Entergy

Entergy Operations, Inc.
1448 S.R. 333
Russellville, AR 72802
Tel 479-858-4704

Stephenie L. Pyle
Manager, Regulatory Assurance
Arkansas Nuclear One

2CAN011502

January 12, 2015

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555-0001

SUBJECT: Response to Request for Additional Information
Concerning the Spring 2014 Steam Generator Inspections
Arkansas Nuclear One – Unit 2
Docket No. 50-368
License No. NPF-6

REFERENCES:

1. Entergy letter to NRC, "Steam Generator Tube Inspection Report - 2R23," dated August 18, 2014 (2CAN081404) (ML14230A898)
2. Email from Andrea George (NRC) to David B. Bice (Entergy), "Request for Additional Information for Spring 2014 Steam Generator Tube Inspection Report for ANO, Unit 2 (MF4653)," dated November 19, 2014 (ML14323A206)

Dear Sir or Madam:

Entergy Operations, Inc. (Entergy) inspected the Arkansas Nuclear One, Unit 2 (ANO-2) steam generator tubes during the Spring 2014 refueling outage (2R23) in accordance with ANO-2 Technical Specification (TS) 6.5.9. ANO-2 TS 6.6.7 requires a written report of the results of the inspection be submitted to the NRC. Reference 1 provided the required report.

In the course of the NRC's review of the report, it was determined that additional information was required to complete the evaluation. The purpose of this submittal is to provide the information that was requested in Reference 2 (see Attachment 1).

This correspondence contains one new commitment. This commitment is summarized in Attachment 2.

A001
LIRR

Should you have any questions regarding this submittal, please contact me.

Sincerely,

SLP/rwc

Attachments: 1. Responses to Request for Additional Information Concerning the Spring 2014 Steam Generator Inspections

2. Regulatory Commitments

cc: Mr. Marc L. Dapas
Regional Administrator
U. S. Nuclear Regulatory Commission, Region IV
1600 East Lamar Boulevard
Arlington, TX 76011-4511

NRC Senior Resident Inspector
Arkansas Nuclear One
P. O. Box 310
London, AR 72847

U. S. Nuclear Regulatory Commission
Attn: Ms. Andrea E. George
MS O-8B1
One White Flint North
11555 Rockville Pike
Rockville, MD 20852

ATTACHMENT 1 TO

2CAN011502

RESPONSES TO REQUEST FOR ADDITIONAL INFORMATION CONCERNING THE SPRING 2014 STEAM GENERATOR INSPECTIONS

RESPONSES TO REQUEST FOR ADDITIONAL INFORMATION CONCERNING THE SPRING 2014 STEAM GENERATOR INSPECTIONS

By letter dated August 18, 2014 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML14230A898), Entergy Operations, Inc. (Entergy, the licensee) submitted information summarizing the results of the Spring 2014 steam generator tube inspections performed at Arkansas Nuclear One, Unit 2. These inspections were performed during refueling outage 23 (RFO 23). In a letter dated June 23, 2014 (ADAMS Accession No. ML14170A060), the U.S. Nuclear Regulatory Commission (NRC) staff summarized a conference call that was held with the licensee during RFO 23.

In order to complete the review, the NRC staff requests responses to the follow questions:

ESGB-RAI-1

The "Cycle Effective Full Power Year (EFPY)" and "Cumulative SG EFPY" columns in Table 1-1 agree with each other up until outage "2R20." Please confirm the values for EFPY in these columns.

RESPONSE

The cumulative value following refueling outage 2R20 was listed as 8.62 which was a transcription error. The actual value should have been 8.26 or a difference of 0.36 EFPY. This was carried through the rest of the values through 2R23. See Table 1 below:

Table 1
ANO-2 Operating Cycles since SG Replacement

Outage	Year	Cycle EFPY	Cumulative EFPY	Notes
2R14	2000	0	0	Baseline (PSI)
2R15	2002	1.35	1.35	1st ISI
2R16	2003	1.35	2.7	Skip
2R17	2005	1.36	4.06	54% Bobbin
2R18	2006	1.43	5.49	Skip
2R19	2008	1.35	6.84	Skip
2R20	2009	1.42	***8.62***	100% Bobbin
2R21	2011	1.40	10.02	Skip
2R22	2012	1.43	11.45	Skip
2R23	2014	1.39	12.84	100% Bobbin

