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

September 11, 2012

Mr. Barry S. Allen
Site Vice President
FirstEnergy Nuclear Operating Company
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 10 CFR 50.55a REQUESTS RP-2 AND RP-4 REGARDING INSERVICE TESTING (TAC NOS. ME8405 AND ME8406)

Dear Mr. Allen:

By letter to the U.S. Nuclear Regulatory Commission (NRC), dated April 9, 2012 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML121000277), FirstEnergy Nuclear Operating Company (the licensee) submitted proposed alternatives RP-2 and RP-4 to certain requirements associated with the fourth 10-year inservice testing (IST) program interval for pumps and valves for the Davis-Besse Nuclear Power Station, Unit No. 1 (DBNPS).

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

Accordingly, the NRC staff concluded 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 alternatives for DBNPS for the duration of the fourth 10-year IST program interval, currently scheduled to start on September 21, 2012, and end 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,

Michael I. Dudek, 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

PROPOSED ALTERNATIVES RP-2 AND RP-4

FOR INSERVICE PUMP TESTING

FIRSTENERGY 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 April 9, 2012 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML121000277), FirstEnergy Nuclear Operating Company (the licensee) submitted proposed alternatives to certain requirements associated with the fourth 10-year inservice testing (IST) program for pumps and valves for the Davis-Besse Nuclear Power Station, Unit No. 1 (DBNPS). Proposed alternatives RP-2 and RP-4 are applicable to the fourth 10-year IST program interval at DBNPS, which is scheduled to start on September 21, 2012, and end on September 20, 2022.

In RP-2 and RP-4, the licensee requested approval to use American Society of Mechanical Engineers (ASME), "Code for Operation and Maintenance of Nuclear Power Plants," (OM Code) Code Case OMN-16, "Use of Pump Curve for Testing," for certain component cooling water (CCW) and service water pumps. Code Case OMN-16 allows the use of pump reference curves to compare the flow rate for a pump with the developed head in lieu of testing the pump at the same flow rate as required by the ASME OM Code.

Specifically, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) 50.55a(a)(3)(i), the licensee requested to use the proposed alternatives on the basis that the alternatives provide an acceptable level of quality and safety.

2.0 REGULATORY EVALUATION

Section 50.55a(f), to 10 CFR "Inservice Testing Requirements," requires, in part, that ISTs of certain ASME Code Class 1, 2, and 3, pumps and valves be performed in accordance with the specified ASME OM Code and applicable addenda incorporated by reference in the regulations. Exceptions are allowed where alternatives had been authorized or relief has been requested by the licensee and granted by the NRC pursuant to paragraphs (a)(3)(ii) or (f)(6)(i) of 10 CFR 50.55a. In proposing alternatives or requesting relief, the licensee must demonstrate that: (1) the proposed alternatives provide an acceptable level of quality and safety (10 CFR 50.55a(a)(3)(i)); (2) 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)); or (3) conformance is impractical for the facility (10 CFR 50.55a(f)(6)(i)). 10 CFR 50.55a allows the NRC to authorize alternatives and to grant relief from ASME Code requirements upon making necessary findings.

The DBNPS fourth 10-year IST program interval begins on September 21, 2012, and is scheduled to end on September 20, 2022. The applicable ASME OM Code edition and addenda for the DBNPS fourth 10-year IST program interval is the 2004 Edition through the 2006 Addenda of Section XI of the ASME Code.

3.0 EVALUATION

3.1 Proposed Alternative RP-2

3.1.1 Components For Which Relief Is Requested

Relief No.	Component No.	Description	Class	Group
RP-2	P43-1	CCW Pump	3	A
	P43-2			
	P43-2			

These CCW pumps are centrifugal, horizontally mounted pumps.

3.1.2 ASME Code Requirements

Subparagraph ISTB-5121(b) of the ASME Code, states, in part, that "The resistance of the system shall be varied until the flow rate equals the reference point. The differential pressure shall then be determined and compared to the reference value."

Subparagraph ISTB-5121(d) of the ASME Code, states, in part, that "Vibration (displacement or velocity) shall be determined and compared with the reference value."

3.1.3 Licensee's Proposed Alternative to the ASME Code

Pump reference curves, developed per the guidelines in NRC-developed NUREG-1482, Revision 1, Section 5.2, "Use of Variable Reference Values for Flow Rate and Differential Pressure During Pump Testing," will be used to compare flow rate with developed pump head at the flow conditions dictated by CCW system loads each quarter. Baseline vibration data obtained at various flow points on the pump curve will be used to develop a vibration verses flow curve.

In lieu of using ASME OM Code Case OMN-9, "Use of a Pump Curve for Testing," as referenced in Section 5.2 of NUREG-1482, Code Case OMN-16 shall be used.

Deviations from the reference curves shall be compared with the ranges of ASME OM Code, Table ISTB-5121-1.

