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SUBJECT: PALISADES NUCLEAR PLANT - SUMMARY OF CONFERENCE CALL REGARDING STEAM GENERATOR TUBE INSPECTIONS (EPID L-2024-NFO-0008)

Dear Jean Fleming:

On September 3, 2024, the U.S. Nuclear Regulatory Commission staff and representatives from Holtec Decommissioning International, LLC participated in a conference call to discuss the ongoing steam generator tube inspection activities at Palisades Nuclear Plant. The plant is currently in a decommissioning status, however, Holtec is performing these inspections as part of an effort to restart power operations.

A summary of the conference call is attached as an enclosure to this letter.

If you have any questions, please contact me at 301-415-2048 or via e-mail at Justin.Poole@nrc.gov.

Sincerely,

/RA/

Justin C. Poole, Project Manager
Plant Licensing Branch III
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-255

Enclosure:
Summary of Conference Call

cc: Listserv

SUMMARY OF CONFERENCE CALL

HOTLEC DECOMMISSIONING INTERNATIONAL, LLC

PALISADES NUCLEAR PLANT

DOCKET NO. 50-255

STEAM GENERATOR TUBE INSPECTIONS

On September 3, 2024, the U.S. Nuclear Regulatory Commission (NRC) staff and representatives from Holtec Decommissioning International, LLC (the licensee), participated in a conference call regarding the ongoing steam generator (SG) tube inspection activities at Palisades Nuclear Plant (Palisades). The plant is currently in a decommissioning status; however, Holtec is performing these inspections as part of an effort to restart power operations.

Palisades has two Combustion Engineering Model 2530 replacement SGs. Each SG has 8,219 mill-annealed, Alloy 600 tubes. The tubes have an outside diameter of 0.75 inches, and a wall thickness of 0.042 inches. Stainless steel, eggcrate, lattice-type tube supports; diagonal straps; and vertical straps support the tubes at various locations. The tubes were expanded through the full depth of the tubesheet during fabrication.

The NRC discussion questions and Holtec responses are summarized below. The NRC staff notes that the information provided to the NRC during the call is preliminary and that additional tube inspections and analyses will be performed before the inspection is complete.

1. Discuss any trends in the amount of primary-to-secondary leakage observed during the recently completed cycle.

   There was minimal leakage in the most recent operating cycle, 1R28, which was from the fall of 2020 to the spring of 2022. Leakage has been just above the detectability limit for recent cycles from 1R24 to 1R28, approximately 1 gallon per day (gpd). During operation, the plant used an administrative limit of 72 gpd, which was below the operational technical specification limit of 150 gpd.

2. Discuss whether any secondary side pressure tests were performed during the outage [i.e., during the current shutdown period] and the associated results.

   At the time of the call, there were no secondary side pressure tests planned for the 2024 restart inspection (1D28). The NRC staff notes that Holtec switched the naming convention of the restart inspection to 1D28, from the refueling operating cycle naming convention of 1R28.

3. Discuss any exceptions taken to the industry guidelines.

   For operating cycle 22 (2012) Palisades submitted a Technical Justification Supporting Deviation from the Electric Power Research Institute (EPRI) Appendix I, ETSS for outside diameter stress corrosion cracking (ODSCC) sizing. The document supports use

of a modified ETSS for ODSCC by only using the subset of data from Combustion Engineering (CE) plants in Appendix I28432.

4. For each SG, provide a description of the inspections performed including the areas examined and the probes used (e.g., dents/dings, sleeves, expansion-transition, U-bends with a rotating probe), the scope of the inspection (e.g., 100 percent of dents/dings greater than 5 volts and a 20 percent sample between 2 and 5 volts), and the expansion criteria.

   Full length eddy current (ECT) inspections with a bobbin probe were performed in all in-service tubes (except the row 1 - 3 U-bends) in both SGs

   ECT +Point™ probe inspections were performed in both SGs:
   - 100 percent row 1-3 U-bends
   - 100 percent of the hot-leg from four inches above the top-of-tubesheet (TTS +4") to a minimum of 13.5 inches below the bottom of the expansion transition
   - 100 percent of free span dings >5 Volts (V) from the hot-leg TTS to the cold-leg TTS
   - 100 percent of dents >2V at eggcrate, diagonal bar, and vertical strap intersections between hot-leg TTS and cold-leg TTS
   - 25 percent of the historical percent-through-wall (TW) calls at diagonal bars
   - 50 percent of the historical percent-TW calls at vertical straps
   - 100 percent of historical trackable (TRA) indications
   - The outer 3 peripheral tubes at the cold-leg from TTS+4 inches to TTS-2 inches for detection of possible loose parts or wear signals. The periphery region is defined to be the outer three tubes exposed to the annulus, all tubes in rows 1 through 4, and the inner three tubes around the stay cylinder region.