6.84 + 1.42 = 8.26

All the EFPYs were reviewed as part of developing this response. Previously some of the values were projected values versus actual values for the outages. The table has been updated with the actual values. A corrected table with additional data is provided below (Table 2):

Table 2
ANO-2 Operating Cycles since SG Replacement

Outage	Year	Cycle	EFPD		EFPY	Cumulative	Notes
2R14	2000	14	517.004		1.42	0.00	Baseline (PSI)
2R15	2002	15	471.493		1.29	1.29	1st ISI
2R16	2003	16	492.902		1.35	2.64	Skip
2R17	2005	17	495.698		1.36	4.00	54% Bobbin
2R18	2006	18	522.796		1.43	5.43	Skip
2R19	2008	19	489.419		1.34	6.77	Skip
2R20	2009	20	495.707		1.36	8.13	100% Bobbin
2R21	2011	21	493.944		1.35	9.48	Skip
2R22	2012	22	528.071		1.45	10.93	Skip
2R23	2014	23	498.19		1.36	12.30	100% Bobbin
2R24	2015	24	452	PROJECTED	1.24	13.53	Skip

EFPD = Effective Full Power Days

EFPY = Effective Full Power Years

ESGB-RAI-2

The NRC staff notes that in Tables 3.6.1 and 3.6.2 of the letter dated August 18, 2014, the "% Plugged" columns appear to be incorrect based on the number of tubes plugged in each SG. Please clarify.

RESPONSE

In the originally submitted % Plugged column, the numerical values represented did not increase the values by 100 necessary to achieve a "percent". Therefore, if the values are multiplied by 100, true percent values can be obtained. There are 10637 tubes per generator. A corrected table is listed below:

Table 3
Cumulative Plugs in Service in SG A

YEAR	OUTAGE	INSTALLED	CUMULATIVE	% PLUGGED
2000	Fabrication	0	0	0
2000	Baseline	0	0	0
2002	2R15	0	0	0
2005	2R17	4	4	0.04
2009	2R20	1	5	0.05
2014	2R23	5	10	0.09

Table 4
Cumulative Plugs in Service in SG B

YEAR	OUTAGE	INSTALLED	CUMULATIVE	% PLUGGED
2000	Fabrication	1	1	0.009
2000	Baseline	0	1	0.009
2002	2R15	0	1	0.009
2005	2R17	7	8	0.08
2009	2R20	5	13	0.12
2014	2R23	5	18	0.17

ESGB-RAI-3

In the teleconference summary dated June 23, 2014, the NRC staff noted that "an evaluation of blockage of the top support plate will be done as part of the eddy current auto-analysis that is verifying the position of the AVBs [anti-vibration bars]." Please discuss the results of the position verification of the AVBs and the evaluation of the blockage of the top support plate.

RESPONSE

This analysis was being performed post outage utilizing the 2R23 eddy current data. The AVB design of the Westinghouse Delta 109 is complex and has resulted in difficulties in pinpointing the exact locations since there are changes in configuration within the individual AVBs by design. Therefore, the evaluation is not yet complete.

The original intent of the sludge buildup at the top tube support plate analysis was to evaluate the operating experience by the French where a tube locked into place due to excessive sludge build up and eventually severed due to fatigue. It was not anticipated that this would be the case for ANO-2 due to differences in the designs. This will be a qualitative assessment to determine if there is an excessive buildup of deposits. ANO-2 has operated 14 calendar years since the steam generators were replaced. The analysis will be of individual locations on the top support plate to determine the deposit at the top, bottom and center of the intersections.

Entergy will provide the information for both the AVB positioning and sludge evaluation within 45 days of Entergy's receipt of the AREVA report. Currently it is estimated that Entergy will have received the report from AREVA prior to mid-February 2015.

ESGB-RAI-4

Please discuss the results of the primary side channel head inspections and the tube plug inspections.

RESPONSE

Visual inspections of the primary side cladding and previously installed plugs were performed in 2R23. All four channel heads were included in the inspection. There were no irregularities identified in the cladding inspection or any issues identified in the previously installed plugs.

