



Entergy Nuclear Operations, Inc.
Palisades Nuclear Plant
27780 Blue Star Memorial Highway
Covert, MI 49043-9530
Tel 269 764 2000

Jeffery A. Hardy
Regulatory Assurance Manager

PNP 2016-038

June 17, 2016

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

SUBJECT: Response to Request for Additional Information – Palisades Nuclear Plant 2015 Steam Generator Tube Inspection Report (CAC No. MF7554)

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

- References:
1. Entergy Nuclear Operations, Inc. letter to NRC, PNP 2016-008, "2015 Steam Generator Tube Inspection Report," dated March 30, 2016 (ADAMS Package Accession Number ML16092A086)
 2. NRC e-mail to Entergy Nuclear Operations, Inc., "Palisades Nuclear Plant - Request for Additional Information – 2015 Steam Generator Tube Inspection Report (CAC No. MF7554)," dated May 05, 2016 (ADAMS Accession Number ML16130A717)

Dear Sir or Madam:

Entergy Nuclear Operations, Inc. (ENO) submitted Reference 1 to the Nuclear Regulatory Commission (NRC) providing the results of steam generator tube inspections conducted during the 2015 Palisades Nuclear Plant (PNP) refueling outage. ENO received an electronic request for additional information (RAI) from the NRC in Reference 2.

Attached is the ENO response to the RAI.

This letter contains no new or revised commitments.

Sincerely,

A handwritten signature in black ink, appearing to read "JAH", with a stylized flourish at the end.

JAH/jpm

Attachment 1: Response to Request for Additional Information Palisades Nuclear Plant 2015 Steam Generator Tube Inspection Report

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

ATTACHMENT 1

Response to Request for Additional Information Palisades Nuclear Plant 2015 Steam Generator Tube Inspection Report

A request for additional information (RAI) regarding Palisades Nuclear Plant (PNP) 2015 Steam Generator (SG) Tube Inspection Report was received by electronic mail on May 5, 2016.

By letter dated March 30, 2016 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML16092A086), in accordance with Technical Specification Section 5.6.8, "Steam Generator Tube Inspection Report," Entergy Nuclear Operations, Inc. (the licensee) submitted information summarizing the results of the fall 2015 steam generator tube inspections performed at Palisades Nuclear Plant (PNP). The U.S. Nuclear Regulatory Commission (NRC) staff summarized a conference call regarding the fall 2015 SG tube inspections at PNP in a letter dated October 27, 2015 (ADAMS Accession Number ML15294A300).

In order to complete the review, the NRC staff requests responses to the following questions:

NRC Request (RAI 1)

1. *In your letter dated August 5, 2014 (ADAMS Accession Number ML14218A548), primary to secondary leakage was reported as 0.0003 gallons per minute (0.4 gallons per day) or less over operating cycle 23 (2012 – 2014). Your letter dated March 30, 2016, indicated that primary to secondary leakage was approximately 5 gallons per day at the start of operating cycle 24, and trended downward throughout the cycle.*
 - a. *Please discuss any insights you have into why the amount of primary to secondary leakage at the start of cycle 24 was greater than the amount of leakage at the end of cycle 23.*

ENO Response (RAI 1a)

- a. The amount of steam generator (SG) primary to secondary leakage near the start of operating cycle 24, 5 gallons per day (gpd), or 0.00347 gallons per minute (gpm), which was reported in the 2015 Palisades (PNP) SG inspection report, was based on readings from condenser off-gas radiation indicating alarm (RIA-0631), while for cycle 23, the 0.0003 gpm and the <0.0001 gpm primary to secondary leakage values reported in the 2014 PNP SG inspection report were based on XE-135 activity from condenser off-gas samples. Determination of primary to secondary leak rate based on XE-135 is more accurate than use of RIA-0631 and therefore explains the differences between cycle 24 and cycle 23 reported primary to secondary leak rate values. To further validate this insight primary to secondary leakage values over cycle 24 based on XE-135 activity are provided and compared to primary to secondary leakage values over cycle 23.

Cycle 24 SG primary to secondary leakage based on condenser off gas sample analysis of XE-135 trended down from 0.00038 gpm (0.547 gpd) near the start of cycle to less than 0.0001 gpm (0.144 gpd) at the end of cycle.

