

June 14, 2006

Mr. James H. Lash
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SUBJECT: BEAVER VALLEY POWER STATION, UNIT NOS. 1 AND 2 (BVPS-1 AND 2) -
REVIEW OF THE 2004 AND 2005 STEAM GENERATOR (SG) TUBE
INSPECTIONS REPORTS (TAC NOS. MC8770 AND MC8771)

By letter dated November 5, 2004 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML043200116), as supplemented by letters dated 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), October 14, 2005 (ADAMS Accession No. ML052920617), and April 7, 2006 (ADAMS Accession No. ML061020310), FirstEnergy Nuclear Operating Company (the licensee) submitted information summarizing the results of the SG eddy current examinations for the BVPS-1 sixteenth refueling outage in October 2004 and the BVPS-2 eleventh refueling outage in April 2005. The Nuclear Regulatory Commission (NRC) staff previously reviewed portions of the January 26, 2005, letter 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).

Based on a review of the information provided, the NRC staff concludes that the licensee provided the information required by its technical specifications and there are no technical issues that warrant follow-up action at this time. The staff's review of the reports is enclosed. TAC Nos. MC8770 and MC8771 have been closed, based on the issuance of this letter.

Sincerely,

/RA/

Timothy G. Colburn, Senior Project Manager
Plant Licensing Branch I-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket Nos. 50-334 and 50-412

Enclosure:
As stated

cc w/encl: See next page

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SUMMARY OF STAFF'S REVIEW
OF THE 2004 AND 2005 STEAM GENERATOR (SG) TUBE INSPECTIONS
FIRSTENERGY NUCLEAR OPERATING COMPANY
BEAVER VALLEY POWER STATION, UNIT NOS. 1 AND 2 (BVPS-1 AND 2)
DOCKET NOS. 50-334 AND 50-412

By letter dated November 5, 2004 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML043200116), as supplemented by letters dated 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), October 14, 2005 (ADAMS Accession No. ML052920617), and April 7, 2006 (ADAMS Accession No. ML061020310), FirstEnergy Nuclear Operating Company (the licensee) submitted information summarizing the results of the SG eddy current examinations for the BVPS-1 sixteenth refueling outage in October 2004 and the BVPS-2 eleventh refueling outage in April 2005. The Nuclear Regulatory Commission (NRC) staff previously reviewed portions of the January 26, 2005, letter 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 area, is documented in a letter dated August 4, 2005 (ADAMS Accession No. ML052140156).

The SGs at BVPS-1 and 2 during the period of the subject inspections were Westinghouse Model 51 SGs. BVPS-1 replaced its SGs during the spring 2006 refueling outage with Westinghouse Model 54F SGs. Each SG contains 3,388 mill annealed Alloy 600 tubes. Each tube has a nominal outside diameter (OD) of 0.875-inch and a nominal wall thickness of 0.050-inch. The tubes are supported by a number of carbon steel tube support plates and Alloy 600 anti-vibration bars. The tubes in the BVPS-1 SGs were explosively expanded into the tubesheet at both ends for the full length of the tubesheet. The tubes in the BVPS-2 SGs were roll expanded into the tubesheet at both ends for the full length of the tubesheet. In BVPS-2, the entire length of tube within the tubesheet was shot-peened on both the hot and cold-leg side of the SG prior to operation. In addition, the U-bend region of the small radius tubes in BVPS-2 were in-situ stress relieved prior to operation.

The only sleeves installed in the BVPS-1 Model 51 SGs were Westinghouse laser-welded sleeves. These sleeves were installed during 1R13 (February 2000). Both tubesheet and tube support plate sleeves were installed during 1R13. There are no sleeves installed in the BVPS-2 SGs as of 2R11 (spring 2005).

In addition to the depth-based tube repair criteria, the licensee is also authorized to apply the voltage-based tube repair criteria for predominantly axially-oriented OD stress-corrosion cracking (ODSCC) at the tube support plate elevations in both BVPS-1 and 2. Although authorized to implement the voltage-based repair criteria, the licensee has not found it necessary to implement these criteria at BVPS-2 since few indications subject to this repair criteria have been identified.

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

(i.e., tube plugging) taken in response to the inspection findings.

As a result of the review of the reports, the NRC staff has the following comments/observations:

Twenty three tubes that were previously plugged, but returned to service by inserting a sleeve during 1R13, were found to have axial indications in the parent tube at the location of the lower tube-to-sleeve joint. The parent tube indications are approximately 1.0 inch above the tube-end and are coincident with the area where a tube plug was previously removed by the tungsten inert gas relaxation process. These tubes were plugged. Similar indications were detected in approximately 28 tubes during 1R15 (refer to November 2, 2004, letter (ADAMS Accession No. ML042960054) for additional details). The licensee did not clarify whether the indications in the 23 tubes plugged in 1R16 could be located in the 1R15 data with the benefit of hindsight (or whether these indications "initiated" during the cycle).

No bulged or obstructed tubesheet sleeves were found during 1R16.

Two tubes were plugged during 1R16 because the tubes were in close proximity. Two tubes were also plugged in 1R15 since they were in close proximity (refer to November 2, 2004, letter (ADAMS Accession No. ML042960054) for additional details).

In SG A in BVPS-1, 88 locations in 44 tubes were hydraulically expanded in 1986 to reduce or eliminate the effects of wall thinning due to vibration. The expansions were performed at the first and second cold-leg tube support plate. As of 1R16, 32 of these tubes remained in service.

In the BVPS-2 SGs, several small foreign objects were left in service during 2R11. No wear was observed on the tubes adjacent to these foreign objects. An analysis was performed by the licensee demonstrating that the foreign objects would not result in a loss of tube integrity. During 2R12 (scheduled for fall 2006), the licensee will attempt to remove these foreign objects.

In the BVPS-2 SGs, 15 circumferential ODSCC indications were detected during 2R10. In 2R11, 44 circumferential ODSCC indications were detected. All of these indications were associated with the expansion transition. In 2R11, one of the tubes with a circumferential ODSCC indication at the expansion transition also had a circumferential primary water stress-corrosion cracking indication at the expansion transition. The two indications did not intersect.

In the BVPS-2 SGs, approximately 7 axial indications were detected in both 2R10 and 2R11 at the expansion transition or slightly above the top of the tubesheet on the hot-leg side of the SG (e.g., in the sludge pile region).

Based on a review of the information provided, the NRC staff concludes that the licensee provided the information required by its technical specifications. In addition, the staff concludes that there are no technical issues that warrant follow-up action at this time since 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.

Principal Contributor: K. Karwoski

Date: June 14, 2006