   Special interest exams which include but are not limited to:
   - All current shutdown period bobbin I-code signals
   - All eggcrate bobbin percent-TWs called during the current shutdown period
   - All wear scars >= 40 percent TW by bobbin
   - All new percent-TW indications regardless of location
   - Hot-leg square bend region of tubes surrounding the tube in Row 99, Column 140 (R99C140) of SG B.
   - All bobbin probe indications of foreign objects (FO) and FO wear
   - Bounding of FO signals (new in 1D28 and rotating pancake coil (RPC)-confirmed possible loose parts (PLPs) from 1R27) and foreign object wear at all elevations. These bounding exams will continue until a one tube deep perimeter has been examined in which no PLP or FO wear indication is identified.
   - Ghent probe
     - Sample of TTS RPC confirmed crack indications for comparison
     - Sample of tube support plate (TSP) RPC confirmed crack indications for comparison
   - Bounding of locations in tubes recently plugged that had a PLP indication or FO wear near the TTS
   - Mag-biased +Point coil exam of all bobbin permeability variation (PVN) indications that cannot be eliminated using non-mag-biased +Point coil
   - All tube regions which cannot be examined effectively with bobbin due to data quality concerns

- Any other location specified by the tube integrity engineer (TIE) as required to support the condition monitoring and operational assessment (CMOA)

5. For each area examined (e.g., tube supports, dent/dings, sleeves, etc), provide the following:

   a. A summary of the number of indications identified to date for each degradation mode (e.g., number of circumferential primary water stress corrosion cracking indications at the expansion transition).

      As of 9/3/2024 @ 0600 hours

SG	Location	Type	Number of Indications	Number of Tubes
A	hot-leg TTS	Axial ODSCC	17	19
A	hot-leg TTS	Axial PWSCC	52	51
A	hot-leg TTS	Circ PWSCC	30	10
A	hot-leg TTS	Circ ODSCC	67	59
A	hot-leg TTS	Volumetric	16	16
A	TEC to TEH	Wear > 40 percent TW	5	5
B	hot-leg TTS	Axial ODSCC	10	9
B	hot-leg TTS	Axial PWSCC	9	9
B	hot-leg TTS	Circ PWSCC	1	1
B	hot-leg TTS	Circ ODSCC	17	15
B	hot-leg TTS	Volumetric	6	5
B	TEC to TEH	Wear > 40 percent TW	3	3
A	Tube supports	Axial ODSCC	853	594
A	Freespan	Axial ODSCC	17	16
B	Tube supports	Axial ODSCC	310	216
B	Freespan	Axial ODSCC	4	4
	Total		1417	1032

      The NRC staff notes that stress corrosion crack indications must be appropriately addressed to maintain the generator's pressure boundary.

   b. For the most significant indications in each area, provide an estimate of the severity of the indication (e.g., voltage, depth, and length of the indication), including whether tube integrity (structural and accident induced leakage integrity) was maintained during the previous operating cycle. In addition, discuss any analyses performed specifically for the most significant indications to demonstrate tube integrity.

      SG A
      - Axial ODSCC at hot-leg TTS+0.57 SAI R32C115 (max voltage indication)
        - 4.29V, 0.45 inches length, 91 percent TW

- Axial ODSCC at TSP 01H+0.8 SAI R15C122 (max voltage indication)
    - 2.26V, 0.77 inches length, 85 percent TW
- Axial Primary Water Stress Corrosion Cracking (PWSCC) at hot-leg TTS-0.16 R107C80 (max voltage indication)
    - 2.65V, 0.19 inches length, 78 percent TW
- Circ PWSCC at hot-leg TTS-11.04 SCI R36C23 (max voltage indication)
    - 5.47V, 0.6 inches length (103 degrees), 90 percent TW, Percent Degraded Area (PDA) – To be determined (TBD)
- Circ ODSCC at hot-leg TTS-0.06 SCI R109C102
    - 4.45V, 1.03 inches length (157 degrees), 90 percent TW, 25.77 PDA
- Tube support wear max depth 41 percent TW
- Historical FO wear flaws – under review
- New FO wear flaws – under review

SG B

- Axial ODSCC at hot-leg TTS+0.69 R30C51 (max voltage indication)
    - 2.22V, 0.6 inches length, 80.1 percent TW,
- Axial ODSCC at TSP H01-0.4 R73C94 (max voltage indication)
    - 1.27V, 1.71 inches length, 73 percent TW
- Axial PWSCC at hot-leg TTS-1.7 R42C103 (max voltage indication)
    - 2.47V, 0.37 inches length, 76 percent TW
- Circ PWSCC at hot-leg TTS-11.82 R54C25
    - 0.89V, 0.22 inches length, 67 percent TW, PDA - TBD
- Circ ODSCC at hot-leg TTS-0.03 R45C52 (max voltage indication)
    - 1.69V, 0.37 inches length (57 degrees), 81 percent TW, PDA - TBD
- Tube support wear max depth 44 percent TW
- Historical FO wear flaws – under review
- New FO wear flaws – under review