Cycle 23 SG primary to secondary leakage based on condenser off gas sample analysis for XE-135 trended down from 0.0003 gallons per minute (gpm) (0.432

ATTACHMENT 1

Response to Request for Additional Information Palisades Nuclear Plant 2015 Steam Generator Tube Inspection Report

gallons per day (gpd)) near the start of the cycle to less than 0.0001 gpm (0.144 gpd) at the end of the cycle as reported in the 2014 SG inspection report (Reference 1). As can be seen in the table below, which provides a comparison of cycle 24 to cycle 23 primary to secondary leakage rates based on gaseous sample analysis of XE-135, the primary to secondary leakage values over cycle 24 are comparable to cycle 23.

Cycle / Outage	Near Start of Cycle	Near End of Cycle
24 / 1R24	0.547 gpd	Less than 0.144 gpd
23 / 1R23	0.432 gpd	Less than 0.144 gpd

NRC Request (RAI 1b)

1. *In your letter dated August 5, 2014 (ADAMS Accession Number ML14218A548), primary to secondary leakage was reported as 0.0003 gallons per minute (0.4 gallons per day) or less over operating cycle 23 (2012 – 2014). Your letter dated March 30, 2016, indicated that primary to secondary leakage was approximately 5 gallons per day at the start of operating cycle 24, and trended downward throughout the cycle.*
 - b. *Please discuss any actions taken to identify the source of the primary to secondary leakage and the results of those actions.*

ENO Response (RAI 1b)

- b. No actions were taken to identify a source of the primary to secondary leakage in cycle 24 since SG primary to secondary leakage based on XE-135 values, which is what was reported in cycle 23, were low and consistent with previous cycles.

NRC Request (RAI 2)

2. *A few of the axial outside diameter stress corrosion cracking indications had structural depths exceeding 50 percent through wall. Please discuss any trends in the number and sizes of axial outside diameter stress corrosion cracking indications. Please discuss whether data quality during the 2015 outage was comparable to the data quality in prior outages.*

ENO Response (RAI 2)

A summary of the axial outside diameter stress corrosion cracking (ODSCC) indications identified during the three most recent SG tube examinations are provided in Table E-1, and in Figure E-1 and Figure E-2. As shown, the maximum reported depth was 63.8% through-wall (TW) at 1R24, which is within approximately 2% of the maximum depths reported at both 1R22 and 1R23. The average reported depth was somewhat higher in both 1R23 and 1R24; however, due to the relatively small number of indications reported during 1R23 and 1R24, this difference is not considered to be meaningful. It is also noted that the durations of Cycles 23 and 24 were somewhat longer than that of Cycle 22. A longer operating duration would tend to produce deeper indications and this effect may account for the observed difference in average depth. In summary, the TW depths of axial ODSCC indications have remained relatively stable and the

ATTACHMENT 1

Response to Request for Additional Information Palisades Nuclear Plant 2015 Steam Generator Tube Inspection Report

number of reported indications in 1R23 and 1R24 are less, by more than a factor of 3, than those reported in 1R22.

A comparison of 1R23 and 1R24 eddy current results revealed no transients in signal amplitudes which would suggest a degradation of data quality, and innocuous indications which were not removed from service produced similar responses from outage to outage. In addition, measurements of signal noise in regions of interest within the SGs confirm that data quality has not deteriorated with time (Figures E-3 and Figure E-4).

