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L-06-008

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

Subject: Beaver Valley Power Station, Unit No. 1 and No. 2
BV-1 Docket No. 50-334, License No. DPR-66
BV-2 Docket No. 50-412, License No. NPF-73
Response to Request for Additional Information on
2004 and 2005 Steam Generator Tube Inspections (TAC Nos. MC8770 and MC8771)

By letter dated October 14, 2005, FirstEnergy Nuclear Operating Company (FENOC) submitted information summarizing the results of the 2004 and 2005 steam generator tube inspections at Beaver Valley Power Station (BVPS) Unit Nos. 1 and 2, respectively. In a letter dated December 21, 2005, the NRC staff requested additional information in order to complete its review of the October 14, 2005 steam generator tube inspection reports. The FENOC responses to this request are provided in Attachment A to this letter.

No new regulatory commitments are contained in this submittal. If there are any questions or if additional information is required, please contact Mr. Gregory A. Dunn, Manager – FENOC Fleet Licensing, at (330) 315-7243.

I declare under penalty of perjury that the foregoing is true and correct. Executed on April 7, 2006.

Sincerely,

James H. Lash

Attachment
A. FENOC Response to Request for Additional Information

A001

c: Mr. T. G. Colburn, NRR Senior Project Manager
Mr. P. C. Cataldo, NRC Senior Resident Inspector
Mr. S. J. Collins, NRC Region I Administrator
Mr. D. A. Allard, Director BRP/DEP
Mr. L. E. Ryan (BRP/DEP)

Attachment A of L-06-008

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION (RAI)

BEAVER VALLEY POWER STATION, UNIT NOS. 1 AND 2 (BVPS-1 AND 2)

2004 AND 2005 STEAM GENERATOR (SG) TUBE INSPECTIONS

DOCKET NOS. 50-334 AND 50-412

By letters dated November 5, 2004 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML043200116), November 12, 2004 (ADAMS Accession No. ML043270491), January 26, 2005 (ADAMS Accession Nos. ML050320038 and ML050320213), April 19, 2005 (ADAMS Accession No. ML051150335), April 26, 2005 (ADAMS Accession No. ML051220112), July 5, 2005 (ADAMS Accession No. ML051940281), and October 14, 2005 (ADAMS Accession No. ML052920617), FirstEnergy Nuclear Operating Company (the licensee) submitted information summarizing the results of the 2004 and 2005 SG tube inspections at BVPS-1 and 2, respectively. The Nuclear Regulatory Commission (NRC) staff previously reviewed portions of the January 26, 2005, letter and its enclosure regarding implementation of the voltage-based alternate tube repair criteria and the W* methodology (i.e., inspections in the tubesheet region). The NRC staff's review, in those areas, is documented in a letter dated August 4, 2005 (ADAMS Accession No. ML052140156).

In order for the NRC staff to complete its review of the October 14, 2005, SG reports, we request that the licensee provide responses to the enclosed RAI.

BVPS-1

Question 1.

The SG report stated that 23 SG tubes were identified having indications in the parent tube behind the lower sleeve joint. These locations were inspected during the 1R15 (2003) inspection and no indications were reported in the parent tube behind the sleeve. Discuss possible causes for these indications. If there is primary water getting between the sleeve and the parent tube at this location, the basis for not including this leakage in the operational assessment should be provided.

RESPONSE: All 23 tubes were associated with at least one evolution of roll plug removal by the tungsten inert gas (TIG) relaxation process. In some cases, tubes had been de-plugged and re-plugged twice prior to the outage when tubesheet sleeves were installed. In these cases, the original plug was replaced due to plug material concerns (replaced Inconel 600 plugs with ones fabricated from Inconel 690). The second plug removal was associated with returning tubes to service by installing tubesheet sleeves. The application of the TIG relaxation process could have introduced a change in tubes' magnetic properties that produced an eddy current response but not one representative of true tube degradation. None of the 23 tubes with indications in the parent tube had evidence of sleeve collapse, supporting the conclusion that no primary to secondary leakage past the sleeve to tube hard-roll joint occurred. Since a tube pull was not performed, the nature of these signals could not be definitively confirmed. All 23 tubes were plugged.

Question 2.

The information contained in Attachment 1 to the November 12, 2004, letter does not appear consistent with the data table on page B-3 of the January 26, 2005, letter. In addition, these tables do not always appear to match the discussions in Appendix B to the January 26, 2005, letter. Please clarify these apparent differences. The major discrepancies appear to be with the indications at the tube support plates. For indications in the sludge pile and within the tubesheet, it appears that the information provided in the January 26, 2005, letter uses the top of tubesheet as the demarcation point for reporting the indications whereas other locations of this information focus on the location of the expansion transition (i.e., all circumferential indications are in the expansion transition which may be above or below the top of tubesheet).

