



October 12, 2019

NRC 2019-0038
TS 5.6.8

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

Point Beach Nuclear Plant Unit 1
Docket No. 50-266
Renewed License No. DPR-24

Spring 2019 Unit 1 (U1R38) Steam Generator Tube Inspection Report

Pursuant to the requirements of Point Beach Nuclear Plant (PBNP) Technical Specification, TS 5.6.8 "Steam Generator Tube Inspection Report," NextEra Energy, LLC is submitting the 180-day Steam Generator Tube Inspection Report. The enclosure to this letter provides the results of the fall 2019, Unit 1 (U1R38) steam generator tube inspections.

This letter contains no new regulatory commitments and no revisions to existing commitments.

Sincerely,

NextEra Energy Point Beach, LLC

A handwritten signature in black ink, appearing to read "Eric Schultz", with a long horizontal flourish extending to the right.

Eric Schultz
Licensing Manager

Enclosure

cc: Administrator, Region III, USNRC
Project Manager, Point Beach Nuclear Plant, USNRC
Resident Inspector, Point Beach Nuclear Plant, USNRC
PSCW

NextEra Energy Point Beach, LLC

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ENCLOSURE

**NEXTERA ENERGY POINT BEACH, LLC
POINT BEACH NUCLEAR PLANT, UNIT 1**

**POINT BEACH UNIT 1
U1R38 STEAM GENERATOR TUBE INSPECTION REPORT**

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Enclosure
Point Beach Unit 1
U1R38 Steam Generator Tube Inspection Report

Introduction:

The enclosed Steam Generator Tube Inspection Report for Point Beach Unit 1 is submitted for the inspection of the SGs during refueling outage 38 (hereafter referred to as the U1R38 inspection or outage), as required by Technical Specification section 5.6.8. After implementation of TSTF-510¹ the 4th ISI period is 72 EFPM per the Point Beach Unit 1 Technical Specification section 5.5.8.d.2.i. The inspection in U1R38 was performed in accordance with Technical Specification 5.5.8.d.2.i, and was the 2nd (and last) inspection of the SGs in the 4th ISI period. The U1R37 refueling outage was a SG inspection "skip". At unit shutdown for the U1R38 inspection, the SGs had operated for approximately 29.98 EFPY (359.76 EFPM) since installation, including 60.2 EFPM in the 4th ISI period. Since the last SG inspection (U1R36), the SGs operated for approximately 1.495 EFPY (17.94 EFPM) and 1.371 EFPY (16.452 EFPM) during fuel cycles 37 and 38, respectively, leading up to the U1R38 inspection. Initial entry into Mode 4 following completion of the U1R38 inspection was made on April 15, 2019.

Point Beach Unit 1 is a Westinghouse 2-loop PWR with Model 44F steam generators. The SGs are U-tube heat exchangers with tube bundles fabricated using thermally treated Alloy 600 tubing. Each SG contains 3,214 tubes arranged in 45 rows and 92 columns, in a square-pitch configuration. Nominal tube OD is 0.875" with a 0.050" nominal wall thickness. Each SG tube bundle is supported by one drilled-hole flow distribution baffle (FDB) and 6 quatrefoil-designed, broached-hole tube support plates (TSPs) all fabricated from stainless steel. Two (2) sets of anti-vibration bars (AVBs) in the U-bends also provide tube bundle support. The inspection of the SGs during the U1R38 outage met the requirements of the Point Beach Unit 1 Technical Specifications, EPRI SGMP: PWR Steam Generator Examination Guidelines Revision 8, and EPRI SGMP: Steam Generator Integrity Assessment Guidelines Revision 4.

Appendix A provides references to recent SG Tube Inspection Reports and acronyms used in this report. Appendix B provides a list of indications reported in U1R38.

