February 14, 2008

Mr. Peter P. Sena III
Site Vice President
FirstEnergy Nuclear Operating Company
Beaver Valley Power Station
Mail Stop A-BV-SEB1
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Shippingport, PA 15077

SUBJECT: BEAVER VALLEY POWER STATION, UNIT NO. 2 - RELIEF REQUEST NOS. PRR1, PRR2, PRR3, PRR4, PRR5, PRR6, PRR7, PRR8, PRR9, AND VRR1 REGARDING THE THIRD 10-YEAR INSERVICE TESTING PROGRAM RELIEF REQUESTS (TAC NOS. MD5595 - MD5604)

Dear Mr. Sena:

By letter dated May 11, 2007, as supplemented by letters dated September 24, and November 14, 2007, FirstEnergy Nuclear Operating Company (FENOC, licensee), submitted ten relief requests for authorization of alternatives and granted reliefs associated with the inservice testing program third 10-year interval update for the Beaver Valley Power Station, Unit No. 2 (BVPS-2). By letter dated September, 24, 2007, the licensee withdrew Relief Request No. PRR1.

Based on the information provided by the licensee, the Nuclear Regulatory Commission staff has concluded that pursuant to Section 50.55a(a)(3)(i) of Part 50 of Title 10 of the *Code of Federal Regulations* (10 CFR), Relief Request Nos. PRR2, PRR6, PRR8, PRR9, and VRR1 are authorized on the basis that the proposed alternatives would provide an acceptable level of quality and safety. Pursuant to 10 CFR 50.55a(f)(6)(i), Relief Request Nos. PRR3, PRR4, PRR5, and PRR7 are granted and alternative requirements are imposed on the basis that the American Society of Mechanical Engineers *Code for Operation and Maintenance of Nuclear Power Plants* requirements are impractical for the facility.

If you have any questions, please contact the Beaver Valley Project Manager, Nadiyah Morgan, at (301) 415-1016.

Sincerely,

/ra/

Mark G. Kowal, Chief
Plant Licensing Branch I-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-412

Enclosure:
As stated

cc w/encl: See next page

If you have any questions, please contact the Beaver Valley Project Manager, Nadiyah Morgan, at (301) 415-1016.

Sincerely,

/ra/

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As stated

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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

REGARDING THE THIRD 10-YEAR INTERVAL INSERVICE TESTING PROGRAM

FOR RELIEF REQUEST NOS. PRR2, PRR3, PRR4,

PRR5, PRR6, PRR7, PRR8, PRR9, AND VRR1

FIRSTENERGY NUCLEAR OPERATING COMPANY

FIRSTENERGY NUCLEAR GENERATION CORP.

OHIO EDISON COMPANY

THE TOLEDO EDISON COMPANY

BEAVER VALLEY POWER STATION, UNIT NO. 2

DOCKET NO. 50-412

1.0 INTRODUCTION

By letter dated May 11, 2007, Agencywide Document Access and Management System (ADAMS) accession number ML071370347, as supplemented by letters dated September 24, 2007, ADAMS accession number ML072040259 and November 14, 2007, ADAMS accession number ML073240030, FirstEnergy Nuclear Operating Company (FENOC, licensee), submitted ten relief requests regarding the third 10-year inservice testing (IST) program interval for Beaver Valley Power Station, Unit No. 2 (BVPS-2). The licensee requested alternative authorization and relief from certain IST requirements of the 2001 Edition through 2003 Addenda of the American Society of Mechanical Engineers (ASME) *Code for Operation and Maintenance of Nuclear Power Plants* (OM Code). By letter dated September, 24, 2007, the licensee withdrew Relief Request No. PRR1. The BVPS-2 third 10-year IST interval commenced on November 18, 2007.

2.0 REGULATORY EVALUATION

Section 50.55a of Part 50 of Title 10 of the *Code of Federal Regulations* (10 CFR), requires that IST of certain ASME Code Class 1, 2, and 3 pumps and valves be performed at 120-month (10-year) IST program intervals in accordance with the specified ASME Code and applicable addenda incorporated by reference in the regulations, except where alternatives have been authorized or relief has been requested by the licensee and granted by the Commission pursuant to paragraphs (a)(3)(i), (a)(3)(ii), or (f)(6)(i) of 10 CFR 50.55a. In accordance with

