UNITED STATES
NUCLEAR REGULATORY COMMISSION
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November 18, 2009

Mr. Paul Harden
Site Vice President
FirstEnergy Nuclear Operating Company
Beaver Valley Power Station
Mail Stop A-BV-SEB1
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SUBJECT: BEAVER VALLEY POWER STATION, UNIT NO. 2 (BVPS-2) - SUMMARY OF CONFERENCE CALL REGARDING THE SPRING 2008 STEAM GENERATOR TUBE INSERVICE INSPECTION RESULTS (TAC NO. ME2216)

Dear Mr. Harden:

The Nuclear Regulatory Commission (NRC) staff formally reviews all steam generator (SG) inservice inspection summary reports submitted by licensees in accordance with the plant's Technical Specification requirements. The NRC staff also participates in conference calls with most licensees when approximately 70% of the SG tube inspections are completed. On October 23, 2009, the NRC staff participated in a conference call with Beaver Valley Power Station, Unit No. 2 representatives regarding the ongoing SG tube inspection activities for Refueling Outage 14. The summary of the conference call is enclosed.

Please contact me at (301) 415-1016, if you have any questions regarding this issue.

Sincerely,

Nadiyah S. Morgan, Project Manager
Plant Licensing Branch I-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-412

Enclosure:
As stated

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SUMMARY OF CONFERENCE CALL

REGARDING THE SPRING 2008 STEAM GENERATOR TUBE INSPECTION RESULTS

BEAVER VALLEY POWER STATION, UNIT NO. 2

DOCKET NO. 50-412

On October 23, 2009, the Nuclear Regulatory Commission (NRC) staff participated in a conference call with representatives of FirstEnergy Nuclear Operating Company, Inc. (licensee) regarding the ongoing steam generator (SG) tube inspection activities at Beaver Valley Power Station, Unit No. 2 (BVPS-2). Information provided by the licensee for the conference call is included as an attachment to this enclosure.

The SGs at BVPS-2 are Westinghouse model 51 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 were roll expanded at both ends for the full length of the tubesheet. 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 were in-situ stress relieved prior to operation.

Additional clarifying information or information not included in the material provided by the licensee is summarized below:

- No cracking has ever been observed in the U-bend region of the tubes in rows 3 - 8.

- 25% of the free span dings greater than 5 volts, as measured from the bobbin coil, were scheduled to be inspected with a +Point coil. In previous outages, since approximately refueling outage 9, 100% of the free span dings greater than 5 volts have been inspected with a +Point coil.

- At the time of the conference call, no other indications except those near the top of the tubesheet and wear (e.g., at the anti-vibration bars) had been detected.

- At the time of the conference call, the bobbin coil inspections were approximately 71% complete in SG A, 65% complete in SG B, and 94% complete in SG C. The rotating probe inspections at the top of the tubesheet on the hot-leg side of the SG were approximately 96 percent complete. Overall, the inspections were approximately 77% complete at the time of the call.

- At the time of the call, eight axial OD stress corrosion cracking (ODSCC) indications had been detected near the top of the tubesheet on the hot-leg side of the SG. As a result, the 68 tubes requiring plugging included 67 with cracks near the top of the tubesheet and 1 from wear at the anti-vibration bars. These results are preliminary and subject to change since the inspections are still ongoing.

- At the end of the conference call, the NRC staff requested that the licensee inform the NRC project manager if anything unusual/unexpected is discovered in the remainder of the inspection, such as if an in-situ pressure test is performed, or if an inspection sample size must be increased.

