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1CAN080501

August 8, 2005

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555

SUBJECT: License Amendment Request
Response to NRC Request for Additional Information on ANO-1 Once Through Steam Generator Inservice Inspection Report
Arkansas Nuclear One, Unit 1
Docket No. 50-313
License No. DPR-51

REFERENCES:

1. Entergy letter dated August 3, 2004, *Once Through Steam Generator Inservice Inspection Report Arkansas Nuclear One, Unit 1* (1CAN080401)

2. Entergy letter dated March 1, 2004, *Response to NRC Request for Additional Information Regarding ANO-1 Steam Generator Tube Inservice Inspection Report from 1R17* (1CAN030402)

Dear Sir or Madam

On August 3, 2004 (Reference 1), Entergy provided the Arkansas Nuclear One, Unit 1 (ANO-1), Once Through Steam Generator Inservice Inspection Report in accordance with Technical Specification 5.6.7.a. This report covered steam generator (SG) inspection activities for the ANO-1 eighteenth refueling outage (1R18). As part of that report, Entergy provided the best-estimate total leakage that would result from an analysis of the limiting large break loss of coolant accident.

As a result of NRC Staff review of this report, requests for additional information (RAIs) were provided to Entergy on December 3, 2004 and May 31, 2005. Entergy provided draft responses to these RAIs on March 9, 2005 and June 21, 2005, respectively. This letter provides the documentation for the NRC RAIs and Entergy's response to these RAIs.

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This submittal contains no new commitments. Should you have any questions, please contact Steve Bennett at (479) 858-4626.

Sincerely,

DEJ/sab

Attachments:

1. Response to Requests for Additional Information (RAIs) Received on December 3, 2004, regarding the ANO-1 1R18 Outage Steam Generator Inservice Inspection Report

2. Response to Requests for Additional Information (RAIs) Received on May 31, 2005, regarding the ANO-1 1R18 Outage Steam Generator Inservice Inspection Report

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Attachment 1

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Response to Requests for Additional Information (RAIs) Received on December 3, 2004 regarding the ANO-1 1R18 Outage Steam Generator Inservice Inspection Report

Response to Requests for Additional Information (RAIs) Received on December 3, 2004 regarding the ANO-1 1R18 Outage Steam Generator Inservice Inspection 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.

ANO 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	OTSG A	OTSG 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.

ANO 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 OTSG-A and 3 tubes in OTSG-B that would have had an additional repair roll installed were plugged for other indications or because a second repair roll had already been installed (OTSG-A 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 1980s. 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	OTSG-A	OTSG-B
Axial	2	11
Circumferential	11	6
Volumetric	3	0
Total	16	17

TABLE 3

OTSG-A				OTSG-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

OTSG-A			
ROW	TUBE	OUTAGE	REPAIR TYPE
123	2	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

OTSG-B			
ROW	TUBE	OUTAGE	CODE
95	7	1R14	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.).*

ANO Response:

Single Axial and Multiple Axial indications are Outside Diameter Stress Corrosion Cracking (ODSCC) while the volumetric indications are IGA patches. The 1R18 breakdown of indications is provided in Table 4 below.

Table 4

INDICATIONS	OTSG-A	OTSG-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.*

ANO Response:

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

TABLE 5

Mechanism	1R18 Leakage Actual		Condition Monitoring Met?
	OTSG-A	OTSG-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.*

ANO 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 (OTSG-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

Attachment 2

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Response to Requests for Additional Information (RAIs) Received on May 31, 2005 regarding the ANO-1 1R18 Outage Steam Generator Inservice Inspection Report

Response to Requests for Additional Information (RAIs) Received on May 31, 2005 regarding the ANO-1 1R18 Outage Steam Generator Inservice Inspection Report

The August 3, 2004, report (ADAMS Accession No. ML042240207) provided the results for the calculated total best-estimate large-break loss-of-coolant accident (LBLOCA) leakage during the ANO-1 eighteenth refueling outage (1R18). The calculated total best-estimate LBLOCA leakage for Cycle 18 was estimated to be 2.57 gallons-per-minute (gpm) for the initial two minutes and 1.49 gpm for the remaining 30 days. In Question 5 of the NRC staff's request for additional information (see e-mail at ADAMS Accession No. ML051450289), the licensee was asked to provide a summary of the flaws used in the evaluation and to discuss their individual contributions to the leak rate. In their draft response (see e-mail at ADAMS Accession No. ML051450296), the licensee discovered that there were flaws that had been classified as being in the pressure boundary during the original calculation, but were in fact outside the pressure boundary. When the licensee re-calculated the total best estimate LBLOCA leakage for Cycle 18, the estimate was revised downward. The revised best estimate LBLOCA leakage was estimated to be 1.29 gpm for the initial two minutes and 0.02 gpm for the remaining 30 days.

The staff notes that the licensee's LBLOCA leakage estimate during the previous refueling outage (1R17) considered the potential leakage of all circumferential cracks found during the inspection, including those above the re-roll repairs, because of the possibility that a leak path could exist around the roll or re-roll joints.

RAI 1. *Discuss why the flaws in question were classified as being inside the pressure boundary for the original LBLOCA leakage estimate for Cycle 18, and discuss the basis for re-classifying the flaws as being outside of the pressure boundary. Include in your discussion the reasons why you concluded that the flaws in question should not be included in the LBLOCA leakage estimate and why the revised leakage estimate is conservative.*

ANO Response:

The difference was due to the way the analyst labeled flaws in the steam generator database for 1R18. The program used to calculate LBLOCA leakage acquired data based on the way they were labeled in the steam generator database. Therefore, some flaws were conservatively called to be inside the pressure boundary (i.e. like a crack in a transition above the roll). As a result, a higher LBLOCA leakage value was reported in the 1R18 OTSG ISI report.

This methodology for 1R18 is consistent with the methodology used in the previous cycle (1R17). The revised 2-minute leakage value of 1.29 gpm is believed to be representative of the as-found flaws discovered during 1R18. However, even if the leakage value was not revised downward, the previously reported leakage value of

2.57 gpm is still well within the accident leakage of 9.0 gpm for the initial 2 minutes and 3.0 gpm for the remaining 30 days (Reference 2). Either value still retains conservative margin to the accident analysis.

RAI 2. *Discuss whether the LBLOCA leakage estimate methodology (i.e., not considering cracks above original rolls or re-roll repairs in the leakage estimate) has changed since the previous outage. If the LBLOCA leakage estimate methodology has changed, provide a technical basis. Include in your discussion the reasons why the leakage of flaws above the original rolls or re-roll repairs during a LBLOCA is no longer important in your assessment.*

ANO Response:

As mentioned in question 1 above, the methodology is the same, therefore there is no difference. The flaws above the rolls are still included but are limited by the leakage past the roll.