

NRR-PMDAPEm Resource

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Subject: [External_Sender] CPNPP-NRC SG Tube Inspection Discussion Points
Attachments: CPNPP-NRC SG Tube Inspection Discussion Points for 04-20-17.pdf

Here you go. I also sent you a meeting invite.

Let me know if you have any questions.

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STEAM GENERATOR TUBE INSPECTION DISCUSSION POINTS
COMANCHE PEAK NUCLEAR POWER PLANT, UNIT 2
APRIL 20, 2017

The following discussion points have been prepared to facilitate the conference call arranged with the licensee to discuss the results of the steam generator tube inspections to be conducted during the upcoming spring 2017, Unit 2 refueling outage (2R16). This conference call is scheduled to occur towards the end of the planned SG tube inspections, but before the unit completes the inspections and repairs.

The NRC staff plans to document a summary of the conference call as well as any material that is provided in support of the call.

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

There was no primary-to-secondary leakage observed during the recently completed cycle.

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

There were no secondary side pressure tests performed during the outage up to this point.

3. Discuss any exceptions taken to the industry guidelines.

There have been no exceptions taken to the industry guidelines.

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.

- 1) 50% Bobbin full length inspection of tubes in all four SGs (straight legs only in Rows 1 and 2).
SG 1 - 2408 tubes - 53%
SG 2 - 2317 tubes - 51%
SG 3 - 2370 tubes - 52%
SG 4 - 2410 tubes - 53%
- 2) 100% Bobbin inspection of the tubes identified as potentially having high residual stress
SG 1 - 7 tubes
SG 2 - 9 tubes
SG 3 - 34 tubes
SG 4 - 15 tubes
- 3) 100% Bobbin inspection of all prior indications of degradation and/or historical PLPs in all four SGs.
- 4) 100% Bobbin inspection of all prior indications with %TW calls located at AVBs, PBPs, and FDB in all four SGs.
- 5) +Point inspection of HL TTS from +3.00 inches/-15.00 inches (H* distance = 14.01 inches), which includes a 100% of the peripheral tubes, open lane and T-slot tubes (two tube pitch).
SG 1 - 3836 tubes - 84%
SG 2 - 3588 tubes - 79%
SG 3 - 4552 tubes - 100%
SG 4 - 3842 tubes - 85%

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- 6) +Point inspection CL TTS +3.00 inches/-3.00 inches of 100% of the peripheral tubes, including the open lane and T-slot, 2 pitches into the bundle.
SG 1 - 826 tubes
SG 2 - 820 tubes
SG 3 - 849 tubes
SG 4 - 840 tubes
- 7) +Point inspection of all HL and CL TSP locations and HL and CL TTS +3 inches/-3 inches in the high residual stress tubes (-2 sigma tubes) that are still in service.
SG 1 - 7 tubes
SG 2 - 9 tubes
SG 3 - 34 tubes
SG 4 - 15 tubes
- 8) 50% +Point inspection of the U-bends in Rows 1 and 2 (same tubes as in the bobbin program).
SG 1 - 118 tubes
SG 2 - 116 tubes
SG 3 - 118 tubes
SG 4 - 118 tubes
- 9) 50% +Point inspection of all dents/dings > 5.0 volts on HL and U-bend in all four SGs.
- 10) 50% +Point inspection of all dents/dings > 2.0 volts at and below TSP C7 in all four SGs.
- 11) 100% +Point inspection of dents > 2.0 volts at H3 TSP in all four SGs.
- 12) 100% +Point inspection of tubes Expanded at preheater Baffle Plate B (PBP-B) in all four SGs.
- 13) 100% +Point inspection of PBP-B in SG 2 and SG 3 of tubes in Rows 21 to 49.
- 14) 50% +Point inspection of tubes Expanded at preheater Baffle Plate D in all four SGs.
- 15) 100% +Point inspection of legacy loose parts in all four SGs.
- 16) 100% +Point inspection of bobbin I-code indications in all four SGs.
- 17) 100% Visual inspection of plugs in HL and CL in all four SGs.
- 18) Video scan of the entire channel head bowl in HL and CL in all four SGs.

Expansion Criteria:

Expansions were done in the hot leg +Point inspections because of a circumferential PWSCC indication in SG 3. We expanded to 100% +Point inspection of hot leg TTS in SG 3. Since we were already doing greater than the required 20% sample in SG 1, 2, and 4 no expansion was required, but we did expand our +Point inspected to 100% of all over expansions and bulges in the tubesheet. In addition we inspected with +Point all tubes that were not inspected in 2RF14 or scheduled to be inspected this outage.

Our expansion exceeded the expansion requirements of the "EPRI Steam Generator Management Program: Pressurized Water Reactor Steam Generator Examination Guidelines", Revision 7 and "EPRI Steam Generator Management Programs: Pressurized Water Reactor Steam Generator Integrity Assessment Guidelines," Revision 3. Preliminary Operational Assessment indicated expanding SGs 1, 2, and 4 to support CPNPP Unit 2 operation to 2RF17.

