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**JAN 10 2014**

Technical Specification 6.9.1.10

LR-N14-0009

U.S. Nuclear Regulatory Commission  
ATTN: Document Control Desk  
Washington DC 20555-001

Salem Nuclear Generating Station Unit 2  
Renewed Facility Operating License No. DPR-75  
NRC Docket No. 50-311

Subject: Response to Request for Additional Information Regarding Steam Generator  
Tube Inspection Conducted During the Fall 2012 Nineteenth Refueling Outage  
Salem Nuclear Generating Station, Unit No. 2 Docket No. 50-311  
(ML13330A585)

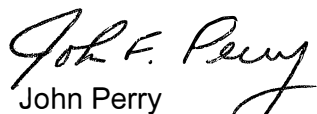
Reference: (1) PSEG Letter LR-N13-0122, "Steam Generator Tube Inspection Report –  
Nineteenth Refueling Outage (2R19)," dated May 9, 2013 (ML13133A083)

PSEG Nuclear LLC (PSEG) hereby transmits its response to the Nuclear Regulatory  
Commission (NRC) request for additional information regarding Reference 1. Attachment 1  
contains the NRC's questions in bolded text followed by PSEG response.

There are no commitments contained in this letter.

Should you have any questions regarding this submittal, please contact Mr. C. Dahms at (856)  
339-5456.

Sincerely,

  
John Perry  
Site Vice President – Salem

Attachments (1)

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- 1. In the "Steam Generator Tube Plugging" table of Attachment 1, it shows that 72 tubes were plugged in the 2012 outage. However, in the table in Attachment 4, it shows that 74 tubes were plugged in all SGs. Please clarify the number of tubes plugged during the 2012 outage.**

PSEG Response:

A total of Seventy-two (72) tubes were plugged during the 2012 outage (nineteenth refueling outage, 2R19). Attachment 4 (of ML13133A083) provides a table for 2R19 Nondestructive Examination Techniques. PSEG believes the NRC was referring to the table provided in Attachment 3. The table in Attachment 3 (of ML13133A083) provides the number of tubes and indications (indic) affected for the respective wear types (AVB or TSP). Footnote 2 of this table provides clarification that 2 tubes reported for TSP wear were actually plugged for AVB wear in the same tubes. The only tubes with both AVB and TSP wear in the same tube (detected during 2R19) were in SG 21, tubes R78-C66 and R93-C65. Attachment 2 of this response provides a revised table with further clarifications and corrections.

- 2. Please discuss the scope and results of any secondary side inspections. Please discuss whether the nuts that were previously found loose on various hatches or camera ports remained tightened and whether previously inaccessible locations were accessed to tighten the nuts using a higher torque.**

PSEG Response:

In each steam generator (SG), following top of tubesheet (TTS) water lancing (sludge lancing), visual inspections and Foreign Object Search and Retrieval (FOSAR) were performed at the top of tubesheet. These inspections included the full length of the no tube lane (area between row 1 tubes), some inner bundle inspections (both hot leg and cold leg), re-inspection of the locations where foreign material was identified in outage 2R17 (also reference ML102440037), and completely around the annulus tube areas (shell-to-tube bundle region, including periphery tubes). The annulus / periphery tubes inspection included articulating the camera angle to view into the bundle (from the annulus region) allowing inspection between the periphery tubes into the bundle. The purpose of these inspections was to identify and remove foreign material and to assess the effectiveness of the water lancing. Visual inspections of the SG TTS showed that water lancing was successful in removing most of the TTS deposits (sludge, hard deposits, and foreign material). This was also evident in the approximately 54 pounds of TTS deposits removed from all four SGs (total).

Two of the three foreign objects identified and not removed in 2R17 were not identified with eddy current or secondary side visual inspections in 2R19. It is likely these small objects were removed from the steam generator by water lancing. The third foreign object identified in 2R17 (SG 21, Row 103 Column 67) was confirmed still present and fixed to the TTS, and not able to be removed in 2R19. This foreign object was previously evaluated in the corrective action program (also reference Attachment 1 ML102440037), with no tube wear expected for the life of the plant. No tube wear from this foreign material was identified in any tube during outage 2R19.

The table below summarizes the foreign material identified during the 2R19 TTS secondary side visual inspections. At least one neighboring tube is used to represent the location within the SG, when this information is available. Measurements are approximate or best estimates. Some other material such as small sludge rocks and deposit material were also identified, and are deemed inconsequential and not listed in this summary table. Tube wear from foreign objects was not detected in any SG during the 2R19 outage.