ESGB-RAI-5

Please provide a tubesheet map so the NRC staff can better understand the locations of the indications. In addition, please provide the thickness of the tubesheet with and without cladding.

RESPONSE

Please refer to the ANO-2 tubesheet map included in this letter. The tubesheet is a forged carbon steel plate with cladding installed on the primary side.

Tubesheet thickness without the clad	31.13 inches
Tubesheet cladding thickness	0.43 inches
Tubesheet thickness with clad	31.56 inches

ESGB-RAI-6

In Section 3.2 of the letter dated August 18, 2014, a number of dents were reported. It was indicated that these dents were present in the preservice inspection. Please discuss whether these dents have been increasing in size (voltage). Please discuss whether these dents are service-induced or have been present since the preservice inspection. If service-induced, please discuss the cause.

RESPONSE

Dents (DNT) were reported with the bobbin coil examination at 1128 locations in 319 tubes. The criteria for reporting DNTs are ≥ 2.00 volts on Channel P1 (630 / 150 kHz differential mix) in the free span and at structures. All DNT signals have been compared with historical data and exhibited no change in signal formation, voltage, and/or phase.

The dents were fabrication induced due to elevated temperatures during post-weld heat treatment. There are no service induced dents identified to date.

ESGB-RAI-7

A number of possible loose part (PLP) indications were reported in both steam generators. In steam generator B, three parts were removed, reducing the number of PLP indications to one. Please discuss whether visual inspections were performed at all PLP locations. If visual inspections were performed, please discuss the results of these inspections. If any loose parts were left in the steam generators, please discuss the results of any assessments performed on the effect these parts may have on tube integrity.

RESPONSE

A Foreign Object Search and Retrieval (FOSAR) activity was performed to confirm / retrieve any potential objects identified by eddy current testing. Eddy current inspections identified PLP indications affecting 15 tubes in SGA and affecting 17 tubes in SGB; however, no wear was associated with any of the affected tube locations. Visual inspections were performed and all foreign material was either retrieved or determined to be acceptable as-is (unretrieved).

Refer to Table 8-1 (from operational assessment) of this letter, which summarizes the assessment of PLP indications and foreign objects identified during 2R23.

Arkansas Unit 2 - Replacement Hardware Repair Status Post RFO23 - 05/14

AREVA - FDMS map module Version 11.0

GROUP	TUBES
B WELDED	0
F ROLLED - AREVA	5
H ROLLED - W	4
I ROLLSTAB - W	1

FORCED SCALE: 0.283977 X
Fri Jun 06 09:07:25 2014
Arkansas Unit 2 - Replacement: S/G A COLD Westinghouse

Drawing #: 02-6004834-E-003
DCN : 121-9224603-000

Drawn by FDMS Map Module
Passed by Victor E Gallier Victor E Gallier 6/6/14
Reviewed by Jon M Parrish 06/06/2014
Approved by Kevin T Matthews 06/19/2014

