UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

May 8, 2013

Mr. Ray Lieb
Site Vice President
FirstEnergy Nuclear Operating Company
Davis-Besse Nuclear Power Station
Mail Stop A-DB-3080
5501 North State Route 2
Oak Harbor, OH 43449-9760

SUBJECT: DAVIS-BESSE NUCLEAR POWER STATION, UNIT NO. 1 - SAFETY EVALUATION IN SUPPORT OF PROPOSED ALTERNATIVE REGARDING POST-REPAIR PRESSURE TESTING REQUIREMENTS (TAC NO. MF0537)

Dear Mr. Lieb:

By letter to the U.S. Nuclear Regulatory Commission (NRC) dated January 18, 2013, and supplemented by letter dated March 8, 2013 (Agencywide Documents Access and Management System (ADAMS) Accession Nos. ML13018A349 and ML13070A226, respectively), FirstEnergy Nuclear Operating Company (FENOC, the licensee), submitted a proposed alternative for relief request (RR)-E1, which would allow the use of an alternate method of containment testing following activities associated with steam generator (SG) replacement for the Davis-Besse Nuclear Power Station (DBNPS), Unit No. 1.

The licensee plans to replace the DBNPS SGs in the spring of 2014. These replacement activities require the opening of the containment vessel to provide access for the removal of the original SGs, as well as the installation of the replacement SGs. Following replacement of these major components, the containment vessel will be restored to its original design requirements.

Once the containment vessel has been restored, a leakage test in accordance with IWE-5223.4, as modified by 10 CFR 50.55a, Paragraph (b)(2)(ix)(J), would be required. However, due to the nature of the repair, which restores the containment vessel to ASME requirements, an effective post-repair test of containment structural and leak-tight integrity can be performed by an alternative leakage test, which pressurizes the entire containment vessel in accordance with IWE-5223.4(a).

The proposed alternative is in lieu of the required Appendix J, Type A, integrated leak rate test following restoration of the containment vessel pressure boundary.

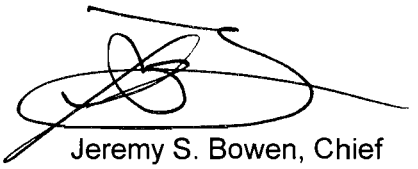
The NRC staff has reviewed the licensee's submittal and concludes that the licensee's proposed alternatives provide an acceptable level of quality and safety.

Accordingly, the NRC staff concludes that the licensee has adequately addressed all of the regulatory requirements set forth in Title 10 of the *Code of Federal Regulations*, Section 50.55a(a)(3)(i). Therefore, the NRC staff authorizes the proposed alternative, RR-E1, at DBNPS, for one-time only, for use during the fourth 10-year inservice inspection interval for DBNPS that commenced September 21, 2012, and ends on September 20, 2022.

The NRC staff's safety evaluation is enclosed.

Please contact the DBNPS Project Manager, Michael Mahoney at (301) 415-3867 if you have any questions on this action.

Sincerely,



Jeremy S. Bowen, Chief
Plant Licensing Branch III-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-346

Enclosure:
Safety Evaluation

cc w/encl: Listserv

UNITED STATES
NUCLEAR REGULATORY COMMISSION
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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO ALTERNATIVE REQUEST RR-E1

FOR THE FOURTH 10-YEAR INSERVICE INSPECTION INTERVAL

FIRST ENERGY NUCLEAR OPERATING COMPANY

DAVIS-BESSE NUCLEAR POWER STATION, UNIT NO. 1

DOCKET NO. 50-346

1.0 INTRODUCTION

By letter to the U.S. Nuclear Regulatory Commission (NRC) dated January 18, 2013, and supplemented by letter dated March 8, 2013 (Agencywide Documents Access and Management System (ADAMS) Accession Nos. ML13018A349 and ML13070A226, respectively), First Energy Nuclear Operating Company (FENOC, the licensee), submitted alternative relief request (RR)-E1, for the Davis-Besse Nuclear Power Station (DBNPS), Unit No. 1.

