



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

December 16, 2022

Mr. John J. Grabnar
Site Vice President
Energy Harbor Nuclear Corp.
Beaver Valley Power Station
Mail Stop P-BV-SSEB
P.O. Box 4, Route 168
Shippingport, PA 15077-0004

SUBJECT: BEAVER VALLEY POWER STATION, UNIT 2 – REVIEW OF THE FALL 2021
2R22 STEAM GENERATOR TUBE INSPECTION 180 DAY REPORT
(EPID: L-2022-LRO-0064)

Dear Mr. Grabnar:

By letter dated May 5, 2022, as supplemented by letter dated October 21, 2022 (Agencywide Documents Access and Management System (ADAMS) Accession Nos. ML22126A089 and ML22304A213, respectively), Energy Harbor Nuclear Corp. submitted the Refueling Outage 22 (2R22) Steam Generator Tube Inspection 180 Day Report for Beaver Valley Power Station, Unit 2, in accordance with Technical Specification 5.6.6.2, "Unit 2 SG [Steam Generator] Tube Inspection Report." The steam generator tube inspections were performed during the fall 2021 refueling outage.

The U.S. Nuclear Regulatory Commission staff has completed its review of the information provided and concludes that the licensee provided the information required by its technical specifications. The staff's review summary is enclosed.

J. Grabnar

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If you have any questions, please contact me at 301-415-0680 or by email to Brent.Ballard@nrc.gov.

Sincerely,

/RA/

Brent T. Ballard, Project Manager
Plant Licensing Branch I
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-412

Enclosure:
2R22 Steam Generator Tube Inspection
180 Day Report Summary

cc: Listserv

REVIEW OF THE FALL 2021

2R22 STEAM GENERATOR TUBE INSPECTION 180 DAY REPORT

ENERGY HARBOR NUCLEAR CORP.

ENERGY HARBOR NUCLEAR GENERATION LLC

BEAVER VALLEY POWER STATION, UNIT 2

DOCKET NO. 50-412

By letter dated May 5, 2022, as supplemented by letter dated October 21, 2022 (Agencywide Documents Access and Management System (ADAMS) Accession Nos. ML22126A089 and ML22304A213, respectively), Energy Harbor Nuclear Corp. (the licensee), submitted the Unit 2 Refueling Outage 22 (2R22) Steam Generator Tube Inspection 180 Day Report summarizing the results of the fall 2021 steam generator (SG) inspections performed at the Beaver Valley Power Station (Beaver Valley), Unit 2. Beaver Valley, Unit 2, Technical Specification (TS) 5.6.6.2.1 requires that a report be submitted within 180 days after the initial entry into hot shutdown (MODE 4) following completion of an inspection of the SGs performed in accordance with TS 5.5.5.2, "Unit 2 SG Program." Technical Specification 5.5.5.2 requires that an SG Program be established and implemented to ensure SG tube integrity is maintained.

On October 22, 2021, the U.S. Nuclear Regulatory Commission (NRC) staff held a conference call with the licensee regarding the fall 2021 SG tube inspections at Beaver Valley, Unit 2. The meeting summary, dated November 9, 2021, is available in ADAMS (ML21308A071). In addition, on November 3, 2022 (ML22269A491), the NRC staff issued a summary of its review of the licensee's Generic Letter 95-05 Voltage-Based Alternate Repair Criteria Final Report and the Unit 2 – 2R22 Steam Generator F* (F Star) Report (ML22041B540). These reports were submitted in accordance with Beaver Valley, Unit 2, TS 5.6.6.2.2 and TS 5.6.6.2.4.

Beaver Valley, Unit 2, is a 3-loop plant with Westinghouse Model 51M SGs. Each SG contains 3,376 mill-annealed Alloy 600 tubes with a nominal outside diameter of 0.875 inches and a nominal wall thickness of 0.050 inches. The tubes are supported by carbon steel tube support plates (TSPs) and Alloy 600 anti-vibration bars (AVBs). The tubes were roll expanded at both ends for the full depth of the tubesheet. The portion of tubes from about 3 inches above the top of the tubesheet to about 1 inch above the tube ends was shot-peened on both the hot-leg and cold-leg side of the SG, prior to operation. In addition, the U-bend region of the small radius tubes received in-situ thermal stress relief prior to operation.