S/G A
COLD
PRIMARY FACE

TOTAL TUBES: 10637
SELECTED TUBES: 10
OUT OF SERVICE (#): 10

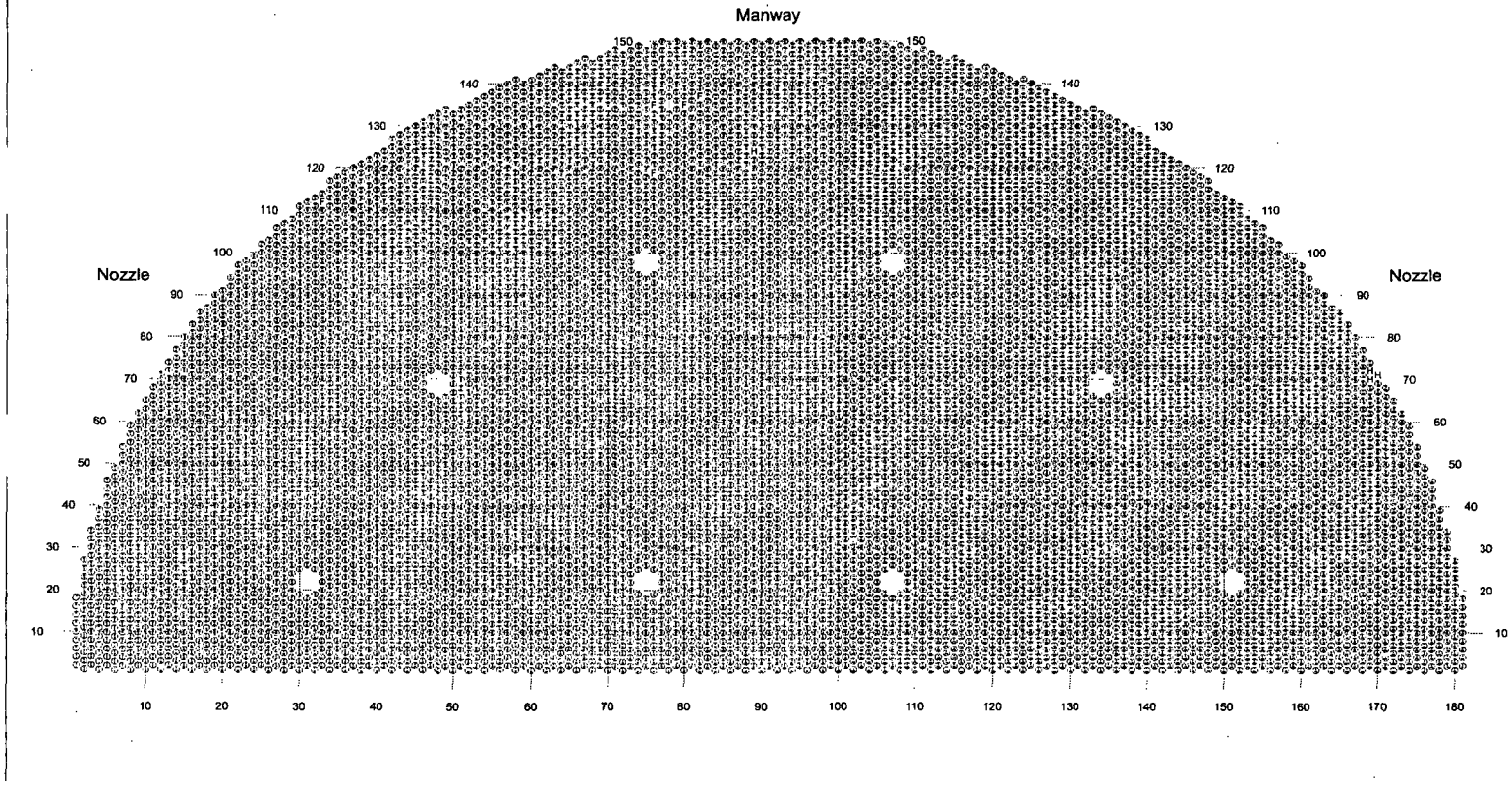

Table 8-1: ANO 2R23 PLP and FOSAR Summary

SG	2R23 PLP Indications		History	2R23 SSI Results	Loose Part Wear Assessment
	Row-Col.	Location			
A	4-89	TSC +0.20	New PLP in 2R23	SSI identified sludge rock at tubes 4-89, 5-88, and 6-89 CL and left as-is.	No wear identified by ECT and object not a threat to tube integrity.
	5-88	TSC +0.17	New PLP in 2R23	See tube R4-C89 above.	See tube R4-C89 above.
	6-89	TSC +0.17	New PLP in 2R23	See tube R4-C89 above.	See tube R4-C89 above.
	6-91	TSH +0.31	PLP in 2R20 & 2R23	SSI not performed for this historical PLP.	No wear identified by ECT.
	7-92	TSH +0.54	PLP in 2R20 & 2R23	SSI not performed for this historical PLP.	No wear identified by ECT.
	8-91	TSH +0.86	PLP in 2R20 & 2R23	SSI not performed for this historical PLP.	No wear identified by ECT.
	40-87	TSH +0.17	PLP in 2R20 & 2R23	SSI not performed for this historical PLP.	No wear identified by ECT.
	40-89	TSH +0.15	PLP in 2R20 & 2R23	SSI not performed for this historical PLP.	No wear identified by ECT.
	41-88	TSH +0.15	PLP in 2R20 & 2R23	SSI not performed for this historical PLP.	No wear identified by ECT.
	48-151	TSH +1.62	PLP in 2R20 & 2R23	SSI not performed for this historical PLP.	No wear identified by ECT.
	49-152	TSH +0.74	PLP in 2R20 & 2R23	SSI not performed for this historical PLP.	No wear identified by ECT.
	50-151	TSH +1.26	PLP in 2R20 & 2R23	SSI not performed for this historical PLP.	No wear identified by ECT.
	50-153	TSH +0.24	PLP in 2R20 & 2R23	SSI not performed for this historical PLP.	No wear identified by ECT.
	51-152	TSH +0.49	PLP in 2R20 & 2R23	SSI not performed for this historical PLP.	No wear identified by ECT.
	128-57	03H +3.19	NDF with PlusPt	SSI not required for this PLP.	No wear identified by ECT.
B	15-42	TSH +0.63	PLP in 2R20 & 2R23	SSI not performed for this historical PLP.	No wear identified by ECT.
	104-67	TSC +30.02	New PLP in 2R23	SSI could not access the elevation at this location for visual confirmation of new PLP.	Acceptable to leave as-is. PLP is in a low flow region and no wear was identified by ECT.
	105-66	TSC +30.11	New PLP in 2R23	SSI could not access the elevation at this location for visual confirmation of new PLP.	Acceptable to leave as-is. PLP is in a low flow region and no wear was identified by ECT.
