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September 28, 2009
L-09-227

10 CFR 50.90

ATTN: Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

SUBJECT:
Davis-Besse Nuclear Power Station
Docket No. 50-346, License No. NPF-3
License Amendment Request to Update the Leak-Before-Break Evaluation for the
Reactor Coolant Pump Suction and Discharge Nozzle Dissimilar Metal Welds

By correspondence dated January 30, 2009 (Accession Number ML090350070), FirstEnergy Nuclear Operating Company (FENOC) submitted to the Nuclear Regulatory Commission (NRC) proposed alternatives to certain requirements associated with reactor vessel nozzle, reactor coolant pump nozzle, and reactor coolant piping weld repairs for the Davis-Besse Nuclear Power Station (DBNPS).

The proposed alternatives support application of optimized weld overlays or full structural weld overlays. Applying these weld overlays on the reactor coolant pump suction and discharge nozzle dissimilar metal welds requires an update to the DBNPS leak-before-break (LBB) evaluation. Pursuant to the requirements of 10 CFR 50, Appendix A, General Design Criterion 4, NRC approval of this leak-before-break evaluation update is required. As requested by the NRC staff, FENOC is submitting a proposed amendment to update the leak-before-break evaluation.

The enclosures provide a description, regulatory evaluation, and technical evaluation of the proposed amendment. The enclosures satisfy FENOC Commitments 1(d) and 2(d) contained in the January 30, 2009 submittal. Changes to the DBNPS Technical Specifications are not required.

FENOC requests approval of the proposed amendment by February 5, 2010. Implementation of the amendment is planned within 90 days of approval.

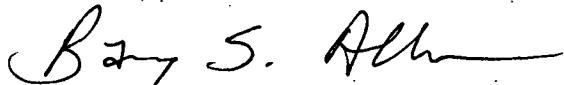
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There are no regulatory commitments contained in this submittal. If there are any questions, or if additional information is required, please contact Mr. Thomas A. Lentz, Manager - Fleet Licensing, at (330) 761-6071.

I declare under penalty of perjury that the foregoing is true and correct. Executed on September 28, 2009.

Sincerely,



Barry S. Allen

Enclosures:

- A. Evaluation of Proposed License Amendment
- B. Leak-Before-Break Evaluation of Reactor Coolant Pump Suction and Discharge Nozzle Weld Overlays for Davis-Besse Nuclear Power Station

cc: NRC Region III Administrator
NRC Resident Inspector
NRC Project Manager
Executive Director, Ohio Emergency Management Agency,
State of Ohio (NRC Liaison)
Utility Radiological Safety Board

EVALUATION OF PROPOSED LICENSE AMENDMENT

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Subject: License Amendment Request for Updating the Leak-Before-Break Evaluation for Davis-Besse Nuclear Power Station Reactor Coolant Pump Suction and Discharge Nozzle Dissimilar Metal Welds.

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1.0 SUMMARY DESCRIPTION

This evaluation supports a FirstEnergy Nuclear Operating Company (FENOC) request to update the Davis-Besse Nuclear Power Station (DBNPS) Leak-Before-Break (LBB) evaluation. In the original LBB evaluation [References 1 and 2], the potential for corrosion mechanisms to be present in pressurized water reactor (PWR) butt weld locations containing Alloy 82/182 was not considered. The LBB evaluation submitted herein is related to the application of optimized weld overlays (OWOLs) or full structural weld overlays (FSWOLs) to the existing reactor coolant pump discharge and suction nozzles Alloy 82/182 dissimilar metal welds. No Technical Specifications changes are required; only the license amendment number will be added.

2.0 DETAILED DESCRIPTION

Using a LBB evaluation as a method for meeting the requirements of 10 CFR 50 Appendix A, General Design Criterion (GDC) 4, was reviewed by the NRC staff and in a letter dated February 18, 1986 [Reference 3], it was concluded that an acceptable technical basis had been provided to eliminate, as a design basis, the dynamic effects of large ruptures in the main loop piping of those B&W Owners Group listed facilities. Davis-Besse Nuclear Power Station Unit 1 was one of the listed plants. The original NRC approval was granted pending the completion of rulemaking on this subject and submittal of information to demonstrate that leakage detection systems comply with Regulatory Guide 1.45. The GDC-4 criteria were then modified in April 1986 and October 1987 and Davis-Besse implemented LBB in 1990 by letter to the NRC dated November 6, 1990 [Reference 4]. This November 6, 1990 letter provided the requested information regarding leakage detection systems. The original evaluation was determined to be adequate in showing compliance with 10 CFR 50, Appendix A, General Design Criterion (GDC) 4, Environmental and Dynamic Effects Design Bases.

At the time of approval, the susceptibility of primary water stress corrosion cracking (PWSCC) in the reactor coolant pump dissimilar metal welds was not known or recognized. Guidance in Standard Review Plan (SRP) Section 3.6.3 [Reference 5], states that piping systems that are susceptible to active stress corrosion cracking degradation mechanisms may qualify for application of LBB evaluation if treated with two mitigation methods and the piping contains no flaws larger than those permitted by ASME Section XI without repair.

