September 17, 2003

MEMORANDUM TO: John A. Grobe, Chairman
Davis-Besse Oversight Panel
Region III

FROM: Jon B. Hopkins, Senior Project Manager, Section 2 ***/RA/***
Project Directorate III
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

SUBJECT: DAVIS-BESSE NUCLEAR POWER STATION, UNIT 1 - INCORE MONITORING NOZZLE INSPECTIONS (TAC NO. MB9686)

The Office of Nuclear Reactor Regulation (NRR) staff, at the request of the Davis-Besse Manual Chapter 0350 Oversight Panel Chairman, has reviewed the FirstEnergy Nuclear Operating Company's (the licensee's) letter dated July 30, 2003, concerning the incore monitoring instrumentation (IMI) nozzle inspections that have taken place at the Davis-Besse Nuclear Power Station (DBNPS), Unit 1. In addition, the NRR staff has reviewed chemical data supplied by Region III and the additional measures that will be taken by the licensee prior to restart of DBNPS.

Based on its assessment and the experience with lower-head deposits observed by other licensees, the NRR staff concluded that (1) the results of the chemical analysis do not provide conclusive evidence that the deposits observed at DBNPS were from IMI nozzles, and (2) the deposits observed at DBNPS were characteristic of deposits left by washdown from higher elevation sources.

Docket No. 50-346

Attachment: NRR Staff Assessment

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ASSESSMENT BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO INCORE MONITORING NOZZLE INSPECTIONS

FIRST ENERGY NUCLEAR OPERATING COMPANY

DAVIS-BESSE NUCLEAR POWER STATION, UNIT 1

DOCKET NO. 50-346

1.0 BACKGROUND

During the current Davis-Besse Nuclear Power Station (DBNPS) refueling outage, the FirstEnergy Nuclear Operating Company (the licensee) performed a visual inspection of the exterior surface of the DBNPS reactor pressure vessel (RPV). This inspection identified stains consisting of boric acid residue and rust/corrosion running down the sides and bottom of the RPV. This inspection showed a number of RPV bottom-head incore monitoring instrumentation (IMI) nozzle penetrations with deposits around the nozzles that the licensee attributed to washdown of borated water from higher elevations to the IMI nozzles. The licensee identified several potential sources for the flowpaths and deposits: (1) leakage from the refueling canal past the cavity seal plate; (2) leakage from the refueling canal through the RPV nozzle access covers; (3) leakage from cracks found in the RPV flange O-ring monitor lines; and/or (4) effluent from RPV upper-head decontamination and cleaning activities during the past DBNPS refueling outages. The observed deposits were flat and tightly adhering to the RPV surface. No indications of “popcorn-type” deposits (i.e., this deposit morphology has been observed at other plants where nozzle leakage is occurring) were observed around any of the IMI penetrations.

During the inspection, the licensee obtained samples of the deposits for chemical analysis. The deposits from the side of the RPV, bottom of the RPV, and from around the nozzles were removed by scraping and were analyzed using inductively coupled plasma spectroscopy. The results of the analyses indicated that the concentrations of boron and lithium in the deposits were not uniformly distributed and did not provide conclusive evidence regarding the connection between the flowpaths and the nozzle deposits. The licensee compared the DBNPS results to the chemistry results obtained from bottom-head deposits at the South Texas Project Nuclear Plant (STP), Unit 1, which were generated by primary coolant system leaks. The chemistry results from the DBNPS deposits showed that the concentrations of boron and lithium were a factor of 4 lower.

Public meetings on the inspection findings were held on November 26, 2002, and April 4, 2003. At the public meetings, the licensee presented the results of its inspection findings to the Nuclear Regulatory Commission staff. In addition, the licensee also discussed a proposed test to pressurize the reactor coolant system (RCS) including the RPV at normal operating pressure (NOP) and maintain the pressure for approximately 7 days. Following the test, the IMI nozzle penetrations will be visually inspected with a crawler video camera to confirm that there is no

visible leakage from the IMI nozzles. In addition, the test will provide the licensee with information about visible RCS leakage at other locations (e.g., flanges and seals).

By letter dated July 30, 2003, the licensee docketed its as found inspection results and final conclusions as to the source of the material on the lower head, with particular emphasis on the material found near the DBNPS IMI penetrations. The licensee's conclusions were that the rust/corrosion stains and boric acid residue found around several DBNPS IMI nozzle penetrations did not result from leakage from the IMI nozzles. These conclusions were based on the following facts:

- During the visual inspection of the IMI nozzles, no "popcorn-type" deposits similar to those found recently at STP, Unit 1, were identified around any of the penetrations.

- The boron and lithium concentrations in the samples taken from the IMI nozzles were below the concentrations found in the STP, Unit 1, deposits, which were confirmed as resulting from RCS pressure boundary leakage. The chemistry results from the DBNPS deposits showed that the concentrations of boron and lithium were a factor of 4 lower than the deposits found at STP, Unit 1. This significant difference in concentrations is indicative of different sources of leakage when comparing DBNPS and STP, Unit 1.

2.0 NRR STAFF ASSESSMENT

The DBNPS Technical Specifications (TSs) do not allow entry into MODE 4 operation with RCS pressure boundary leakage. To confirm that the boric acid residue was not RCS pressure boundary leakage from the IMI nozzles, the licensee performed visual inspections and analyses. Based on this the licensee concluded that the boric acid residue was not RCS pressure boundary leakage through the IMI nozzles. Therefore the licensee concluded that the TSs for entry into MODE 4 concerning RCS leakage were satisfied. The NRR staff has reviewed the actions taken by the licensee and concluded that there was not sufficient evidence upon which to conclude that the boric acid residue in the vicinity of the IMI nozzles was RCS pressure boundary leakage through the nozzles.

The NRR staff based its finding on the experience with lower-head deposits observed by other licensees. The NRR staff concluded that (1) the results of the chemical analysis do not provide conclusive evidence of RCS leakage from the IMI nozzles, and (2) the deposits observed at DBNPS were characteristic of deposits left by washdown from higher elevation sources.

Other activities will be taken by the licensee in the future (e.g., a 7-day pressure test at normal operating pressure, installation of an online local leak monitoring system in the area of the lower RPV head, and a mid-cycle inspection of the lower head for evidence of leakage) that will help to assure prompt identification of any significant RCS pressure boundary leakage should it develop.

Principal Contributor: M. Mitchell

Date: September 17, 2003

ATTACHMENT