	115-138	TSH +4.61	New PLP in 2R23	SSI identified and removed a long machine turning piece at tubes 115-138, 116-139, 117-138, 117-140, 118-139, and 119-140	Object was removed and no wear was identified by ECT.
	115-146	TSH +21.52	New PLP in 2R23	SSI identified and removed a long machine turning piece at tubes 115-146, 116-145, 116-147, 117-146, 117-148.	Object was removed and no wear was identified by ECT.

SG	2R23 PLP Indications		History	2R23 SSI Results	Loose Part Wear Assessment
	Row-Col.	Location			
B	116-139	TSH +4.76	New PLP in 2R23	See Tube R115-C138 above.	See Tube R115-C138 above.
	116-145	TSH +21.39	New PLP in 2R23	See Tube R115-C146 above.	See Tube R115-C146 above.
	116-147	TSH +21.00	New PLP in 2R23	See Tube R115-C146 above.	See Tube R115-C146 above.
	117-138	TSH +4.63	New PLP in 2R23	See Tube R115-C138 above.	See Tube R115-C138 above.
	117-140	TSH +4.98	New PLP in 2R23	See Tube R115-C138 above.	See Tube R115-C138 above.
	117-146	TSH +21.49	New PLP in 2R23	See Tube R115-C146 above.	See Tube R115-C146 above.
	117-148	TSH +20.89	New PLP in 2R23	See Tube R115-C146 above.	See Tube R115-C146 above.
	118-139	TSH +4.72	New PLP in 2R23	See Tube R115-C138 above.	See Tube R115-C138 above.
	119-140	TSH +5.28	New PLP in 2R23	See Tube R115-C138 above.	See Tube R115-C138 above.
	137-118	TSH +33.28	PLP in 2R20 & 2R23	SSI identified and removed a long machine turning piece at tubes 137-118, 138-119, and 139-118.	Object was removed and no wear was identified by ECT.
	138-119	TSH +33.66	PLP in 2R20 & 2R23	See Tube R137-C118 above.	See Tube R137-C118 above.
	139-118	TSH +34.05	PLP in 2R20 & 2R23	See Tube R137-C118 above.	See Tube R137-C118 above.

ATTACHMENT 2 TO

2CAN011502

REGULATORY COMMITMENTS

List of Regulatory Commitments

This table identifies actions discussed in this letter for which Entergy commits to perform. Any other actions discussed in this submittal are described for the NRC's information and are not commitments.

COMMITMENT	TYPE (Check one)		SCHEDULED COMPLETION DATE (If Required)
	ONE-TIME ACTION	CONTINUING COMPLIANCE	
Entergy will provide the information for both the AVB (anti-rotation bar) positioning and sludge evaluation.	X		Within 45 days of Entergy receipt of AREVA report