Subsequent to the conference call, the licensee provided the NRC staff with the following additional information:

- Three circumferential ODSCC indications were detected. All three of these indications were associated with dings.
    - A free span ding indication in SG C was approximately 2.7 inches above the third hot-leg tube support plate in the tube in row 43, column 36. The voltage of this indication as measured with a +Point coil was 1.33 volts.
    - A free span ding indication in SG C was approximately 9.7 inches above the second hot-leg tube support plate in the tube in row 13, column 49. The voltage of this indication as measured with a +Point coil was 14.84 volts.
    - A free span ding indication in SG A was approximately 44.6 inches above the sixth hot-leg tube support plate in the tube in row 41, column 36. The voltage of this indication as measured with a +Point coil was 4.52 volts.
- As a result of finding the first indication, the licensee expanded their inspection of dings to include all free span dings in all SGs. The licensee indicated that dings are reported when their bobbin voltage is 1 volt.
- In-situ pressure testing was performed on the 2 circumferential ODSCC indications found within a free span dings in SG C STET in row 13, column 49 and row 43, column 36. These were successfully completed with no leakage identified.
- No in-situ pressure testing was planned for the indication reported in SG A.
- The indication in tube row 43, column 36 was associated with a 2.25 volt ding and the indication in tube row 13, column 49 was associated with a 14.84 volt ding. The indication in SG A was believed to be associated with a ding whose voltage was greater than 2.25 volts.

STEAM GENERATOR TUBE INSPECTION DISCUSSION POINTS

The following discussion points have been prepared to facilitate the conference call arranged with the licensee to discuss the results of the steam generator (SG) tube inspections to be conducted during the upcoming fall 2009, Beaver Valley Power Station, Unit No. 2 (BVPS-2) refueling outage. This conference call is scheduled to occur towards the end of the planned SG tube inspections, but before the completion of the inspections and repairs.

The Nuclear Regulatory Commission staff plans to document a summary of the conference call, as well as any material that is provided in support of the call.

1. Discuss any trends in the amount of primary-to-secondary leakage observed during the recently completed cycle.

   RESPONSE: No primary to secondary leakage was observed during the recently completed cycle.

2. Discuss whether any secondary side pressure tests were performed during the outage and the associated results.

   RESPONSE: No secondary side pressure tests were performed 2R14.

3. Discuss any exceptions taken to the industry guidelines.

   RESPONSE: No exceptions have been taken to industry guidelines.

4. For each SG, provide a description of the inspections performed including the areas examined and the probes used (e.g., dents/dings, sleeves, expansion-transition, U-bends with a rotating probe), the scope of the inspection (e.g., 100% of dents/dings greater than 5 volts and a 20% sample between 2 and 5 volts), and the expansion criteria.

   RESPONSE: See next page.