**2R19 Top of Tubesheet SSI/FOSAR Summary**

<b>SG</b>	<b>2R19 SSI/FOSAR</b>	<b>Final Result</b>
21	R103-C67 TSC small machine turning ~1/64" in diameter and 0.05" long	Part still present from 2R17. Evaluated in corrective action program, with no tube wear expected for the life of the plant.
21	R40-C60 TSH small wire bristle ~0.05" in diameter and 0.75" long	Identified in 2R19, not removed. Fixed to TTS. Evaluated in corrective action program, with no tube wear expected for the life of the plant.
21	R95-C89 TSH piece of Weld Splatter ~0.10" x 0.25" x 1"	Identified in 2R19, removed from SG.
22	Tube periphery/annulus area, small piece of rubber like material.	Identified in 2R19, removed from SG.
24	R44-C60 TSH small wire bristle ~0.05" in diameter and 0.75" long	Identified in 2R19, not removed. Fixed to TTS. Evaluated in corrective action program, with no tube wear expected for the life of the plant.
24	R40-C60 TSH small wire bristle ~0.05" in diameter and 0.75" long	Identified in 2R19, not removed. Fixed to TTS. Evaluated in corrective action program, with no tube wear expected for the life of the plant.
24	R40-C68 TSH small wire bristle ~0.05" in diameter and 0.75" long	Identified in 2R19, removed from SG.
24	R91-C83 TSH piece of flexitallic gasket ~0.13" in wide 2.5" long	Identified in 2R19, removed from SG.

Secondary side inspections of the upper internals were not performed, or required, during outage 2R19. The nuts that were previously found loose and retightened, and the nuts that were inaccessible and left as-is, were not inspected during 2R19. The evaluations performed previously in 2R17 and 2R18, and in the pre-outage Degradation Assessment for 2R19, determined that the conditions within the upper internals do not require re-inspection at this time; including the loose nuts (also reference ML102440037 item #2 and ML12088A010 item #1). In summary of the loose nuts evaluations, the two (2) nuts inaccessible remain bounded by evaluation which allows use as-is. The nuts that were previously found loose in 2R17 on various hatches or camera ports, and tightened to higher torque, were re-inspected in 2R18. These inspections confirmed the adequacy of the corrective actions conducted in 2R17, since none of the re-tightened nuts in 2R17 were found loose in 2R18. PSEG is investigating additional new/modified tooling for the two (2) inaccessible nuts.

**3. Please provide the cumulative effective full power year for each inspection outage since SG replacement.**

PSEG Response:

The table below provides the effective full power year (EFPY) of operation per cycle for each outage, and the cumulative EFPY for each inspection outage since SG replacement. Cycle 17 was the first cycle of operation completed with the Salem Unit 2 replacement SGs.

Outage / Cycle	EFPY / Cycle	Cumulative EFPY
2R16 (end of cycle 16)	SG Replacement Outage	0
2R17 (end of cycle 17)	1.399	1.399
2R18 (end of cycle 18)	1.370	2.769
2R19 (end of cycle 19)	1.394	4.163

**4. During inspection of the channel heads, various marks were found on the cladding in all four SGs. Please discuss the results of the eddy current exams and enhanced video inspection of these marks. Please discuss the cause and the disposition of these marks.**

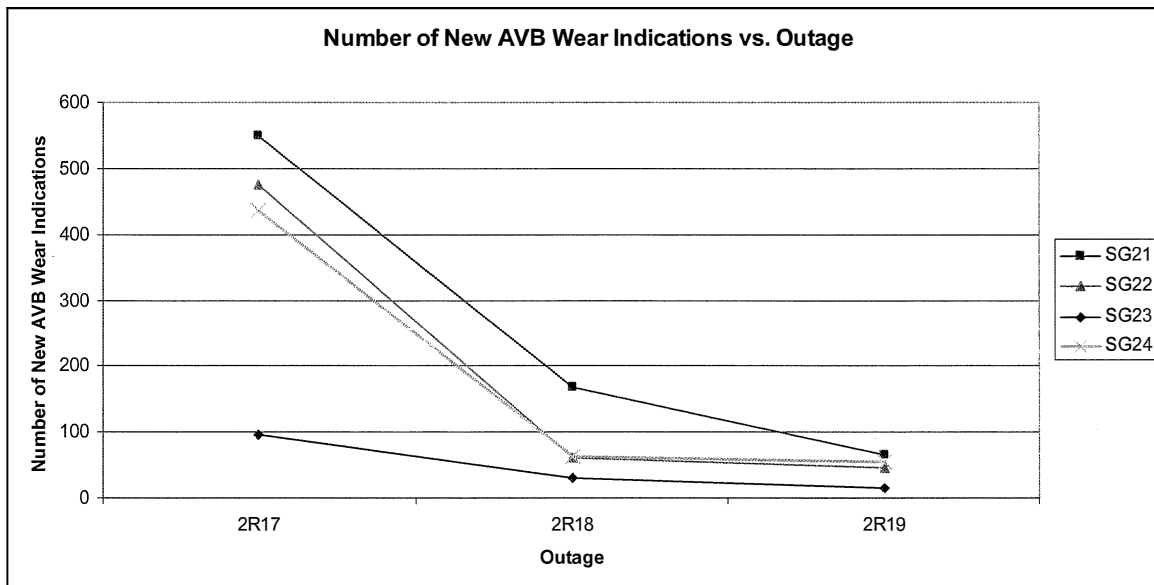
PSEG Response:

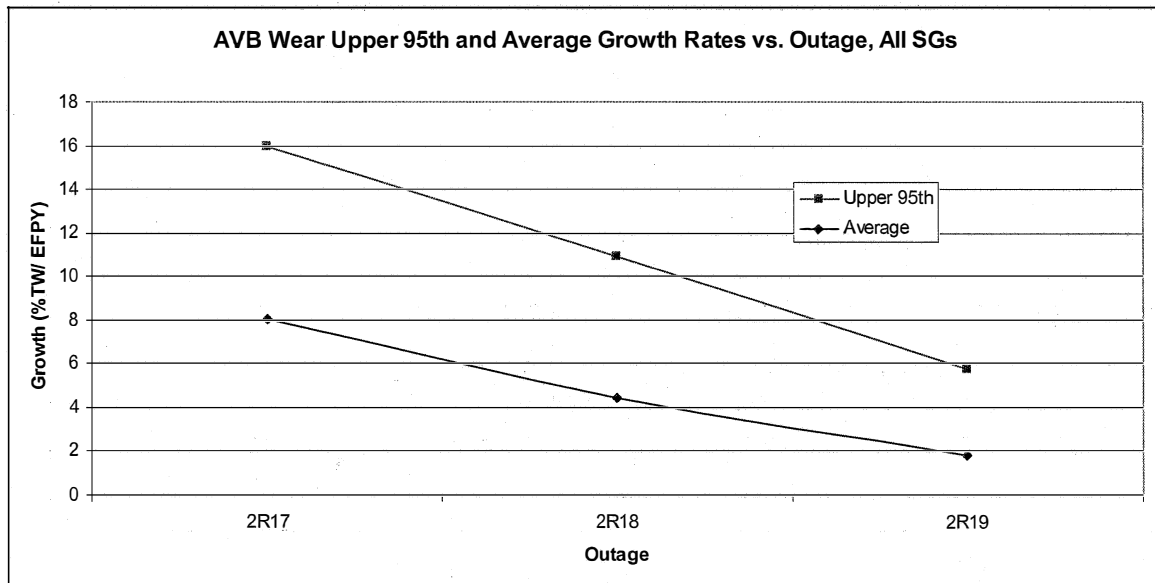
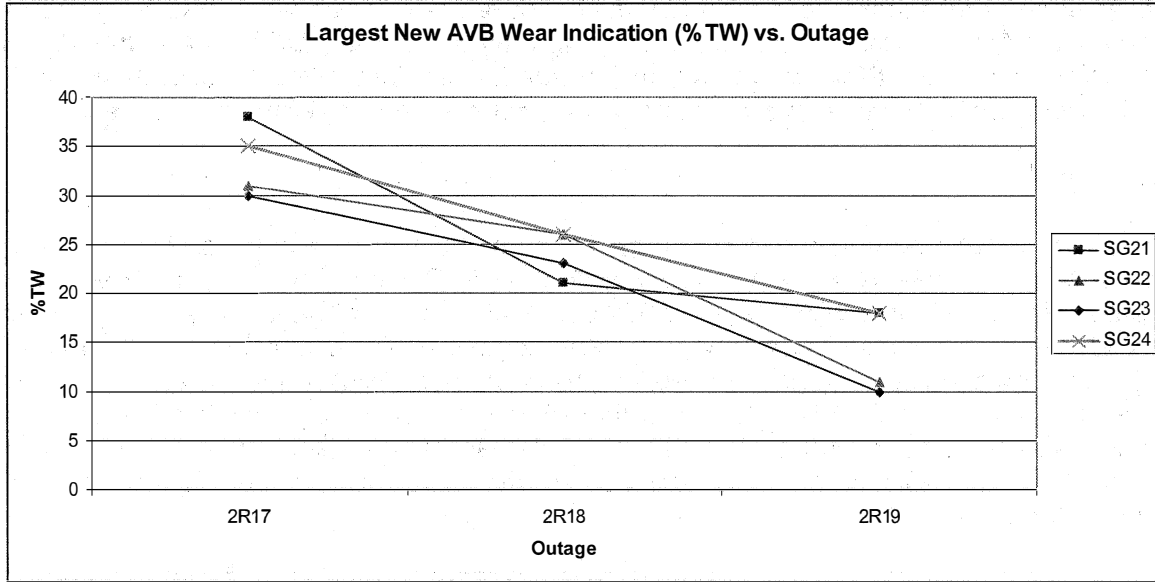
During outage 2R19, PSEG performed visual inspection (equivalent to a VT3) of the steam generator channel head internal (primary side) cladding surfaces in all four steam generators, both on the hot leg and cold leg. Surface marks were observed on the lower portion of the channel head cladding, primarily between the access manway and the nozzle. All the marks were similar between steam generators. Based on the examination review these indications appear to be tooling marks made during nozzle dam installation and other steam generator maintenance activities. The Salem Unit 2 replacement steam generators were manufactured with electropolished channel head cladding. The electropolishing process provides an extremely smooth surface, and therefore sensitive to surface marks. Contact from a nozzle dam, a nozzle dam bolt, or other tool could cause a superficial surface mark. PSEG conservatively reexamined one channel head (SG 24 hot leg) using VT1 capable camera(s) and qualified inspection personnel. The results of all the inspections provided reasonable assurance that the cladding was not breached, and only minor surface marks exist. These results were reviewed with the NRC inspector onsite at that time. No eddy current exams were performed, or required, for these marks.

