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Subject: Arkansas Nuclear One - Unit 2
Docket No. 50-368
License No. NPF-6
2000 Annual Report of Steam Generator Tubing Inservice Inspections

Gentlemen:

Arkansas Nuclear One, Unit 2 (ANO-2) Technical Specifications 4.4.5.5.b and 6.9.1.5.b require that results of ANO-2 steam generator (SG) tubing inservice inspections performed during the report period be submitted to the NRC on an annual basis. Attached is the Steam Generator Tubing Inservice Inspection Report which presents the results from ANO-2's scheduled mid-cycle outage (2P00) and refueling outage (2R14) inspections. These inspections were conducted during July and September 2000.

The 2P00 inspections performed on both SGs involved a 100% full-length bobbin coil examination, with the exception of the tube area below the sleeves. The RPC used consists of a 0.115-inch pancake coil with both axially oriented and circumferentially oriented coils. The RPC was also utilized for confirmation of bobbin coil indications.

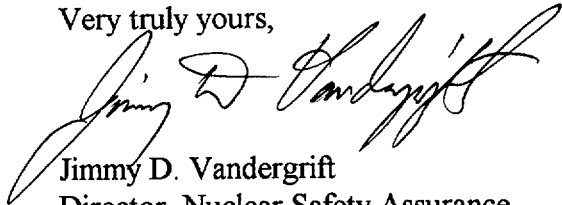
The 2R14 inspection was the baseline examination for the replacement steam generators (pre-service inspection). A 100% bobbin examination was performed on both generators in August just prior to the start of the outage. This was performed onsite. The plus point coil was used for diagnostic testing of bobbin indications.

This submittal completes the reporting requirements of ANO-2 Technical Specifications 4.4.5.5.b and 6.9.1.5.b for 2000. The attachment also provides the information designated by NEI 97-06 "Steam Generator Program Guidelines" to be included in the report to be submitted 12 months after each inservice inspection. This submittal contains no commitments.

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

ADD1

Very truly yours,



Jimmy D. Vandergrift
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JDV/fpv
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ARKANSAS NUCLEAR ONE, UNIT 2 STEAM GENERATOR TUBING INSERVICE INSPECTION ANNUAL REPORT

1 INTRODUCTION

Arkansas Nuclear One, Unit 2 (ANO-2) Technical Specification (TS) 4.4.5.5.b requires Entergy Operations to submit an annual report to the NRC that outlines the details of the steam generator (SG) tubing inservice inspections that were performed during the reporting period. The report shall include:

1. Number and extent of tubes inspected.
2. Location and percent of wall-thickness penetration for each indication of an imperfection.
3. Identification of tubes plugged or sleeved.

In addition to the above information, the 12-month report specified in NEI 97-06, "Steam Generator Program Guidelines" requires the following:

1. Scope of inspection performed.
2. Active degradation mechanisms found.
3. NDE techniques utilized for each degradation mechanism.
4. Number of tubes plugged or repaired during the inspection outage for each active degradation mechanism. Repair methods utilized and the number of tubes repaired by each repair method.
5. Total number and percentage of tubes plugged and/or repaired to date and the effective plugging percentage in each steam generator.
6. Description of tube integrity assessment.
7. Description of corrective actions implemented, if any.
8. Evaluation of circumstances if condition monitoring results exceeded the previous cycle operational assessment.

This report is formatted to reflect the information listed above for the NEI annual report. Since item #2 from the TS requirements (location and percent of wall-thickness

penetration for each indication of an imperfection) is not included in the NEI format, it will be discussed after item #8. The information requested by items #1 and #3 from the Technical Specifications report are subsumed within the NEI 97-06 report items.

The operating period for this report includes two outages, a tri-cycle inspection (2P00) in July 2000 and the baseline inspection of the replacement steam generators in September 2000.

