



Entergy Nuclear Northeast
Entergy Nuclear Operations, Inc
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December 19, 2002

Re: Indian Point Unit No. 2
Docket No. 50-247
NL-02-161

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Mail Stop O-P1-17
Washington, DC 20555-0001

Subject: Steam Generator Inservice Examination Program Results
2002 Refueling Outage (2R15)

Reference: ENO letter to NRC, "Proposed Steam Generator Examination Program – 2002
Refueling Outage (2R15)," dated August 21, 2002

Dear Sir:

Enclosed is a report of the Steam Generator Examination Program Results conducted at Indian Point Unit 2 during the 2002 refueling outage (2R15), submitted pursuant to Technical Specification 4.13.C.2.

No new regulatory commitments are being made by ENO in this correspondence.

Should you or your staff have any questions regarding this matter, please contact Mr. John McCann, Manager, Licensing at (914) 734-5074.

Sincerely,

A handwritten signature in black ink, appearing to be "Fred Dacimo".

Fred Dacimo
Vice President - Operations
Indian Point 2

Attachment

ADD1

cc: Mr. Hubert J. Miller
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ATTACHMENT 1 TO NL-02-161

Steam Generator Examination Program Results
2002 Refueling Outage (2R15)

Entergy Nuclear Operations, Inc.
Indian Point Unit No. 2
Docket No. 50-247

Indian Point Unit 2
Steam Generator Examination Program Results
2002 Refueling Outage (2R15)

1.0 Examination Program Description

Details of the Indian Point Unit 2 steam generator tube inservice examination program to be conducted during the fifteenth refueling outage were submitted to the NRC via ENO letter dated August 21, 2002. The original examination scope is described in Section 2 below. This original scope was subsequently expanded during the outage, to include all periphery tubes in the cold leg inspection. This change was primarily due to finding two (2) confirmed loose parts with Rotating Pancake Coil (RPC) at the top of tubesheet (TTS) hot leg. The results and conclusions of the full examination scope are provided in Sections 3 and 4 respectively.

2.0 Examination Scope

a. Steam Generator Tube Eddy Current Examination

The Indian Point Unit 2 Fall 2002 steam generator eddy current inspection was the first inservice inspection for the replacement steam generators, which were installed in December of 2000. All bobbin full length tests, TTS RPC, low row U-bend RPC, and hot leg special interest tests were collected on the hot legs first, and then the robots were moved to the cold legs to finish the straight section bobbin and special interest tests on the cold legs.

The original planned inspection programs consisted of the following:

- Full-length bobbin coil test of 100% of the open tubes in all four steam generators, except for the U-bend sections of rows 1 and 2, which were tested with the rotating plus point coil.
- 3-Coil Rotating Probe inspection of approximately 26-27% (20% random plus all peripheral tubes) of the Top of Tubesheet (TTS) intersections in the Hot Leg of each SG. The extent of each TTS exam was -3" to +3" as a minimum.
- 100% row 1, and 2 U-bends were inspected with a mid-range +Point coil. Both primary and secondary analysts monitored noise values at the apex of each U-bend and were reviewed by lead analyst.
- 100% of dings and dents ≥ 5.0 volts from bobbin were inspected with +Pt RPC. This accounted for a total of 23 tests.

Additionally, a series of special interest +Point MRPC exams were planned, which included all "I" codes, and other codes of interest from the bobbin exam.

