May 22, 2002

Mr. Howard Bergendahl
Vice President-Nuclear, Davis-Besse
FirstEnergy Nuclear Operating Company
Davis-Besse Nuclear Power Station
5501 North State Route 2
Oak Harbor, OH 43449-9760

SUBJECT: SUMMARY OF CONFERENCE CALLS WITH FIRSTENERGY REGARDING THE 2002 STEAM GENERATOR TUBE INSPECTION RESULTS AT DAVIS-BESSE NUCLEAR POWER STATION, UNIT 1 (TAC MB4213)

Dear Mr. Bergendahl:

On February 21, 28, and April 25, 2002, the staff of the Materials and Chemical Engineering Branch participated in conference calls with FirstEnergy Nuclear Operating Company representatives regarding the steam generator tube inspection activities during the 13th refueling outage at the Davis-Besse Nuclear Power Station, Unit 1. The enclosure summarizes the conference calls.

We understand that you will also be submitting a comprehensive inspection report in accordance with the plant technical specifications in the coming months. We appreciate your support in this matter.

Sincerely,

/RA/

Douglas V. Pickett, Senior Project Manager, Section 2
Project Directorate III
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket No. 50-346

Enclosure: As stated

cc w/encl: See next page

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*See ALund to AMendiola memorandum dated March 21, 2002
**See previous concurrence

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SUMMARY OF CONFERENCE CALLS WITH

FIRSTENERGY NUCLEAR OPERATING COMPANY

REGARDING CURRENT STEAM GENERATOR INSPECTION RESULTS

AT DAVIS-BESSE NUCLEAR POWER STATION, UNIT 1

On February 21, 2002, the staff conducted a pre-inspection phone call with the licensee to discuss its inspection plan for the upcoming steam generator tube inspections at Davis-Besse. The licensee planned to perform the following inspections and all sample inspections are subject to 100 percent expansion based on inspection findings:

1. Inspect any new sleeves and re-rolls.
2. Inspect all in-service tubes and sleeves by a bobbin coil.
3. Inspect 60 percent of the sleeve roll expansions by a plus point coil.
4. Inspect 59 percent of the tube upper roll expansions by a plus point and pancake coil.
5. Inspect all of the non-stress-relieved tube roll expansions–factory re-rolls by a plus point and pancake coil.
6. Inspect 61 percent of the hot leg roll plugs by a pancake coil.
7. Inspect the tubes bordering the sleeve region by a plus point and pancake coil.
8. Inspect all of the flaw-like indications reported from bobbin by a plus point and pancake coil.
9. Inspect the dent indications, including all those located above the 14th tube support plate and a 60 percent sample of the remaining population by a plus point and pancake coil.
10. Inspect 500 tubes at the sludge pile region of the lower tubesheet in each steam generator by a pancake coil.
11. Inspect plugged tube per the Three Mile Island (TMI) severance tube event.
12. Inspect all welded tube plugs by qualified VT-1.

A total of 540 tubes (1080 plugs) have been plugged in the Davis-Besse steam generators:

36 Alloy 600 welded pre-service Babcock & Wilcox (B&W) plugs
973 Alloy 690 B&W roll plugs
56 Alloy 690 Asea Brown Boreri-Combustion Engineering, Inc. (ABB-CE) roll plugs
6 Alloy 690 B&W welded tubesheet plugs
8 Alloy 690 B&W welded tube end cap plugs
1 Alloy 690 ABB-CE welded tubesheet plug

As a result of the TMI-1 event where a plugged tube severed and impacted neighboring tubes (refer to Nuclear Regulatory Commission (NRC) Information Notice 2002-02, ML013480327), the licensee will deplug and inspect:

(a) 19 B&W/FTI Alloy 690 roll plugs that were installed as a replacement for the original Alloy 600 plugs. Originally, 20 tubes had their upper tube end plugs removed and replaced, and were not stabilized. These tubes could have potentially let water become

trapped in the tightly sealed tube. This plug replacement was in response to discovery of cracking of Inconel 600 tube plugs. None of these tubes are in the Steam Generator periphery drilled TSP locations. One of these tubes was pulled full length during 11RFO and displayed no trapped water or swelling. An inspection of the 19 remaining tubes by deplugging the upper tube end, inspecting for water and performing eddy current profileometry is to be performed.