Table E-1: Summary of Axial ODSCC Indications During Recent Outages

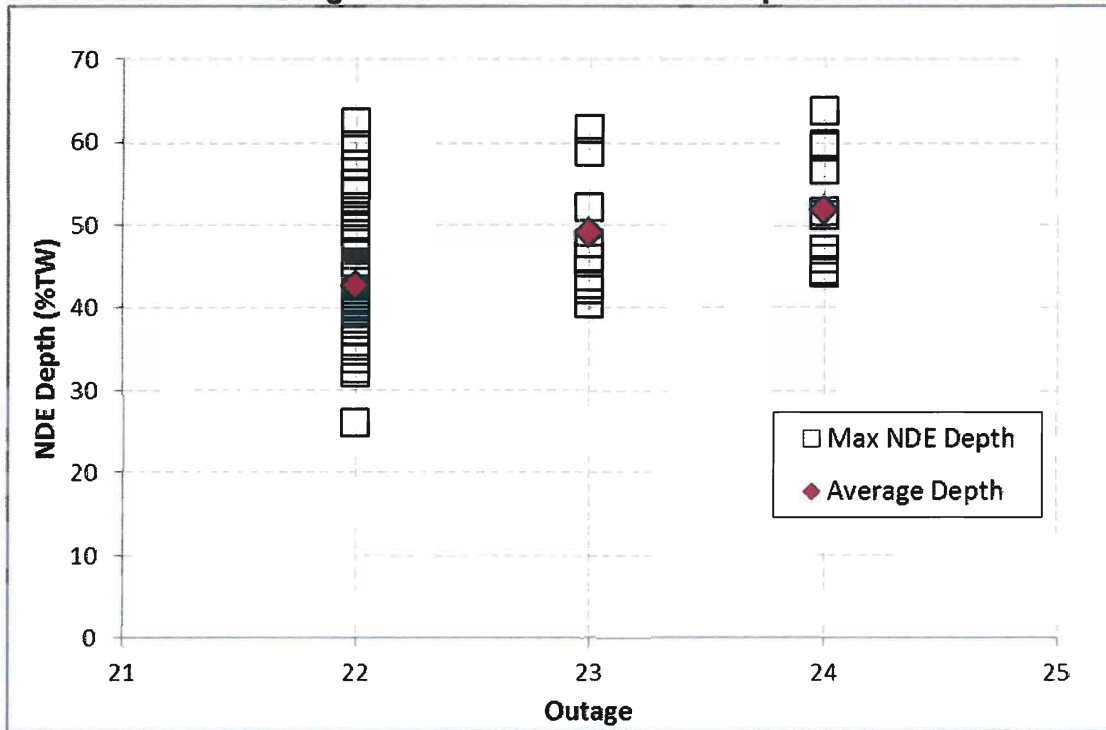
Cycle / Outage	Cycle Length (EFPY)	Number of Indications	Max Depth (%TW)	Average Depth (%TW)	St. Dev Depth (%TW)
22 / 1R22	1.36	42	62.36	42.78	7.84
23 / 1R23	1.41	8	61.69	49.01	7.87
24 / 1R24	1.48	12	63.80	51.91	6.61

Acronym: Effective Full Power Years (EFPY)

ATTACHMENT 1

Response to Request for Additional Information Palisades Nuclear Plant 2015 Steam Generator Tube Inspection Report

