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Energy to Serve Your World℠

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U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
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Vogtle Electric Generating Plant Unit 2
Twelfth 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 twelfth maintenance/refueling outage (2R12). Also included in this report are the results of the chemical cleaning process applied to the Vogtle 2 steam generators during 2R12. Initial entry into Mode 4 occurred on April 18, 2007.

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

Sincerely,

B. J. George
Manager, Nuclear Licensing

BJG/DRG/phr

Enclosure: 2R12 Steam Generator Tube Inspection Report

cc: Southern Nuclear Operating Company
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Vogtle Electric Generating Plant Unit 2

Enclosure

2R12 Steam Generator Tube Inspection Report

Enclosure
Vogtle Electric Generating Plant – Unit 2
2R12 Steam Generator Tube Inspection Report

Introduction

The Vogtle Electric Generating Plant Unit 2 twelfth maintenance/refueling outage (2R12) was conducted after a cumulative service equivalent to ~16 EFPY (effective full power years); the Cycle 12 power generation was ~1.4 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 were performed by the Steam Generator Maintenance Services Group of the Westinghouse Nuclear Services Division. Secondary data analysis was performed by ANATEC under direct contract with Southern Nuclear.

2R12 Inspection Scope

The base scope for 2R12 involved the scheduled inspections listed below in SGs 2 and 3.

- Bobbin examination of the full length of 100% of the tubes except for the U-bends of Rows 1 and 2, which were inspected from tube end to TSP#7 from both HL and CL.
- 50% +Point™ RPC (mid-range) examination of small radius U-bends (Row 1 and Row 2).
- ≥ 50% +Point™ RPC (mid-range) examination top of tubesheet region (TTS) on HL side +/- 3.00" plus areas of special interest arising from the 1R13 inspection (Low Row, High Column area 216 tubes).
- +Point™ RPC (mid-range) tests of special interest, HL and CL, possible bobbin flaw locations (including U-bends).
- 100% +Point™ RPC examination of dents/dings ≥5 Volts in U-bends and hot leg straight length, not previously inspected during the current inspection period.
- 100% +Point™ RPC inspection of expanded tubesheet section bulges (BLGs) and overexpansions (OXPs), TSH-17" to TSH+3" SG 2 (31 tubes) and SG 3 (25 tubes).
- +Point™ RPC examination of areas of special interest related to possible loose parts.
- Visual inspection of tube plugs.

No scope expansions were required during the 2R12 steam generator tube inspection.

Enclosure
Vogtle Electric Generating Plant – Unit 2
2R12 Steam Generator Tube Inspection Report

Damage Mechanisms Found and NDE Techniques Utilized

The following damage mechanisms were discovered in Vogtle Unit 2 SG 2 and SG 3 during 2R12:

- Antivibration bar (AVB) wear was found in SG 2 (116 locations) and SG 3 (26 locations). AVB wear is identified during the bobbin inspection except for rows 1 and 2 which were inspected with +Point™ RPC. Only one of the AVB wear indications was not seen in 2R10.
- One non-pluggable volumetric indication (VOL) was identified in SG 2 by special interest +Point™ RPC testing of a possible bobbin flaw indication.

Service Induced Indication Descriptions

The VOL indication was found during Vogtle 2R12 in SG 2 in the tube at location Row 1, Column 46, at approximately 11 inches above the top of the tubesheet (TTS) on the cold leg (CL) side. This VOL indication data is provided in the following table. The location was visually inspected and no indications of foreign objects were detected. No tubes were plugged as a result of this VOL indication.

SG	Row	Column	Volts	% Depth	Location
2	1	46	.27	21	TSC+10.66 inches (1)

(1) TSC – Tubesheet region on CL side.

The AVB wear data identified during Vogtle 2R12 is provided in the following tables. No tubes were plugged as a result of AVB wear.

Enclosure
Vogtle Electric Generating Plant – Unit 2
2R12 Steam Generator Tube Inspection Report

