Entergy

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PNP 2011-063

September 26, 2011

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

SUBJECT: Response to Request for Additional Information – Steam Generator Tube Inspection Report

Palisades Nuclear Plant
Docket 50-255
License No. DPR-20

References:
1. Entergy Nuclear Operations, Inc. letter to NRC dated April 25, 2011, 2010 Steam Generator Tube Inspection Report (ADAMS Accession Number ML11119A040)
2. NRC e-mail dated August 1, 2011, Palisades Nuclear Plant – SG Tube ISI Report – RAIs – ME6102 (ADAMS No. ML112170066)

Dear Sir or Madam:

Entergy Nuclear Operations, Inc. (ENO) submitted Reference 1 to the Nuclear Regulatory Commission (NRC) providing the results from steam generator tube inspections conducted during the 2010 refueling outage. ENO received an electronic request for additional information (RAI) from the NRC in Reference 2. ENO and the NRC held a conference call, on August 25, 2011, to clarify the RAI.

Attached is the ENO response to the RAI.

This letter contains no new or revised commitments.

Sincerely,

owg/jlk

Attachment: 1. RAI Response on 2010 Steam Generator Tube Inspection Report

cc: Administrator, Region III, USNRC
Project Manager, Palisades, USNRC
Resident Inspector, Palisades, USNRC

ATTACHMENT 1
RAI RESPONSE ON 2010 STEAM GENERATOR TUBE INSPECTION REPORT

Request for additional information received by electronic mail August 1, 2011

Nuclear Regulatory Commission (NRC) Request

1. *Please clarify the following sentence on page 3: "No leakage was predicted for either operating or accident conditions for the 2009 to 2010 operating cycle due to observed SG [steam generator] tube degradation in the 2010 refueling outage."*

Entergy Nuclear Operations, Inc (ENO) Response

1. This sentence should be deleted. A revised page 3 is enclosed. The Palisades Technical Specifications Section 5.5.8b.1. steam generator tube structural integrity performance criterion was satisfied. Technical Specifications Section 5.5.8b.2. steam generator tube integrity accident induced leakage performance criterion was also satisfied. Steam generator leakage did not exceed the 0.3 gallon per minute (gpm) limit. Primary-to-secondary leak rate measured, using condenser off-gas (Xenon-133 or Xenon-135), was <0.001 gpm for the 2009 to 2010 operating cycle (cycle 21), with a slightly decreasing trend over the cycle.

NRC Request

2. *Please confirm the "Inspection Period EFPM [Effective Full Power Months]" for refueling outage 21 in Table A. It would appear that the correct value is 56.0 EFPM rather than 64.2 EFPM.*

ENO Response

2. The correct value is 56.0 EFPM. A revised Table A is enclosed.

NRC Request

3. *It appears that two freespan crack-like indications were detected during the 2010 outage (SG A, row 2 column [1]21 and SG B row 85, column 44). These indications were presumably associated with dings. Please discuss the size (voltage amplitude) of the dings associated with these indications. If the voltage amplitude of the dings is near 5.0 volts, please discuss the basis for not expanding the rotating probe examinations to include dings whose voltage amplitude is less than or equal to 5.0 volts.*

ENO Response

3. In SG A, row 2 column 121:
The bobbin coil inspection was not performed, due to the small radius of the tube. As a result, there is not a voltage associated with the indication. An axial stress corrosion crack (SCC) indication was detected in the U-bend region. Originally, due to the ovality of the tubing, it was dispositioned as having a ding. Upon further review, a ding-like signal response is not detectable with the +Pt examination. Due to the eddy current characterization of the large horizontal component in the small radius U-bend, a ding could not be identified. Scope expansion included all row three U-bend tubes, which were tested with the +Pt, and no further indications were reported. Therefore, the characterization of this indication is an axial crack in the small radius U-bend.