3.1.4 Licensee's Reason for Request

The CCW system at DBNPS was not designed with installed pump test lines. To achieve the same operating point for each test, manual butterfly valves (which are not designed to throttle flow), would need to be used. Repeatability of the test results when using these valves to throttle flow is poor. Depending on plant operating and climatic conditions, the cooling requirements range from minimum cooling loads (approximately 3,000 gallons per minute (gpm)) to 100 percent (approximately 8,000 gpm). CCW system operating conditions do not allow adjusting system resistance without significant impact on the plant's thermal stability.

A fixed flow rate through the pump aligned to the essential and non-essential loads cannot be accomplished because system resistances are continuously varying and flows to parallel loads are dependent on each other. Spent fuel cooling and boric acid evaporators have temperature control valves which vary demand on the CCW system according to heat load. CCW flow to the reactor coolant pump seal coolers varies, dependent on the throttle valve positions on the supply lines for the four reactor coolant pumps. CCW flow to the control rod drive stators also passes through filters whose flow will change dependent on filter loading.

3.1.5 Licensee's Basis For Use

Paragraph ISTB-3320 of the ASME OM Code provides for an additional set of reference values. When it is not feasible to test a pump at a reference value of flow and differential pressure, testing in the "as found" condition and comparing values to an established reference curve should be considered as an acceptable alternative. The proposed alternative establishes a reference pump curve for which the pump is known to operate acceptably. Acceptance criteria based on this reference curve permits evaluation of the pump conditions and detection of degradation.

Code Case OMN-16 is included in the 2006 Addenda but has not yet been included in NRC-developed Regulatory Guide (RG) 1.192, "Operation and Maintenance Code Case Acceptability, ASME OM Code," for general industry use. However, Code Case OMN-9 was conditionally accepted in RG 1.192. The conditions imposed on Code Case OMN-9 as stated in RG 1.192 have been incorporated into Code Case OMN-16. Code applicability for the use of OMN-16 includes ASME OM Code 2004 Edition through 2006 Addenda, which is the fourth 10-year IST program interval, "Code of Record," for DBNPS.

Using the provisions of this request as an alternative to the requirements of ASME OM Code, subparagraphs ISTB-5121(b) and ISTB-5121(d) provides reasonable alternative to the ASME OM Code requirements for detecting pump degradation. The proposed alternative method for monitoring CCW pumps for degradation provides an acceptable level of quality and safety, and assurance that the pumps are operationally ready and capable of performing their safety function.

3.1.6 NRC Staff Evaluation

As discussed in Code Case OMN-16, when testing a centrifugal pump where throttling to a specific reference value is impractical, the establishment of additional pump curves for reference flow rates and differential pressures and vibration is acceptable. Code Case OMN-16 has been

reviewed by the NRC staff. Although this code case has not yet been incorporated into RG 1.192, Code Case OMN-16 is an acceptable replacement for Code Case OMN-9. Code Case OMN-9 is currently an authorized alternative for setting reference values as required by ISTB-5121. Additionally, Code Case OMN-16 from the 2006 Addenda of the ASME OM Code, has incorporated the NRC staff's conditions for Code Case OMN-9, as listed in RG 1.192. The NRC staff finds that Code Case OMN-16 from the 2006 Addenda of the ASME OM Code, provides an acceptable level of quality and safety for testing the subject pumps, and is an acceptable replacement for Code Case OMN-9, which was previously approved for use in RG 1.192.

Based on a review of the information provided by the licensee, the NRC staff finds that for CCW pumps P43-1, P43-2 and P43-3, it is not practical to return to the same flow configuration for each inservice pump test. In the CCW system, reproducing one of these reference flow points is difficult using the installed large butterfly valves. The pumps will be tested in a range of flows and the results will be compared to the acceptance criteria based on a portion of the pump curve and on the hydraulic and vibration acceptance criteria specified in Code Case OMN-16. The licensee's proposed alternative testing complies with the requirements of Code Case OMN-16, from the 2006 Addenda of the ASME OM Code.

3.2 Proposed Alternative RP-4

3.2.1 Components For Which Relief Is Requested

Relief No.	Component No.	Description	Class	Group
RP-4	P3-1	Service Water Pump	3	A
	P3-2			
	P3-3			

The service water pumps are centrifugal, vertical line shaft pumps.

3.2.2 ASME Code Requirements

Subparagraph ISTB-5121(b) of the ASME Code, states, in part, that "The resistance of the system shall be varied until the flow rate equals the reference point. The differential pressure shall then be determined and compared to the reference value."

Subparagraph ISTB-5121(d) of the ASME Code, states, in part, that "Vibration (displacement or velocity) shall be determined and compared with the reference value."

3.2.3 Licensee's Proposed Alternative to the ASME Code

Pump reference curves, developed per the guidelines in NUREG-1482, Revision 1, Section 5.2, will be used to compare flow rate with developed pump head at the flow conditions dictated by service water loads each quarter. Baseline vibration data obtained at various flow points on the pump curve will be used to develop a vibration verses flow curve.

