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Subject: Response to Request for Additional Information Regarding the 2006 Steam Generator Tube Inspections (TAC No. MD3378)

Ladies and Gentlemen:

By letters dated April 6, 2006 (Serial Number 3246), June 9, 2006 (Serial Number 3260), July 21, 2006 (Serial Number 3278), and October 6, 2006 (Serial Number 3288), the FirstEnergy Nuclear Operating Company (FENOC) reported the results of the Davis-Besse Nuclear Power Station (DBNPS) steam generator tube inspections performed during the Fourteenth Refueling Outage (14RFO). On January 19, 2007, by facsimile transmission, the Nuclear Regulatory Commission provided FENOC with additional questions regarding the DBNPS 2006 steam generator inspections. The responses to these questions are provided in Attachment 1. Attachment 2 identifies that there are no commitments contained in this submittal.

If there are any questions or if additional information is required, please contact Mr. Henry L. Hegrat, Supervisor – FENOC Fleet Licensing, at (330) 374-3114.

Very truly yours,

Mark B. Bezilla, Vice President - Nuclear

TSC

Attachments

A001

cc: Regional Administrator, NRC Region III
NRC/NRR Project Manager
NRC Senior Resident Inspector
Utility Radiological Safety Board

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION DAVIS-BESSE NUCLEAR POWER STATION FOURTEENTH REFUELING OUTAGE (14 RFO) STEAM GENERATOR INSPECTIONS (TAC NO. MD3378)

The NRC staff has requested additional information related to DBNPS Steam Generator Inspections to complete their review. FENOC's response to this request is provided below.

The following abbreviations are used in this Attachment:

EFPY	Effective Full Power Years
GMD	Geometric Mean Distortion
IGA	Intergranular Attack
LOCA	Loss-of-Coolant Accident
LTS	Lower Tube Sheet
MCO	Mid-Cycle Outage
MVI	Multiple Volumetric Indications
OTSG	Once Through Steam Generator
POD	Probability of Detection
PWSCC	Primary Water Stress Corrosion Cracking
RFO	Refueling Outage
TSP	Tube Support Plate
TW	Through Wall
UTS	Upper Tube Sheet
xxS	Support Plate Number

Question #1:

Discuss the cause of the single volumetric indication identified in Tube Row 105 Column 119 (R105C119) in Steam Generator 1-B.

DBNPS Response:

Tube Row 105 Column 119 (R105C119) in Steam Generator 1-B contained the only crevice indication discovered during 14RFO. This indication was detected by the full length bobbin coil exam and received a plus point coil examination under the special interest scope. This tube was not part of the twenty-one percent preplanned upper tubesheet plus point sample. Although not confirmed by a tube pull, the degradation mechanism is believed to be volumetric IGA of the susceptible alloy 600 tubing based on industry experience. The Degradation Assessment recognized this as an active damage mechanism and predicted that five IGA indications would be detected in the crevice regions in the worst case OTSG for 14RFO.

Question #2:

Discuss whether SG 2-A has been identified as having geometric mean distortions (GMD). If there are GMDs in SG 2-A, please discuss why the GMDs were not bobbin probe inspected during Refueling Outage (RFO) 14.

DBNPS Response:

There have been no GMDs identified in OTSG 2-A. GMD is limited to sleeves installed in OTSG 1-B during 8RFO.

Question #3:

In Table 6, Tubes R45C120 and R61C1 were identified to have single circumferential indications outside the pressure boundary (above the repair roll) and these tubes were reported to be plugged. Discuss why these tubes were plugged.

DBNPS Response:

Tubes R45C120 and R61C1 in OTSG 2-A had repair rolls installed in prior outages. These tubes were plugged due to changes in the original circumferential flaws that were considered to be outside of the pressure boundary. These flaws had relatively high plus point voltages, were near the periphery, and exhibited some apparent growth in circumferential length. Davis-Besse is licensed for repair roll joint slippage during accidents; however, these tubes were plugged to make the evaluation for large-break LOCA leakage more easily managed, and to avoid any possibility for tube sever at the weld region during accident conditions. A 100% plus point coil exam of repair roll expansions was completed so that no inspection escalation was necessary for this damage mechanism.

Question #4:

Discuss the results of the dent and ding inspections performed during RFO 14 (i.e., whether there were any new dents/dings identified (if so, causal mechanism), whether there were changes in the dent/ding signals (if so, causal mechanism), and if indications were identified in the dents/dings). If indications were identified, discuss the site of the dent/ding and the indication and the basis for the scope of the inspection.

DBNPS Response:

A very aggressive dent detection and inspection program was implemented in 14RFO to address indications found at dented locations at similar plants. All 14MCO and new

periphery region from 14MCO and any new dents reported during 14RFO received a plus point examination. Additionally, all dent indications ≥1 volt located in non-periphery tubes at and above 14S received a plus point examination.

The dent reporting threshold above the 14S was reduced from 2.5 volts to 0.5 volts.

A total of 1871 dents (946 in OTSG 2-A and 925 in OTSG 1-B) were reported from the bobbin probe using the conservative reporting requirements discussed previously. Of the 946 dents called in OTSG 2-A, 563 received a plus point examination, and of the 925 dents called in OTSG 1-B, 621 received a plus point examination. All 1184 dents that received a plus point examination were found to be defect free (no indications); therefore, there was no escalation in the inspection scope.

In both steam generators there were clusters of new dents observed. These dents were around the lane and wedge region at or near the UTS, and were presumed to be resulting from sludge collars that are developing at the UTS secondary face. The vast majority of these new dents were <2.50 volts and were the result of new dent reporting criteria. The new dents above 14S (which were not clustered) were predominantly the result of the new more conservative reporting criteria and are believed to predominately originate from steam generator construction. The majority of the dents below 14S are located in the LTS region. Compared to other similar plants, Davis Besse does not have a significant denting problem at the LTS due to chemical cleaning during 12RFO, as identified by only 14 new LTS dents in OTSG 2-A and 19 new LTS dents in OTSG 1-B.

