From: Tobin, Jennifer
To: Lashley, Phil H.
Subject: Beaver Valley Unit 2 - Request for Additional Information (FINAL) - Steam Generator Technical Specification LAR (EPID L-2018-LLA-0075)
Date: Wednesday, August 29, 2018 1:28:00 PM

Dear Mr. Lashley,
By letter dated March 28, 2018 (Agencywide Documents and Management System (ADAMS) Accession No. ML18087A293), FirstEnergy Nuclear Operating Company (the licensee), proposed a license amendment request that changes the technical specifications for Beaver Valley Power Station, Unit 2. The proposed technical specification changes would allow the use of Westinghouse leak-limiting Alloy 800 sleeves for an additional three fuel cycles of operation, bringing the total usage time from five to eight fuel cycles of operation. The proposed technical specification changes also clarify wording in two sections of the technical specifications related to use of the leak-limiting Alloy 800 sleeves.

The Nuclear Regulatory Commission's (NRC) staff is reviewing your submittal and has determined that additional information is needed to complete its review. The specific request for additional information (RAI) FINAL questions (nonproprietary version) are provided below. A proprietary version will be sent under separate cover via AMRDC SAFE. A clarification phone call was held August 29, 2018 and the questions remained the same. Due to the technical nature of the questions, a response to these RAIs is due within 60-days (due date of October 29, 2018).

If you have any questions, please contact me at (301) 415-2328. A copy of this e-mail will be made publicly available in ADAMS.

Thanks,
Jenny

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REQUEST FOR ADDITIONAL INFORMATION REGARDING

BEAVER VALLEY POWER STATION UNIT NO. 2 AMENDMENT REQUEST FOR

USE OF WESTINGHOUSE LEAK-LIMITING ALLOY 800 SLEEVES IN STEAM GENERATORS

DOCKET NO. 50-412

1. Inspection of previously installed hybrid expansion joint and laser welded sleeves that "likely" included +POINT^{TM} inspection is discussed on pages 9 and 10 of Enclosure C, to the letter dated March 28, 2018 (ADAMS Accession No. ML18087A293). The table summarizing the installations shows the number of sleeves installed and effective full power years (EFPY) to replacement.

    a. To the extent possible, please provide the EFPY to final sleeve inspection since the sleeves were presumably not inspected after the last operating cycle.

    b. Since no sleeve parent tube flaws were detected in Farley, Unit 2 prior to steam generator (SG) replacement, it is stated that residual stresses at the parent tube inside diameter (ID) surface do not support stress corrosion cracking (SCC) initiation and/or installation of the sleeves results in a reduced tube temperature resulting in a reduced SCC initiation function. Please discuss if another possibility could include that SCC cracking initiated but had not yet reached a size that was detected by inspection.

2. Figure 2, "Alloy 800 Sleeve Worldwide Installations" of Enclosure C provides a cumulative plot of Alloy 800 tubesheet sleeves installed worldwide and a plot of those sleeves still in-service after accounting for SG replacements. Please discuss these installations in terms of the EFPY of the sleeves that remain in-service (or EFPY at the time of SG replacement), how sleeve inspections are performed, and benchmark these to the

projected age in EFPY of the Beaver Valley Power Station sleeves after eight cycles of operation.

3. Page 14 of Enclosure C indicates that the degradation assessment for Beaver Valley Power Station, Unit 2, for the fall 2018 and subsequent outages, will identify that SCC of the parent tube behind the nickel band is not a potential degradation mechanism. Page 15 indicates that the licensee intends to continue +POINT™ probe inspection of the sleeve each outage to monitor the condition of the tube-to-sleeve roll joint, upper joint, and sleeve length in between. Please confirm that detection of crack like indications in either the sleeve or parent tube at any location, including adjacent to the nickel band, will result in tube plugging.

4. Page 37 of Enclosure C states: "For PWSCC (primary water stress corrosion cracking), 100% TW (through-wall) flaw penetration has 300 kHz +POINT™ coil amplitude of approximately 4 volts." It is unclear to the staff if a specific measurement was used for the 4 volt amplitude referenced above. More specifically, is the 4 volt estimate from one particular indication, the average response of the four laboratory grown indications, or is it from some other reference document. The staff notes that laboratory tests generally suggest that probe response from 100% TW SCC can vary significantly, depending on crack morphology, tightness, etc. Please clarify the basis for the statement regarding the 4 volt sizing of the 100% TW PWSCC flaw.

5. The same paragraph on page 37 also discusses how the flaw amplitudes were increased following the expansion process [ ] Please discuss if tube wall thinning from the expansion process could also affect the flaw amplitudes.

6. On page 38 of Enclosure C, there is discussion of how Flaw 4 (a non-through-wall flaw) was not detectable at 300 kHz (suggesting that penetration at this frequency was limited) and how Flaws 1, 2, and 3 (two through-wall flaws and one likely through-wall flaw) did have observable signals at 50, 75, and 150 kHz. Please discuss the signals associated with Flaw 4 at the 50, 75, and 150 kHz frequencies, and what these signals mean with regards to detection of non-through-wall flaws, including cracks originating from the inside diameter of the parent tube.

7. Pages 39 and 40 of Enclosure C discuss how the eddy current signal at the edge of the nickel band can have a transitioning noise effect similar to the expansion transition at the top-of-the tubesheet in a steam generator. Page 40 also states the center of the nickel band does not have this noise influence due to the design of the +Point™ coil. In the Model Assisted Probability of Detection (MAPOD) simulation that is discussed on page 42, the noise distribution was developed by performing noise measurements at 70 and 130 kHz at the center of the nickel band. Please discuss why the measurements were taken at the center of the band and not at the edge of the nickel band, since the edge of the band would have likely resulted in higher noise and a lower signal-to-noise ratio.

8. Page 42 of Enclosure D (also from the letter dated March 28, 2018), discusses how the major challenge to performing a MAPOD simulation for the parent tube adjacent to the nickel band of the Alloy 800 sleeve was that the analysis frequencies were 75 kHz (for the sleeved tube) and 300 kHz (for the parent tube) and there was no direct amplitude correlation between the two frequencies. [ ] Thus, it was judged that existing A-hat function for axial PWSCC in non-sleeved tubes could be extended to the sleeve tube condition in 70 kHz. [ ] Please discuss how this could affect the probability of detection simulations presented in Figure 19 and Table 3.