In lieu of using Code Case OMN-9, as referenced in Section 5.2 of NUREG-1482, Code Case OMN-16 shall be used.

Deviations from the reference curves shall be compared with the ranges of ASME OM Code Table ISTB-5221-1.

3.2.4 Licensee's Reason for Request

The service water system at DBNPS is in continuous operation during all modes of plant operation and system flow varies with the temperature requirement of the various safety and nonsafety-related loads. The service water system was not designed with installed pump test lines. The service water system operating conditions do not allow adjusting system resistance without significant impact on the plant's thermal stability.

Depending on plant operating and climatic conditions, the cooling requirements range from minimum cooling loads (approximately 6,000 gpm) to 100 percent (approximately 10,000 gpm). Many of the system loads are automatically placed in operation in response to local temperature requirements. Operating experience has shown that plant conditions preclude setting the service water pumps to the exact flow rate for a specific reference value, due to varying heat loads that require cooling by the service water system.

3.2.5 Licensee's Basis For Use

Paragraph ISTB-3320 of the ASME OM Code provides for an additional set of reference values. When it is not feasible to test a pump at a reference value of flow and differential pressure, testing in the "as found" condition and comparing values to an established reference curve should be considered as an acceptable alternative. The proposed alternative establishes a reference pump curve for which the pump is known to operate acceptably. Acceptance criteria based on this reference curve permits evaluation of the pump conditions and detection of degradation.

Code Case OMN-16 is included in the 2006 Addenda but has not yet been included in RG 1.192 for general industry use. However, Code Case OMN-9 was conditionally accepted in RG 1.192. The conditions imposed on Code Case OMN-9 as stated in RG 1.192 have been incorporated into Code Case OMN-16. Code applicability for the use of OMN-16 includes ASME OM Code 2004 Edition through 2006 Addenda, which is the fourth 10-year IST program interval, "Code of Record," for DBNPS.

Using the provisions of this request as an alternative to the requirements of ASME OM Code subparagraphs ISTB-5121(b) and ISTB-5121(d) provides a reasonable alternative to the ASME OM Code requirements for detecting pump degradation. The proposed alternative method for monitoring service water pumps for degradation provides an acceptable level of quality and safety, and the assurance that the pumps are operationally ready and capable of performing their safety function.

3.2.6 NRC Staff Evaluation

As discussed in Code Case OMN-16, in cases when testing a vertical line shaft centrifugal pump where adjustment to a specific reference value is impractical, the establishment of additional pump curves for reference flow rates and differential pressures and vibration is acceptable. Code Case OMN-16 has been reviewed by the NRC staff. Although this code case has not yet

been incorporated into RG 1.192, Code Case OMN-16 is an acceptable replacement for Code Case OMN-9. Code Case OMN-9 is currently an authorized alternative for setting reference values as required by ISTB-5221. Additionally, Code Case OMN-16 from the 2006 Addenda of the ASME OM Code, has incorporated the NRC staff's conditions for Code Case OMN-9, as listed in RG 1.192. The NRC staff finds that Code Case OMN-16 from the 2006 Addenda of the ASME OM Code, provides an acceptable level of quality and safety for testing the subject pumps, and is an acceptable replacement for Code Case OMN-9, which was previously approved for use in RG 1.192.

Based on a review of the information provided by the licensee, the NRC staff finds that for service water pumps P3-1, P3-2, and P3-3, it is not practical to return to the same flow configuration for each inservice pump test. In the service water system, reproducing one of these reference flow points is difficult without causing significant impacts on the plant's thermal stability. The service water pumps will be tested in a range of flows, and the results will be compared to the acceptance criteria based on a portion of the pump curve and on the hydraulic and vibration acceptance criteria specified in Code Case OMN-16. The licensee's proposed alternative testing complies with the requirements of Code Case OMN-16 from the 2006 Addenda of the ASME OM Code.

4.0 CONCLUSION

As set forth above, the NRC staff has determined that proposed alternatives RP-2 and RP-4, provide an acceptable level of quality and safety, and assurance that CCW pumps, P43-1, P43-2, and P43-3, and service water pumps, P3-1, P3-2, and P3-3, are capable of performing their 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). Therefore, the NRC staff authorizes the alternatives RP-2 and RP-4, to use Code Case OMN-16, from the 2006 Addenda of the ASME OM Code, for the fourth 10-year IST program interval at DBNPS which is scheduled to start on September 21, 2012.

All other requirements of the ASME Code for which relief has not been specifically requested and authorized remain applicable, including a third-party review by the Authorized Nuclear Inservice Inspector.

Principal Contributor: J. Billerbeck, NRR

Date of issuance: September 11, 2012

Mr. Barry S. Allen
Site Vice President
FirstEnergy Nuclear Operating Company
Mail Stop A-DB-3080
5501 North State Route 2
Oak Harbor, OH 43449-9760

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

Sincerely,
/ RA /

Michael I. Dudek, 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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