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Date: 5/11/04 11:31AM
Subject: 1R18 Steam Generator Discussion of May 3, 2004

Tom,

Attached is the discussion points from last Monday that we promised. There were a few minor changes that were updated from our call. However, there were no changes that affected how we were proceding to repair the OTSGs or the acceptability of our Operability Assessment.

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- docket 50-313
- PM is T. Alexion

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NRC Conference Call During 1R18
Arkansas Nuclear One (Unit One)

Large Break LOCA Best Estimate Leakage:

LBLOCA leakage for 1R18 is predicted to be 2.57 gpm for the first two minutes and 1.49 gpm average leak rate for 30 days. Current ANO leakage limit is 9 gpm for the first two minutes and 3 gpm average leak rate. During 1R18 there were11 circumferential indications found inboard of the repair roll in the "A" OTSG and 6 in the "B" OTSG. Additionally, there were 52 circumferential indications found in the "A OTSG located in the original roll or heat affected zone and 9 in the "B" OTSG.

1. **Discuss whether any primary to secondary leakage existed in this unit prior to shutdown.**

Minimal leakage was detected consistently throughout the cycle. Tritium averaged ~1.6 gpd during Cycle 18.

2. **Discuss the results of secondary side hydrostatic tests.**

There were no secondary side hydrostatic tests performed during 1R18.

3. **For each steam generator, provide a general description of areas examined, including the expansion criteria utilized and type of probe used in each area.**

SG 'A'				
Area	# Tested	Probe	Expansion	Mechanism/Criteria
FL Bobbin	14536	bobbin	No	Impingement, Wear, Axial IGA/ODSCC, Vol IGA
Upper Roll Transition	14109	plus point	No	Circ/Axial ODSCC Circ/Axial PWSCC
LTS Sludge & Dents	659	plus point	No	Circ/Axial ODSCC
Super Heat Dents	128	plus point	No (1)	Circ/Axial PWSCC
I600 Sleeves	101	plus point	No	OD IGA/SCC
Lower Roll Transitions	5014	Plus point	Yes (2)	ID/OD IGA/SCC
Lower Tube End	5014	Plus point	Yes (2)	Circ/Axial PWSCC

(1) expand based on EPRI GL; no cracks found
(2) exception to EPRI GL; expand if more indications than predicted

SG 'B'				
Area	# Tested	Probe	Expansion	Mechanism/Criteria
FL Bobbin	15133	bobbin	No	Impingement, Wear, Axial IGA/ODSCC, Vol IGA
Upper Roll Transition	14654	plus point	No	Circ/Axial ODSCC Circ/Axial PWSCC
LTS Sludge & Dents	436	plus point	No	Circ/Axial ODSCC
Super Heat Dents	65	plus point	Yes (1)	Circ/Axial PWSCC
I600 Sleeves	69	plus point	No	OD IGA/SCC
Lower Roll Transitions	5257	Plus point	Yes (2)	ID/OD IGA/SCC
Lower Tube End	5257	Plus point	Yes (2)	Circ/Axial PWSCC

(1) expand based on EPRI GL; 1 crack found; critical area established
(2) exception to EPRI GL; expand if more indications than predicted

4. Discuss any exceptions taken to the industry guidelines.

Three exceptions were taken to two requirements in Revision 6 of the EPRI PWR SG Examination Guidelines. One exception was to use the bobbin probe for lower tubesheet examinations based on a site qualification when the technique is not Appendix H qualified as required in section 6.2. A 21% sample of the tubes in the kidney region were examined with plus point probes. No indications were found at the LTS dent/sludgepile region.

The other two exceptions are taken are on the inspection expansion requirements in section 3.6 and Table 3-2 for indications found in the lower tube ends and lower roll transitions.