10 CFR 50.55a(f)(4)(ii), licensees are required to comply with the requirements of the latest edition and addenda of the ASME Code incorporated by reference in the regulations 12 months prior to the start of each 120-month IST program interval. In accordance with 50.55a(f)(4)(iv), IST of pumps and valves may meet the requirements set forth in subsequent editions and addenda that are incorporated by reference in 10 CFR 50.55a(b), subject to the Commission approval. Portions of editions or addenda may be used provided that all related requirements of the respective editions and addenda are met. In proposing alternatives or requesting relief, the licensee must demonstrate that: (1) the proposed alternatives provide an acceptable level of quality and safety; (2) compliance would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety; or (3) conformance is impractical for the facility. Section 50.55a authorizes the Commission to approve alternatives and to grant relief from ASME OM Code requirements upon making necessary findings. The Nuclear Regulatory Commission (NRC) guidance contained in Generic Letter (GL) 89-04, "Guidance on Developing Acceptable Inservice Testing Programs," provides alternatives to ASME Code requirements which are acceptable. Further guidance is given in GL 89-04, Supplement 1, and NUREG-1482 Revision 1, "Guidance for Inservice Testing at Nuclear Power Plants."

3.0 TECHNICAL EVALUATION

3.1 Relief Request No. PRR2

3.1.1 Code Requirements/Components Affected

The licensee requested relief from ISTB-3510(b)(1), which requires that the full-scale range of each analog instrument shall be not greater than three times the reference value.

Relief from ISTB-3510(b)(1) for Group A and B tests was requested for the following instruments because full-scale range for each instrument below exceeds three times the reference value:

- 2CHS-PI151A Suction Pressure - Charging Pump A
- 2CHS-PI152A Suction Pressure - Charging Pump B
- 2CHS-PI153A Suction Pressure - Charging Pump C
- 2CHS-PI123A Suction Pressure - Boric Acid Transfer Pump
- 2CHS-PI123B Suction Pressure - Boric Acid Transfer Pump
- 2SIS-PI938 Suction Pressure - Low-Head Safety Injection (LHSI) Pump
- 2SIS-PI939 Suction Pressure - LHSI Pump
- 2CCP-PI150A Suction Pressure - Component Cooling Water (CCW) Pump
- 2CCP-PI150B Suction Pressure - CCW Pump
- 2CCP-PI150C Suction Pressure - CCW Pump
- 2EGF-PI201A Discharge Pressure - Emergency Diesel Generator (EDG) Fuel Oil Transfer Pump
- 2EGF-PI201B Discharge Pressure - EDG Fuel Oil Transfer Pump
- 2EGF-PI201C Discharge Pressure - EDG Fuel Oil Transfer Pump
- 2EGF-PI201D Discharge Pressure - EDG Fuel Oil Transfer Pump
- 2FWE-FI100A Flow Indicator - Motor Driven Auxiliary Feedwater (AFW) Pump
- 2FWE-FI100B Flow Indicator - Motor Driven AFW Pump
- 2FWE-FI100C Flow Indicator - Motor Driven AFW Pump

ISTB-3510 requires that pressure instruments be accurate within ± 2% of full-scale for Group A and B tests.

3.1.2 Instruments 2CHS-PI151A, 2CHS-PI152A, and 2CHS-PI153A

3.1.2.1 Licensee's Basis for Request

The suction pressure gauges 2CHS-PI151A, 2CHS-PI152A, and 2CHS-PI153A for the Chemical and Volume Control Charging pumps 2CHS*P21A, 2CHS*P21B, and 2CHS*P21C have a range of 0 - 160 pounds per square inch gauge (psig). During Group A tests, the suction pressure reference points are approximately 30 - 40 psig, which is lower than 1/3 of the gauge range.

3.1.2.2 Licensee's Proposed Alternative

Instruments 2CHS-PI151A, 2CHS-PI152A, and 2CHS-PI153A will be calibrated to be accurate within ± 0.5% instead of ± 2% as specified by ISTB-3500 to compensate for not meeting the ISTB-3510(b)(1) requirement for range. These instruments will be used for Group A tests.

3.1.2.3 Staff Evaluation

Section 5.5.1 of NUREG-1482, Revision 1, provides guidance for evaluating alternatives to ASME Code requirements when the range of a permanently installed analog instrument is greater than three times the reference value. Section 5.5.1 states, "when the range of a permanently installed analog instrument is greater than three times the reference value, but the accuracy of the instrument is more conservative than that required by the Code, the NRC staff may authorize relief when the combination of the range and accuracy yields a reading that is at least equivalent to that achieved using instruments that meet the Code requirements (i.e., up to ± 6% for a Group A and B tests.....)." The accuracy of instruments 2CHS-PI151A, 2CHS-PI152A, and 2CHS-PI153A, as derived based upon the current reference value, is as follows:

Minimum reference value = 30 psig
Full scale range = 160 psig
Instrument tolerance = ± 0.5% x 160 psig = ± 0.8 psig

Therefore, the indicated accuracy is as follows:

± 0.8 psig / 30 psig x 100% = ± 2.7%

As demonstrated, the combination of range and accuracy of Instruments 2CHS-PI151A, 2CHS-PI152A, and 2CHS-PI153A yield a reading of ± 2.7%, which is better than the ± 6% that is theoretically allowed by the ASME Code. Thus, instruments 2CHS-PI151A, 2CHS-PI152A, and 2CHS-PI153A are capable of providing an indicated accuracy at the reference value that is superior to the minimum indicated accuracy that would be required by ISTB-3510.