Attachment

Table 4-2 Detection Inspection/Expansion Plan: Beaver Valley Unit 2, 2R14 Inspection				
Degradation Mechanism	**Location**	**Probe Type**	**Detection Inspection/Expansion Plan**	
			Inspection Sample Plan	**Expansion Plan**
Existing Degradation Mechanisms				
Axial ODSCC	Hot leg sludge pile and expansion transition	Bobbin	100% full length bobbin	None
		Plus Point	100% HL TTS 6" above TTS to 3" below TTS	20% cold leg from +6" to -3" for C-3 condition at hot leg in SGB, SGC
Circumferential ODSCC	HL TTS expansion transition	Plus Point	100% HL TTS 6" above TTS to 3" below TTS	20% cold leg from +6" to -3" for C-3 condition at hot leg in SGB, SGC
Axial ODSCC	Non-Dented TSP Intersections	Bobbin	100% full length bobbin 100% +Pt exam of all DSI/DNI reports	None
	Non-Dented TSP Intersections (confirmation only)	Plus Point	100% bobbin indications, 100% mix residuals $\geq$2V, 25% mix residuals $\geq$1.5 but <2V. If GL 95-05 is implemented, 100% bobbin indications >2 volts, plus mixed residuals as above are to be RPC tested.	100% mix residuals $\geq$1.5V for conformation of ODSCC in $\geq$1.5V SPR
	Dented TSP Intersections $\geq$ 5 volt	Plus Point	100% hot leg intersections $\geq$ 5 volt	None – Potential expansion if circ indications observed
Axial ODSCC	Freespan dings >5V (1)	3-coil Plus Point	25% freespan dings >5V	100% freespan dings >5V in affected SG
Axial PWSCC	Hot Leg TTS expansion transition	Plus Point	100% hot leg TTS from 6" above to 3" below TTS	20% cold leg from +6" to -3" for C-3 condition at hot leg in SGB, SGC
	Within Tubesheet (below F*)	Bobbin	100% full length bobbin all SGs	None
		3-coil Plus Point	100% BLG and EXP signals above hot leg tube end +10"	None
Circ PWSCC	Hot Leg TTS expansion transition	Plus Point	100% hot leg TTS all SGs (initial plan dictated by active mechanisms)	20% cold leg from +6" to -3" for C-3 condition at hot leg in SGB, SGC
Axial PWSCC	Dented TSP intersections (1)	Plus Point	100% dented hot leg intersections >5V, 100% >2V and <5V dents at 01H through 04H, 100% TSP residual signals with phase angle $\leq 55^{o}$	100% >5V cold leg dented TSP intersections if ODSCC confirmed at cold leg TSPs, 100% >2V dents at hot leg TSP if PWSCC is detected in a dent voltage <5.
Circumferential ODSCC	Freespan dings, all voltages	3-coil Plus Point	25% freespan dings, all voltages	100% freespan dings, all voltages
Tube Wear	AVB intersections	Bobbin	100% full length bobbin all SGs	None
Volumetric (not corrosion related)	Entire tube length	Bobbin	100% full length bobbin all SGs	None
		Plus Point	100% special interest testing of bobbin indications Defined by existing +Pt programs	None for bobbin based detection

Resolution for Classification of Indications				
Freespan Differential	Freespan	Bobbin	100% full length, all SGs	Historical review; RPC if no history or changed
Potential MBMs	All	Bobbin	100% full length, all SGs	Historical review; RPC if no history or changed
Potential Degradation Mechanisms				
Axial and Circ ODSCC	Cold Leg TTS (2)	3-coil Plus Point	SGA: 20% CL TTS 6" above TTS to 3" below TTS	100% CL TTS in SGA, 20% CL TTS in SGB, SGC
Axial ODSCC	Freespan	Bobbin	100% full length bobbin all SGs	None
Axial ODSCC	Freespan dings <5V	Bobbin 3-coil Plus Point	100% full length bobbin 100% +Pt exam of all DNI reports 100% +Pt of dents (regardless of voltage) at AVBs	None
Axial and Circumferential PWSCC	Row 1 and 2 U-bends	Plus Point	100% Row 1 and Row 2 U-bends using mid-range +Pt 100% Row 1 U-bends with excessive mid-range noise (≥0.65Vvm) using high frequency +Pt (see Appendix B). High frequency +Pt inspection of all mid-range reported flaws.	100% Row 3 mid-range inspection in SGs with indications detected in Row 2. 100% HF +Pt of Row 1 tubes with mid-range Vvm noise values >0.59 volts for high frequency detection without mid-range detection in tubes with Vvm noise ≥0.65 volts
Oblique PWSCC	Row 3 thru 10 U-bends	Plus Point	25% U-bends in Rows 3 thru 8	See Section 4.3
Axial PWSCC	Row 3 thru 10 U-bends	Plus Point	25% U-bends in Rows 3 thru 8	See Section 4.3
Axial ODSCC	Dented AVB intersections	Plus Point	100% dented AVB intersections regardless of voltage	None
Thinning	Cold Leg TSP intersections	Bobbin	100% full length bobbin all SGs	None
Tube Wear (loose parts)	TTS periphery, tube lane	Bobbin	100% full length bobbin +FOSAR	None
		Plus Point	100% hot leg TTS from 6" above to 3" below TTS	None unless FOSAR identifies objects on CL not seen by bobbin
Pitting	Cold leg TTS	Bobbin	100% full length bobbin all SGs	None
		Plus Point	100% +Pt exam of all NQI reports	None

1: Mechanism has not been observed since 2R09 but will be considered existing for this assessment.
2. Considered potential in SG "A" only because of hot leg C-3 condition at 2R13.