The licensee provided the scope, extent, methods, and results of their SG tube inspections in the documents referenced above. In addition, the licensee described corrective actions, such as tube plugging and sleeving, taken in response to the inspection findings.

Based on the review of the information provided, the NRC staff has the following observations:

- A total of 24 tubes were plugged during 2R22 (18 in SG A, 4 in SG B, and 2 in SG C) due to axial and circumferential outside diameter stress corrosion cracking (ODSCC), AVB wear, and circumferential indications in previously sleeved tubes.

Enclosure

- During 2R22, 50 previously plugged tubes were de-plugged and returned to service after installing sleeves (26 in SG A and 24 in SG B), and 2 tubes in SG B were returned to service with application of Generic Letter 95-05, "Voltage-Based Repair Criteria for Westinghouse Steam Generator Tubes Affected by Outside Diameter Stress Corrosion Cracking" (ML031110067). An additional 69 tubes were repaired by installing sleeves (42 in SG A, 25 in SG B, and 2 in SG C) due to axial and circumferential ODSCC and axial primary water stress corrosion cracking.
- Circumferential indications were observed with the +Point™ probe in four Alloy 800 nickel banded mechanical tubesheet sleeves (three installed in 2R20 (2018) and one installed in 2R21 (2020)). The indications were located at the lower tubesheet hard roll joint at the lower expansion transition below the nickel band region. The licensee determined that the circumferential signals may be related to sleeve installation and not flaws from in-service degradation. The sleeve installed in 2R20 (2018) in tube Row 18, Column 24 of SG B had a circumferential signal after sleeve installation and prior to being placed in service. In the supplement dated October 21, 2022, the licensee stated that there was no change in +Point™ probe response from 2R21 to 2R22 when the Ghent Version 2 probe was used. The licensee also clarified that preliminary assessments suggested circumferential ODSCC on the outer surface of the parent tube because the eddy current signal phase response for the circumferential signals were similar to the phase response for the outside diameter circumferential electrical discharge machining notch on the calibration standard parent tube. The affected tubes were plugged during 2R22.

In the supplement dated October 21, 2022, the licensee clarified that high-speed buffing has not been used to condition SG tubes prior to sleeve installation at Beaver Valley, Unit 2. The licensee stated that five of the nine samples used for the EPRI "Pressurized Water Reactor Steam Generator Examination Guidelines" Appendix H, "Performance Demonstration for Eddy Current Examination Techniques and Equipment," qualification of the Ghent Version 2 probe had circumferential signals, therefore, they concluded that the circumferential signals are not related to a lack of tube conditioning prior to sleeve installation. In addition, the licensee stated that they are not currently considering changes to the sleeving process.

- Cold leg thinning was observed for the first time in the Beaver Valley, Unit 2, SGs during 2R21. The one location in one tube in SG A was re-inspected during 2R22 with no change in depth and small increases in length and width. A second cold leg thinning indication was identified during 2R22 that measured 0 percent through wall (TW), however, the licensee conservatively assigned a 10 percent TW depth. The licensee noted there were precursor indications in prior inspections.

- The licensee clarified in the supplement dated October 21, 2022, that the EPRI Examination Technique Sheet (ETSS) 96012.1 and the “Internal Westinghouse Technique Qualification” (“supplemental screening”) have been used in conjunction since 2005 to detect axial primary water stress corrosion cracking at dented TSPs less than 2 volts. The licensee stated that the supplemental screening was developed to reduce the number of overcalls from application of ETSS 96012.1.

Based on the review of the information provided, the NRC staff concludes that the licensee provided the information required by their technical specifications. In addition, the staff concludes that the inspections appear to be consistent with the objective of detecting potential tube degradation and the inspection results appear to be consistent with industry operating experience at similarly designed and operated units.

SUBJECT: BEAVER VALLEY POWER STATION, UNIT 2 – REVIEW OF THE FALL 2021
 2R22 STEAM GENERATOR TUBE INSPECTION 180 DAY REPORT
 (EPID: L-2022-LRO-0064) DATED DECEMBER 16, 2022

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