A. Scope of Inspections Performed on each SG

The inspection scope for U1R38 met the requirements of Point Beach Unit 1 Technical Specification section 5.5.8. License Amendment 260, H* alternate repair criteria², was implemented in Fall 2017; therefore, the extent of eddy-current (ECT) inspections within the tubesheet was performed to meet the revised requirements which are in Technical Specifications. For all sample inspections, tube selection priority was given to the ones not inspected in U1R36 to meet the sequential period requirements in Technical Specifications. Unless otherwise noted, the defined U1R38 base inspection scope in each SG was:

Primary-side:

- 100% full-length bobbin probe examination of all active tubes except U-bends of Rows 1 and 2.
- 50% sample of tubes in the U-bends of Rows 1 & 2 using the +Point™ probe.
- Peripheral tubes (3 outermost tubes of each row) exposed to the annulus, and Rows 1 and 2 in the tube-free lane were inspected in the HL and CL using the +Point™ probe. The test extent was from the TTS + 3 inches to -3 in below TTS.
- 50% sample of tubes in the HL from +3 inches above the TTS to the H* depth (-20.6 in.) using the +Point™ probe, including 50% of the BLG/OXP within the H* depth (TTS-20.6") of the tubesheet.

¹ Point Beach Nuclear Plant, Units 1 and 2 – Issuance of Amendments for the Steam Generator Technical Specifications, to Reflect Adoption of TSTF-510 RE: (TAC NOS. MF6043 and MF6044); NRC License Amendment 254 and 258; ADAMS Accession No. ML15293A457

² Point Beach Nuclear Plant, Unit 1 - Issuance of Amendment to Approve H*: Alternate Repair Criteria for Steam Generator Tube Sheet Expansion Region; NRC License Amendment 260; ADAMS Accession No. ML17159A778

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- 50% sample of Dings/Dents > 5V in the HL (freespan, TSPs), and the U-bend using the +Point™ probe.
- +Point™ probe inspection of a) all "high stress" (minus 2-sigma) tubes within the HL tubesheet section (TSH+3" to TEH), and b) 75% sample of "high stress" tubes at HL tube support structures and top CL TSP.
- +Point™ probe exam of all tubes adjacent to (1-tube bounding of) previously reported PLP indications and foreign objects reported during FOSAR in U1R36.
- Other special interest/diagnostic exams based on the results of bobbin coil exams including +Point™ probe inspection of all "I-codes" from bobbin.
- Visual inspection of all mechanical and welded plugs.
- Channel head visual inspection, and bowl scan per Westinghouse NSAL 12-1 Rev 1, "Steam Generator Channel Head Degradation," October 2017.

Inspection Expansion: Additional +Point™ probe inspections were performed in SG-A to identify any wear that might have occurred on tubes adjacent to a foreign object (piece of small grade wire) that was found in a quatrefoil flow slot during secondary-side inspection of the top TSP. Apart from this special interest item, no scope expansion was required.

Secondary-side:

- Top-of-tubesheet (TTS) Sludge Lancing in each SG.
- TTS FOSAR performed in the annulus and tube-free lane of each SG. This included TTS in-bundle inspections in each SG.
- Upper tube-bundle visual inspection in SG-A at the top TSP (06H/06C).
- Upper steam drum visual inspection in SG-A. UT thickness measurements were also obtained at sample locations on the feeding T-box, and all J-tubes and moisture separators.

B. Degradation Mechanisms Found

The following degradation mechanisms were identified during the U1R38 inspection:

- Wear at anti-vibration bar (AVB) contact points.
- Wear at broached TSPs.
- Foreign object wear at one location in SG-B above the TTS in the CL.

No degradation was identified as a result of a corrosion damage mechanism.

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C. NDE Techniques utilized for each Degradation Mechanism

Table 1a is the list of the EPRI ETSSs used for degradation detection during the U1R38 ECT inspection.