5. For each area examined (e.g., tube supports, dent/dings, sleeves, etc), provide a summary of the number of indications identified to-date for each degradation mode (e.g., number of circumferential primary water stress-corrosion cracking indications at the expansion transition). For the most significant indications in each area, provide an estimate of the severity of the indication (e.g., provide the voltage, depth, and length of the indication). In particular, address whether tube integrity (structural and accident induced leakage integrity) was maintained during the previous operating cycle. In addition, discuss whether any location exhibited a degradation mode that had not previously been observed at this location at BVPS-2 (e.g., observed circumferential primary water stress-corrosion cracking at the expansion transition for the first time at BVPS-2).

RESPONSE:

Inspection Range: 6 inches above to 3 inches below hot leg TTS (Tube Basis)					
SG	Number Axial PWSCC	Number Circ PWSCC	Number Axial ODSCC	Number Circ ODSCC	
A	0	0	2	28	
B	0	0	4	12	
C	0	0	1	19	
Total	0	0	7	59	

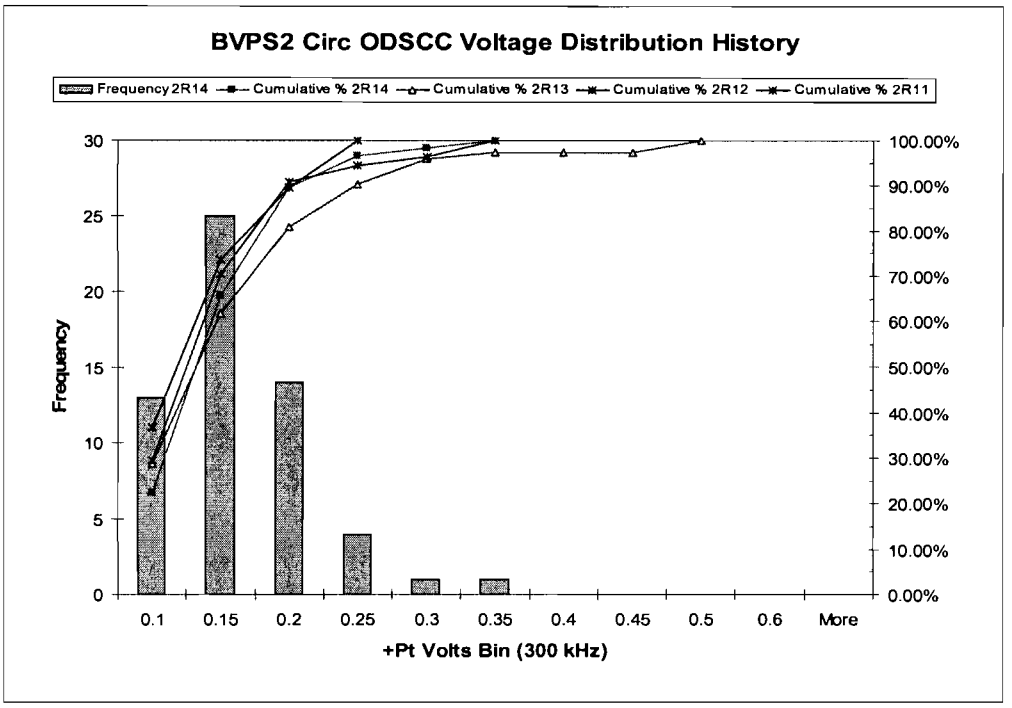
Flaw length assessment follows a two-pass process. The first pass is performed at the resolution stage and is intended to provide a bounding length assessment. The second pass includes profiling to more accurately assess flaw parameters of those indications which exceed the screening values.

