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Date: 3/9/05 11:40AM
Subject: Draft 1R18 SG ISI RAI Responses

Tom,

Attached is the draft responses to Joseph Terrell's 1R18 OTSG ISI Report. As you will notice in response to question 5, we have reduced our best estimate LBLOCA leakage due to some of the flaws being outside the pressure boundary.

Due to the ANO-2 outage, we may be limited on availability to discuss these until after the outage.

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Response to Requests for Additional Information (RAIs)
Received on the ANO-1 1R18 Outage Steam Generator ISI Report

RAI 1 - *On page 5 of the C-3 submittal regarding the upper tubesheet original roll transitions, it was stated that the 172 total indications found in OTSG-A and OTSG-B included axial, circumferential, and volumetric indications, and that all of the tubes with these indications were re-rolled.*

Provide a breakdown of these indications in terms of the number of axial, circumferential, and volumetric indications for each OTSG. Describe your assessment concerning the defect mechanism and cause of the volumetric indications.

RESPONSE:

No volumetric indications were identified in the upper tubesheet original roll expansion transition during 1R18. The number of axial and circumferential indications reported in the upper tubesheet original expansion transition is provided in Table 1 below.

TABLE 1

INDICATIONS	SG A	SG B
Axial	79	91
Circumferential	2	0
Total	81	91

RAI 2 - *On page 5 of the C-3 submittal regarding the upper tubesheet re-roll transitions, it was stated that the 33 total indications found in OTSG-A and OTSG-B included volumetric and axial/mixed mode indications, and that these indications were repaired by installing a second re-roll below the initial re-roll.*

Confirm that re-rolls were performed only during the 1R14 and 1R15 outages. Provide a breakdown of these indications in terms of: (a) the outage in which the re-roll was performed, and (b) the number of volumetric and axial/mixed mode indications for each OTSG. Describe your assessment concerning the defect mechanism and cause of the volumetric indications.

RESPONSE:

Repair Rolls have been installed every outage since 1R14. Table 3 provides a list of tubes with repair rolls that were repaired in 1R18. This table includes the outage that the original repair roll was installed. Five tubes in SGA and 3 tubes in SGB that would have had an additional repair roll installed were plugged for other indications or because a second repair roll had already been installed (SGA R5 T11). Mix mode indications were reported based on their axial and circumferential components for condition monitoring assessment. The number of

axial, circumferential and volumetric indications reported at repair roll transitions is provided in Table 2 below. The volumetric indications identified are the same upper tubesheet Intergranular Attack (IGA) that has been present since the early 1980's. This mechanism was initiated by high sulfate concentrations which have been removed therefore the initiation of new IGA patches in the unexpanded portion of the tube is essentially zero. The volumetric indications identified in the repair rolls are believed to be old initiation sites that when stressed by the installation of a repair roll, over time, grow to become detectable with eddy current testing.

TABLE 2

INDICATIONS	SG A	SG B
Axial	2	11
Circumferential	11	6
Volumetric	3	0
Total	16	17

TABLE 3

STEAM GENERATOR A				STEAM GENERATOR B			
ROW	TUBE	OUTAGE	REPAIR TYPE	ROW	TUBE	OUTAGE	CODE
5	11	1R14 & 1R16	Repair Roll	4	28	1R14	Repair Roll
5	11	1R18	Plug	4	28	1R18	Repair Roll
10	34	1R14	Repair Roll	10	17	1R14	Repair Roll
10	34	1R18	Plug	10	17	1R18	Plug
35	105	1R14	Repair Roll	17	32	1R14	Repair Roll
35	105	1R18	Plug	17	32	1R18	Repair Roll
38	104	1R14	Repair Roll	27	99	1R14	Repair Roll
38	104	1R18	Plug	27	99	1R18	Repair Roll
39	99	1R14	Repair Roll	28	96	1R14	Repair Roll
39	99	1R18	Repair Roll	28	96	1R18	Repair Roll
39	101	1R14	Repair Roll	63	48	1R16	Repair Roll
39	101	1R18	Repair Roll	63	48	1R18	Repair Roll
39	103	1R14	Repair Roll	71	51	1R14	Repair Roll
39	103	1R18	Repair Roll	71	51	1R18	Repair Roll
40	98	1R16	Repair Roll	73	51	1R14	Repair Roll
40	98	1R18	Repair Roll	73	51	1R18	Repair Roll
54	110	1R14	Repair Roll	81	11	1R14	Repair Roll
54	110	1R18	Repair Roll	81	11	1R18	Repair Roll
90	54	1R14	Repair Roll	81	14	1R14	Repair Roll
90	54	1R18	Repair Roll	81	14	1R18	Repair Roll
98	5	1R14	Repair Roll	82	11	1R14	Repair Roll
98	5	1R18	Repair Roll	82	11	1R18	Repair Roll
123	2	1R14	Repair Roll	95	7	1R14	Repair Roll

123	2	1R18	Repair Roll
132	35	1R14	Repair Roll
132	35	1R18	Repair Roll
141	26	1R14	Repair Roll
141	26	1R18	Plug
142	51	1R14	Repair Roll
142	51	1R18	Repair Roll
144	42	1R14	Repair Roll
144	42	1R18	Repair Roll

