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L-03-048

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

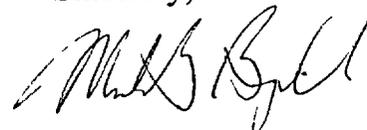
**Subject: Beaver Valley Power Station, Unit No. 1  
Docket No. 50-334, License No. DPR-66  
Steam Generation Tubesheet Inspection Information**

**Reference: Nuclear Energy Institute (NEI) Letter to NRC dated February 4, 2003  
Regarding Steam Generator Tubesheet Inspection Information**

In response to a request from the NRC staff, NEI indicated in the referenced letter that plants that may be susceptible to stress corrosion cracking within their steam generator tubesheet would provide the NRC with information on past and future steam generator tubesheet inspections. Attached is requested information for Beaver Valley Power Station (BVPS) Unit 1. BVPS Unit 1 is currently performing steam generator tube inspections as part of the current refueling outage activities (1R15).

There are no regulatory commitments contained in this letter. If there are any questions concerning this matter, please contact Mr. Larry R. Freeland, Manager, Regulatory Affairs/Performance Improvement at 724-682-5284.

Sincerely,



Mark B. Bezilla

Attachment

c: Mr. T. G. Colburn, NRR Senior Project Manager  
Mr. D. M. Kern, NRC Sr. Resident Inspector  
Mr. H. J. Miller, NRC Region I Administrator

A 001

Attachment to Letter L-03-048  
Beaver Valley Power Station Unit 1  
Steam Generator Tubesheet Inspection Information

## TUBESHEET INSPECTION PRACTICES

### Plant Information

Plant: Beaver Valley Unit 1  
Steam Generator Model: Westinghouse Model 51  
Tube Material: I-600, Mill Annealed  
Tube Diameter: 0.875"  
Tube Thickness: 0.050"  
Expansion Process and Extent: WEXTEx – full length  
Tubesheet Thickness: 21"  
 $T_{HOT} = 607^{\circ}F$   
EFPY @EOC 15 = 16.95 EFPY

### Susceptible to degradation below expansion transition region:

Yes  No

If no, provide basis for non-susceptibility determination

### Historical Inspection Practices and Results

Most recent past outage:  
1R14 – October 2001  
End of Cycle #14

#### Inspection techniques used for tubesheet examination:

- bobbin coil
- +Point

#### Extent of tubesheet inspections:

- Hot leg active tubes
  - 100% bobbin; 21"
  - 100% +Point; top of tubesheet +6"; -8"
- Cold leg active tubes
  - 100% bobbin; 21"
  - 20% +Point; top of tubesheet +6"; -8"

**Inspection results:**

- Axial and circumferential PWSCC identified on hot leg below expansion transitions
- No degradation identified on cold leg below expansion transitions
- Maximum depth of PWSCC on hot leg = TTS - 7.66" (circumferential orientation)
- Total number of circumferential indications on hot leg = two (2): maximum circumferential extent = 38°
- Total number of axial indications on hot leg = 13

**Bases for inspection technique and inspection extent:**

The bobbin coil examination is capable of detecting significant axial and/or volumetric degradation throughout the full depth of the expanded tubesheet region and ensures compliance to Technical Specification surveillance requirements.

Rotating pancake coil techniques (+Point) are used in the tubesheet region to adequately assess its structural and leakage integrity. The +Point techniques are qualified in accordance with Appendix H of the EPRI PWR Steam Generator Inservice Inspection Guidelines and provide adequate detection capabilities for both axial and circumferential oriented degradation in this region of the tube bundle. The +Point examination extents below the top of tubesheet are limited to that portion of the tube that can be demonstrated to provide adequate pressure and leakage boundary capabilities.

All corrosion related degradation identified from either the bobbin coil or +Point examinations in this region of the tube bundle is repaired upon detection. Thus, upon completion of the above-described examinations, technical specification compliance and structural and leakage integrity can be assured.

WCAP-14797 Revision 1, "Generic W\* Tube Plugging Criteria for 51 Series SG Tubesheet Region WEXTEx Expansions" defines the bases for the W\* alternate repair criteria for the tubesheet region in Westinghouse Series 51 explosively expanded steam generator tubes. This document establishes a minimum required length of non-degraded expanded tubing in the tubesheet region that would provide structural and leakage integrity for postulated circumferential degradation that results in a complete separation of the tube below the required length. This generic document establishes the bases for the required depth of inspection for the +Point probe in the WEXTEx expanded portion of the tube below the expansion transition. Any degradation, regardless of orientation, below the depth established by WCAP-14797, Rev 1 would have no adverse effect on structural or leakage integrity. The leakage contribution of any undetected degradation below the required unflawed tube length is negligible.

The determination of the required non-degraded tube length considers the residual preload capability of the tube expansion process, the thermal tightening effects due to thermal expansion coefficient differences between the tube and tubesheet material, pressure tightening effects, and loss of preload due to tubesheet bow effects. The residual preload inherent to the expansion process is independent of differences between analysis and plant conditions.

While WCAP – 14797, Rev 1 establishes varying depths below the Bottom of the WEXTX Transition (BWT) for pressure and leakage boundary integrity dependent upon tube location across the tubesheet, Beaver Valley Unit 1 utilizes the most conservative of these depths of 7.5” below BWT as the inspection depth by +Point technique in order to be able to assess structural and leakage integrity. Since the inspection depth is measured from the top of tubesheet on the secondary side, the BV1 minimum +Point inspection extent was conservatively established as 8” below top of tubesheet to account for BWT and ECT measurement uncertainty. WCAP-14797, Rev 1 identified BWT as approximately 0.25 inches below the top of tubesheet, and the ECT uncertainty as 0.12 inches.

The determination of the required non-degraded expanded tube length within the tubesheet region described in WCAP-14797 Rev 1 is conservative for the expected conditions within the BVPS Unit 1 steam generators. The inputs and assumptions used in generic WCAP-14797, Rev 1 bound the design and operating conditions of the BV1 steam generators. Therefore, the defined required non-degraded tube lengths of WCAP-14797 Rev 1 form a conservative basis for the BV1 structural and leakage boundaries for the tubing below the expansion transitions.

**Previous outages:**

1R13 – February 2000

Inspection techniques, extents and bases were identical to those described for 1R14.

**Planned Inspection for Ongoing Outage**

1R15 – March 2003

Inspection techniques, extents and bases will be identical to those described for 1R14 except the BWT for each active tube will be measured by eddy current techniques and the 20% cold leg +Point examination will be performed in one steam generator. Adjustments will be made to the inspection depth, if necessary, to further ensure the minimum required tube distance as established by WCAP – 14797, Rev 1 is being interrogated by NDE techniques qualified in accordance with EPRI PWR SG Inservice Inspection Guidelines.