3.1.3 Instruments 2CHS-PI123A and 2CHS-PI123B

3.1.3.1 Licensee's Basis for Request

The suction pressure gauges 2CHS-PI123A and 2CHS-PI123B for the Boric Acid Transfer pumps 2CHS*P22A and 2CHS*P22B have a range of 0 - 30 psig. During Group A tests, the suction pressure reference points are approximately 3 - 5 psig, which is lower than 1/3 of the gauge range.

3.1.3.2 Licensee's Proposed Alternative

Instruments 2CHS-PI123A and 2CHS-PI123B will be calibrated to be accurate within ± 0.5% instead of ± 2% as specified by ISTB-3500 to compensate for not meeting the ISTB-3510(b)(1) requirement for range. These instruments will be used for Group A tests.

3.1.3.3 Staff Evaluation

Section 5.5.1 of NUREG-1482, Revision 1, provides guidance for evaluating alternatives to Code requirements when the range of a permanently installed analog instrument is greater than three times the reference value. Section 5.5.1 states, "when the range of a permanently installed analog instrument is greater than three times the reference value, but the accuracy of the instrument is more conservative than that required by the Code, the NRC staff may authorize relief when the combination of the range and accuracy yields a reading that is at least equivalent to that achieved using instruments that meet the Code requirements (i.e., up to ± 6% for a Group A and B tests.....)." The accuracy of instruments 2CHS-PI123A and 2CHS-PI123B, as derived based upon the current reference value, is as follows:

Reference value = 3 psig
Full scale range = 30 psig
Instrument tolerance = ± 0.5% x 30 psig = ± 0.15 psig

Therefore, the indicated accuracy is as follows:

± 0.15 psig / 3 psig x 100% = ± 5%

As demonstrated, the combination of range and accuracy of instruments 2CHS-PI123A and 2CHS-PI123B yield a reading of ± 5%, which is better than the ± 6% that is theoretically allowed by the ASME Code. Thus, instruments 2CHS-PI123A and 2CHS-PI123B are capable of providing an indicated accuracy at the reference value that is superior to the minimum indicated accuracy that would be required by ISTB-3510.

3.1.4 Instruments 2SIS-PI938 and 2SIS-PI939

3.1.4.1 Licensee's Basis for Request

The suction pressure gauges 2SIS-PI938 and 2SIS-PI939 for the LHSI pumps 2SIS*P21A and 2SIS*P21B have a range of 0 - 160 psig. During Group B tests, the suction pressure reference points are approximately 32 psig, which is lower than 1/3 of the gauge range.

3.1.4.2 Licensee's Proposed Alternative

Instruments 2SIS-PI938 and 2SIS-PI939 will be calibrated to be accurate within ± 0.5% instead of ± 2% as specified by the ISTB-3500 to compensate for not meeting the ISTB-3510(b)(1) requirement for range. These instruments will be used for Group B tests.

3.1.4.3 Staff Evaluation

Section 5.5.1 of NUREG-1482, Revision 1, provides guidance for evaluating alternatives to Code requirements when the range of a permanently installed analog instrument is greater than three times the reference value. Section 5.5.1 states, "when the range of a permanently installed analog instrument is greater than three times the reference value, but the accuracy of the instrument is more conservative than that required by the Code, the NRC staff may authorize relief when the combination of the range and accuracy yields a reading that is at least equivalent to that achieved using instruments that meet the Code requirements (i.e., ± 6% for a Group A and B tests.....)." The accuracy of instruments 2SIS-PI938 and 2SIS-PI939, as derived based upon the current reference value, is as follows:

Reference value = 32 psig
Full scale range = 160 psig
Instrument tolerance = ± 0.5% x 160 psig = ± 0.8 psig

Therefore, the indicated accuracy is as follows:

± 0.8 psig / 32 psig x 100% = ± 2.5%

As demonstrated, the combination of range and accuracy of instruments 2SIS-PI938 and 2SIS-PI939 yield a reading of ± 2.5%, which is better than the ± 6% that is theoretically allowed by the ASME Code. Thus, instruments 2SIS-PI938 and 2SIS-PI939 are capable of providing an indicated accuracy at the reference value that is superior to the minimum indicated accuracy that would be required by ISTB-3510.