FENOC intends to apply OWOLs or FSWOLs to the reactor coolant pump suction and discharge nozzle dissimilar metal welds during the Davis-Besse Nuclear Power Station spring 2010 refueling outage. The weld overlays will utilize a non-PWSCC susceptible material (Alloy 52M).

Due to the intended application of OWOLs or FSWOLs over the existing welds, the LBB evaluation has been updated to reflect the new weld configuration with the weld overlays in place. The application of OWOLs or FSWOLs with Alloy 52/52M weld metal provides a PWSCC resistant barrier and also reduces stresses on the inner

portions of the welds. Acceptable residual stresses are those which, after application of the weld overlay, are substantially reduced in susceptible material on the inner portion of the existing nozzle at operating temperatures, pressures, and loads.

In addition, the compressive stresses that exist in the interior of the dissimilar metal weld, after application of the weld overlays, are increased to the point where the PWSCC of an existing flaw may be arrested. The crack growth analyses completed using these favorable through-thickness residual stresses produced by the weld overlay conclude that any PWSCC flaw in the original weldment would be acceptable within the inspection interval of the dissimilar metal weld. Therefore, the application of the weld overlays provide the requisite two mitigation methods, in addition to providing a smooth outside diameter surface that can enhance future non-destructive examinations of the welds.

The following is a summary of the LBB evaluation approach:

1. Review the methodology and margins in the current NRC approved LBB evaluation. This will assure consistent use of material properties, critical flaw sizing, leakage prediction and plant leakage detection capability with that previously approved by the NRC.
2. Address the effectiveness of PWSCC mitigation by application of the weld overlays and demonstrate that the post-weld overlay crack growth (resulting from both PWSCC and fatigue) is within acceptable limits for the balance of plant life. The post-weld overlay inspections performed to maintain the integrity of the repair are also addressed.
3. Determine critical through-wall flaw sizes with the application of the weld overlays at the dissimilar metal welds. This evaluation will collectively consider the composite strength of the materials consisting of the original material and the weld overlay material.
4. Determine leakage through half-critical flaw sizes and show that it is greater than the detectable leakage (1 gpm) with a factor of 10. The effects of the Alloy 82/182 PWSCC crack morphology will be considered in the determination of leakage.
5. Provide the methods, results and conclusions of the evaluations in a technical report.

The Davis-Besse Nuclear Power Station Leak-Before-Break (LBB) evaluation update, "Leak-Before-Break Evaluation of Reactor Coolant Pump Suction and Discharge Nozzle Weld Overlays for Davis-Besse Nuclear Power Station," [Reference 6] is provided with this request.

3.0 TECHNICAL EVALUATION

A technical evaluation is provided in the Davis-Besse Nuclear Power Station "Leak-Before-Break Evaluation of Reactor Coolant Pump Suction and Discharge Nozzle Weld Overlays for Davis-Besse Nuclear Power Station" [Reference 6]. This evaluation update has determined that the results of the original leak-before-break evaluation remain unaffected by the application of weld overlays and the weld overlays will not adversely affect component function or reactor coolant system operation; therefore, UFSAR accident analyses are not affected.

4.0 REGULATORY EVALUATION

The proposed amendment would update the Davis-Besse Nuclear Power Station leak-before-break evaluation to address the application of optimized weld overlays (OWOLs) or full structural weld overlay (FSWOLs) at the reactor coolant pump nozzle dissimilar metal welds

4.1 Significant Hazards Consideration

FirstEnergy Nuclear Operating Company (FENOC) has evaluated whether or not a significant hazards consideration is involved with the proposed amendment by focusing on the three standards set forth in 10 CFR 50.92, "Issuance of amendment," as discussed below:

1. Does the proposed amendment involve a significant increase in the probability or consequences of an accident previously evaluated?

Response: No.

The applicable accident is a Large Break Loss of Coolant Accident (LBLOCA). Since the application of OWOLs or FSWOLs will enhance the integrity of welds and the reactor coolant system, the probability of a previously evaluated accident is not increased. The consequences of a LBLOCA have been previously evaluated and found to be acceptable. Application of OWOLs or FSWOLs to the existing welds will cause no change to the dose analysis associated with a LBLOCA. Therefore, the leak-before-break (LBB) evaluation update does not involve a significant increase in the probability or consequences of an accident previously evaluated.

2. Does the proposed amendment create the possibility of a new or different kind of accident from any accident previously evaluated?

Response: No.

The LBB evaluation update will allow application of OWOLs or FSWOLs to mitigate potential primary water stress corrosion cracking (PWSCC) of the existing welds. These welds provide a primary pressure boundary function. This request does not

change the function of the welds, or the way the plant is operated; it supports the application of OWOLs or FSWOLs that will enhance the ability of the welds to perform the pressure boundary function.

Therefore, the proposed LBB update does not create the possibility of a new or different kind of accident from any accident previously evaluated.

3. Does the proposed amendment involve a significant reduction in a margin of safety?

Response: No.