95	7	1R18	Repair Roll
111	2	1R14	Repair Roll
111	2	1R18	Repair Roll
115	8	1R14	Repair Roll
115	8	1R18	Plug
132	53	1R14	Repair Roll
132	53	1R18	Repair Roll
138	67	1R14	Repair Roll
138	67	1R18	Repair Roll
140	18	1R14	Repair Roll
140	18	1R18	Plug

RAI 3 - *In Table 2 of the 90-day submittal, it is reported that a total of 64 upper tubesheet crevice indications were detected. Describe the indications in more detail, including a more detailed description of each indication (i.e., single axial indication, single circumferential indication, volumetric indication, etc.), and a defect mechanism (i.e., ODSCC, intergranular attack, etc.).*

RESPONSE:

Single Axial and Multiple Axial indications are ODSCC while the volumetric indications are IGA patches. The 1R18 breakdown of indications is provided in Table 4 below.

Table 4

INDICATIONS	SG A	SG B
Single Axial	59	0
Multiple Axial	3	0
Volumetric	1	1
Total	63	1

RAI 4 - *In the 90-day submittal, the condition monitoring leakage estimates for upper tube end cracking (Tables 4 and 5) and upper tubesheet ODIGA (Table 10) were given. Identify any other mechanisms and their contributions to total condition monitoring estimate of accident-induced leakage. State the condition monitoring estimate of total accident-induced leakage from all mechanisms.*

RESPONSE:

The following Table 5 lists the different mechanisms identified and the associated estimated leakage:

TABLE 5

Mechanism	1R18 Leakage Actual		Condition Monitoring Met?
	SG A	SG B	
TSP Wear New	0	0	Yes
TSP Wear Old	0	0	Yes
ORT Axial	0	0	Yes
ORT Circ	0	0	Yes
Re-roll Cracking (Heel)	0	0	Yes
Re-roll Cracking (Toe)	0	0	Yes
Sleeve Cracking	0	0	Yes
FS Groove IGA	0	0	Yes
FS Volumetric	0	0	Yes
TSP Axial	0	0	Yes
TSP Circ	0	0	Yes
TSP & Dent Volumetric	0	0	Yes
Dent Axial	0	0	Yes
UTS Axial	0	0	Yes
LTS Axial, Circ and Volumetric	0	0	Yes
TEC UTS (SAA/MAA)	0.568	0.409	Yes
TEC LTS	0.0016	0.0031	Yes
UTS IGA	0.0962	0.104	Yes
Installed Re-roll Leakage	0.001	0.001	Yes
Hardware Plugs and Sleeves	0.02	0.02	Yes
Total	**0.69**	**0.54**	

TSP = Tube Support Plate
ORT = Original Roll Transition
FS = Free Span
LTS = Lower Tube Sheet
TEC = Tube End Cracking
IGA = Inter-Granular Attack

RAI 5 - *The cover letter for the 90-day submittal states that the calculated total best estimate LBLOCA leakage during 1R18 is estimated to be 2.57 gpm for the initial two minutes and 1.49 gpm for the remaining 30 days. Provide a summary of the flaws used in the LBLOCA leakage evaluation and discuss their individual contributions to the leak rate. Discuss whether the general approach used to evaluate LBLOCA leakage for 1R18 was the same as that used during 1R17, and describe any differences.*

RESPONSE:

During the process of answering this question, it was discovered that there were flaws that had been classified as being in the pressure boundary (IPB), when in fact the flaws were located out of the pressure boundary (OPB). This resulted in a revision to the calculated total best estimate LBLOCA leakage during 1R18. The best estimate LBLOCA leakage has been revised to be 1.29 gpm for the initial two minutes and 0.02 gpm for the remaining 30 days; instead of the 2.57 gpm and 1.49 gpm that had been originally reported. Table 6 below lists the location, quantity, and leakage amounts for the flaws used in the LBLOCA leakage evaluation for the most limiting Steam Generator (SG "A").

The same general approach was used during 1R18 as was used in 1R17 with the exception of the inclusion of the Lower-Tube-Sheet examination into the 1R18 LBLOCA leakage evaluation.

TABLE 6

Flaws Contributing to Leakage	TEC Flaws	UORT Flaws	URRT Flaws	LORT Flaws	Total Flaws
Flaws Contributing zero LBLOCA Leakage	281	7	329	1	618
Flaws Contributing to LBLOCA Leakage	43	0	18	0	61
Total Flaws	324	7	347	1	679

Leakage Assignment	TEC Leakage	UORT Leakage	URRT Leakage	Axials, Sleeves, Plugs, etc.	Total Leakage
Average LBLOCA - Leak Rate for first 2 minutes	0.83	0.00	0.44	0.02	1.29
Average LBLOCA - Leak Rate for 30 days	0	0	0	0.02	0.02

OPB - Out of Pressure Boundary
TEC - Tube End Crack
UORT - Upper-Tube-Sheet Original Roll Transition
URRT - Upper-Tube-Sheet Re-Roll Transition
LORT - Lower-Tube-Sheet Original Roll Transition