Axial ODSCC:
Length: 0.16 to 0.51 inch length, average of 0.30 inch (first pass)
Maximum length from profiling is 0.31 inch
Voltage: 0.09 to 0.29 volt, average of 0.18 volt (300 kHz)
Depth: 39 to 54% TW

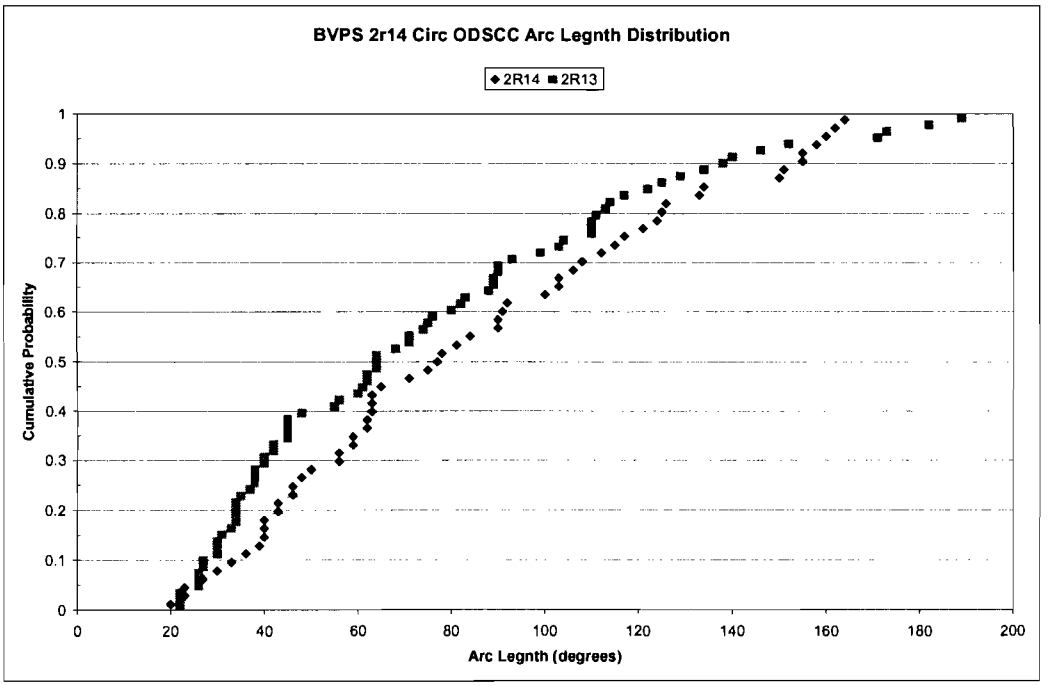
Circ ODSCC:
Length: 20 to 164 degrees arc, average of 84 degrees arc
Voltage: 0.05 to 0.33 volt, average of 0.15 volt (in 300 kHz)
Depth: 0 to 92%TW, average of 36%TW, based on phase analysis
A screen of percent degraded areas (PDAs) for circ ODSCC indications are developed based on observed arc length and maximum depth (including NDE error). Two indications required further profiling to determine a more accurate PDA. The PDA from profiling was < 28% for both.

The following figures compare several flaw parameters for the 2R14 and 2R13 outages. The conclusion is that there is no apparent difference in the flaw signals between these two inspections. At 2R13, a top of tubesheet ASCA cleaning process was applied. This reduced the deposit influence at the top of tubesheet and resulted in reduced noise conditions. The 2R14 eddy current data is judged to include a reduced noise level compared to prior outages. The observations that flaw parameters are consistent between 2R13 and 2R14 suggests that the ODSCC aggressiveness condition may have been slightly reduced for Cycle 14 compared to Cycle 13 as the improved noise condition would be expected to result in "larger" flaws at 2R14. The number of tubes affected by SCC at the hot leg top of tubesheet is slightly reduced for 2R14 compared to 2R13.