Margin of safety is related to the ability of the fission product barriers to perform their design functions during and following accident conditions. These barriers include the fuel cladding, the reactor coolant system, and the containment. This request does not involve a change to the fuel cladding or the containment. This amendment request updates the LBB evaluation to account for the application of OWOLs or FSWOLs to the existing reactor coolant pump suction and discharge nozzle dissimilar metal welds for the Davis-Besse Nuclear Power Station. The effect of applying a weld overlay repair has been evaluated with respect to the LBB evaluation at these locations. This evaluation addresses mitigation of PWSCC in these welds and allows the application of a PWSCC resistant weld overlay that has the added benefit of producing compressive stresses on the inner portion of the existing welds.

Acceptable residual stresses for purposes of satisfying this requirement are those which, following the application of OWOLs or FSWOLs with Alloy 52/52M weld metal, provide a PWSCC resistant barrier and also result in reduced stresses on the inner portion of the welds. Acceptable residual stresses are those which, after application of the weld overlay, are substantially reduced on the inner portion of the nozzle susceptible material at operating temperatures, pressures, and loads.

In addition, the compressive stresses which exist in the interior of the dissimilar metal weld are increased to the point where the PWSCC of an existing flaw may be arrested. The crack growth analyses resulting from these through-thickness residual stresses ensure that any PWSCC flaws would be acceptable within the inspection interval of the dissimilar metal weld. The effect of the adverse morphology on leakage due to PWSCC cracking was also evaluated. The effect of the application of the weld overlay is to increase the critical flaw size, resulting in additional margin between the critical flaw size and the leakage flaw size. Although the longer flow path and considerations of crack morphology for the Alloy 82/182 weld location reduces leakage somewhat for a given through-wall flaw, the larger critical flaw size following application of the weld overlay allows for increased leakage margin. The evaluation described above demonstrates that these welds will perform as originally intended and that the adverse effects of PWSCC will be mitigated. Therefore, the proposed LBB update does not involve a significant reduction in a margin of safety. Based on the above, FENOC concludes that the proposed amendment does not involve a significant hazards consideration under the standards set forth in

10 CFR 50.92(c), and, accordingly, a finding of "no significant hazards consideration" is justified.

4.2 Applicable Regulatory Requirements/Criteria

The proposed update has been evaluated to determine whether applicable regulations and requirements would continue to be met. FENOC has determined that the proposed update does not require any exemptions or relief from regulatory requirements, and does not affect conformance with any General Design Criterion differently than described in the DBNPS UFSAR. The applicable regulatory requirement for submitting to the Nuclear Regulatory Commission the LBB evaluation to exclude dynamic effects associated with postulated pipe ruptures from the design basis is specified in 10 CFR 50, Appendix A, General Design Criterion 4.

4.3 Precedent

No precedent was found.

4.4 Conclusions

In conclusion, based on the considerations discussed above, (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) such activities will be conducted in compliance with the Commission's regulations, and (3) the issuance of the amendment will not be inimical to the common defense and security or to the health and safety of the public.

5.0 ENVIRONMENTAL CONSIDERATION

A review has determined that the proposed amendment would change a requirement with respect to installation or use of a facility component located within the restricted area, as defined in 10 CFR 20, or would change an inspection or surveillance requirement. However, the proposed amendment does not involve (i) a significant hazards consideration, (ii) a significant change in the types or significant increase in the amounts of any effluents that may be released offsite, or (iii) a significant increase in individual or cumulative occupational radiation exposure. Accordingly, the proposed amendment meets the eligibility criterion for categorical exclusion set forth in 10 CFR 51.22(c)(9). Therefore, pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the proposed amendment.

6.0 REFERENCES

1. Babcock & Wilcox Owners Group, "Leak-Before-Break Evaluation of Margins Against Full Break for RCS Primary Piping of B&W Designed NSS," Report BAW-1847, Revision 1, September 1985.

2. Babcock & Wilcox Owners Group, "Piping Material Properties for Leak-Before-Break Analysis," Report BAW-1889P, October 1985.
3. U.S. Nuclear Regulatory Commission letter to Toledo Edison, Subject: Safety Evaluation of B&W Owners Group Reports Dealing with Elimination of Postulated Pipe Breaks in PWR Primary Main Loops, Davis-Besse Nuclear Station, Unit 1, Docket Number 50-346, February 18, 1986.
4. Centerior Energy letter to U.S. Nuclear Regulatory Commission, Subject: Comparison of Davis-Besse Reactor Coolant System Leak Detection Systems to Regulatory Guide 1.45, Docket Number 50-346, License Number NPF-3, Serial Number: 1849, November 6, 1990.
5. U.S. Nuclear Regulatory Commission, NUREG-0800, Standard Review Plan, Section 3.6.3, "Leak-Before-Break Evaluation Procedures," Revision 1, March 2007.
6. Structural Integrity Associates, Inc., "Leak-Before-Break Evaluation of Reactor Coolant Pump Suction and Discharge Nozzle Weld Overlays for Davis-Besse Nuclear Power Station," Report 0800368.404, Revision 0, July 20, 2009.