2 DESIGN

The previous ANO-2 generators were of a Combustion Engineering (CE) Model 2815 design that began operation in December 1978. The plant had two recirculating SGs, each having 8411 high temperature mill annealed Inconel Alloy 600 tubes with a 0.75" outer diameter and a 0.048" wall thickness. The tubes were full depth explosively expanded into the tubesheet. The tube supports in the lower part of the SG were of an eggcrate (EC) type which consisted of an array of intersecting one inch wide and two inch wide flat carbon steel plates at each support elevation. There were seven full EC support plates, two partial EC support plates, two partial drilled support plates, and five strap supports called batwings (BW) for the horizontal run of the tubing. The BW supports consisted of two diagonal and three vertical straps. Two tube sleeve types, Babcock & Wilcox (B&W) kinetic and CE tungsten inert gas (TIG) welded, were installed in the SGs.

The replacement generators are Westinghouse (W) Model Delta 109's. They consist of Inconel 690 thermally treated tubing that is 11/16" in diameter with a 0.040" wall thickness. The tubes are expanded full depth hydraulically in the tubesheet. The tube supports are constructed of stainless steel and are a broached trifoil hole design. The upper bundle supports consist of ten stainless steel anti-vibration bars (AVB's).

3 2P00 OUTAGE RESULTS

3.1 2P00 Scope

The purpose of the 2P00 outage was to validate that the tubing was capable of meeting its intended structural integrity requirements. The tubing was tested from the tube end hot (TEH) to the 07Hot support structure. Table 3.1 lists the inspection scope of 2P00.

Table 3.1
2P00 Inspection Scope

SG "A"

<u>Examination Type</u>	<u>Inspections Conducted</u>	<u>% Scope</u>	<u>Expansion Req'd</u>
Bobbin	6924	100	N/A
Special Interest	492	N/A	N/A

SG "B"

<u>Examination Type</u>	<u>Inspections Conducted</u>	<u>% Scope</u>	<u>Expansion Req'd</u>
Bobbin	6951	100	N/A
Special Interest	376	N/A	N/A

3.2 Degradation Mechanisms Found

Table 3.2 outlines the number of indications found during the outage for each location. The active damage mechanism is outside diameter stress corrosion cracking (ODSCC).

Table 3.2
2P00 Inspection Results

<u>Location</u>	<u>SG "A"</u>	<u>SG "B"</u>
Sludge Pile (axial and volumetric)	0	0
EC Support Plate (axial)	64	148
Free Span (axial)	0	0

3.3 NDE Techniques Utilized

Table 3.3 identifies the non-destructive examination (NDE) technique used for each location:

Table 3.3
2P00 NDE Techniques

<u>Location</u>	<u>NDE Technique</u>
Sludge Pile	0.600" bobbin with 0.115" pancake for confirmation
EC Support Plate	0.600" bobbin with 0.115" pancake for confirmation
Free Span	0.600" bobbin with 0.115" pancake for confirmation

3.4 Number of Tubes Plugged or Repaired by Damage Mechanism

There were no sleeves installed during 2P00. Mechanical-rolled plugs were used for all repairs. This consisted of 58 tubes in SGA and 131 in SGB. Some tubes had multiple indications. All repairs were made due to eggcrate indications.

3.5 Number and Percent Plugged and Sleeved Following 2P00

The number of tubes plugged and inservice sleeves following 2P00 are shown in Table 3.5.

Table 3.5
Cumulative Plugs and Sleeves in Service

	SG "A"	SG "B"
B&W Sleeves	283	47
CE TIG Sleeves	371	146
Plugs	1547	1591
Equivalent Plugs	1571.154	1597.998
Percent Plugged	18.68 %	18.99 %

3.6 Description of Tube Integrity Assessment

The tube integrity is based on two assessments. The methodologies are condition monitoring during the outage and the operational assessment performed following the outage to evaluate the acceptable runtime following the outage. Condition monitoring was performed to evaluate both leakage and tube integrity and was submitted in Entergy letter 2CAN090004 dated September 14, 2000. The condition monitoring performance criteria were met. The operational assessment was also submitted in the same document. The operational assessment was performed using deterministic methods for the identified damage mechanism and justified operation until the next scheduled outage, which was 2R14 in September of 2000.

3.7 Description of Corrective Actions

There were no corrective actions taken since all tests met the specified criteria.

3.8 Evaluation of Exceeding Condition Monitoring

Not applicable since all conditions were met.

3.9 Item #2 of the Technical Specification (location and percent of wall-thickness penetration for each indication of an imperfection)

This topic is addressed for the 2P00 outage in Tables 1 and 2 for SG "A" and SG "B", respectively at the end of this report.