The licensee requested authorization to use alternative testing, in lieu of the containment leakage rate testing requirements, specified in the 2007 Edition with 2008 Addenda of the American Society of Mechanical Engineers (ASME) *Boiler and Pressure Vessel Code* (B&PV Code) Section XI, as conditioned by Title 10 of the *Code of Federal Regulations* (10 CFR), Section 50.55a(b)(2)(ix)(J), following the post-repair of the DBNPS steel containment vessel.

Alternative request, RR-E1, is a one-time only request applicable to the fourth 10-year inservice inspection (ISI) program interval at DBNPS. The fourth 10-year ISI interval at DBNPS began on September 21, 2012, and ends on September 20, 2022.

Specifically, pursuant to 10 CFR 50.55a(a)(3)(i), the licensee requested to use the alternative RR-E1, since the proposed alternative provides an acceptable level of quality and safety.

2.0 REGULATORY EVALUATION

Section 50.55a(g)(4) to 10 CFR requires that the ISI of the pressure retaining components of the steel (Class MC) and concrete (Class CC) containments meet the requirements set forth in Section XI of the ASME B&PV Code and Addenda that are incorporated by reference in 10 CFR 50.55a(b), subject to the condition listed in paragraph (b)(2)(vi), and the conditions listed in paragraphs (b)(2)(viii) and (b)(2)(ix). Exceptions are allowed to these requirements when alternatives have been authorized pursuant to 10 CFR 50.55a(a)(3)(i) or (a)(3)(ii).
In proposing alternatives, a licensee must demonstrate that the proposed alternatives provide an acceptable level of quality and safety (10 CFR 50.55a(a)(3)(i)) or compliance would result in

hardship or unusual difficulty without a compensating increase in the level of quality and safety (10 CFR 50.55a(a)(3)(ii)). Section 50.55a of 10 CFR allows the NRC to authorize alternatives to ASME Code requirements upon making necessary findings. Any proposed alternatives must be submitted and authorized prior to implementation.

The DBNPS fourth 10-year ISI interval began on September 21, 2012, and this alternative is proposed to support the construction activities related to steam generator (SG) replacement planned for the spring 2014, refueling outage. The applicable ASME B&PV Code, Section XI, edition and addenda for DBNPS is the 2007 Edition with 2008 Addenda.

The licensee intends to perform a major containment repair/replacement activity in the 2014 refueling outage involving creation and restoration of a construction opening to facilitate SG replacement. The post-repair system pressure test provisions in Article IWE-5000, of the above stated code edition/addenda, is conditioned by 10 CFR 50.55a, Paragraph (b)(2)(ix)(J), which states:

> In general, a repair/replacement activity such as replacing a large containment penetration, cutting a large construction opening in the containment pressure boundary to replace steam generators, reactor vessel heads, pressurizers, or other major equipment; or other similar modification is considered a major containment modification. When applying IWE-5000 to Class MC pressure retaining components, any major containment modification or repair/replacement, must be followed by a Type A test to provide assurance of both containment structural integrity and leak-tight integrity prior to returning to service, in accordance with 10 CFR part 50, Appendix J, Option A or Option B on which the applicant's or licensee's Containment Leak-Rate) Testing Program is based. When applying IWE-5000, if a Type A, B, or C Test is performed, the test pressure and acceptance standard for the test must be in accordance with 10 CFR part 50, Appendix J.

The above regulatory condition is intended to ensure that the post-repair pressure test provides a verification of both the structural and leak-tight integrity of the restored containment. The licensee has submitted this request seeking authorization to use a proposed alternative to the requirement in the regulatory condition on IWE-5000 in 10 CFR 50.55a (b)(2)(ix)(J) of performing an Appendix J, Type A, test following the proposed major containment repair/replacement activity.

This safety evaluation addresses whether the proposed alternative provides an acceptable level of quality and safety in ensuring post-repair verification of both structural and leak-tight integrity of the restored steel containment vessel following SG replacement.