Lower Tube Ends: An initial inspection scope of 34% of the tube ends in each steam generator identified 1 and 4 tube end circumferential cracks in A and B SG respectively. A scope expansion to 100% was not performed because the cracks in this location can't burst and the original lower tube rolls limit the potential leakage from any crack indications. There was additional leakage calculated for the uninspected population.

Lower Roll Transitions: The lower roll transitions were examined as part of the lower tube end inspection. During the initial 34% sample two small volumetric indications (< 0.5 inches in either direction, <1 volt) classified as inside diameter IGA were found in 'A' SG. Similar to the LTE exception these indications could not burst and leakage tests done on earlier IGA patches in the upper tubesheet demonstrated very little leakage. The sample inspection was a 34% total of the LRT population.

5. **Provide a summary of the number of indications identified to date of each degradation mode and SG tube location (e.g. tube support plate, top-of-tubesheet, etc). Also provide information such as voltages, and estimated depths and lengths of the most significant indications.**

***ANO-1 1R18 Eddy Current Inspection Results**

Degradation/Area	"A" OTSG Indications	"B" OTSG Indications	CM for Worse Case OTSG
Upper Tube End Flaws	1775	1038	2380
Upper Tube End Flaws (Repairable)	48	6	N/A*
Upper Roll Transition PWSCC	81	91	70
Re-Roll Indications	16	17	42
Upper Tubesheet Crevice	63	1	0
Upper Tubesheet IGA	2	3	0
Sleeves	0	0	49
Indications in Dents (superheated region and LTS)	0	8	15
TSP Wear	0	0	0
TSP Flaws/Freespan	294	167	86
Lower Tubesheet	0	0	20
Lower Roll Transition PWSCC	0	0	0
Lower Roll Transition IGA	2	0	0
Lower Tube End Flaws	1	4	280*

* Repairable indications in the tube ends are accounted for in the upper tube end flaw totals. The repairable indications account for leakage the same as non-repairable indications located within the tube end.

One indication in a dent in the "B" OTSG passed in-situ screening criteria. This flaw was 64% average depth. 1.0v MRPC voltage. Many of the confirmed freespan flaws found during 1R18 were low voltage. None of the freespan flaws required in-situ pressure testing.

6. **Describe repair/plugging plans for the SG tubes that meet the repair/plugging criteria.**

Repairs have/will be made using I690 mechanical rolled plugs and re-rolls made in the UTS.

	A SG	B SG
Plugs	234	78
Rerolls	233	110

7. **Discuss the previous history of SG tube inspection results, including any "look backs" performed, *specifically for significant indication or indications where look backs are used in support of dispositioning (e.g., manufacturing burnish marks).***

Look backs are performed to disposition MBM indications based on history. For the indication to be classified as a MBM it must have received a rotating probe examination during a previous inspection. If there was a change in the bobbin examination signal the indication was scheduled for a rotating probe examination this outage. All wear indications that have been left in service from previous inspections have received a rotating probe examination. History review is performed on wear indications and if there is a change in the bobbin signature the indications is scheduled for a rotating probe examination this outage.

8. **Discuss, in general, the new inspection findings *(e.g., degradation mode or location of degradation new to this unit).***

Two modes of degradation previously found at ANO-1 were found in new locations during this inspection. Two small patches of IDIGA were found in the lower transition rolls and five circ cracks were found in lower tube ends.

9. **Discuss your use or reliance on inspection probes (eddy current or ultrasonic) other than bobbin and typical rotating probes, if applicable.**

No inspection probes other than bobbin and typical rotating probes were used in 1R18.

10. **Describe in-situ pressure test plans and results, if applicable and available, including tube selection criteria.**

In-situ selection is performed in accordance with the EPRI guidelines. Screening is performed and all those flaws that pass the final screening criteria are tested. No bounding is performed. One in-situ test was performed on an axial crack in a freespan dent at the 15 TSP (tube 88-40 B SG) 1.0 v 0.25 in.64.3% PDA. The indication did not leak at 3 DP (4500 psi). The dent itself was 2.9 volts.

