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*Energy to Serve Your World*

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U. S. Nuclear Regulatory Commission  
ATTN: Document Control Desk  
Washington, D. C. 20555-0001

Vogtle Electric Generating Plant – Unit 2  
Thirteenth Maintenance/Refueling Outage  
Steam Generator Tube Inspection Report

Ladies and Gentlemen:

In accordance with the requirements of Vogtle Electric Generating Plant Technical Specification 5.6.10, Southern Nuclear Operating Company submits this report of the steam generator tube inspections performed during the Unit 2 thirteenth maintenance/refueling outage (2R13). Entry into Mode 4 occurred on October 15, 2008.

This letter contains no NRC commitments. If you have any questions, please advise.

Sincerely,

A handwritten signature in cursive script that reads "Mark J. Ajluni".

M. J. Ajluni  
Manager, Nuclear Licensing

MJA/TAH/daj

Enclosure: 2R13 Steam Generator Tube Inspection Report

cc: Southern Nuclear Operating Company  
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**2R13 Steam Generator Tube Inspection Report**

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### Vogtle Electric Generating Plant – Unit 2 2R13 Steam Generator Tube Inspection Report

#### Introduction

The 2R13 outage was conducted after cumulative service equivalent to ~17.2 EFPY (effective full power years); the Cycle 13 power generation was ~1.3 EFPY. Analyses based on conservative assumptions used in the Condition Monitoring and Operation Assessments demonstrated that there were no tubes that exceeded the Reg. Guide 1.121 and NEI-97-06 Revision 2 criteria for tube integrity. The steam generator (SG) tubing eddy current inspections and primary analysis were performed by the Steam Generator Maintenance Services Group of the Westinghouse Nuclear Services Division. Secondary data analysis was performed by NDE Technologies under direct contract with Southern Nuclear.

#### 2R13 Inspection Scope

The inspection program required by Revision 7 of the EPRI PWR SG Examination Guidelines is detailed below:

- 100% Bobbin examination of tubes in SGs 1 and 4, full length except for Rows 1 and 2, which are inspected from tube end to TSP#7 from both HL and CL. Row 1 tubes will be scrutinized for suggestions of indications associated with the elevation of the sludge lance monorail that has been associated with tube damage in other plants.
- 50% +Point (mid-range) examination of small radius U-bends (Row 1 and Row 2) in SGs 1 and 4, including all Row 1 and Row 2 tubes that were not +Point inspected in the U-bend during 2R11.
- 50% +Point examination (mid-range) at HL TTS,  $\pm 3$ " in SGs 1 and 4. • +Point tests (mid-range) of Special Interest, HL and CL, of bobbin possible flaw locations (including U-bends). Tubes indicating Seabrook-type U-bend offset behavior with DSIs (TSP indications) that are not confirmed will nonetheless be preventively plugged.
- +Point inspection of expanded tubesheet section BLGs and OXPs in the region TEH+4" to TSH+3"; 50% of SG1 (23 tubes) and 50% of SG4 population (36 tubes). The inspection extent for these tubes is TEH to TSH+3". The sampled extents in SG1 and SG4 for this inspection program include all BLG and OXP locations in this elevation range which were not tested during the 2R11 outage. Tubes actually tested: SG1 = 34 of 46 (74%); SG4 = 63 of 72 (88%).
  - BLG = differential mix diameter discontinuity signal within the tubesheet of 18 volts or greater as measured by bobbin coil probe;
  - OXP = a tube diameter deviation within the tubesheet of 1.5 mils or greater as measured by bobbin coil profile analysis.
- +Point inspection of expanded tubesheet section BLGs and OXPs in the region TEH to TEH+4"; 50% of SG1 (11 tubes) and 50% of SG4 population (56 tubes). The inspection extent for these tubes is TEH to TEH+4". This population was not sampled during past inspections; tubes actually tested: SG1 = 15 of 21(71%); SG4 = 61 of 112 (54%).

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- 40% +Point examination of the tubes in SG1 and SG4 from TEH to TEH+4.03" (the hot leg end of the tube including the tube-end weld) – in response to the replacement of the single-cycle B\* Technical Specification requirements with the single-cycle Interim Alternate Repair Criterion (IARC) Technical Specification requirements, based on mid-outage approval of IARC by the NRC.
- 100% +Point examination of dents/dings  $\geq 2$  volts in U-bends of SG1 and SG4, with the total number of inspected dents and dings to comprise no less than 25% of the total dents and dings  $\geq 2V$  in Vogtle Unit 2 SGs, and with any makeup required to meet the 25% quantity being selected from the HL straight lengths.
- Video inspection of tube plugs in SGs 1 and 4.
- All techniques used were in accordance with EPRI Steam Generator Management Program Pressurized Water Reactor Steam Generator Examination Guidelines, Revision 7 Appendix H.