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5. For each area examined (e.g., tube supports, dent/dings, sleeves, etc), provide a summary of the number of indications identified to-date for 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).

During the hot leg +Point inspection we found Circumferential PWSCC in SG 3. This is the first time PWSCC cracking in the tubesheet has been observed at CPNPP Unit 2. The following table provides the information regarding the PWSCC Circumferential Indications in SG 3:

Row	Column	Elevation from Top of TS (in)	Voltage	Depth (%TW)	Crack Length (in)
5	79	-1.00	0.71	48	0.29
1	94	-2.00	1.03	46	0.26
1	94	-2.00	0.79	43	0.22
48	86	0.00	0.64	69	0.22

Due to the characteristics of the above PWSCC indications, structural and leakage integrity criteria was maintained during the operating cycle (2RF16). Therefore no In Situ testing is required.

6. Describe repair/plugging plans.

As of April 19, 2017, the following tubes will be plugged and stabilized:

Steam Generator Number	Tube (Row – Column)
3	1-94
3	5-79
3	48-86

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

There is no in-situ pressure testing required at this point in the inspection and there are no plans to perform any tube pulls.

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8. Discuss the following regarding loose parts:

- **what inspections are performed to detect loose parts**
- **a description of any loose parts detected and their location within the SG (including the source or nature of the loose part, if known)**
- **if the loose parts were removed from the SG**
- **indications of tube damage associated with the loose parts**

Detection of loose parts is split into two separate programs, eddy current and secondary side visual examination.

The eddy current inspection consisted of:

- +Point inspection of TTS in the Hot Leg (+3.00" inches/-15.00") and Cold Leg (+3.00" inches/-3.00") a two tube pitch of 100% of the peripheral tubes, open lane and T-slot tubes.
- 100% +Point inspection of tubes Expanded at Preheater Baffle Plate B (PBP-B) in all four SGs.
- 100% +Point inspection of PBP-B in SG 2 and SG 3 of tubes in Rows 21 to 49.
- 50% +Point inspection of tubes Expanded at preheater Baffle Plate D in all four SGs.
- 100% +Point inspection of legacy loose parts in all four SGs.

The secondary side visual examination was of specific regions in each SG. These regions include, top of the tubesheet, pre-heater baffle plate, and upper tube support plates.

In 2RF14 pieces of a broken metal shim from an upstream valve were found in the SGs as loose parts, the PBP-B inspection scope was expanded in all 4 SGs. The expanded scope for 2RF16 consist of Foreign Object Search And Retrieval (FOSAR) in Rows 21 to 49 in SGs 1 and 4 and +Point inspection of these areas in SGs 2 and 3.

In addition, possible loose part (PLP) verification and FOSAR will be completed in Rows 40 to 49 for SGs 2 and 3 following the completion of the eddy current inspection.

As of April 19, 2017, a total of 14 objects have been removed from the all for SGs and no wear due to loose parts has been reported.

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

Sludge Lancing was done in all four SGs.

See the table below for the full secondary side inspection scope:

Steam Generator(s)	Inspection Program	Location in SG	Tube Columns to be Inspected	Rows to be Inspected
1, 2, 3, and 4	FOSAR	Top of Tubesheet	50/51 HL/CL	All
			55/56 HL/CL	All
			57/58 HL/CL	1-8
			63/64 HL/CL	All
			70/71 HL/CL	All
			80/81 HL/CL	All
			Annulus Region	General Area
			Tube Lane	General Area
			T-Slot	General Area
2 and 3	FOSAR	Baffle Plate B (C2)	Periphery	General Area
			T-Slot	General Area
			All	Row 24/25
			All	Rows 40-49
1 and 4	FOSAR	Baffle Plate B (C2)	Periphery	General Area
			T-Slot	General Area
			All	Rows 21-49
1	Upper Bundle FOSAR	TSP L/M	71/72 HL/CL	All
			97/98 HL/CL	All
		TSP P	71/72 HL/CL	All
			94/95 HL/CL	All
			97/98 HL/CL	All

Additionally, legacy objects that have potential to cause wear on the tubes, were re-examined both visually and with eddy current. This is done to see if the object is still there and if the tube or tubes surrounding it have wear.

10. Discuss any unexpected or unusual results.

There were no unexpected or unusual results. All results are listed as either existing or potential Degradation Mechanisms in the Degradation Assessment.

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

- Complete Eddy Current inspection on SG 1 and 3 Cold Leg (SG 2 and 4 are complete).
- Plug and stabilize 3 tubes in SG 3 (any other tubes based on Cold Leg inspection).
- Upon completion of Eddy Current inspection secondary side FOSAR will be performed.