4 2R14 BASELINE RESULTS

The replacement steam generators were installed during the 14th refueling outage (2R14). The pre-service inspection was performed on the generators while they were horizontal on site just prior to installation.

4.1 2R14 Baseline Scope

Table 4.1 lists the inspection scope of 2R14.

Table 4.1
2R14 Baseline Inspection Scope

SG "A"

<u>Examination Type</u>	<u>Inspections Conducted</u>	<u>% Scope</u>	<u>Expansion Req'd</u>
Bobbin	10637	100	No
RPC of MBM's	33	20	N/A
RPC of Dents*	95	20	N/A
Special Interest	3	N/A	N/A

SG "B"

<u>Examination Type</u>	<u>Inspections Conducted</u>	<u>% Scope</u>	<u>Expansion Req'd</u>
Bobbin	10636	100	No
RPC of MBM's	63	20	N/A
RPC of Dents*	80	20	N/A
Special Interest	3	N/A	N/A

* Testing performed on dents > 7.00 volts

4.2 Degradation Mechanisms Found

Table 4.2 outlines the number of indications found during the outage for each location. There are no active damage mechanisms in the replacement steam generators.

Table 4.2
2R14 Baseline Inspection Results (indications)

<u>Location</u>	<u>SG "A"</u>	<u>SG "B"</u>
Dents	1738	871
MBMs	156	314

4.3 NDE Techniques Utilized

Table 4.3 identifies the NDE technique used for each degradation mechanism:

Table 4.3
2R14 NDE Techniques

Degradation Mechanism	NDE Technique
Bobbin	0.560" bobbin coil
RPC	0.560" plus point with 0.115 pancake and 0.080 pancake coils

4.4 Number of Tubes Plugged or Repaired by Damage Mechanism

No sleeves were installed during 2R14. There were no Mechanical-rolled plugs installed. There was one welded I-690 plug installed in SGB in tube R23C8 during fabrication.

4.5 Number and Percent Plugged Following 2R14

The number of tubes plugged following 2R14 are shown in Table 4.5:

Table 4.5
Cumulative Tubes Plugged

	SG "A"	SG "B"
Plugs	0	1
Equivalent Plugs	0.000	1.000
Percent Plugged	0.0000%	0.0094 %

4.6 Description of Tube Integrity Assessment

All condition monitoring performance criteria were met during the outage. This conclusion is based on the fact that there were no crack-like indications identified. The amount of denting was not significant enough to perform in-situ testing. All tubing is expected to meet the integrity requirements specified by the performance criteria in NEI 97-06.

4.7 Description of Corrective Actions

There were no corrective actions taken since all tests met the specified criteria.

4.8 Evaluation of Exceeding Condition Monitoring

There were no performance criteria exceeded during 2R14 baseline inspection.

4.9 Item #2 of the Technical Specification (location and percent of wall-thickness penetration for each indication of an imperfection)

There were no tubes identified with percent through wall imperfections.