#### **Damage Mechanisms Found and NDE Techniques Utilized**

The following existing damage mechanisms were seen in Vogtle Unit 2 SGs during 2R13:

- Antivibration bar (AVB) wear was found in SGs 1 (70 locations) and 4 (178 locations). AVB wear is identified during the bobbin inspection except for rows 1 and 2 which are inspected with +Point™ RPC. Fourteen of the AVB wear indications were not seen in 2R11.
- The Volumetric (VOL) indications that were observed were verified as previously present and unchanged from prior inspections. They were inspected with +Point™ RPC.

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#### Service Induced Indication Descriptions

The volumetric (VOL) indications seen previously in SG 1 and SG4 were unchanged in 2R13 and are provided in the table below.

SG	Row	Column	Volts	% Depth	Location
1	1	46	0.24	17	TSH
1	1	78	0.96	19	TSH
1	1	78	0.65	13	TSH
4	12	57	0.17	16	TSH
4	42	93	1.29	24	TSC

The AVB wear identified in Vogtle 2R13 in SG1 and SG4 is provided in the following tables. One tube (SG1 R50C28) was plugged as a result of AVB wear.

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**Vogtle 2 Steam Generator 1 AVB Indications for 2R13**

Row	Column	Location	% Depth	Row	Column	Location	% Depth
29	105	AV2	10	44	94	AV5	12
29	112	AV2	14	46	24	AV4	16
30	10	AV2	12	46	26	AV4	18
30	10	AV6	15	46	32	AV3	17
34	13	AV2	11	46	32	AV4	19
34	13	AV4	13	47	27	AV2	28
34	25	AV1	9	47	36	AV1	13
35	14	AV4	13	47	99	AV2	13
35	74	AV4	13	47	99	AV5	12
37	33	AV3	9	48	27	AV2	15
37	35	AV3	9	48	27	AV3	17
37	39	AV4	9	48	28	AV2	18
41	20	AV1	8	48	96	AV2	9
41	20	AV2	17	49	29	AV6	10
41	20	AV3	11	50	28	AV3	28
41	20	AV4	13	50	28	AV4	44
41	20	AV5	12	50	28	AV6	13
41	20	AV6	8	50	92	AV2	11
41	23	AV5	11	50	93	AV3	12
41	23	AV6	10	53	33	AV4	19
41	27	AV5	12	53	34	AV3	14
42	20	AV2	20	53	34	AV4	13
43	100	AV2	12	53	89	AV5	12
43	100	AV3	17	54	50	AV2	12
43	100	AV4	20	54	50	AV3	11
43	100	AV5	12	54	50	AV4	11
44	22	AV4	17	55	39	AV2	12
44	22	AV6	15	55	39	AV3	12
44	23	AV2	10	55	78	AV1	10
44	23	AV3	16	55	81	AV2	9
44	23	AV4	14	58	53	AV1	14
44	23	AV5	24	58	72	AV1	18
44	27	AV2	9	58	73	AV1	15
44	27	AV3	12	58	75	AV6	16
44	72	AV6	11	59	68	AV1	15

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**Vogtle 2 Steam Generator 4 AVB Indications for 2R13**

Row	Column	Location	% Depth	Row	Column	Location	% Depth
15	36	AV6	12	43	69	AV5	17
15	46	AV1	12	43	71	AV4	12
27	79	AV5	10	43	76	AV5	18
29	14	AV6	9	43	85	AV4	13
30	9	AV5	19	44	29	AV3	16
31	113	AV2	8	44	29	AV4	16
32	109	AV6	10	44	42	AV3	11
34	81	AV1	10	44	42	AV4	18
35	81	AV1	10	44	42	AV5	24
36	13	AV3	10	44	42	AV6	14
36	14	AV2	15	44	44	AV3	16
37	74	AV3	12	44	54	AV1	11
37	79	AV1	11	44	54	AV2	11
37	81	AV1	10	44	54	AV5	18
38	39	AV4	10	44	59	AV1	11
38	79	AV1	10	44	59	AV3	15
38	81	AV1	11	44	59	AV4	13
39	26	AV3	11	44	85	AV3	11
39	64	AV1	15	45	22	AV2	11
39	64	AV2	21	45	22	AV3	13
39	64	AV3	31	45	23	AV2	10
39	64	AV4	16	45	23	AV3	10
39	64	AV6	18	45	23	AV5	11
40	79	AV1	11	45	32	AV3	21
40	106	AV1	11	45	42	AV4	11
40	106	AV3	11	45	58	AV3	19
42	51	AV6	11	45	58	AV4	13
42	56	AV6	13	45	58	AV5	18
42	87	AV3	11	45	66	AV2	17
43	21	AV5	12	45	66	AV5	19
43	22	AV4	12	46	26	AV4	13
43	36	AV2	12	46	26	AV6	15
43	47	AV2	12	46	31	AV3	16
43	51	AV6	12	46	31	AV4	14
43	53	AV3	10	46	31	AV5	17
43	58	AV5	10	46	51	AV6	12
43	65	AV4	15	46	88	AV3	9
43	68	AV3	20	47	36	AV4	11
43	68	AV4	24	47	41	AV2	13
43	68	AV5	23	47	41	AV3	12