Table 1a - NDE Detection Techniques for Degradation Mechanisms

Detection probe	ETSS used for Detection	Degradation Mechanism	Location / Applicability
Bobbin	I96041.1 Rev 6	Wear	AVB locations
	96004.1 Rev 13		TSP and FDB locations
	27091.2 Rev 2		Due to foreign objects
+Point™	21998.1 Rev 4		
Bobbin	96005.2 Rev 9	Pitting	In the freespan and sludge pile
	I-28411 Rev 4	Axial ODSCC	At FDB locations
	I-28413 Rev 5		In the freespan
	I-28413 Rev 5		At broached TSPs
	24013.1 Rev 2		At Dents/Dings ≤ 5V
	10013.1 Rev 1		At Dents/Dings > 5V
+Point™	I-28424 Rev 4	Axial/Circ PWSCC	sludge pile/expansion transition
	I-28425 Rev 4		In low row U-bends
	I28424 Rev 4		At BLGs/OXPs
	10411.1 Rev 0	Axial PWSCC	At expansion transition
	96511.2 Rev 16		
	99997.1 Rev 10		
	20511.1 Rev 8		
	20510.1 Rev 7	Circ PWSCC	

Table 1b is the list of the EPRI ETSSs used for degradation sizing based on the degradation mechanisms reported during the U1R38 ECT inspection.

Table 1b - NDE Sizing Techniques for Degradation Mechanisms

Sizing probe	ETSS used for Sizing	Degradation Mechanism	Location / Applicability
Bobbin	I96041.1 Rev 6	Wear	AVB locations
+Point™	96910.1 Rev 11		At broached TSPs
	21998.1 Rev 4		Foreign object wear (volumetric) slightly above TTS

D. Location, orientation (if linear), and measured sizes (if available) of service induced indications

For each SG, Attachment B provides the listing of service-induced indications identified during the U1R38 inspection, including locations and measured sizes. Note:

For AVB wear, the indication depth as measured by the bobbin probe is provided.

For all other locations, the indication depth as measured by the +Point™ probe is provided.

E. Number of tubes plugged during the inspection outage for each degradation mechanism

One tube was plugged based on the U1R38 inspection. This is summarized below in Table 2:

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Table 2 – U1R38 Tubes Plugged

SG	Tube	Degradation Mechanism	Notes
A	R13C49	No tube degradation reported at location of foreign object	Tube was preventively plugged due to presence of a foreign object (small grade wire) within the quatrefoil flow slot. No tube degradation was detected at this location.

F. Number and percentage of tubes plugged to date, and the effective plugging percentage in each steam generator

The number and percentage of SG tubes plugged to-date, and the effective plugging percentage in each SG are summarized in Table 3.

Table 3 - Tubes plugged to-date and effective plugging percentage

	SG-A	SG-B	Total
Tubes Plugged	6	8	14
Percent Plugged	0.19%	0.25%	0.22%

G. Results of Condition Monitoring, including the results of tube pulls and in-situ testing

All indications found in U1R38 satisfy the condition monitoring (CM) requirements of NEI 97-06 and Point Beach Technical Specifications for structural and leakage integrity. No indication exceeded the structural limits. All indications of degradation were screened against the in-situ test selection criteria contained in the EPRI SGMP Steam Generator In-Situ Pressure Test Guidelines, Rev 5, and provided for Point Beach Unit 1 conditions. No tube pulls were performed. The U1R38 inspection results validate the projections and conclusions of the Operational Assessment of the previous inspection at U1R36.