In SG B, row 85 column 44:
One free span ding crack was reported. This tube contained numerous dings greater than 5.0 volts in the 06H to 07H span. An axial outside diameter stress corrosion crack (ODSCC) indication was reported at an elevation coincident with a 3.14 volt ding. Review of the bobbin data indicates that a reportable bobbin signal (0.82 volt, 152 degrees phase angle) which meets the Palisades guidelines flowchart and the EPRI examination technique specification sheet, ETSS No. 24013.1, was present at this location but not reported. A review of the less than 5.0 volt dings was performed to ensure no other indications meeting the guidelines were present. No additional indications were detected in this review. The bobbin voltage amplitude of the ding was not near the 5.0 volt limit for detection, therefore, no further +Pt inspection was required.

NRC Request

4. Please discuss the nature of the single volumetric indications listed in Table 4A. Are these wear indications attributed to loose parts?

ENO Response

4. As described below, two tubes in each steam generator had single volumetric indications (SVI), which are attributed to loose parts. These four tubes were stabilized and plugged. A third tube in SG B was preventatively plugged because it is next to a loose part.

Two tubes in SG A, row 129 column 62, and row 131 column 62, had wear associated with a possible loose part (PLP) reported approximately two inches above the hot leg top of tube sheet. Since the loose part could not be removed, the two tubes were reported as SVI, stabilized, and plugged.

Two tubes, in SG B, row 110 column 35, and row 111 column 36, had wear associated with a PLP reported approximately 1.5 inches above the cold leg top of tubesheet. Since the loose part could not be removed, the two tubes were reported as SVI, stabilized, and plugged.

A third tube in SG B, row 109 column 36, identified in Table 6 as SVI had no volumetric indication, but was identified as next to a loose part, and was preventatively stabilized and plugged.

NRC Request

5. In Table 4A, there are some depths that are greater than 100-percent through-wall. Please clarify.

ENO Response

5. The column in Table 4A labeled "+Pt Depth Voltage" was labeled incorrectly and does not indicate percent through-wall. The values in this column represent the circumferential extent around the tube (in degrees) and are only valid for the circumferential indications reported. The column titled "Length Axial (Ax) inch" represents the length of the axial indications (in inches) and are not relevant to the circumferential indications. The Westinghouse ANSER software automatically includes both the circumferential and axial measurements regardless of the flaw orientation. Only the number relevant to the particular indication is used to assist in the tube integrity evaluation by engineering. Both columns, "+Pt Depth Voltage," and "Length Axial (Ax)," should not have been included in the report and have been removed in the revised Table 4A that is enclosed. There are no greater than 100% through wall indications in the Palisades steam generator inspection database.

NRC Request

6. Please discuss whether any secondary side inspections other than foreign object search and retrieval were performed. If secondary side inspections were performed, please summarize the results.

ENO Response

6. There were no secondary side inspections completed in the 2010 refueling outage other than the foreign object search and retrieval.

NRC Request

7. In Table 3, there is reference to wear from tube-to-tube contact. This wear appears to be limited to the square bend region. Was any such wear observed during this inspection? If so, please discuss the extent of the degradation (number and size).

ENO Response

7. Table 3 is the technique table for the various damage mechanisms. Tube-to tube wear was not observed in the 2010 refueling outage.

   The tube-to-tube wear discussed in Table 3 was observed in the 2007 refueling outage. A tube in SG A, row 136 column 77, was identified with apparent tube to tube wear. The adjacent tube was already plugged for a wear indication. Therefore, the tube, in row 136 column 77, was preventatively stabilized and plugged.

ENCLOSURE

ERRATA information

Replacement Information for the Steam Generator Inspection Report for the Refueling Outage

Report Page 3,

Report Table A,

and

Report Table 4A

Changes to the information submitted in the 2010 Steam Generator Tube Inspection Report submitted on April 25, 2011, are indicated by vertical lines in the right hand column.

Inspection Summary

Palisades Technical Specification (TS) 5.6.8, Steam Generator Tube Inspection Reports, requires Entergy Nuclear Operations, Inc. (ENO), to submit a report to the NRC within 180 days after initial entry into mode 4 following a steam generator inspection performed in accordance with Specification 5.5.8, Steam Generator (SG) Program. The report shall include:

a. The scope of inspections performed on each SG (Table 1),
b. Active degradation mechanisms found (Table 2),
c. Nondestructive examination techniques utilized for each degradation mechanism (Table 3),
d. Location, orientation (if linear), and measured sizes (if available) of service induced indications (Tables 4A, 4B and 4C),
e. Number of tubes plugged during the inspection outage for each active degradation mechanism (Table 5),
f. Total number and percentage of tubes plugged to date (Table 5),
g. The results of condition monitoring, including the results of tube pulls and in-situ testing, (Table 6), and
h. The effective tube plugging percentage for all plugging in each SG (Table 5).