5. Please discuss whether the number of new anti-vibration bar wear indications has decreased from inspection to inspection and whether the growth rate has been decreasing with time. Please discuss any trends in this data. Please discuss whether the results of the inspection were bounded by your previous operational assessment.

PSEG Response:

Below are three graphs representing the trends for the number of new anti-vibration bar wear indications, the largest new AVB wear indication, and the AVB wear growth rates. The growth rate graph provides the trends with the upper 95<sup>th</sup> percentile growth rate and the average growth rate, for AVB wear indications with history (with exception of 2R17, since all indications in 2R17 are new). As shown in these graphs, the trends for the number of new anti-vibration bar wear indications, the largest new AVB wear indication, and the AVB wear growth rates at each inspection outage have continued to decline with each inspection outage. The findings of the 2R19 steam generator examination are bounded by the behavior projected in the cycle 19 operational assessment.





- 6. In 3 of the 4 SGs, there is wear at a tube support plate (TSP) in the tube located in row 1, column 63. Since wear at the TSPs is normally random, please discuss any insights on why this location appears to be particularly susceptible to wear at the TSPs.**

PSEG Response:

It is observed that 3 of the 4 SGs have shown TSP wear in the tube at row 1 column 63. PSEG did not identify any unique cause related to these specific tubes. The Operational Assessment for cycle 20 conservatively evaluated all the TSP wear, including those tubes at row 1 column 63. PSEG plans to re-inspect all steam generators during the next refueling outage (2R20, end of cycle 20), including the tubes at row 1 column 63.



### Summary of Salem 2R19 Wear Indications (Tubes/ Indications)

	SG 21		SG 22		SG 23		SG 24		Total	
	Tubes	Indic	Tubes	Indic	Tubes	Indic	Tubes	Indic	Tubes	Indic
<b>Detected</b>										
<b>AVB</b>	253	755	202	534	54	129	158	483	667	1901
<b>TSP (Note 1)</b>	5	8	2	3	4	4	8	11	19	26
<b>Total (Note 2)</b>	256	763	204	537	58	133	166	494	684	1927
<b>Plugged</b>										
<b>AVB</b>	29	148	23	108	0	0	20	92	72	348
<b>TSP (Note 2)</b>	2	2	0	0	0	0	0	0	2	2
<b>Total (Note 2)</b>	29	150	23	108	0	0	20	92	72	350
<b>Returned to Service</b>										
<b>AVB</b>	224	607	179	426	54	129	138	391	595	1553
<b>TSP</b>	3	6	2	3	4	4	8	11	17	24
<b>Total</b>	227	613	181	429	58	133	146	402	612	1577

Notes:

1. The table above lists the indications identified by Bobbin probe.
2. All tubes with AVB wear did not have TSP wear in the same tube, with exception of two tubes in SG 21; Row 78 Column 66 and Row 93 Column 65. These two tubes were plugged due to having AVB wear indications >39%, which also removed the TSP wear indications in those tubes from service.