1. Wear at AVB locations has been the dominant mode of degradation for the Point Beach Unit 1 SGs and accounts for the majority of the indications reported (Attachment B). However, all AVB wear indications fell below the Tech Spec limit for plugging (40% TW), and the 95th percentile AVB wear growth rate was determined to be low at approximately 1.5%TW/EFPY. Therefore, since AVB wear indications have a CM limit of 57%, they meet the requirements for CM. The deepest TSP wear indication reported was 16% TW and fell well-below the CM limit of 46%.
2. A FO (volumetric) wear indication sized at 25% TW was reported just above the TTS in the CL of SG-B at tube R11C84. No objects were observed in the vicinity of the tube during FOSAR exams. No wear was identified at any of the locations where PLP signals were reported. The tube which was plugged in U1R38 (FO-related) reported no degradation, and was plugged as a preventive measure. The TTS volumetric indication was below the CM limit (57%) for FO wear.
3. No degradation was detected during the +Point inspection of "high stress" tubes, and the DNG/DNT sample inspection scope. During the +Point™ probe inspection of tubes in the tubesheet, no indication was detected at locations where BLGs/OXPs were located. No corrosion degradation mechanisms were observed during the U1R38 inspection.
4. Channelhead Components Visual Inspection:
 - Tube Plug Inspection: During the inspection of tube plugs in U1R38, all installed plugs were confirmed to be in their correct location. In addition, all plugs were found to be dry; no dripping plugs were identified. No degradation or visible signs of leakage were noted on the plugs during the visual inspection.
 - Other Channelhead Inspections: Visual inspection of various channelhead components were performed to identify degradation per guidance in Westinghouse NSAL 12-1 Rev 1, "Steam Generator Channel Head Degradation" and LR-ISG-2016-01, "Changes to Aging Management Guidance for Various Steam Generator Components." Areas inspected include the divider plate-to-channelhead weld, the weld at the top of the channelhead bowl drain tube, the

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channelhead-to-tubesheet girth weld seam region, the divider plate, and all clad surfaces of the channelhead bowl and tubesheet. The previously-reported rust coloration due to missing cladding at one location³ in SG-B, was again inspected in U1R38. The cladding defect does not appear to be growing and no evidence of rust coloration was observed in U1R38. No other degradation of channelhead components was observed in U1R38.

5. Secondary-side Inspections and Maintenance:

- A total of 21 lbs. of sludge was removed from the 2 SGs based on secondary-side cleaning in U1R38 (10 lbs. in SG-A, 11 lbs. in SG-B). Removal of 2 newly-identified objects (one in each SG) was unsuccessful during FOSAR activities. The objects appear to be a small nail in SG-A and a small piece of gasket material in SG-B. An evaluation determined that the objects can remain in the SG until the next inspection in U1R40. The other FOs remaining in the SGs were mostly small wire bristles and scales. An evaluation is in place for all FOs not retrieved that have the potential to cause tube damage.
- Upper Bundle Inspection: No evidence of blockage or occlusion of the quatefoils was observed during upper tube-bundle visual inspection in SG-A at 06H/06C. Two FOs (small grade wires) were identified within the top TSP quatefoil areas (separate locations); both objects were irretrievable. +Point™ inspection of one of the affected tubes (R13C49 HL) and bounding tubes was added to the "special interest" program and performed at this location; no tube degradation was detected. The tube was preventively plugged. No degradation was identified on the other affected tube (R45C49 CL). An evaluation determined that this FO can remain in the SG until the next SG inspection; the tube will be added to the +Point™ "special interest" items in U1R40.
- Upper Internals Inspection: Visual inspections performed in SG-A (for erosion/corrosion, mechanical damage, foreign material and unusual conditions) included all moisture separators, the feedring and all J-nozzles. UT thickness measurements on the feedring, j-tubes and primary moisture separators revealed no degradation of base material. A light coating of what appears to be magnetite was seen on the moisture separators. No damage or degradation was observed during the inspection of steam drum components.

H. **Primary-to-secondary leakage rate observed in each SG during the previous cycle**

Point Beach Unit 1 has observed primary-to-secondary leakage ranging from 0.0 to 0.08 gpd during the previous 2 fuel cycles (Cycles 37 and 38). This low-level leakage has existed for several cycles, is not increasing, and is conservatively assumed to be from one SG.