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**Vogtle 2 Steam Generator 4 AVB Indications for 2R13 (continued)**

Row	Column	Location	% Depth	Row	Column	Location	% Depth
48	31	AV3	9	52	33	AV6	16
48	31	AV4	13	52	45	AV2	9
48	57	AV3	13	52	45	AV3	14
48	57	AV4	14	52	45	AV4	16
48	57	AV5	20	52	45	AV5	12
48	58	AV4	13	52	66	AV1	10
48	79	AV2	11	52	66	AV2	20
48	79	AV3	9	52	66	AV3	13
48	81	AV1	10	52	71	AV1	11
48	97	AV2	12	52	71	AV2	19
48	97	AV3	11	52	71	AV3	25
49	53	AV3	11	52	72	AV2	27
49	53	AV4	10	52	72	AV3	15
49	83	AV3	17	52	78	AV4	13
49	93	AV4	20	52	85	AV1	11
49	93	AV5	24	53	34	AV2	12
49	96	AV2	13	53	34	AV6	9
50	53	AV3	12	53	36	AV5	12
50	55	AV3	7	53	43	AV1	11
50	70	AV3	16	53	43	AV2	11
51	35	AV4	18	53	43	AV3	34
51	39	AV2	12	53	43	AV4	22
51	39	AV3	11	53	43	AV5	21
51	39	AV4	18	53	43	AV6	11
51	43	AV3	11	53	44	AV3	15
51	43	AV4	14	53	80	AV5	14
51	43	AV5	14	53	89	AV6	12
51	54	AV3	11	54	35	AV4	11
51	54	AV4	23	54	35	AV5	18
51	54	AV5	12	54	35	AV6	12
51	55	AV2	14	54	37	AV1	12
51	55	AV3	24	54	37	AV6	12
51	60	AV3	16	54	83	AV5	11
51	76	AV4	17	55	41	AV5	15
51	76	AV5	14	55	83	AV5	13
51	92	AV1	14	56	42	AV6	11
52	33	AV2	15	56	45	AV4	13
52	33	AV3	18	56	45	AV5	11
52	33	AV4	17	56	47	AV3	19
52	33	AV5	37	56	82	AV2	15

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**Vogtle 2 Steam Generator 4 AVB Indications for 2R13 (continued)**

Row	Column	Location	% Depth		Row	Column	Location	% Depth
57	48	AV2	13		57	78	AV4	11
57	48	AV3	19		57	78	AV6	13
57	48	AV4	13		57	78	AV6	13
57	48	AV5	32		58	47	AV5	11
57	48	AV6	11		58	57	AV3	12
57	71	AV6	14		58	57	AV4	15
57	73	AV2	16		58	75	AV2	11
57	76	AV5	15		59	63	AV6	11
57	78	AV2	14		59	66	AV6	12

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#### **Number of Tubes Plugged**

One tube (SG1 R50C28) was plugged during 2R13.

Total plugging in the Vogtle 2 SGs after 2R13 is as follows:

SG 1 – 6 tubes for a total of .11% tubes plugged  
SG 2 – 12 tubes for a total of .21% tubes plugged  
SG 3 – 4 tubes for a total of .07% tubes plugged  
SG 4 – 21 tubes for a total of .37% tubes plugged

#### **Secondary Side Activities**

FOSAR was performed in both SG1 and in SG4. In SG4, one small wire was removed and eleven small objects were not removed. A loose parts analysis considering the mass, location, and dimensions of the unretrieved items in SG4 confirms that these objects will not cause excessive wear for at least two cycles. In addition, 5 PLP indications with no wear were seen in SG 1. FOSAR in SG 1 confirmed that the locations identified with PLP signals exhibited only sludge agglomerations.

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### Vogtle 2R13 Steam Generator Tube Inspection Report

#### Condition Monitoring Results

No indications were found to exceed the condition monitoring limits specified in the Degradation Assessment.

No tubes exhibited degradation that required in situ pressure testing to demonstrate structural integrity. The tube plugged due to an AVB wear indication exceeded the Tech Spec plugging criteria, but the reported degradation satisfies the Condition Monitoring limit, and therefore the SG Performance Criteria were not exceeded.

There was no primary to secondary leakage during the 2R13 operating cycle. Therefore, the calculated accident leakage, in accordance with the IARC Tech Spec change commitment is zero.

Given the absence of operating leakage during Cycle 13, it is concluded that there was no leakage from plugs. This is consistent with the video inspection of the tube plugs in SG 1 and SG 4 which identified no leakage.

Evaluation of the indications found in the 2R13 inspection indicate that the condition monitoring requirements for structural and leakage integrity as specified in NEI-97-06 Revision 2 are satisfied. No SG tube samples were pulled for laboratory examination during 2R13.