11. **Describe tube pull plans and preliminary results, if applicable and available; include tube selection criteria.**

There were no tube pulls during 1R18.

12. Discuss the assessment of tube integrity for the previous operating cycle *(i.e., condition monitoring).*

The techniques used were qualified or demonstrated equivalent with the EPRI PWR Steam Generator Examination Guidelines. Several modes of degradation were detected during the exams. Most forms were expected, with the exception small patches of IGA in two lower roll transition. By benchmarking actual inspection results to the projected values, reasonable projections can be made for EOC 19. The structural aspects of the various modes of degradation are either bound by 1R18 in-situ testing or considered not a concern based on location within the tubesheet (e.g., URT, re-roll flaws). Additionally, the HAZ flaws and the upper tubesheet IGA are being addressed through specific Technical Specification requirements. The conclusion of this condition monitoring evaluation is that none of the performance criteria in NEI-97-06 were exceeded and based on the comprehensive exams performed it is concluded that the EOC 18 condition would not exceed the performance criteria.

CM .684 gpm in bounding OTSG

13. Discuss the assessment of tube integrity for next operating cycle *(i.e., operational assessment).*

The operational assessment will be performed in accordance with the NEI 97-06. Potential for burst and leakage will be assessed before entering Mode 4 for a 90 day period to allow the development of the full cycle report.

OA ..81 gpm in bounding OTSG

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

Eddy current testing	complete
Insitu testing	05/01/04 (Sat.)
Repair	05/03/04 (Monday)
Close Generator	05/05/04 (Wednesday)

15. With regard to loose parts, discuss the following:

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

Eddy current inspections were used to detect the presence of loose parts touching steam generator tubes. No possible loose part (PLP) indications were identified during those examinations. No secondary side examinations were performed.

16. Once-Through Steam Generators: If you have Babcock and Wilcox (B&W) welded plugs installed in the SGs, be prepared to discuss the actions taken in response to Framatome's notification of the effect of tubesheet hole dilation on the service life of B&W welded plugs.

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During a recent review of calculations associated with OTSG Remote Welded Plugs (RWP) and Manually Welded, Taper Welded Plugs (MWP), Framatome discovered that the plugs are not qualified in accordance with the requirements stated in the equipment specification requirements and associated purchase order. Specifically, the stress reports define the design transient heatup/cooldown cycles were originally evaluated for 240 cycles. The stress reports submitted to Davis Besse for their most recent outage define the heatup/cooldown cycles be limited to less than 33 to maintain a fatigue life of less than one. The latest stress reports were developed with tubesheet dilation included.

RWP's were not installed in the ANO-1 OTSG's prior to 1993 so those plugs have seen less than 15 heatup/cooldown cycles.

The results of the current Framatome re-analysis shows that the MWP is acceptable for 144 heatup/cooldown cycles. None of the MWP's installed at ANO-1 have experienced heatup/cooldown cycles anywhere near 144. The most conservative number published by Framatome is 67 heatup/cooldown cycles for ANO-1 MWP's. ANO personnel have calculated 45 heatup.cooldown cycles (the discrepancy is based on a BWOG report that counted any plant power change other than normal power swings as a cooldown). Even with the most conservative heatup/cooldown cycles (67) ANO-1 is well within the acceptable limit of 144 heatup/cooldown.

17. Once-Through Steam Generators: Describe your inspection/plugging plans with respect to the industry-identified severed tube issue (NRC Information Notice (IN) 2002-02 and IN 2002-02, Supplement 1).

Inspections during 1R17 in October 2002 addressed the issues associated with the potential for severed tubes. 31 tubes were plugged and stabilized in the "A" OTSG and 30 tubes were plugged and stabilized in "B" OTSG. All tubes identified for plugging in 1R18 are screened for stabilization and the database cannot be closed with any wear indications found at the secondary face of either tubesheet.