Both SGs – Support Structure Wear

- Average growth is about 0.3 percent TW per Effective Full Power Year (EFPY)
- 95/50 growth rate is <0.7 percent TW per EFPY

<u>Freespan/U-bends</u>

Currently there are 17 free span repairable indications in SG A and 4 in SG B

c. Discuss whether any location exhibited a degradation mode that had not previously been observed at this location at this unit (e.g., observed circumferential primary water stress corrosion cracking at the expansion transition for the first time at this unit).

    No new degradation modes identified

6. Describe repair/plugging plans.

    Currently 701 potential tubes in SG A and 248 in SG B are candidates for plugging or repair
    All SCC will be plugged. Any circ SCC near TTS will be stabilized and plugged
    C* depth applicable to hot-leg and cold-leg
    All wear indications (at supports) >40 percent TW will be plugged

Any indications of FOs that present a threat to tube integrity will be plugged and stabilized as necessary. Presently no such indications.

7. Describe in-situ pressure test and tube pull plans and results (as applicable and if available).

   At the time of the call, data were still being reviewed with respect to Structural Integrity Performance Criteria and Accident-Induced Leakage Performance Criteria.

   Currently two indications require in-situ pressure testing:

   1 – SGA R32C115
   2 – SGA R109C102

8. Discuss the following regarding loose parts:

   a. The inspections performed to detect loose parts.

      The hot-leg TTS region was inspected with +Point™ probe up to a nominal 4 inches, not less than 3.5 inches and not less than sludge pile height, above TTS. A similar inspection in the cold-leg TTS region that was 3 tubes deep along the periphery and tube lane and 3 inches above the TTS. A foreign object search and retrieval (FOSAR) was performed for the periphery, tube lane annulus, and stay cavity areas. This inspection scope is similar to last outage.

   b. A description of any loose parts detected and their location within the SG (including the source or nature of the loose part, if known).

      Initial FOSAR is complete; follow-up actions based on ECT data will take place after data are reviewed. As of 9/3/2024 at 0400, +Point PLP results are as follows:

      SG A - 105 PLP in 108 tube locations
      SG B - 58 PLP in 62 tube locations
      Over 85 percent are historical

   c. If the loose parts were removed from the SG.

      All new LPs removed if possible. All legacy parts removed if possible. Parts remaining in the SG evaluated for plugging.

   d. Indications of tube damage associated with the loose parts.

      SG A - 16 volumetric wear indications
      SG B - 6 volumetric wear indications

9. Discuss the scope and results of any secondary side inspection and maintenance activities (e.g., in-bundle visual inspections, feedring inspections, sludge lancing, assessing deposit loading, etc).

   Secondary side inspections planned to occur beginning 9/3/2024 and conclude 9/4/2024. Scope includes inspections above moisture separator can deck, inspections above dryer deck, and inspections in feedwater ring area.

10. Discuss any unexpected or unusual results.

    For both SGs the quantity of tubes with Axial ODSCC at TSPs far exceeded estimates based on previous operating history as shown in Question 5. For comparison, in 1R27 the total number of Axial ODSCC indications at TSPs was 4, and for 1D28 this number is 1163.

11. Provide the schedule for steam generator-related activities during the remainder of the current outage [i.e., activities during the remainder of the current shutdown period].

    At the time of the call on September 3, 2024, the SG inspections were expected to complete within the following week. However, the NRC was informed after the call that the inspections will be completed later.

12. Discuss any actions taken or plans for obtaining water samples or deposit samples (e.g., sludge pile, tube scale, etc.) to evaluate potential detrimental chemistry conditions or contaminants (e.g., chlorides, sulfates, Pb) during the plant shutdown.

    The SGs are currently being inspected. Sludge samples are being collected for analysis and will be used in determining the condition of the SGs. In addition, these analyses will be included in the plant's Chemistry Strategic Plan and used to assess whether the secondary water chemistry program will need adjustments. The site placed the SGs in wet layup once it was determined they would be attempting to recommence normal operations. The SGs were drained for the inspections. The site stated they have a plan to return the secondary system to normal layup conditions according to EPRI guidelines for secondary water chemistry and wet layup after the SG inspections. The NRC staff confirmed that the SGs were returned to wet layup conditions after the call.

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