3.0 TECHNICAL EVALUATION

3.1 Licensee's Alternative Request RR-E1

ASME Code Component Affected

Component: Steel containment vessel

Class Type: Seismic Class I, Class MC

Description: Freestanding cylindrical steel pressure vessel with hemispherical dome and ellipsoidal bottom

Applicable Code Requirement from Which Relief is Requested

Paragraph IWE-5223, "Pneumatic Leakage Test", sub-paragraphs IWE-5223.2 and IWE-5223.4 as below, of Subsection IWE is conditioned by 10 CFR 50.55a, Paragraph (b)(2)(ix)(J).

IWE-5223.2 Boundaries states: "The test boundary may be limited to brazed joints and welds affected by the repair/replacement activity."

IWE-5223.4 Examination states:

> During the pneumatic leakage test, the leak tightness of brazed joints and welds affected by the repair/replacement activity shall be verified by performing one of the following: (a) a bubble test-direct pressure technique in accordance with Section V, Article 10, Appendix I, or any other Section V, Article 10 leak test that can be performed in conjunction with the pneumatic leakage test. (b) a Type A, B, or C Test, as applicable, in accordance with 10CFR50, Appendix J.

Article IWE-5000, in general, and specifically IWE-5223 is conditioned by 10 CFR 50.55a Paragraph (b)(2)(ix)(J), which states:

> In general, a repair/replacement activity such as replacing a large containment penetration, cutting a large construction opening in the containment pressure boundary to replace steam generators, reactor vessel heads, pressurizers, or other major equipment; or other similar modification is considered a major containment modification. When applying IWE-5000 to Class MC pressure retaining components, any major containment modification or repair/replacement, must be followed by a Type A test to provide assurance of both containment structural integrity and leak-tight integrity prior to returning to service, in accordance with 10 CFR part 50, Appendix J, Option A or Option B on which the applicant's or licensee's Containment Leak-Rate) Testing Program is based. When applying IWE-5000, if a Type A, B, or C Test is performed, the test pressure and acceptance standard for the test must be in accordance with 10 CFR part 50, Appendix J.

Reason for Request

The licensee plans to replace the DBNPS SGs in the spring of 2014. These replacement activities require the creation and restoration of construction openings in the shield building and the pressure boundary of the free-standing steel containment vessel to provide access for the removal of the original SGs as well as the installation of the replacement SGs. Following replacement of these major components, the steel containment vessel will be restored to its original design requirements.

Once the containment vessel has been restored, a leakage test in accordance with IWE-5223, as conditioned by 10 CFR 50.55a(b)(2)(ix)(J), would be required. However, due to the nature of the repair, which restores the containment vessel to ASME Code requirements, an effective post-repair test of containment structural and leak-tight integrity can be performed by an alternative leakage test, in accordance with IWE-5223.4(a), following pressurization of the entire containment vessel.

Proposed Alternative:

The proposed alternative is in lieu of the required Appendix J, Type A, integrated leak rate test following restoration of the containment vessel pressure boundary. Structural integrity and the leak-tight integrity of the repair will be ensured by the proposed localized leakage bubble test. The containment vessel opening repair weld will be bubble tested after pressurizing the entire containment to between 0.96 Pa [pressure absolute] and 1.1 Pa, where Pa is the design basis loss-of-coolant accident containment peak pressure as specified in the technical specifications, which is 38.0 pounds per square inch gauge (psig). The bubble test of the repair weld will be performed after a hold time of at least 15 minutes. The test acceptance criteria will be zero detectable leakage, which will be determined by the absence of bubble formation, as observed from the annular space, using a leak detection medium in accordance with test procedures. Any leakage identified will be corrected and the test will be re-performed.