Long term trending of circ ODSCC +Pt amplitudes shows essentially no change over multiple outages. Therefore it can be concluded that the slight temperature increase associated with uprating has had no discernable effect upon SCC signal amplitude @ 2R14.



Circ ODSCC arc length distribution for 2R14 is bounded by 2R13 data:



6. Describe repair/plugging plans.

RESPONSE: No sleeves have previously been installed. No sleeves will be installed this outage. All crack-like indications are plugged. Currently 68 tubes require plugging. All top-of-tubesheet circumferential indications are stabilized prior to plugging. If circ. indications are reported in other areas of the tube bundle, those locations are evaluated for stabilization on a case-by-case basis. All AVB wear exceeding TS repair limit of 40% TW are plugged. Only one tube has an AVB wear indication that requires repair (40%TW with 5%TW growth). Any observed foreign object wear with the object remaining in contact with the tube will be stabilized and plugged.

7. Describe in-situ pressure test and tube pull plans and results (as applicable and if available).

RESPONSE: In situ pressure test screening follows the guidance of Rev 3 of EPRI In Situ Pressure Test Guidelines.

The largest amplitude axial ODSCC indication is bounded by the proof and leakage screening criteria, thus testing is not required. Structural integrity calculations support the conclusions based on screening against in-situ pressure test guideline values.

The largest amplitude circumferential ODSCC indication is bounded by the leakage screening threshold, thus leakage testing is not required. Structural integrity of circumferential ODSCC indications was established based on flaw parameters and shown to be well below the structural limit (including NDE uncertainty).

No In-situ pressure tests are planned this outage.

No tube pulls are planned for this outage

8. Discuss the following regarding loose parts:

- what inspections are performed to detect loose parts.
- a description of any loose parts detected and their location within the SG (including the source or nature of the loose part, if known).
- if the loose parts were removed from the SG.
- indications of tube damage associated with the loose parts.

RESPONSE: Low frequency eddy current channels are screened for the detection of loose parts. In addition, FOSAR is used to detect foreign objects from the secondary side. FOSAR is performed in the periphery annulus region and tube lane region. The FOSAR plan applied at BVPS2 uses a two-pass process. That is, the video probe is inserted into one inspection port, pushed around the periphery to the opposite inspection port, and withdrawn. The inspection is performed during the withdraw process. The probe is then inserted into the opposite inspection port, pushed around the periphery to the opposite inspection port, and withdrawn. This is repeated for both the hot and cold leg sides, thus, the FOSAR is in essence performed twice. This procedure permits multiple viewing angles for each tube location, thus increasing the potential for foreign object detection.

9. Discuss the scope and results of any secondary side inspection and maintenance activities (e.g., in-bundle visual inspections, feedring inspections, sludge lancing, assessing deposit loading, etc).

   RESPONSE: No feedring inspections are planned for this outage. Secondary side inspections are not scheduled to begin until next week. Normal practice is to visually interrogate any new PLP signals from eddy current testing, including those in-bundle. Sludge lancing will be performed in all SGs. Deposit loading is evaluated each outage using the Westinghouse Scale Profiling analysis.

10. Discuss any unexpected or unusual results.

    RESPONSE: None observed to date.

11 Provide the schedule for SG-related activities during the remainder of the current outage.

   RESPONSE: Primary Side: Finish eddy current, perform In-situ (if required), tube stabilization, tube plugging. Secondary Side: Sludge lancing, FOSAR, Machine SG "C" inspection port gasket seating surfaces.

November 18, 2009

Mr. Paul Harden
Site Vice President
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SUBJECT: BEAVER VALLEY POWER STATION, UNIT NO. 2 (BVPS-2) - SUMMARY OF CONFERENCE CALL REGARDING THE SPRING 2008 STEAM GENERATOR TUBE INSERVICE INSPECTION RESULTS (TAC NO. ME2316)

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Sincerely,

/RA/

Nadiyah S. Morgan, Project Manager
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