TABLE 1
SG "A" REPAIR INDICATION LIST FOR 2P00

No.	Row	Line	Indication	Location	Reason for Repair
1	1	145	SAI	01H	-0.18 EC Axial
2	3	31	SAI	05H	-0.35 EC Axial
3	3	45	SAI	01H	+0.63 EC Axial
4	4	128	SAI	01H	-0.20 EC Axial
5	4	160	SAI	02H	-0.33 EC Axial
6	4	160	SAI	01H	-0.35 EC Axial
7	5	141	SAI	02H	-0.07 EC Axial
8	8	114	SAI	01H	+0.70 EC Axial
9	8	144	SAI	02H	-0.67 EC Axial
10	10	136	SAI	02H	-0.36 EC Axial
11	10	136	SAI	02H	+0.24 EC Axial
12	10	142	SAI	01H	+0.83 EC Axial
13	16	148	SAI	02H	-0.64 EC Axial
14	17	53	SAI	02H	+0.32 EC Axial
15	20	148	SAI	02H	-0.67 EC Axial
16	22	116	SAI	01H	+0.72 EC Axial
17	23	59	SAI	01H	+0.73 EC Axial
18	24	64	SAI	01H	+0.23 EC Axial
19	24	136	SAI	01H	+0.09 EC Axial
20	29	67	SAI	01H	+0.24 EC Axial
21	29	107	SAI	02H	-0.75 EC Axial
22	29	107	SAI	02H	+0.18 EC Axial
23	32	68	SAI	01H	+0.58 EC Axial
24	35	75	SAI	02H	+0.39 EC Axial
25	36	20	SAI	01H	+0.68 EC Axial
26	36	90	SAI	02H	+0.80 EC Axial
27	37	87	SAI	01H	+0.67 EC Axial
28	38	102	SAI	01H	-0.50 EC Axial
29	39	61	SAI	01H	-0.65 EC Axial
30	39	153	SAI	02H	+0.57 EC Axial
31	41	83	SAI	02H	-0.20 EC Axial
32	42	58	SAI	03H	+0.50 EC Axial
33	42	110	SAI	01H	+0.74 EC Axial
34	42	126	SAI	02H	-0.45 EC Axial
35	43	137	SAI	02H	+0.38 EC Axial
36	43	153	SAI	03H	+0.66 EC Axial
37	44	52	SAI	01H	+0.69 EC Axial
38	44	64	SAI	01H	-0.73 EC Axial
39	45	117	SAI	01H	+0.43 EC Axial

TABLE 1
SG "A" REPAIR INDICATION LIST FOR 2P00

No.	Row	Line	Indication	Location	Reason for Repair
40	45	123	SAI	01H	-0.46 EC Axial
41	45	123	SAI	01H	+0.26 EC Axial
42	48	68	SAI	01H	-0.31 EC Axial
43	50	84	SAI	01H	+0.77 EC Axial
44	51	151	SAI	02H	+0.20 EC Axial
45	52	86	SAI	01H	+0.70 EC Axial
46	53	35	SAI	01H	+0.74 EC Axial
47	54	88	SAI	02H	-0.27 EC Axial
48	54	134	SAI	01H	+0.52 EC Axial
49	56	44	SAI	01H	+0.47 EC Axial
50	56	134	SAI	01H	-0.71 EC Axial
51	59	77	SAI	01H	-0.12 EC Axial
52	60	124	SAI	02H	-0.25 EC Axial
53	64	124	SAI	02H	-0.26 EC Axial
54	68	44	SAI	01H	+0.61 EC Axial
55	68	44	SAI	01H	-0.36 EC Axial
56	68	116	SAI	01H	-0.77 EC Axial
57	84	104	SAI	01H	+0.72 EC Axial
58	84	104	SAI	01H	-0.52 EC Axial
59	84	118	SAI	03H	-0.28 EC Axial
60	87	83	SAI	01H	-0.47 EC Axial
61	91	65	SAI	01H	+0.58 EC Axial
62	93	31	SAI	02H	+0.43 EC Axial
63	95	143	SAI	03H	+0.82 EC Axial
64	103	127	SAI	01H	-0.41 EC Axial

Legend:

EC - Egg Crate Support
MAI - Multiple Axial Indication
SAI - Single Axial Indication