RESPONSE: Information provided in the reports may appear to disagree, but the reports are provided for different purposes. The reports are consistent in indicating that the same tubes were plugged. One source of apparent difference arises when one tube has multiple degradation modes. For example, one tube may contain a > 2.00 volt distorted support indication (DSI) at a tube support plate (TSP) and confirmed axial outside diameter stress corrosion cracking (ODSCC) indication within a large mix residual at a different TSP. Both conditions are a cause for repair. Therefore, the 2005 letter shows that there were 108 repairable signals in 104 repaired tubes. Other sources of discrepancy come from the selection of the demarcation for axial indications at top-of-tubesheet (TTS). The 2004 letter separates indications by location only, and combines ODSCC and primary water stress corrosion cracking (PWSCC) indications below TTS into one group. The 2005 letter separates indications by initiation direction. All circumferential ODSCC at TTS was associated with the expansion transition.

Question 3.

Pages B-2 and B-3 of the January 26, 2005, letter and Attachment 1 of the November 12, 2004, letter, indicate that volumetric indications were detected. In one instance, it was reported that the volumetric indications were not associated with corrosion while in another instance the volumetric indications were not associated with loose parts. Please clarify the discussions of all locations where volumetric indications were identified. In addition, discuss the nature/cause of these volumetric indications.

RESPONSE: Refer to the following table with entries that correspond to volumetric indications tabulated in Attachment 1 of the November 12, 2004 letter. No other volumetric indications were identified. It should be noted that these indications were described in the January 26, 2005 letter in terms of mechanisms not believed to be involved because accurate causes were not clearly established.

1R16 Volumetric Indications

Indication Location					Possible Cause
	SG	Row	Column	Distance	
Above hot leg top of tubesheet	B	2	83	0.03 in.	Evidence of corrosion mechanisms was not observed. No foreign objects were identified at these locations during 1R16. No change was observed since 1R15. Possible causes may include foreign objects that were previously removed by cleaning, or manufacturing laps.
	C	20	17	1.07 in.	
	C	21	17	0.91 in.	
Above cold leg top of tubesheet	B	1	94	0.98 in.	
At dented tube support plate (01H)	B	45	40	-0.09 in.	The dent and volumetric indication were not coincident. No foreign objects were identified at this location during 1R16 (via eddy current analysis). Access to this area to perform visual inspections is not easily obtained. A possible cause is thinning which has been observed at cold leg tube support plates in Model 51 SG's.

Question 4.

Provide additional information regarding the tube support plate axial indication located above the tubesheet sleeve (e.g., is this indication associated with the sleeve or does this indicate that the tube was not inspected with the nominal size probe so the tube was plugged).

RESPONSE: The tube in which the indication was located was a lower row tube. The tube contained a hot leg tubesheet sleeve and a TSP sleeve at the 01H elevation. As such, the indication (located at the 02H elevation) could not be examined from the cold leg with a probe of adequate size (0.720") since this probe size would have been too large to traverse the U-bend. The indication was reported using a 0.640" wide groove probe which was the probe used to examine the tubesheet sleeve. Since this probe is not qualified for alternate repair applications (sizing) for ODSCC at TSPs, the tube was plugged.

Question 5.

Regarding the permeability variation and the secondary side anomalies that were plugged, please discuss whether the indications were traceable to previous inspections, whether they are changing with time, and how it was determined that there was no degradation at these locations.

RESPONSE: In all cases, the signals were traced to previous outages with no change in signal characteristics and a +Point probe was used to better characterize the signals. Two tubes were preventatively plugged due to U-bend proximity (i.e., almost touching each other), a third due to an anomalous signal in a small radius U-bend (Resolution analysts could not conclude whether the signal was a dent or a flaw) and the fourth due to a permeability signal that extended into a hot leg TSP.

Question 6.

In order to confirm the absence of cracking at wear scars, were rotating-probe exams performed at any of these locations? If not, provide the basis for not conducting rotating-probe exams at these locations.

RESPONSE: For several consecutive outages, a 20% +Point (rotating probe) sampling of anti-vibration bar (AVB) wear scars has been performed to confirm the presence of ODSCC within the AVB wear scar. No ODSCC signals have ever been identified.

Question 7.

Describe in greater detail, the cold-leg expanded tube support plate intersections that are discussed on Page B-1 of the January 26, 2005, letter.

RESPONSE: During 1R05 (1986), eighty-eight (88) first and second cold leg TSP intersections (44 tubes) in SG "A" were hydraulically expanded in an attempt to reduce or eliminate the effects of wall thinning due to tube vibration. The intent was to close the tube-to-TSP gap to halt the thinning mechanism. Every outage, each expanded TSP location is inspected, early on with single and three coil rotating probes, currently with the +Point probe. Indications representative of thinning or degradation are plugged. Sixty-four (64) cold leg intersections (32 tubes) remain in-service during the current operating cycle.

Question 8.

Please discuss the difference between the signals characterized as parent-tube flaws and parent-tube problems.