Additional testing (scope expansion) included the following:

- There were a total of 991 RPC special interest tests of bobbin signals. The actual number of bobbin “I” codes tested was 1074 (some tests covered multiple “I” code signals). An “I” code from bobbin was reported when either the signal was not present in the baseline or had changed from baseline history. The large number of signals that changed from history was due to the fact that this was the first operating cycle of the generators; therefore, the first time heat was applied to the tubes. Steam generators with thermal treated I600 tubing throughout the industry are well known to contain many benign signals which change rapidly after the first cycle and not as much in subsequent cycles, so the large number of RPC tests which needed to be performed, was not unexpected.
- A total of 51 tubes were RPC tested at the top of tube sheet to bound all tubes with Possible Loose Parts.
- Due to finding two (2) confirmed loose parts with RPC at the top of tubesheet hot leg, ENO added all peripheral tubes on the cold leg side to the RPC top of tube sheet inspection program. This was a total of 1080 tubes.

b. Secondary Side Examination

The steam generator secondary side examination plan assesses steam generator internals, both in-bundle and steam drum, and top of tubesheet regions. Visual inspection is utilized to assess the presence of loose parts or other steam generator secondary side component conditions that could affect the structural integrity of the primary boundary and leak tightness.

The secondary side inspection incorporated sludge lancing and foreign object search and retrieval (FOSAR). In-bundle inspection was performed in approximately every fifth column. The upper bundle inspection was performed by looking up from the bottom on all four steam generators. Also for one steam generator, the inspection port located above the top support plate was removed, and an inspection looking downward was performed.

c. Steam Generator Sludge

The sludge removed from the steam generator tubesheets during 2R15 by lancing operations is being analyzed.

3.0 2002 Examination Results

a. Steam Generator Tube Eddy Current Examination

Inspection Results- Overall Summary

Anti vibration bar (AVB) wear was reported during the 2R15 inspection. Thirteen tubes contained AVB wear indications $\geq 9\%$ with the highest percentage wear measured at 20% in 3 locations over 2 tubes.

3 Volumetric (VOL) indications were found in the free span of the tubes and measured using the EPRI qualified sizing technique #21998.1 for the Plus Point Probe. None measured $>19\%$.

Steam generator inspections were performed in accordance with the EPRI PWR Steam Generator Examination Guidelines, Rev. 5, and all applicable requirements of Station Administrative Order (SAO)-180, "Administrative Steam Generator Program Plan," Rev. 4.

Table 1 summarizes the overall inspection results.

Inspection Results - Possible Loose Parts Indications

No wear was found on any tubes due to Possible Loose Parts (PLP). All PLP reported during the 2R15 inspections were detected by the +PT RPC and all were reported on top of the tube sheets. It is sometimes difficult to distinguish sludge from a loose part with eddy current, therefore reporting a PLP with eddy current indicates only the possibility of a loose part present and does not indicate that a loose part is present for certain.

In SG 24, four adjacent tubes were reported originally by RPC on the top of the tubesheet hot leg. The tubes were R37 C22, R38 C22, R37 C23, and R38 C24. As a result of these reported PLP calls, a 2.5" long piece of metal bracket was removed from that area. When the tubes were retested with +PT after the removal of the part, the indications were no longer present from eddy current.

All other PLP calls reported from eddy current were visually checked on the secondary side. As a result, one other loose part was found wedged between tubes in SG 21 on the hot leg Top of Tubesheet and in the periphery of the steam generator, however could not be removed. Westinghouse performed an evaluation to leave the tubes with PLP indications in service. None of the PLP locations showed any sign of tube wear from +PT testing. All tubes adjacent to PLP calls were tested with +PT RPC to bound all PLP indications.

Table 2 summarizes all PLP calls remaining in the database.

Inspection Results - Tubes Plugged

A total of 16 tubes were administratively plugged during the 2R15 inspection with Westinghouse (W) mechanical plugs fabricated from Alloy 690. A total 13 tubes were plugged due to AVB wear and 3 tubes were plugged due to volumetric indications. None of the tubes plugged met EPRI Rev. 5 criteria for requiring repair. No crack-like indications were reported.

The qualified bobbin sizing standard contains only single sided wear. All three 20% bobbin indications at AVB locations were tested with +Pt RPC and confirmed as double sided wear. Therefore, the qualified bobbin sizing technique that was used overestimated the 20% calls. In addition, 2 other < 20% bobbin calls at the AVB's were tested with +Pt and confirmed as wear (single sided).