The dent growth rate was reviewed by comparison of measurements taken in 14MCO and 14RFO using the bobbin voltage response. In review of this data, the dent voltages were confirmed to not be increasing between 14MCO and 14RFO; hence, the dents were not changing.

Question #5:

Confirm that no cracks were observed at wear scars.

DBNPS Response:

During the 14RFO plus point examination of wear scars, only TSP wear was observed. No additional degradation modes, including cracking, were identified during this exam.

Question #6:

Discuss the cause of the single axial indications and the multiple axial indications located outside the tubesheet region. In addition, it appears that several of these indications are in adjacent tubes. If there are clusters of indications, discuss any insights regarding this observation (i.e., bridging deposits, etc.).

DBNPS Response:

As predicted for 14RFO, tube end cracking was observed at the upper tubesheet tube end weld heat affected zone. There were both axial and circumferential indications in the upper tubesheet tube ends. This damage mechanism has been observed since 11RFO at Davis-Besse and is believed to be PWSCC. These indications have also been identified in other original OTSGs. NRC Information Notice 98-27 was previously issued to alert the industry to this condition. Based on the limited number of indications, there appears to be a positive correlation between the higher yield strength tubes and the identified indications. This implies that the higher yield tubes are more susceptible to PWSCC. This conclusion is consistent with what is fundamentally understood about the PWSCC mechanism.

As seen in other OTSGs, at the onset of this damage mechanism, indications in the tube ends appear to occur in tubes that are in close proximity to each other. This phenomenon is not believed to be influenced by contaminant deposits forming on the primary face of the upper tubesheet. The most likely cause is that the steam generators were originally tubed in rows of similar heats of material. Therefore regions in the steam generators containing tubing heats of material that are more susceptible to PWSCC initiate cracks first and therefore cause these indications to group together. As this damage mechanism becomes more progressed the indications appear to be more random in distribution.

Question #7:

Confirm that all tubes in which degradation was identified had adequate tube integrity at the time of the inspection.

DBNPS Response:

The observed severity of degradation at the 14RFO was evaluated to determine if structural and leakage integrity requirements were maintained. The scope of this evaluation included all the forms of tubing degradation observed at the 14RFO inspection. Structural and leakage integrity requirements were met during the previous period of operation. Additionally, eddy current inspection results and flaw analysis were used to conclude that no tubing defects were large enough to meet the In-Situ pressure

testing screening criteria threshold as defined in the Davis-Besse 14RFO In-Situ Selection document, demonstrating that there existed the required margin of safety at the end of Cycle 14.

Question #8:

Given that a full-depth tubesheet inspection was performed on approximately 21-percent of the non-sleeved, inservice tubes, discuss whether there were any indications identified with the rotating pancake coil but not identified with the bobbin coil.

DBNPS Response:

A 21 percent plus point and rotating pancake coil examination of the upper tubesheet crevice regions of both OTSGs was performed in 14RFO to address industry experience that the upper tubesheet crevice region may potentially have degraded bobbin coil POD. No tubesheet crevice indications were identified by either the bobbin coil or the plus point and rotating pancake coil examination of the 21% upper tubesheet crevice sample.

The single crevice indication discovered during 14RFO was OTSG 1-B tube R105C119. That indication was detected by the full length bobbin coil exam and received a plus point and rotating pancake coil examination under the special interest scope. This tube was not part of the preplanned UTS crevice plus point and rotating pancake coil sample.

Question #9:

Discuss whether there were any indications identified in the tubes bordering the sleeved region. If any indications were identified, discuss the basis for not expanding the inspection scope.

DBNPS Response:

One indication was observed by the sleeve border/lane and wedge region plus point exam. This indication was a wear call in Tube R68C3 in OTSG 1-B which had a 9% TW wear indication reported at 15S. This indication has been tracked since 11RFO. No other indications of degradation were reported in this examination scope. Since wear is addressed under the 100% bobbin exam, no exam escalation was required.

Question #10:

Discuss why all dent indications greater than 0.5-volts were inspected between the 15th support plate and the upper tubesheet in the periphery region in SG 2-A while

the dent indications greater than 0.5-volts were inspected between the 14th support plate and the upper tubesheet in the periphery region in SG 1-B.

DBNPS Response:

There was a typographical error in the October 6, 2006 letter containing the 12-month SG tube inservice inspection report for 14RFO. As discussed in the response to question 4, all locations containing ≥0.5 volts (bobbin) dents at or above 14S in the periphery region from 14MCO and any new dents reported during 14RFO received a plus point examination in both OTSGs during 14RFO. The error has been addressed through the DBNPS Corrective Action Program, and FENOC has determined it has no safety significance.

Question #11:

The staff is aware that no auxiliary feedwater (AFW) header movement was observed during Mid-cycle Outage 14. Discuss whether any AFW header movement was observed during RFO 14.

DBNPS Response:

The 14RFO eddy current inspection showed that the AFW header was not moving through a special evaluation of the in service tube bobbin coil exam data.

COMMITMENT LIST

The following list identifies those actions committed to by the Davis-Besse Nuclear Power Station (DBNPS) in this document. Any other actions discussed in the submittal represent intended or planned actions by the DBNPS. They are described only for information and are not regulatory commitments. Please contact Mr. Henry L. Hegrat, Supervisor – FENOC Fleet Licensing, at (330) 374-3114 of any questions regarding this document or any associated regulatory commitments.

COMMITMENT	DUE DATE
None	N/A