Vogtle 2 Steam Generator 2 AVB Indications for 2R12

Row	Column	Location	% Depth		Row	Column	Location	% Depth
29	10	AV5	10		58	70	AV2	9
34	12	AV3	7		51	71	AV6	11
36	14	AV4	7		44	72	AV5	15
38	15	AV2	11		51	72	AV2	9
42	19	AV3	14		51	72	AV3	11
42	19	AV4	14		51	72	AV4	9
42	19	AV5	13		51	72	AV5	11
43	20	AV1	9		57	72	AV1	14
43	20	AV2	14		40	73	AV5	15
50	29	AV6	16		40	73	AV6	13
49	32	AV4	13		43	73	AV4	24
52	35	AV6	14		52	73	AV2	9
54	38	AV1	12		52	73	AV3	21
54	38	AV4	10		52	73	AV4	39
38	39	AV3	13		52	73	AV5	29
38	39	AV4	13		52	73	AV6	31
38	39	AV5	19		38	74	AV2	14
39	43	AV2	17		38	74	AV3	17
39	43	AV3	19		38	74	AV4	12
39	43	AV4	15		38	74	AV5	10
39	43	AV5	11		38	74	AV6	9
39	43	AV6	10		42	74	AV2	29
39	44	AV3	10		42	74	AV3	24
39	44	AV5	11		42	74	AV4	11
39	44	AV6	9		42	74	AV5	10
40	48	AV4	19		42	74	AV6	11
40	48	AV5	11		49	74	AV3	21
57	49	AV6	13		51	74	AV3	16
42	50	AV2	13		51	74	AV4	12
42	50	AV3	10		51	74	AV5	9
42	50	AV4	9		51	74	AV6	9
40	54	AV3	12		57	79	AV3	10
59	56	AV4	14		57	79	AV4	10
40	58	AV2	19		38	81	AV2	12
40	58	AV3	30		38	81	AV5	14
40	58	AV4	15		38	81	AV6	10
40	58	AV5	34		56	82	AV5	10
40	58	AV6	12		55	84	AV1	7
40	63	AV3	11		55	84	AV4	11
43	64	AV1	11		54	86	AV4	11

Vogtle 2 Steam Generator 2 AVB Indications for 2R12 (continued)

Row	Column	Location	% Depth		Row	Column	Location	% Depth
51	87	AV2	17		53	90	AV6	10
51	87	AV3	19		49	91	AV2	22
51	87	AV4	21		49	91	AV3	11
51	87	AV5	29		50	91	AV4	12
39	88	AV4	14		51	91	AV3	10
42	88	AV2	11		51	91	AV4	11
53	88	AV4	11		51	91	AV5	13
53	88	AV5	16		51	91	AV6	13
50	89	AV3	11		52	91	AV4	13
50	89	AV4	12		38	100	AV3	14
50	89	AV5	11		36	106	AV3	10
50	89	AV6	11		36	106	AV4	10
51	89	AV4	17		36	106	AV5	12
51	89	AV5	26		36	106	AV6	9
51	89	AV6	17		39	107	AV2	9
51	90	AV4	14		28	115	AV1	13
51	90	AV5	14		28	115	AV6	18
53	90	AV4	10		12	121	AV6	10

Vogtle 2 Steam Generator 3 AVB Indications for 2R12

Row	Column	Location	% Depth		Row	Column	Location	% Depth
32	12	AV2	11		58	49	AV1	13
32	12	AV5	18		58	49	AV5	15
34	13	AV5	18		58	49	AV6	14
41	19	AV4	13		42	53	AV4	8
44	23	AV3	10		39	72	AV2	11
50	29	AV4	10		39	72	AV3	14
48	37	AV3	14		39	72	AV4	12
51	38	AV5	10		41	77	AV4	23
54	38	AV5	17		41	77	AV5	18
57	48	AV4	11		57	78	AV2	10
57	48	AV5	14		56	82	AV2	21
57	48	AV6	16		56	82	AV3	30
57	49	AV4	11		56	82	AV4	21

Number of Tubes Plugged

No tubes were plugged during 2R12.

Total plugging in the Vogtle 2 SGs after 2R12 is as follows:

SG 1 – 5 tubes for a total of .09% 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

Chemical Cleaning

The chemical cleaning process applied to the Vogtle 2 SGs during 2R12 was recognized as part of the planned maintenance activities in the 2R12 Steam Generator Degradation Assessment. The compositions of the iron removal solutions were optimized based on the anticipated sludge and tube deposits inventories. As applied, this chemical cleaning operation incorporated elements of the EPRI/SGOG process and employed several phases, wherein temperature adjustments were made to facilitate dissolution in specific regions of the bundle, such as TSP crevices and the TTS sludge region. Residual iron stage chemicals were removed by multiple rinse operations prior to the copper removal phase of the cleaning process. The process was completed after similar rinse steps following the copper removal step. All four SGs were subjected to chemical cleaning during 2R12.

Condition Monitoring Results

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

The VOL indication in SG 2 did not exceed the plugging criteria or the Condition Monitoring limits as given in the 2R12 Degradation Assessment. Additionally, in situ pressure testing for leakage and for proof of pressure capability was not required since the VOL indication maximum depth does not support a potential for leakage and the bobbin amplitude (1.93 volts) did not approach the leak testing criteria from industry guidelines for wear morphologies.

None of the AVB wear indications in either SG 2 or SG 3 exceeded the plugging criteria. They did not exceed the Condition Monitoring limits as given in the 2R12 Degradation Assessment. The growth rates are essentially negligible.

Evaluation of the indications found during the 2R12 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 2R12.