Table 3 summarizes the plugged tubes.

b. Secondary Side Examination Results

Foreign Object Search and Retrieval (FOSAR) procedures were conducted in the steam generators around the annulus and within the tube bundle during 2R15. Various loose objects were observed during FOSAR and eddy current of the tubesheet region of the steam generators. Some of these objects were removed; however, some were not removed due to the small size of the objects and the time and personnel exposure required to do so. Secondary side inspections after sludge lancing included a visual (by camera) inspection of the peripheral and tube lanes on the tubesheet. Objects found were removed in this area. Additionally a visual inspection was performed at every fifth column. This was where the remaining loose parts were located. The remaining items were evaluated for wear rates on adjacent tubes. The evaluation concluded that the Indian Point Unit 2 steam generators may be returned to service with the identified items, and that operation during Cycles 16 and 17 with these foreign objects would not involve a change to any Technical Specification, and would not represent an unreviewed safety question in accordance with 10CFR 50.59

c. Steam Generator Sludge

Sludge was removed from each of the steam generators by lancing. The sludge is being analyzed. The quantities are listed in Table 5.

4.0 Conclusions

This report provides a summary of the Indian Point Unit 2 steam generator tube integrity condition as determined during the 2R15 refueling outage by NDE inspection and a projection by analysis of the tube integrity until the next planned steam generator inspection. The next inspection is planned for 2R17, which is following the completion of two fuel cycles. All of the activities reported in this report have been conducted in accordance with NEI 97-06 Revision 1 and associated guidelines.

The 2R15 represents the end of the first fuel cycle after steam generator replacement, consequently all four steam generators were inspected. A Condition Monitoring assessment was performed, on a defect specific basis, to demonstrate compliance with integrity criteria by the comparison of 2R15 NDE measurements with calculated burst and leakage integrity limits. Calculated integrity limits, including consideration for appropriate uncertainties, burst and leak analytical correlations, material properties, and NDE technique and analyst uncertainties were provided in the degradation assessment report. All indications in this inspection were below the calculated integrity limits and therefore met integrity requirements without further testing. Based upon the inspection results, all four steam generators were found in compliance with Condition Monitoring requirements.

A preliminary Operational Assessment for assumed operation duration of 4.0 EFPY for Cycle 16 and 17 confirms that the steam generator tube structural and leakage integrity will be maintained until the next planned steam generator inspection.

The 2R15 steam generator tube inservice examination demonstrates that the Indian Point Unit 2 steam generators are acceptable for continued service at full power. A Conditioning Monitoring Assessment performed for Indian Point Unit 2 has established the end of cycle structural and leakage integrity of the steam generator tubing.

Table 1
Inspection Results- Overall Summary

Bobbin Coil Results					
Indication	SG-21	SG-22	SG-23	SG-24	Total
1-19%	11	1	4	7	23
20-39%	2	0	1	0	3
>=40%	0	0	0	0	0
NQI	2	0	1	0	3
PID	6	1	2	4	13
DNS	10	12	11	5	38
DSS	3	0	1	1	5
NQS	287	335	153	246	1021
Total "S" Codes	300	347	165	252	1064
BLG	1	1	1	0	3
DNG < 2.00 Volts	1	9	1	2	13
DNG 2.00 - 4.99 Volts	100	57	58	51	266
DNG >= 5.00 Volts	2	4	3	1	10
Total DNG	103	70	62	54	289
DNT < 2.00 Volts	0	0	0	0	0
DNT 2.00 - 4.99 Volts	75	8	65	13	161
DNT >= 5.00 Volts	3	1	15	2	21
Total DNT	78	9	80	15	182
FSA	31	44	30	49	154
FSD	288	250	225	245	1008
DNR	0	6	2	1	9
INR	155	60	120	81	416
INF	2	6	2	7	17
PVN	7	5	1	5	18
Total Bobbin Results	986	800	696	720	3202
+Point Inspection Results					
Indication	SG-21	SG-22	SG-23	SG-24	Total
1 - 19%	2	0	1	0	3
VOL	10	0	4	0	14
PID	2	0	1	0	3
PLP	6	1	1	0	8
PVN	4	0	1	0	5
DNT	0	1	0	0	1
TRA	2	1	0	0	3
NDF	310	371	188	262	1131
Total +Point Results	336	374	196	262	1168
All Probes	1322	1174	892	982	4370