ENO performed an inspection of its two Combustion Engineering (CE) SGs in October 2010 during refueling outage 1R21. This inspection was the 13th in-service inspection (ISI) following SG installation in 1990 and the 4th of four scheduled inspections in the third sequential inspection period. The unit initially entered mode 4 following this inspection on October 27, 2010.

The TS section 5.5.8b.1. steam generator tube integrity structural integrity performance criterion was satisfied. The TS section 5.5.8b.2. steam generator tube integrity accident induced leakage performance criterion was satisfied. Leakage did not exceed the 0.3 gallon per minute (gpm) accident induced leakage limit. Primary-to-secondary leak rate measured using condenser off-gas (Xenon-133 or Xenon-135) was <0.001 gpm for operating cycle 21 with a slightly decreasing trend over the cycle.

All plugs installed in the Palisades SGs post-operation are Westinghouse ribbed mechanical plugs, which are leak-tight for all plant conditions. The Palisades SGs also contain 308 tubes plugged pre-service in SG E-50A, and 309 tubes plugged pre-service in SG E-50B. Of the tubes plugged pre-service, one tube in SG E-50A and four tubes in SG E-50B are plugged using welded plugs, which are leak tight. The remaining tubes plugged pre-service are plugged using CE roll plugs, which are also designed to be leak tight for all plant conditions.

Table A

Refueling Outage (RFO) Information since Steam Generator Replacement

RFO No.	Year	Cycle EFPD	Cycle EFPM	Replacement SG Cumulative EFPM	Inspection Period EFPM	Sequential Inspection Period	Notes
8	1990/ 1991	NA	NA	0.0	NA	NA	SG Replacement
9	1992	298.5	9.8	9.8	0.0	NA	1st ISI both SG
10	1993	356.8	11.7	21.5	11.7	First	ISI both SG
11	1995	430.5	14.1	35.6	25.9	First	ISI both SG
12	1996	407.4	13.4	49.0	39.3	First	ISI both SG
13	1998	419.6	13.8	62.8	53.0	First	ISI both SG
14	1999	449.3	14.8	77.6	7.8	Second	ISI both SG
15	2001	401.3	13.2	90.8	21.0	Second	ISI both SG
16	2003	444.3	14.6	105.4	35.6	Second	ISI both SG
17	2004	493.1	16.2	121.6	51.8	Second	ISI both SG
18	2006	487.9	16.0	137.6	7.8	Third	ISI both SG
19	2007	459.3	15.1	152.7	22.9	Third	ISI both SG
20	2009	499.8	16.4	169.1	39.3	Third	ISI both SG
21	2010	507.7	16.7	185.8	56.0	Third	ISI both SG

