FENOC
FirstEnergy Nuclear Operating Company

5501 North State Route 2
Oak Harbor, Ohio 43449

Mark B. Bezilla
Vice President - Nuclear

419-321-7676
Fax: 419-321-7582

Docket Number 50-346

License Number NPF-3

Serial Number 3249

March 31, 2006

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

Subject: Davis-Besse Nuclear Power Station
Supplemental Information for 10 CFR 50.55a Request Regarding Inservice Inspection Requirements for the Third Ten-Year Interval (RR-A29)

Ladies and Gentlemen:

By letter dated March 29, 2006 (Serial Number 3248), the FirstEnergy Nuclear Operating Company (FENOC) submitted a 10 CFR 50.55a request regarding American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code), Section XI inservice inspection requirements for the third ten-year interval for the Davis-Besse Nuclear Power Station (DBNPS). The March 29, 2006 letter described a proposed repair for an axial indication found on a Reactor Coolant System (RCS) Loop 1 cold leg drain line during the Fourteenth Refueling Outage (14RFO). The repair would consist of a full structural overlay of the affected area. The letter further noted that the repair would be conducted in accordance with ASME Code Case N-504-2, with modifications, and committed to submittal of a supplemental letter regarding the analyses described in paragraph (g) of the code case. Enclosure 1 provides this information.

As noted in Enclosure 1, FENOC will provide the NRC with a summary of the analyses within 30 days of restart from the 14RFO.

A047

Enclosure 2, Commitment List, identifies the commitments contained in this letter. If there are any questions or if additional information is required, please contact Mr. Gregory A. Dunn, Manager – FENOC Fleet Licensing, at (330) 315-7243.

Mark B. Bezilla, Vice President-Nuclear

MKL

Enclosures

cc: Regional Administrator, NRC Region III
NRC/NRR Project Manager
NRC Senior Resident Inspector
Utility Radiological Safety Board
C. O'Claire, Ohio Emergency Management Agency

TECHINCAL JUSTIFICATION FOR PERFORMING ITEMS g(1) THROUGH g(3) IN CODE CASE N-504-2 AFTER FIELD IMPLEMENTATION OF WELD OVERLAY REPAIR AND STARTUP DAVIS-BESSE NUCLEAR POWER STATION

Introduction

During the weld overlay repair implementation for the Reactor Coolant Pump (RCP) 1-1 cold leg drain nozzle-to-elbow weld at the Davis-Besse Nuclear Power Station (DBNPS), the FirstEnergy Nuclear Operating Company (FENOC) plans to perform evaluations required by Code Case N-504-2. However, due to schedule constraints, FENOC proposes to complete the evaluations required under items g(1) through g(3) of Code Case N-504-2 after the weld overlay repair implementation. The technical justification for this request is provided in the following paragraphs.

Item g(1)

FENOC complies with the recording requirements in IWA-1400(p). The flaw has been recorded in the component's NDE record. It is not expected that there will be operation time or cyclic limits in the analysis performed under Items g(2) and g(3) of Code Case N-504-2 since the overlay is being designed for the licensed life of the plant.

Item g(2)

Four issues are discussed under this item:

1. Consideration of Residual Stresses and Other Applied Loads

It has been shown in several studies (both experimentally and analytically) that the residual stresses resulting from application of a weld overlay repair with water backing, plus the operating stresses due to other applied loads, are compressive in the inner portion of the component and thereby mitigate future crack growth into the overlay [1, 2, 3, 4]. This has been demonstrated for nozzle to safe end welds of various sizes in recent projects for several plants considering an initial weld repair that results in significant through-wall tensile residual stresses. The presence of post weld overlay compressive residual stresses in the inner portion of the component mitigates propagation into the overlay. The welding parameters that will be used during the overlay application are very similar to what have been used in previous industry projects in which favorable residual stresses have been demonstrated, and therefore, it is expected that similar results will be obtained for the component at the DBNPS. The compressive stresses will also tend to mitigate fatigue crack growth since a negative mean stress is introduced which minimizes fatigue crack growth.

2. Potential for Flaw Growth

The overlay is designed as a standard overlay (assuming a 360° flaw through the original pipe wall). As such, no credit is taken for any of the original pipe wall. The overlay material is Alloy 52 (or Alloy 52M or Alloy 52MS), which is very resistant to stress corrosion cracking, and as such, flaw growth into the overlay by this mechanism is not expected. As explained above, the presence of compressive residual stresses on the inside of the component after the overlay application also mitigates stress corrosion cracking and minimizes fatigue crack growth into the overlay. Compared with other components such as spray nozzles, the transients associated with the drain nozzle at the DBNPS are much less severe, and therefore no significant fatigue crack growth is expected.