(b) 28 Alloy 690 roll plugs fabricated by B&W. This population of tubes are the result of re-rolling 33 plugs after one cycle of operation as a required action due to concerns over potential loose plugs. This action could have also lead to water being trapped in the tube if the re-rolled plugs were leaking prior to the re-roll. Of these tubes, 5 are stabilized in the upper span and not at risk to damage adjacent tubes. An inspection of the 28 unstabilized re-rolled plugged tubes, by deplugging the upper tube end, inspecting for water and performing eddy current profileometry would resolve this group. One of these tubes (SG2A tube 45-119) is in the periphery drilled TSP region and not stabilized.

Although not identified as a tube population at risk for swelling, 7 tubes plugged with ABB/CE hardware will be deplugged to support a small power uprate. The ABB-CE plugs were installed at Davis-Besse in 1993. The stabilizers are installed in these tubes because of dents in the upper region of the affected tubes.

On February 28, 2002, the staff conducted a follow-up phone call with the licensee to discuss the preliminary results of its steam generator tube inspection at Davis-Besse.

Davis-Besse has operated 15.8 effective full power years as of the 13th refueling outage. The licensee has plugged 436 tubes in steam generator 2A and 104 tubes in steam generator 1B, leaving a total of 30,374 inservice tubes. At the time of shutdown, minor (less than 1 gallon per day) primary-to-secondary leakage was observed.

The licensee detected six groove intergranular attack (IGA) indications at the 15th tube support intersection and in the upper tubesheet region. This is the first discovery of this damage mechanism at Davis-Besse, although inspections for this mechanism date back to 1998. Two of the indications were identified to exist in previous bobbin inspections, but were only identified with the benefit of lookback knowledge because the previous data was below the detection threshold. The licensee postulated that these indications may have developed in scratches caused during the manufacturing or installation process.

The licensee detected two axial IGA indications at the 4th and 6th tube support intersections, respectively. These indications were caused by a sulfur attack in which service water was introduced into the steam generator inadvertently years ago. The licensee characterized these indications as volumetric and attributed them to closely spaced small pits. The licensee stated that there has been no growth observed in the two axial IGA indications.

The licensee detected about 50 volumetric indications at various tube support intersections and in the upper tubesheet region. The licensee stated that the tube bundle was chemically cleaned during the 12th refueling outage which helped the detection of these volumetric indications.

The licensee detected three single circumferential indications at the heat affected zone of the tube end welds and 40 tube end anomalies in the upper tubesheet region.

The licensee detected a single axial indication caused by primary stress corrosion cracking in the expanded portion of the roll joint in the upper tubesheet region in the steam generator 1B.

The dented locations were identified by the bobbin coil in the 1980's and single axial indications were identified and confirmed as flaws by the plus point coil during this inspection.

The licensee detected 10 wear indications at various tube support intersections.

All these indications will be either plugged or repaired except the wear indications, which will be dispositioned by the plugging limit of 40 percent through wall in accordance with the plant technical specifications.

Davis-Besse steam generators have 36 construction-era welded Alloy 600 plugs in both steam generators. These plugs were manufactured by B&W and were manually welded to the tube end. The licensee detected cracks in the weldment of two of these construction-era welded plugs in steam generator 2B. The licensee has not determined the root cause of the cracks, but has observed that one of the affected plugs may have a cold lap (lack of fusion). Both affected plugs will be removed and replaced with either a remotely welded Alloy 690 plug or manually welded tapered Alloy 690 plug. The licensee is performing analyses to determine the root cause. The licensee has notified B&W owners group and prepared a report to the industry group regarding the crack in these plugs.

The licensee will in-situ pressure test the bounding single axial indication (groove IGA) in the tube in row 22 tube 93. The staff recommended that the licensee in-situ pressure test additional tubes having groove IGA indications.

