear indications were <20% TW?
 - Answer: Attachment 7 was 9 pdf pages of tables.
 - Comment: Counting individual rows in appendices is inefficient.

Reporting Wear at Support Structures – Example #2

- Table 3 provides the total number of indications reported in each SG. Maximum observed tube wear was less than 20 percent through-wall (%TW), maximum depth of the TSP wear indications was 19%TW. The maximum depth of the AVB wear indications was 19%TW.

Table 3 – Tube Wear Summary					
	SG 1-1	SG 1-2	SG 1-3	SG 1-4	Total
TSP Wear Indications (+Point™)	8	22	57	19	106
AVB Wear Indications (Bobbin)	8	4	0	0	12

Reporting Wear at Support Structures – Example #3



Number of Tubes Plugged

c. For each degradation mechanism found:

4. The number of tubes plugged [or repaired] during the inspection outage.

- Some reports have not specifically called out the number of tubes that were preventively plugged during an outage.
- The NRC staff cannot assume that the number of preventively plugged tubes equals the difference between the number of tubes plugged due to degradation in the current outage and the total number of plugged tubes reported from the previous outage.
- Therefore, preventively plugged tubes should be specifically reported, including why they were preventively plugged.

Number of Tubes Plugged – Example

SG	Row	Col	Location	Reason for Plugging
1C	18	5	TSC +2.22	Exceeded TS criteria of $\geq 40\%$
1C	93	54	TSH +0.12	Tube had FO wear and ECT PLP present
1C	94	53	TSH	Preventatively plugged ¹
1C	91	54	TSH	Preventatively plugged ¹
1C	93	54	TSH	Preventatively plugged ¹
1C	95	54	TSH	Preventatively plugged ¹
1C	92	55	TSH	Preventatively plugged ¹
1C	94	55	TSH	Preventatively plugged ¹
1C	109	60	TSH	Preventatively plugged ²
1C	111	60	TSH	Preventatively plugged ²
1C	113	60	TSH	Preventatively plugged ²
1C	108	61	TSH	Preventatively plugged ²
1C	110	61	TSH	Preventatively plugged ²
1C	112	61	TSH	Preventatively plugged ²

Notes:

- 1: All bounding tubes related to tube 93-54 were No Degradation Detected (NDD) and no PLPs with ECT. Visual inspections could not be performed on this location.
- 2: No wear, but FO was visually seen, but unable to confirm description

References

- TSTF Response to NRC Questions on TSTF-577, Revision 0, “Revised Frequencies for Steam Generator Tube Inspections,” and Submittal of Revision 1, dated March 1, 2021 (ML21060B434).
- TSTF-577, Revision 1, Final Safety Evaluation Package (ML21099A086)
- NUREG-1430, Revision 5, “Standard Technical Specifications Babcock and Wilcox Plants,” dated September 2021 (ML21272A363 (Volume 1) and ML21272A370 (Volume 2)).
- NUREG-1431, Revision 5, “Standard Technical Specifications Westinghouse Plants,” dated September 2021 (ML21259A155 (Volume 1) and ML21259A159 (Volume 2)).
- NUREG-1432, Revision 5, “Standard Technical Specifications Combustion Engineering Plants,” dated September 2021 (ML21258A421 (Volume 1) and ML21258A424 (Volume 2)).

Questions