3. Demonstration That Requirements of IWB-3640 Will Be Satisfied

The overlay was sized in accordance with the requirements of IWB-3640, and since no crack growth is expected into the overlay, the requirements of IWB-3640 will be satisfied.

4. Structural Credit of SAW or SMAW Weldment

Since the overlay is designed as a standard overlay and applied with the GTAW process, no structural credit was taken for the underlying weld and base material or for SAW or SMAW weld metal in the overlay. Therefore, the evaluations per Tables IWB-3641-5 and IWB-3641-6 do not apply to this overlay design.

Item g(3)

Two issues are discussed under this item:

1. Increase in Load Due to Weld Overlay

The application of the overlay introduces at most 10 pounds of additional weight to the piping system. The effect of this added weight is not expected to change the stresses on the system by any significant amount. This added mass is also not expected to change the dynamic characteristics of the piping system. Even though the overlay increases the thermal gradient slightly, this is compensated for by the added thickness of the overlay which reduces the thermal stresses. Note that this section of piping is normally insulated, which minimizes the thermal gradient.

2. Weld Overlay Shrinkage and Shrinkage Stresses

The application of the weld overlay will result in a small amount of axial shrinkage. For a 2.5-inch NPS nozzle-to-elbow weld, this shrinkage will typically be on the order of 0.125 inches. The resulting shrinkage stress is expected to be very small (less than 0.5 ksi). This will be confirmed prior to restart. The effect of this axial shrinkage is to impose sustained (non-cyclic) secondary stresses on the system. ASME Code Section III does not require evaluation of non-

cyclic secondary stress, and as such, shrinkage stresses are not considered in the ASME Code, Section III load combinations. However, the shrinkage stresses are considered in flaw evaluations of other welds in the system. Since there are no other flaw evaluations in the system, this is not an issue.

FENOC will perform system inspections of the affected portions of the piping after the overlay implementation to ensure that system restraints, supports and snubbers have not exceeded their design tolerances resulting from weld shrinkage associated with the overlay repair. Due to the relatively small size of the overlay and associated shrinkage, the affected portions of the piping will be in the vicinity of the overlay.

Analyses demonstrating all of the above points are underway, and will be completed within 30 days after restart from the Fourteenth Refueling Outage (14RFO). ASME Code safety margins in the short term are established by the full structural nature of the weld overlay. The additional analyses discussed above are only required to establish the long term life of the weld overlay, which is expected to equal or exceed the remaining life of the plant.

References

1. EPRI-NP-7085-D, "Inconel Weld Overlay Repair for Low Alloy Steel Nozzle to Safe End Joint" Final Report, January 1991.

2. "Materials Reliability Program: Technical Basis for Preemptive Weld Overlays for Alloy 82/182 Butt Welds in PWRs (MRP-169)," 1012843, EPRI, Palo Alto, CA and Structural Integrity Associates, Inc., San Jose, CA, October 2005.

3. N. G. Cofie, D. G. Dijamco, C.R Limpus et al., "Residual Stress Analysis of a Bimetallic Weld Subjected to Stress Improvement and Weld Overlay Repair," to be published in the Proceedings of 2006 Pressure Vessel and Piping Conference, Vancouver, British Columbia, July 2006.

4. EPRI NP-7103-D, "Justification for Extended Weld Overlay Design Life," Topical Report, January 1991.

COMMITMENT LIST

The following list identifies those actions committed to by the Davis-Besse Nuclear Power Station, Unit Number 1, (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 notify Gregory A. Dunn, Manager – FENOC Fleet Licensing (330-315-7243) of any questions regarding this document or associated regulatory commitments.

COMMITMENTS	DUE DATE
FENOC will provide the NRC with a summary of the analyses.	Within 30 days of restart from the 14RFO.
The application of the weld overlay will result in a small amount of axial shrinkage. For a 2.5-inch NPS nozzle-to-elbow weld, this shrinkage will typically be on the order of 0.125 inches. The resulting shrinkage stress is expected to be very small (less than 0.5 ksi). This will be confirmed prior to restart.	Prior to restart from 14RFO.
FENOC will perform system inspections of the affected portions of the piping after the overlay implementation to ensure that system restraints, supports and snubbers have not exceeded their design tolerances resulting from weld shrinkage associated with the overlay repair. Due to the relatively small size of the overlay and associated shrinkage, the affected portions of the piping will be in the vicinity of the overlay.	Prior to restart from 14RFO.