The licensee has no plans to pull any tubes during this outage.

An additional telephone conference call was held with the licensee on April 25, 2002, to discuss the licensee's actions in response to (1) the discovery of a severed plugged tube at Oconee Unit 1, and (2) the discovery that several tubes plugged prior to commercial operation at Davis-Besse had holes inserted into them approximately 2-inches below the upper tubesheet secondary face.

In April 2002, Duke Power Company identified a plugged tube which had severed in their Oconee Unit 1 steam generators. Destructive examination of the severed tube indicated that the tube severed as a result of intergranular attack originating from the inside diameter of the tube. There were no obvious indications of fatigue, transgranular degradation, or significant ductile tearing. The severed tube was one of 12 tubes instrumented with thermocouples during the first cycle of operation (early 1970s). The tubes in which these thermocouples were installed were plugged at one end while the other end remained open. Following the first cycle of operation, the thermocouples were removed and the tubes were plugged at the open end. At the time of plugging, there was water in the tube.

The findings at Oconee have some notable differences from the severed plugged tube found at TMI (refer to NRC Information Notice 2002-02). The tube at TMI severed at the upper tubesheet (UTS), was swollen along the entire length of the tube, and failed as a result of fatigue; whereas, the tube at Oconee, severed at the lower tubesheet (LTS), was not swollen, and failed as a result of intergranular attack.

Based on findings at Oconee, the licensee for Davis-Besse reviewed the results from their eddy current inspection for the portion of tubing in the first span (i.e., from the secondary face of the LTS to the first tube support plate). No volumetric indications were identified next to a plugged tube. (Volumetric indications could be indicative of tube wear as a result of a severed tube.) The data for dents, manufacturing burnishing marks, and non-quantifiable indications were also reviewed. This data review identified one indication next to a plugged tube which warranted additional investigation. This tube had an indication approximately 22.5-inches above the secondary face of the LTS. Inspection with a rotating probe equipped with a plus-point coil did not reveal any degradation; however, the licensee will be re-evaluating the raw eddy current data to confirm the original findings.

The licensee is also reviewing historical records to determine if foreign material has been left in any plugged tube or if any tube has been operated with only one end of the tube plugged. The review for foreign material was conducted since foreign material may have contaminants which could lead to tube degradation such as was observed at Oconee. The review to determine if only one end of a tube was plugged was conducted since the tube that severed at Oconee was operated for one cycle with only one end of the tube plugged. Review of historical records since 1991 did not identify any tubes plugged with foreign material (e.g., stuck probes, etc.) inside. Review of the remaining historical data (i.e., prior to 1991) will be completed prior to plant startup. Review of plant history did not identify any tubes that were operated with only one end of the tube plugged.

During the 2002 inspections, two tubes which had been plugged prior to commercial operation were deplugged and inspected. During these inspections, holes were identified in these tubes. These holes were inserted prior to tube plugging and were located approximately 2 inches below the UTS secondary face. The tubes were plugged by the manufacturer since they did not pass the hydrostatic test. In total, 18 tubes were potentially plugged after poking a hole in the tube. To address the potential that these tubes could sever from a circumferential flaw initiating from the hole location, the licensee developed a plan for stabilizing all tubes surrounding these plugged tubes. Stabilization involves inserting a metal cable/rope into the tube such that if the tube severs it will not impact other tubes. For 16 of the 18 tubes, the licensee stabilized all tubes surrounding the plugged tubes (such that if one of these tubes severed it would impact a tube which was stabilized). For the remaining two tubes, the licensee did not stabilize all of the tubes surrounding the plugged tubes with the "hole" because of equipment limitations at the time of discovery. For one of these two tubes, two surrounding tubes were not stabilized; for the other tubes, four surrounding tubes were not stabilized. Although not stabilized, these six tubes were plugged and analysis performed by the licensee indicated that continued operation for the next cycle was acceptable. Stabilization of these six tubes were planned for the next outage.

Based on the information provided by the licensee, the NRC staff did not identify any issues requiring further discussion.