Table 2
Summary of Possible Loose Part (PLP)

SG	ROW	COL	CODE	Location	Result of Visual Search
21	44	43	PLP	TSH +0.42"	No Part Visible
21	45	43	PLP	TSH +0.21"	No Part Visible
21	44	44	PLP	TSH +0.04"	No Part Visible
21	1	47	PLP	TSH +0.04"	No Part Visible, possible sludge deposits
21	42	59	PLP	TSH +0.07"	Part wedged between tubes. Removal not possible.
21	42	60	PLP	TSH +0.27"	Part wedged between tubes. Removal not possible.
22	1	47	PLP	TSC +0.12"	No Part Visible, possible sludge deposits
23	1	46	PLP	TSC +0.20"	No Part Visible, possible sludge deposits

Table 3
Locations of Indications Plugged

SG	ROW	COL	Location	Reason for Plugging
21	16	28	5H + 5.63"	18% Volumetric Indication (sized by +Pt)
21	44	43	AV3, AV4	WEAR 9% AV3, 10% AV4
21	45	45	AV1, AV2, AV3, AV4	WEAR 17% AV1, 20% AV2, 20% AV3, 14% AV4
21	38	47	AV2, AV3	WEAR 13% AV2, 16% AV3
21	45	47	AV1, AV2	WEAR 14% AV1, 18% AV2
21	28	50	AV3, AV4	WEAR 10% AV3, 14% AV4
21	21	56	TSH + 18.39"	18% Volumetric Indication (sized by +Pt)
21	28	79	AV3	WEAR 12% AV3
22	39	37	AV3	WEAR 10% AV3
23	27	33	5H + 37.98"	19% Volumetric Indication (sized by +Pt)
23	41	46	AV1, AV2, AV3, AV4	WEAR 12% AV1, 17% AV2, 20% AV3, 17% AV4
23	41	61	AV3	WEAR 13% AV3
24	41	41	AV2, AV3, AV4	WEAR 14% AV2, 15% AV3, 16% AV4
24	34	51	AV2	WEAR 12% AV2
24	36	64	AV3, AV4	WEAR 11% AV3, 12% AV4
24	36	66	AV1	WEAR 11% AV1

Table 4
Summary of Tubes Plugged

SG	Plugged in 2002	Previously Plugged	Total Plugged	Percent Plugged
21	8	0	8	0.25 %
22	1	0	1	0.03 %
23	3	0	3	0.09 %
24	4	2	6	0.19 %
Total	16	2	18	0.14 %

Notes:

All tubes were plugged on both the hot and cold legs.

All tubes plugged in 2002 used Westinghouse (W) mechanical plug fabricated from Alloy 690.

All tubes previously plugged used (W) welded plug fabricated from Alloy 690.

Table 5
Sludge Removed (November 2002)

SG	2002
21	13 lbs
22	8 lbs
23	10 lbs
24	11 lbs
Total	42 lbs

Table 6
Eddy Current Data Acronyms

3-Letter Code	Description
BLG	Bulge
DNG	Ding
DNR	Ding With Rotation
DNS	Ding Signal
DNT	Dent
DSS	Distorted Support Signal
FSA	Freespan Absolute Signal
FSD	Freespan Differential Signal
INF	Indication Not Found
INR	Indication Not Reportable
NDF	No Degradation Found
NQI	Non Quantifiable Indication
NQS	Non Quantifiable Signal
PID	Positive Identification
PLP	Possible Loose Part
PVN	Permeability Variation
TRA	Trackable Anomaly
VOL	Volumetric Signal