TABLE 2
SG "B" REPAIR INDICATION LIST FOR 2P00

No.	Row	Line	Indication	Location	Reason for Repair
1	1	29	SAI	03H	-0.41 EC Axial
2	2	24	SAI	01H	+0.62 EC Axial
3	2	24	SAI	01H	+0.15 EC Axial
4	3	145	SAI	02H	+0.59 EC Axial
5	3	145	SAI	03H	-0.61 EC Axial
6	3	151	SAI	01H	+0.56 EC Axial
7	4	40	SAI	04H	-0.24 EC Axial
8	4	122	SAI	01H	-0.39 EC Axial
9	4	122	SAI	02H	-0.62 EC Axial
10	4	122	SAI	02H	+0.56 EC Axial
11	4	138	SAI	02H	-0.58 EC Axial
12	5	19	SAI	02H	+0.23 EC Axial
13	5	41	MAI	01H	+0.71 EC Axial
14	5	41	MAI	01H	+0.52 EC Axial
15	5	41	SAI	04H	+0.50 EC Axial
16	6	112	SAI	02H	-0.50 EC Axial
17	7	21	SAI	01H	+0.77 EC Axial
18	8	26	SAI	03H	+0.08 EC Axial
19	8	150	SAI	02H	+0.63 EC Axial
20	9	29	SAI	02H	+0.71 EC Axial
21	10	34	SAI	01H	+0.79 EC Axial
22	10	126	SAI	01H	+0.64 EC Axial
23	10	140	MAI	01H	-0.49 EC Axial
24	10	140	MAI	01H	-0.57 EC Axial
25	11	17	SAI	02H	+0.67 EC Axial
26	11	37	SAI	01H	+0.54 EC Axial
27	11	39	SAI	01H	+0.59 EC Axial
28	11	147	SAI	02H	-0.58 EC Axial
29	12	26	SAI	02H	+0.51 EC Axial
30	12	138	SAI	04H	+0.19 EC Axial
31	13	107	SAI	02H	+0.72 EC Axial
32	14	34	SAI	02H	-0.53 EC Axial
33	15	27	MAI	03H	+0.45 EC Axial
34	15	27	MAI	03H	-0.22 EC Axial
35	15	115	SAI	01H	-0.38 EC Axial
36	17	33	SAI	01H	+0.63 EC Axial
37	17	53	SAI	02H	+0.17 EC Axial
38	17	127	SAI	02H	+0.57 EC Axial
39	18	30	SAI	01H	+0.89 EC Axial

TABLE 2
SG "B" REPAIR INDICATION LIST FOR 2P00

No.	Row	Line	Indication	Location	Reason for Repair
40	18	148	SAI	01H	-0.74 EC Axial
41	20	32	SAI	02H	+0.80 EC Axial
42	20	34	SAI	03H	+0.76 EC Axial
43	22	16	SAI	01H	+0.50 EC Axial
44	22	114	SAI	01H	-0.57 EC Axial
45	23	145	SAI	02H	-0.45 EC Axial
46	24	130	SAI	01H	-0.54 EC Axial
47	25	131	MAI	02H	+0.82 EC Axial
48	25	131	MAI	02H	+0.62 EC Axial
49	26	30	SAI	01H	+0.68 EC Axial
50	26	38	SAI	01H	+0.33 EC Axial
51	26	44	SAI	03H	-0.62 EC Axial
52	27	131	SAI	02H	-0.41 EC Axial
53	29	33	SAI	01H	+0.02 EC Axial
54	29	47	SAI	02H	-0.11 EC Axial
55	30	58	SAI	05H	+0.64 EC Axial
56	30	138	SAI	01H	+0.63 EC Axial
57	32	122	SAI	01H	+0.58 EC Axial
58	32	140	SAI	03H	-0.14 EC Axial
59	34	48	SAI	02H	+0.18 EC Axial
60	35	63	SAI	02H	-0.46 EC Axial
61	36	68	SAI	01H	-0.29 EC Axial
62	37	37	SAI	01H	+0.68 EC Axial
63	39	75	SAI	02H	-0.20 EC Axial
64	40	60	SAI	01H	+0.45 EC Axial
65	40	86	SAI	02H	+0.43 EC Axial
66	40	108	SAI	01H	+0.48 EC Axial
67	44	52	SAI	01H	-0.40 EC Axial
68	44	80	SAI	01H	-0.23 EC Axial
69	46	50	SAI	02H	-0.40 EC Axial
70	46	54	SAI	02H	-0.54 EC Axial
71	46	54	SAI	02H	+0.31 EC Axial
72	46	90	MAI	01H	-0.63 EC Axial
73	46	90	MAI	01H	+0.02 EC Axial
74	48	40	SAI	02H	+0.79 EC Axial
75	52	52	SAI	01H	+0.17 EC Axial
76	52	60	MAI	02H	+0.70 EC Axial
77	52	60	MAI	02H	+0.75 EC Axial