RESPONSE: Parent tube flaws (PTFs) are indications in the parent tube whose location is in the area where the sleeve is considered to be the pressure boundary. Parent tube problems (PTPs) are observed in the area where both the sleeve and the parent tube combine to form the pressure boundary.

Question 9.

Please discuss the reason for expanding the scope of inspections at the dented tube support locations (greater than 2 volts but less than 5 volts) in SG A.

RESPONSE: A total of nine (9) dented TSP locations were determined to contain axial ODSCC. In some cases the ODSCC was coincident with the dent, in some cases it was not. The indication may have been located at the upper half of the TSP while the dent may have been located at the lower half of the TSP. The ODSCC may have been located at a different azimuthal location than the dent. Five (5) of the nine locations had bobbin DSI reports from normal production analysis. Seven (7) of the nine locations were reported from the > 2.00 volt but < 5.00 volt dent sampling program, which was implemented to look for PWSCC, not ODSCC. As all nine were not reported by bobbin analysis, the > 2.00 volt but < 5.00 volt dent +Point sampling program was expanded to include all locations up to the 07H elevation. The final two locations were reported from the expansion program but at elevations lower in the bundle than 07H.

BVPS-2

Question 1.

One tube was plugged for a permeability variation indication. Please discuss whether this indication has changed since the preservice inspection. If the indication has changed, discuss the reason for any change and discuss how you confirmed the tube had adequate integrity (given that permeability variation may affect your ability to inspect this region with eddy current techniques).

RESPONSE: A review of historical data for tube location R37 C70 in Steam Generator "C" shows that the permeability variation indication (PVN) has remained basically the same, in terms of voltage amplitude and phase angle, since it was originally recorded 1996.

From the baseline inspection in 1985 until 1995 (2R05), this tube location was only examined with bobbin coil probes. Although top-of-tubesheet sampling with rotating coil probes was performed during the latter part of this time frame, this tube location was not selected as part of any random sample to be examined. There were no PVNs recorded from the bobbin coil probe during these examinations.

The first year this PVN was recorded was 1996 (2R06) when it was first examined with a rotating coil probe. It was examined again in the subsequent outage in 1997; however, no indication was recorded. Since the tube is plugged, the reason why the indication was not recorded has not been researched in response to this question. The PVN was not recorded from bobbin coil probe inspections during these outages.

From 2000 (2R08) through 2005 (2R11), the indication has been recorded by rotating coil probes every outage. There has been good agreement in the voltage amplitudes and phase angles being recorded. The tube was removed from service in 2R11 as a conservative measure.

Question 2.

Several non-quantifiable indications and distorted tubesheet signals with possible indications were reported. Please discuss (in general) how these indications were dispositioned (e.g., a rotating-probe exam was performed at each location which did not reveal any service-induced flaws).

RESPONSE: The locations were reported by the bobbin coil but were reported as no detectable degradation (NDD) by the +Point exam. The practice at BVPS is to plug such locations even though the +Point report is NDD if the indication is within the historical sludge pile region.

Question 3.

Please discuss the results of your foreign object search and retrieval. If any foreign object (loose part) was left in the SGs, please discuss any corrective actions taken (e.g., plugged and stabilized surrounding tubes; engineering analysis confirming tube integrity would be maintained, etc.).

RESPONSE: During Foreign Object Search and Retrieval on the secondary side of the BVPS Unit 2 SGs, several small loose parts were identified. Some of the parts were removed; however, others were left in the steam generators. A summary of the remaining parts identified during the 2R11 outage is provided in the following table. Westinghouse performed a wear time analysis to show the loose parts would not cause significant tube damage (i.e., a wear scar greater than the structural limit of 54% through wall with measurement uncertainty included) within two operational cycles. During 2R12, retrieval attempts will again be performed to see if these parts can be removed. Eddy current examinations will be performed on the subject tubes as well as all adjacent tubes. If the parts cannot be removed, the wear time evaluation will be updated to reflect the most recent eddy current information

Foreign Objects Left in the Beaver Valley Power Station Unit No. 2 Steam Generators During 2R11

SG	Location	Row/Column	Description	Adjacent Tube Wear?
A	Tube Lane	C43-C44	Wire; 3/16" x 1/64" D	No
A	Hot Leg	R11-C75	Scale; 1/4" x 3/16" x 1/8"	No
A	Hot Leg	R13-C74	Scale; 3/8" x 3/8" x 1/8"	No
B	Hot Leg	R6-C32	Wire; 3/16" x 1/64" D	No
B	Hot Leg	R22-C15	Gasket; 1/2" x 1/8" x 1/8"	No
B	Hot Leg	R4-C15	Slag; 1/4" x 1/16" x 1/8"	No
C	Hot Leg	R18-R19/C56	Scale; 3/8" x 3/8" x 1/64"	No
C	Tube Lane	C48-C49	Wire; 3/4" x 1/64" D	No
C	Tube Lane	C48-C49	Wire; 3/4" x 1/64" D	No