3.1.5 Instruments 2CCP-PI150A, 2CCP-PI150B, and 2CCP-PI150C

3.1.5.1 Licensee's Basis for Request

The suction pressure gauges 2CCP-PI150A, 2CCP-PI150B, and 2CCP-PI150C for the CCW pumps 2CCP*P21A, 2CCP*P21B, and 2CCP*P21C have a range of 0 - 60 psig. During Group A tests, the suction pressure reference points are approximately 16 -19 psig, which is lower than 1/3 of the gauge range.

3.1.5.2 Licensee's Proposed Alternative

Instruments 2CCP-PI150A, 2CCP-PI150B, and 2CCP-PI150C will be calibrated to be accurate within ± 0.5% instead of ± 2% as specified by ISTB-3500 to compensate for not meeting the ISTB-3510(b)(1) requirement for range. These instruments will be used for Group A tests.

3.1.5.3 Staff Evaluation

Section 5.5.1 of NUREG-1482, Revision 1, provides guidance for evaluating alternatives to Code requirements when the range of a permanently installed analog instrument is greater than three times the reference value. Section 5.5.1 states, "when the range of a permanently installed analog instrument is greater than three times the reference value, but the accuracy of the instrument is more conservative than that required by the Code, the NRC staff may authorize relief when the combination of the range and accuracy yields a reading that is at least equivalent to that achieved using instruments that meet the Code requirements (i.e., ± 6% for a Group A and B tests.....)." The accuracy of instruments 2CCP-PI150A, 2CCP-PI150B, and 2CCP-PI150C, as derived based upon the current reference value, is as follows:

Reference value = 16 psig
Full scale range = 60 psig
Instrument tolerance = ± 0.5% x 60 psig = ± 0.3 psig

Therefore, the indicated accuracy is as follows:

± 0.3 psig / 16 psig x 100% = ± 1.87%

As demonstrated, the combination of range and accuracy of Instruments 2CCP-PI150A, 2CCP-PI150B, and 2CCP-PI150C yield a reading of ± 1.87% which is better than the ± 6% that is theoretically allowed by the ASME Code. Thus, instruments 2CCP-PI150A, 2CCP-PI150B, and 2CCP-PI150C are capable of providing an indicated accuracy at the reference value that is superior to the minimum indicated accuracy that would be required by ISTB-3510.

3.1.6 Instruments 2EGF-PI201A, 2EGF-PI201B, 2EGF-PI201C, and 2EGF-PI201D

3.1.6.1 Licensee's Basis for Request

The discharge pressure gauges 2EGF-PI201A, 2EGF-PI201B, 2EGF-PI201C, and 2EGF-PI201D for the EDG Fuel Oil Transfer pumps 2EGF*P21A, 2EGF*P21B, 2EGF*P21C, and 2EGF*P21D have a range of 0 - 30 psig. During Group B tests, the suction pressure reference points are approximately 9.5 - 10.5 psig. The suction pressure reference point of 9.5 psig is lower than 1/3 of the gauge range.

3.1.6.2 Licensee's Proposed Alternative

Instruments 2EGF-PI201A, 2EGF-PI201B, 2EGF-PI201C, and 2EGF-PI201D will be calibrated to be accurate within ± 1.0% instead of ± 2% as specified by ISTB-3500 to compensate for not meeting the ISTB-3510(b)(1) requirement for range. These instruments will be used for Group B tests.

3.1.6.3 Staff Evaluation

Section 5.5.1 of NUREG-1482, Revision 1, provides guidance for evaluating alternatives to Code requirements when the range of a permanently installed analog instrument is greater than three times the reference value. Section 5.5.1 states, "when the range of a permanently installed analog instrument is greater than three times the reference value, but the accuracy of

the instrument is more conservative than that required by the Code, the NRC staff may authorize relief when the combination of the range and accuracy yields a reading that is at least equivalent to that achieved using instruments that meet the Code requirements (i.e., ± 6% for a Group A and B tests.....)." The accuracy of Instruments 2EGF-PI201A, 2EGF-PI201B, 2EGF-PI201C, and 2EGF-PI201D, as derived based upon the current reference value, is as follows:

Reference value = 9.5 psig
Full scale range = 30 psig
Instrument tolerance = ± 1.0% x 30 psig = ± 0.3 psig

Therefore, the indicated accuracy is as follows:

± 0.3 psig / 9.5 psig x 100% = ± 3.16%

As demonstrated, the combination of range and accuracy of instruments 2EGF-PI201A, 2EGF-PI201B, 2EGF-PI201C, and 2EGF-PI201D yield a reading of ± 3.16%, which is better than the ± 6% that is theoretically allowed by the ASME Code. Thus, instruments 2EGF-PI201A, 2EGF-PI201B, 2EGF-PI201C, and 2EGF-PI201D are capable of providing an indicated accuracy at the reference value that is superior to the minimum indicated accuracy that would be required by ISTB-3510.