The non-destructive examination (NDE) personnel performing the bubble test will be certified as visual testing, VT-2 examiners in accordance with the requirements of American National Institute of Standards (ANSI)/ American Society for Non-destructive Testing (ASNT) CP-189, "ASNT Standard for Qualification and Certification of Nondestructive Testing Personnel." The leakage test shall be performed prior to entry into Mode 4 following restoration of the containment vessel pressure boundary.

Basis for Use

The repair/replacement NDE activities, specifically, the pre-service examination and post-repair/replacement testing requirements, associated with temporary removal and reinstallation of the DBNPS containment vessel opening, will be performed in accordance with the requirements of ASME Code Section XI, 2007 Edition through 2008 Addenda. ASME Code Section XI, Paragraph IWA-4411, "Welding, Brazing, Fabrication, and Installation," notes that welding and installation activities shall be performed in accordance with the Owner's Requirements and, except as modified by IWA-4411 (a) through (i), in accordance with the original Construction Code of the item.
Fabrication and installation activities (e.g., cutting and welding) will be performed in accordance with the original Construction Code Class B of ASME Code Section III, or reconciled to a later edition of the ASME Code in accordance with the requirements of IWA-4000, "Repair/Replacement Activities." The restoration of the construction opening and associated weld will return the structural integrity of the containment vessel to its original design requirements.

Prior to performing the repair weld, the surfaces to be welded will be prepared in accordance with the approved ASME Repair/Replacement Plan. The weld will be performed by qualified personnel in accordance with ASME Code Section IX, "Qualification Standard for Welding and Brazing Procedures, Welders, Brazers, and Welding and Brazing Operators," requirements.

Post-weld examinations will be performed on the containment vessel repair, which will include an 100 percent radiography in accordance with the Construction Code. In addition, a general visual examination will be performed during, or upon completion of, the pressure test.

The reapplication of containment vessel coatings will be performed following completion of radiography and prior to the performance of the localized leakage bubble test. Therefore, the containment vessel opening will have been restored to its original design requirements and will have been examined to ensure weld integrity.

The bubble test will ensure zero leakage at the repair area, in lieu of an Appendix J, Type A, test that measures and permits a specified amount of total containment leakage; in other words, this zero leakage acceptance criterion is more stringent than that of a Type A test. Zero leakage acceptance criteria for the bubble test will ensure that the containment vessel leakage rate was not altered by the SG replacement activity, and it will also verify leak-tight integrity. Additionally, the pressurization of the entire containment vessel to the accident pressure will confirm the structural integrity of the containment vessel after the repair is complete.

DBNPS has successfully completed two Appendix J, Type A, tests following containment vessel restoration associated with two separate reactor vessel closure head replacements. Per the DBNPS Containment Leakage Rate Testing Program, the tests performed in the 2003 refueling outage and the 2011 mid-cycle outage, indicated that the Containment System is performing well within leakage limits since greater than 50 percent margin remained of the 0.375 percent weight per day leakage limit in both cases. Greater than 80 percent margin remained following the restoration of the containment vessel during the 2011, mid-cycle outage.

The licensee summarized that the combination of an 100 percent weld radiography (meeting the construction code radiography acceptance criteria) and the localized leakage bubble test of the repair weld (while at peak calculated accident pressure with a zero leakage acceptance criteria) with the entire containment pressurized to Pa, as well as recent history of acceptable Appendix J, Type A, tests will ensure the structural and leak-tight integrity of the containment vessel. Therefore, the licensee concluded that the proposed alternative, in lieu of the required post-repair Appendix J, Type A, test, provides an acceptable level of quality and safety.

Duration of Proposed Alternative

The licensee requested the duration of the proposed alternative to be through completion and approval of all testing associated with restoration of the containment vessel opening created to support the DBNPS SG replacement during the 2014, refueling outage. The proposed alternative shall be utilized during the fourth 10-year ISI interval, which commenced on September 21, 2012.