TABLE 2
SG "B" REPAIR INDICATION LIST FOR 2P00

No.	Row	Line	Indication	Location	Reason for Repair
78	52	106	SAI	01H	-0.66 EC Axial
79	53	49	SAI	02H	-0.20 EC Axial
80	53	59	SAI	01H	-0.24 EC Axial
81	57	115	SAI	02H	+0.74 EC Axial
82	58	76	SAI	03H	+0.29 EC Axial
83	60	62	SAI	01H	+0.52 EC Axial
84	61	67	SAI	03H	-0.26 EC Axial
85	61	129	SAI	01H	+0.71 EC Axial
86	62	62	SAI	03H	+0.72 EC Axial
87	63	85	MAI	01H	-0.29 EC Axial
88	63	85	MAI	01H	-0.52 EC Axial
89	64	126	SAI	04H	+0.37 EC Axial
90	65	69	SAI	01H	+0.26 EC Axial
91	65	85	MAI	01H	+0.44 EC Axial
92	65	85	MAI	01H	+0.18 EC Axial
93	65	105	SAI	02H	+0.38 EC Axial
94	67	107	SAI	02H	+0.55 EC Axial
95	67	117	SAI	01H	+0.46 EC Axial
96	67	121	SAI	01H	-0.39 EC Axial
97	69	41	SAI	01H	+0.81 EC Axial
98	69	135	SAI	05H	+0.66 EC Axial
99	69	141	SAI	03H	+0.81 EC Axial
100	69	141	SAI	03H	+0.32 EC Axial
101	70	104	SAI	01H	+0.68 EC Axial
102	71	101	SAI	01H	+0.70 EC Axial
103	73	109	SAI	03H	+0.53 EC Axial
104	74	62	SAI	01H	+0.55 EC Axial
105	75	99	SAI	01H	+0.00 EC Axial
106	76	100	SAI	01H	+0.70 EC Axial
107	77	75	SAI	01H	+0.63 EC Axial
108	77	95	SAI	01H	+0.69 EC Axial
109	77	109	SAI	01H	+0.15 EC Axial
110	77	121	SAI	01H	+0.50 EC Axial
111	77	123	SAI	02H	+0.25 EC Axial
112	78	62	SAI	02H	+0.82 EC Axial
113	79	45	SAI	01H	-0.33 EC Axial
114	79	75	SAI	01H	+0.22 EC Axial
115	79	133	SAI	01H	+0.85 EC Axial
116	80	98	SAI	02H	+0.55 EC Axial

TABLE 2
SG "B" REPAIR INDICATION LIST FOR 2P00

No.	Row	Line	Indication	Location	Reason for Repair
117	80	104	SAI	02H +0.39	EC Axial
118	80	110	SAI	02H -0.25	EC Axial
119	81	109	SAI	01H -0.66	EC Axial
120	82	52	SAI	03H +0.65	EC Axial
121	82	58	SAI	02H -0.30	EC Axial
122	82	62	SAI	01H +0.38	EC Axial
123	82	96	SAI	02H -0.66	EC Axial
124	82	106	SAI	01H +0.41	EC Axial
125	83	93	SAI	02H +0.24	EC Axial
126	86	82	MAI	02H +0.02	EC Axial
127	86	82	MAI	02H +0.65	EC Axial
128	86	102	SAI	02H +0.66	EC Axial
129	87	59	SAI	01H +0.74	EC Axial
130	87	101	SAI	01H +0.77	EC Axial
131	88	104	SAI	03H +0.65	EC Axial
132	91	67	SAI	02H +0.46	EC Axial
133	92	96	MAI	01H +0.71	EC Axial
134	92	96	SAI	01H +0.61	EC Axial
135	95	99	SAI	02H -0.14	EC Axial
136	96	64	SAI	01H +0.51	EC Axial
137	96	98	SAI	01H -0.81	EC Axial
138	96	120	SAI	02H -0.16	EC Axial
139	98	94	SAI	02H +0.59	EC Axial
140	98	108	SAI	02H +0.18	EC Axial
141	101	55	SAI	01H -0.31	EC Axial
142	103	53	SAI	03H +0.66	EC Axial
143	103	121	SAI	02H +0.43	EC Axial
144	104	94	SAI	02H -0.20	EC Axial
145	105	47	SAI	04H +0.69	EC Axial
146	114	116	SAI	03H +0.37	EC Axial
147	125	55	SAI	02H -0.68	EC Axial
148	127	57	SAI	02H -0.33	EC Axial

Legend:

EC - Egg Crate Support
MAI - Multiple Axial Indication
SAI - Single Axial Indication