Figure E-1: Axial ODSCC NDE Depths

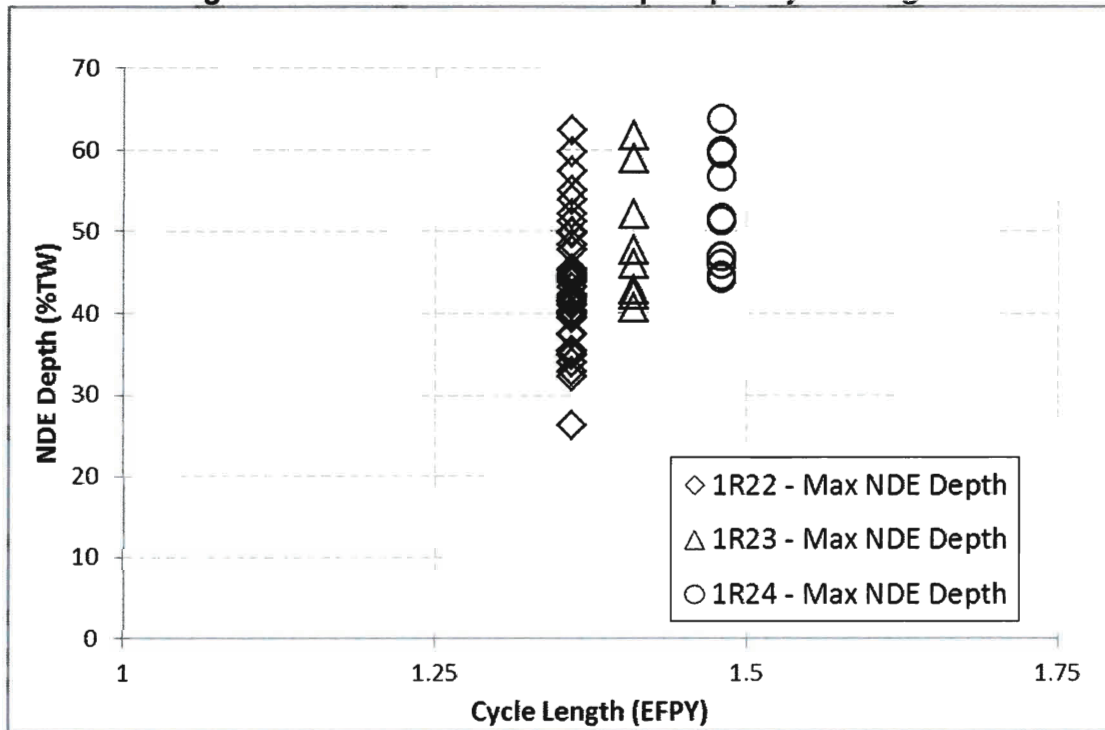


Acronym: Non-destructive Examination (NDE)

ATTACHMENT 1

Response to Request for Additional Information Palisades Nuclear Plant 2015 Steam Generator Tube Inspection Report

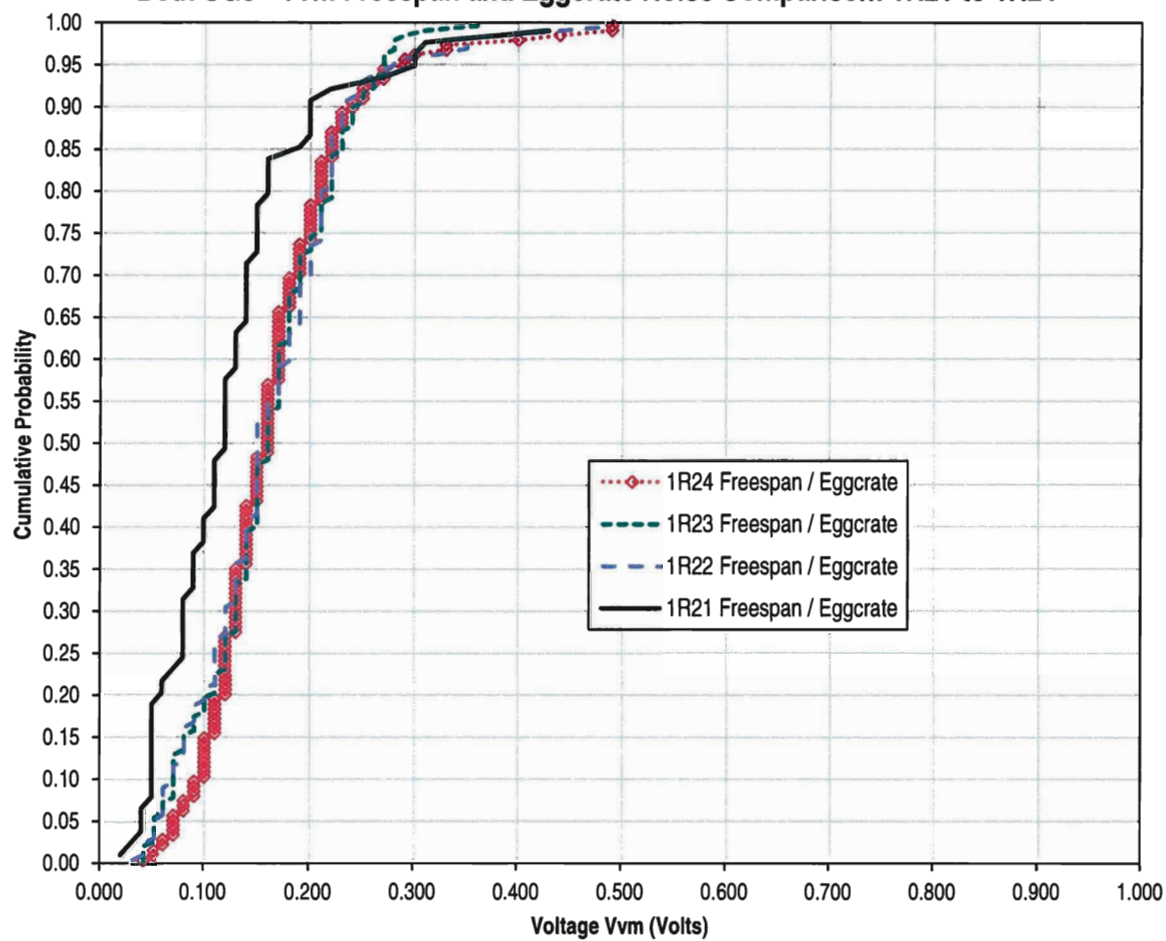
Figure E-2: Axial ODSCC NDE Depths per Cycle Length