3.2 NRC Staff Evaluation

The licensee plans to perform SG replacement at DBNPS during the spring 2014 refueling outage. The SG replacement project requires the creation and restoration of a temporary construction opening in the pressure-retaining boundary of the steel containment vessel to provide access for the removal/installation of the original/new SGs. After the SGs are replaced, the licensee plans to restore the containment vessel to its original design configuration and 100 percent of the repair welds along the perimeter of the construction opening will be subject to

radiographic examination, as required by the Construction Code for the plant.

The creation and restoration of the containment vessel construction opening is considered a major containment modification or repair/replacement activity. The regulatory condition in 10 CFR 50.55a, Paragraph (b)(2)(ix)(J), with regard to post-repair pressure test requirements of Article IWE-5000 of the 2007 Edition with 2008 Addenda of the ASME Code, Section XI, requires that a major containment modification must be followed by a, Appendix J, Type A, test, prior to return to service. This test is required in order to provide a verification of both the structural and leak-tight integrity of the restored containment. The licensee's proposed alternative to the above Appendix J, Type A, test, performed prior to returning the containment to service, includes the following:

1. The entire containment will be pressurized to between 0.96 Pa and 1.1 Pa, and held for at least 15 minutes. IWE-5240 provides visual examination requirements for system pressure tests and is to be performed by VT-2 qualified personnel. The NRC staff finds that an uneventful structural response, in general, and specifically in the repair area, during and after pressurizing the entire containment to the test pressure and holding for at least 15 minutes will provide verification of the structural integrity of the repaired area as well as the restored containment vessel.

2. With the entire containment pressurized as noted in (1) above, a local leakage test of the welds affected by the repair/replacement activity will be performed using a direct pressure technique bubble test in accordance with IWE-5223.4(a). The test acceptance criteria will be zero detectable leakage, which will be determined by the absence of bubble formation, as observed from the annular space, using a leak detection medium, in accordance with test procedures. Any leakage identified will be corrected, and the test will be re-performed. The NRC staff finds that this local bubble leakage test will provide a post-repair verification of the leakage integrity of the welds affected by the repair/replacement and, therefore, the leakage integrity of the restored containment vessel since no other areas have been affected by the repair/replacement activity.

Based on (1) and (2) above, and the fact that DBNPS has successfully completed two Appendix J, Type A, tests following containment vessel restoration previously, the NRC staff finds that the licensee's proposed alternative to the Appendix J, Type A, test will provide a verification of both the structural integrity as well as the leakage integrity of the restored containment vessel.

Therefore, the NRC staff finds that the proposed alternative for the post-repair pressure testing requirements, involving the restored steel containment vessel at DBNPS, provides an acceptable level of quality and safety.

4.0 CONCLUSION

As set forth above, the NRC staff has determined that the proposed alternative, RR-E1, provides an acceptable level of quality and safety, and assurance that the steel containment vessel is capable of performing its safety function.

Accordingly, the NRC staff concludes that the licensee has adequately addressed all of the regulatory requirements set forth in 10 CFR 50.55a(a)(3)(i), and is in compliance with the ASME Code's requirements, as conditioned in 10 CFR 50.55a.

Therefore, the NRC staff authorizes the proposed alternative, RR-E1, at DBNPS for the purpose of meeting post-repair pressure testing requirements of the steel containment vessel following SG replacement, which is currently planned for the spring 2014, refueling outage.

The proposed alternative is authorized for one-time only, for the above purpose, for use during the fourth 10-year ISI interval for DBNPS that commenced September 21, 2012, and ends on September 20, 2022.

All other ASME Code, Section XI, requirements for which relief was not specifically requested and approved remain applicable, including third-party review by the Authorized Nuclear Insurance Inspector.

Principal Contributor: G. Thomas, NRR

The NRC staff's safety evaluation is enclosed.

Please contact the DBNPS Project Manager, Michael Mahoney at (301) 415-3867 if you have any questions on this action.

Sincerely,
/ RA /

Jeremy S. Bowen, Chief
Plant Licensing Branch III-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-346

Enclosure:
Safety Evaluation

cc w/encl: Listserv

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