I. **Calculated accident induced leakage rate**

As described in the H* alternate repair criteria (ARC) for Point Beach Unit 1, the accident induced leakage rate from the portion of the tubes below 20.6 inches from the TTS is calculated from any observed normal operating leakage that cannot be attributed to a source other than the tubesheet expansion region. For Point Beach Unit 1, the maximum operational primary-to-secondary leakage rate from the portion of the tubes below 20.6 inches from the top of the tubesheet is determined by multiplying any normal operating leakage by a factor of 5.22 to determine the accident induced leakage rate. Based on the maximum observed operational primary-to-secondary leakage (per section H of this report), the calculated accident induced leakage rate from the portion of the tubes below 20.6 inches from the top of the tubesheet is 0.42 gpd ($=0.08 \text{ gpd} \times 5.22$).

J. **Results of monitoring for tube axial displacement (slippage)**

A condition for licensing H* was to monitor for tube slippage within the tubesheet region. Monitoring for tube slippage was completed during the U1R38 inspections. No tube slippage was reported.

³ For a previous discussion of the missing cladding in SG-B, see report in ADAMS Accession No. ML16264A202.

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APPENDIX A - Additional Information

References to recent SG Tube Inspection Reports (SGTIR)

EOC #	Outage	ADAMS Accession No.
EOC-34	U1R34	ML13268A108
EOC-35	U1R35	Inspection "skip" (no SGTIR)
EOC-36	U1R36	ML16264A202
EOC-37	U1R37	Inspection "skip" (no SGTIR)

Abbreviations and Acronyms:

ARC	Alternate Repair Criteria	NEI	Nuclear Energy Institute
AVB	Anti Vibration Bar	NSAL	Nuclear Safety Advisory Letter
BLG	Bulge	OD	Outside Diameter
CL	Cold Leg	ODSCC	Outside Diameter SCC
CM	Condition Monitoring	EXP	Over-expansion
DNG	Ding	PLP	Possible Loose Part
DNT	Dent	PWSCC	Primary Water SCC
ECT	Eddy Current Testing	SG	Steam Generator
EFPM	Effective Full Power Months	SGMP	SG Management Program
EFPY	Effective Full Power Years	TEC	Tune End Cold
EPRI	Electric Power Research Institute	TEH	Tube End Hot
ETSS	Exam Technique Spec Sheet	TS	Tubesheet
FDB	Flow Distribution Baffle	TSC	Tube Sheet Cold
FO	Foreign Object	TSH	Tube Sheet Hot
FOSAR	Foreign Object Search and Retrieval	TSP	Tube Support Plate
HL	Hot Leg	TTS	Top of Tube Sheet
INR	Indication Not Reportable	TW	Through Wall
ISPT	In-Situ Pressure Test	VOL	Volumetric

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Appendix B – U1R38 Listing of Indications

Note: Designation used for tube support structures: TSPs: 01H thru 06H on the HL; 01C thru 06C on the CL.
AVBs: AV1 thru AV4

SG-A

Row	Col	Loc	%TW
11	45	AV1	10
11	53	AV4	9
15	87	AV2	INR
		AV3	INR
19	54	AV1	10
		AV2	22
		AV3	12
		AV4	17
19	61	AV1	13
		AV2	17
		AV4	10
22	8	AV3	INR
		AV4	INR
24	63	AV1	11
		AV2	20
		AV3	19
		AV4	8
24	85	AV2	7
26	83	AV3	10
26	84	AV1	INR
		AV2	INR
27	71	AV2	12
		AV3	16
		AV4	11
29	41	AV2	12
29	81	AV2	8
31	35	AV4	13
31	36	AV4	9
31	63	AV2	16
		AV3	11
31	79	AV3	7
32	14	AV2	5
		AV3	7
		AV4	7
32	68	AV1	13
		AV2	11
32	71	AV2	19
		AV3	14
32	78	AV3	7
32	79	AV1	3
33	18	AV3	22
		AV4	16
33	36	AV3	10