ATTACHMENT 1

Response to Request for Additional Information Palisades Nuclear Plant 2015 Steam Generator Tube Inspection Report

Figure E-3: Freespan and Eggcrate Bobbin Noise Comparison
Both SGs - Vvm Freespan and Eggcrate Noise Comparison: 1R21 to 1R24

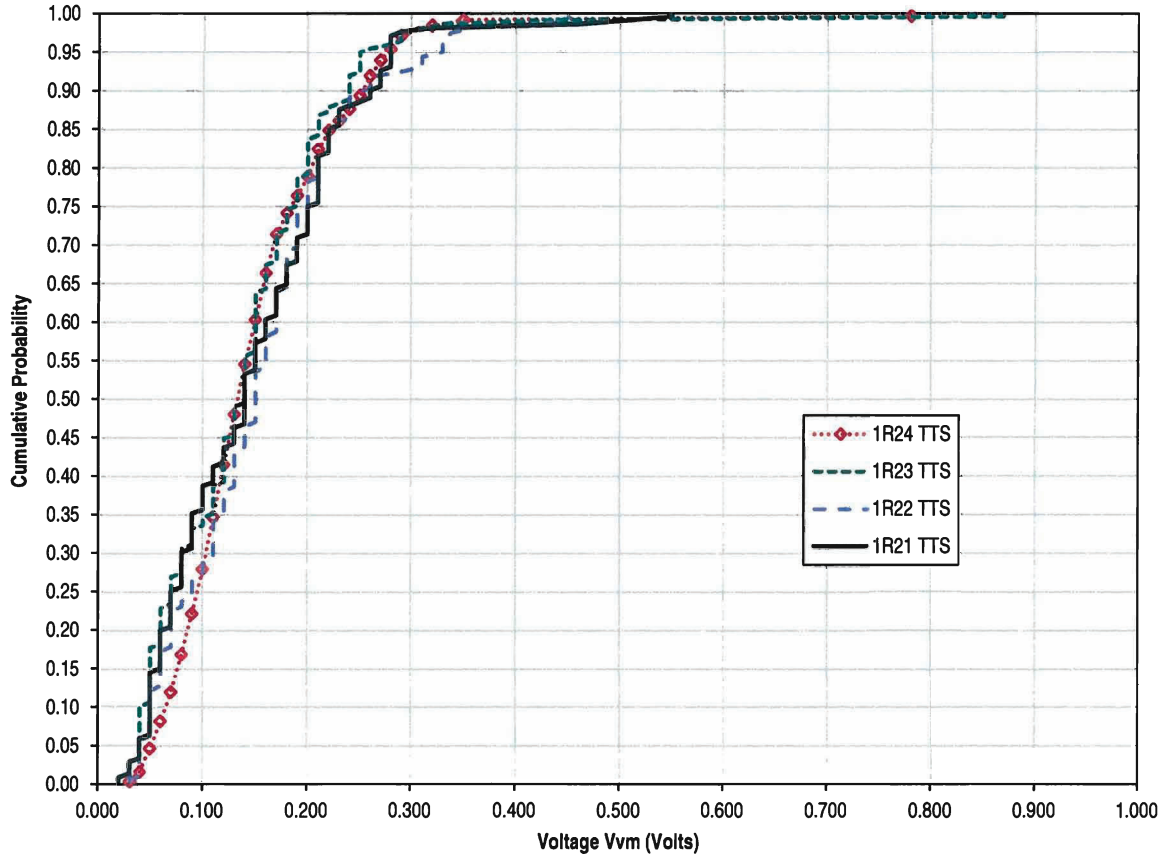


ATTACHMENT 1

Response to Request for Additional Information Palisades Nuclear Plant 2015 Steam Generator Tube Inspection Report

Figure E-4: Top-of-Tubesheet +Point™ Noise Comparison

Both SGs - Vvm TTS Noise Comparison: 1R21 to 1R24



References

1. Entergy Nuclear Operations, Inc. letter to NRC, *Response to Request for Additional Information – Palisades Nuclear 2014 Refueling Outage Steam Generator Inspection Report*, dated March 4, 2015 (ADAMS Accession No. ML15068A352)