EFPD = effective full power days
EFPM = effective full power months

Table 4A Location and Measured Sizes of Service Induced Indications

SG	Row	Column	+Pt Volts	IND	Location	Elevation
A	2	121	0.29	SAI	05H	9.06
A	2	151	0.19	SAI	02H	0.02
A	4	59	0.54	SAI	01H	0.41
A	4	111	0.19	SAI	01H	0.45
A	5	106	0.36	SAI	01H	0.12
A	7	114	0.16	SAI	01H	-0.57
A	7	114	0.24	SAI	01H	0.41
A	7	114	0.32	SAI	02H	0.78
A	9	150	0.44	SAI	02H	-0.23
A	10	55	0.25	SAI	01H	-0.69
A	10	61	0.16	SAI	01H	-0.74
A	10	107	0.08	SAI	03H	0.83
A	11	48	0.26	SAI	01H	-0.23
A	11	130	0.2	SAI	02H	0.18
A	12	119	0.3	SAI	01H	0.59
A	12	125	0.3	SAI	01H	0.74
A	13	44	0.7	SCI	TSH	-5.87
A	13	44	0.68	SCI	TSH	-5.1
A	14	109	0.3	SAI	01H	-0.31
A	16	141	0.2	SCI	TSH	-0.05
A	17	108	0.34	SAI	01H	0.81
A	24	113	0.59	SCI	TSH	-1.6
A	27	50	0.48	SAI	TSH	0.49
A	29	54	0.37	SCI	TSH	0
A	29	110	0.19	SAI	01H	0.31
A	32	111	0.22	SAI	01H	0.42
A	36	33	1.06	SCI	TSH	-8.34
A	39	116	0.23	SAI	TSH	0.69
A	47	100	0.74	SCI	TSH	-12.99
A	47	110	0.35	SAI	01H	0.26
A	48	47	2.37	PCT	VS4	0.81
A	70	39	0.24	SAI	01H	0.53
A	70	77	0.51	SCI	TSH	0.07
A	71	70	0.22	SAI	01H	0.52
A	71	94	0.51	SAI	TSH	0.36
A	73	82	0.2	SCI	TSH	-0.01
A	74	77	0.48	SCI	TSH	-0.06
A	77	100	0.51	SAI	TSH	0.38
A	78	93	0.2	SAI	TSH	0.55
A	84	91	0.42	SCI	TSH	0
A	98	103	0.5	SCI	TSH	-0.22
A	102	119	2.7	PCT	04H	1.04
A	105	50	0.13	SAI	01H	-0.16
A	107	56	0.22	SAI	02H	0.88
A	107	82	0.34	SAI	01H	0.11
A	107	90	0.43	SAI	03H	0.81
A	107	132	0.26	SAI	02H	0.66
A	110	99	0.09	SAI	01H	0.94
A	113	86	0.27	SAI	01H	-0.7
A	117	100	0.19	SAI	01H	0.78
A	129	62	0.32	SVI	TSH	2.41

Table 4A Location and Measured Sizes of Service Induced Indications

SG	Row	Column	+Pt Volts	IND	Location	Elevation
A	130	111	0.23	SAI	02H	0.14
A	131	62	0.4	SVI	TSH	1.99
A	134	85	0.25	SAI	01H	0.67
A	136	73	0.25	SAI	01H	-0.83
B	1	106	0.35	SAI	02H	0.97
B	21	116	0.25	SAI	01H	0.35
B	21	116	0.29	SAI	01H	0.63
B	21	138	0.44	SAI	01H	0.55
B	23	16	0.2	SAI	01H	0.44
B	23	52	0.28	SAI	01H	0.27
B	23	60	0.16	SAI	VS4	-1
B	24	45	0.44	SAI	TSH	0.36
B	24	49	0.34	SAI	TSH	0.9
B	24	129	0.45	SAI	01H	0.41
B	27	50	0.37	SAI	TSH	0.85
B	28	47	0.42	SAI	TSH	0.57
B	28	119	0.19	SAI	01H	-0.23
B	30	107	0.21	SAI	01H	-0.78
B	30	107	0.38	SAI	01H	1.03
B	30	107	0.43	SAI	02H	-0.27
B	30	107	0.47	SAI	02H	0.49
B	31	114	0.25	SAI	01H	-0.84
B	34	105	0.15	SAI	01H	-0.13
B	38	117	0.26	SAI	TSH	0.41
B	39	132	2.56	PCT	VS4	1.17
B	56	67	0.34	SAI	01H	-0.92
B	56	109	0.33	SAI	TSH	0.4
B	72	29	0.32	SAI	03H	-0.73
B	73	98	0.2	SAI	TSH	0.58
B	73	98	0.25	SAI	TSH	0.82
B	73	102	0.41	SAI	TSH	0.44
B	74	97	0.17	SAI	TSH	0.77
B	75	96	0.63	SAI	TSH	0.97
B	78	93	0.38	SAI	TSH	0.8
B	85	44	0.43	SAI	06H	18.82
B	110	35	0.47	SVI	TSC	1.42
B	111	36	0.3	SVI	TSC	1.32
B	126	87	3.36	PCT	VS4	-0.77
B	130	77	0.71	SAI	08H	0.7
B	133	106	2.76	PCT	VS6	-0.03