Row	Col	Loc	%TW
		AV4	11
33	37	AV3	9
		AV4	14
33	48	AV3	11
		AV4	11
33	57	AV1	14
		AV2	15
33	66	AV1	21
		AV2	22
		AV3	7
33	71	AV2	19
		AV3	17
34	33	AV1	13
		AV2	18
34	65	AV3	14
		AV4	21
34	69	AV1	11
		AV2	15
35	18	AV2	11
		AV3	12
35	43	AV3	10
		AV4	14
35	56	AV1	26
		AV2	37
37	20	AV4	7
38	22	AV2	8
		AV3	11
		AV4	7
38	43	AV1	29
		AV2-	25
		AV2+	25
38	54	AV3	22
		AV4	10
38	70	AV4	11
39	68	AV2	6
		AV3	6
		AV4	5
39	69	AV3	10
40	25	AV1	8
		AV2	9
		AV3	8
40	27	AV3	6
40	42	AV1	9

Row	Col	Loc	%TW
40	44	AV3	15
40	47	AV3	15
40	66	AV1	7
		AV4	8
42	61	AV1	5
		AV4	10
43	52	AV4	11
43	56	AV4	8
44	54	AV1	6
		AV4	6
45	41	AV1	9
		AV4	11
45	42	AV1	10
		AV4	10
45	43	AV1	10
		AV4	12
45	45	AV4	12
45	49	AV1	7
		AV2	9
		AV4	11
45	50	AV4	11
45	51	AV4	9
45	52	AV2	8
		AV3	9
		AV4	7

Row	Col	Loc	%TW
18	87	02C	12
21	85	02C	15
36	73	02C	8
37	73	01C	8
39	24	03C	14
39	67	02C	11
40	43	03H	9
41	65	02C	16

Enclosure**Appendix B – U1R38 Listing of Indications**

Note: Designation used for tube support structures: TSPs: 01H thru 06H on the HL; 01C thru 06C on the CL.
AVBs: AV1 thru AV4

SG-B

Row	Col	Loc	%TW
14	15	AV3	8
15	87	AV3	8
16	47	AV2	7
16	70	AV2	INR
16	73	AV2	INR
16	77	AV3	INR
17	70	AV3	11
17	79	AV2	10
18	77	AV3	INR
19	36	AV3	7
21	79	AV2	8
		AV3	5
22	58	AV1	6
		AV2	20
		AV3	16
		AV4	15
23	33	AV1	10
		AV2	17
		AV3	20
		AV4	5
23	79	AV2	8
23	86	AV2	8
		AV3	9
24	13	AV2	6
25	23	AV3	INR
26	28	AV2	8
27	82	AV2	9
28	13	AV2	7
28	41	AV4	7
28	79	AV2	9
29	13	AV2	4
29	40	AV2	7
29	55	AV1	13
		AV3	6
31	25	AV4	7
32	14	AV2	8
32	32	AV3	12
		AV4	9
32	44	AV3	4
32	46	AV1	5
		AV2	17
		AV3	19

Row	Col	Loc	%TW
		AV4	14
32	49	AV1	18
		AV2	17
32	70	AV1	13
		AV2	15
33	16	AV1	5
		AV3	9
33	17	AV2	7
33	71	AV1	20
		AV2	12
		AV3	8
34	17	AV2	9
34	18	AV2	8
34	75	AV2	10
35	18	AV2	8
35	24	AV4	9
36	73	AV2	11
36	74	AV1	7
		AV4	7
37	73	AV3	11
38	22	AV1	9
		AV2	9
39	69	AV2	7
		AV3	8
41	29	AV1	8
		AV4	7
42	31	AV4	11
42	32	AV1	11
42	33	AV1	7
42	58	AV1	10
42	59	AV1	10
43	59	AV4	7
44	50	AV3	8
44	54	AV1	9
		AV3	7
45	44	AV1	8
		AV2	6
45	46	AV1	9

Row	Col	Loc	%TW
5	45	05C	10
34	18	01H	15
38	22	04C	12
39	69	01C	12
11	84	TSC	25