3.1.7 Instruments 2FWE-FI100A, 2FWE-FI100B, and 2FWE-FI100C

3.1.7.1 Licensee's Basis for Request

Flow indicators 2FWE-FI100A, 2FWE-FI100B, and 2FWE-FI100C are located in the three lines to the steam generators from AFW Pumps 2FWE*P23A and AFWE*P23B and have a range of 0 - 400 gallons per minute (gpm). During Group B tests, the reference point for AFW pump flow is approximately 115 gpm, which is lower than 1/3 of the instrument range.

3.1.7.2 Licensee's Proposed Alternative

Instruments 2FWE-FI100A, 2FWE-FI100B, and 2FWE-FI100C will be calibrated to be accurate within ± 1.5% instead of ± 2% as specified by ISTB-3500 to compensate for not meeting the ISTB-3510(b)(1) requirement for range. These instruments will be used for Group B tests.

3.1.7.3 Staff Evaluation

Section 5.5.1 of NUREG-1482, Revision 1, provides guidance for evaluating alternatives to Code requirements when the range of a permanently installed analog instrument is greater than three times the reference value. Section 5.5.1 states, "when the range of a permanently installed analog instrument is greater than three times the reference value, but the accuracy of the instrument is more conservative than that required by the Code, the NRC staff may authorize relief when the combination of the range and accuracy yields a reading that is at least equivalent to that achieved using instruments that meet the Code requirements (i.e., ± 6% for a Group A and B tests.....)." The accuracy of instruments 2FWE-FI100A, 2FWE-FI100B, and 2FWE-FI100C, as derived based upon the current reference value, is as follows:

Reference value = 115 gpm

Full scale range = 400 gpm
Instrument tolerance = ± 1.5% x 400 gpm = ± 6.0 gpm

Therefore, the indicated accuracy is as follows:

± 6.0 gpm / 115 gpm x 100% = ± 5.22%

As demonstrated, the combination of range and accuracy of instruments 2FWE-FI100A, 2FWE-FI100B, and 2FWE-FI100C yield a reading of ± 5.22% which is better than the ± 6% that is theoretically allowed by the ASME Code. Thus, instruments 2FWE-FI100A, 2FWE-FI100B, and 2FWE-FI100C are capable of providing an indicated accuracy at the reference value that is superior to the minimum indicated accuracy that would be required by ISTB-3510.

3.1.8 Conclusion

Based on the above evaluations, the NRC staff has concluded that the licensee's proposed alternatives to the ASME Code accuracy requirements for instruments during pump testing are authorized pursuant to 10 CFR 50.55a(a)(3)(i) on the basis that the alternatives provide an acceptable level of quality and safety. The licensee's proposed alternatives provide reasonable assurance of the operational readiness of the pumps. These alternatives are authorized for the third 10-year IST program interval of BVPS-2.

3.2 Relief Request No. PRR3

3.2.1 Code Requirements/Components Affected

The licensee requested relief from the requirements of ISTB-5121, ISTB-5121(b), ISTB-5123, and ISTB-5123(b) for primary CCW pumps 2CC*P21A, 2CC*P21B, and 2CC*P21C.

ISTB-5121 requires that Group A tests be conducted with the pump operating at a specified reference point. ISTB-5121(b) states, "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 its reference value. Alternatively, the flow rate shall be varied until the differential pressure equals the reference point and the flow rate determined and compared to the reference flow rate value."

ISTB-5123 requires that comprehensive tests be conducted with the pump operating at a specified reference point. ISTB-5123(b) states, "For centrifugal and vertical line shaft pumps, 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 its reference value. Alternatively, the flow rate shall be varied until the differential pressure equals the reference point and the flow rate determined and compared to the reference flow rate value."

3.2.2 Licensee's Basis for Request

The licensee stated that the amount of primary CCW system flow is dependent on service water (SW) system flow rate which is dependent on seasonal Ohio River water temperature. The overall amount of primary CCW flow may vary by several hundred gpm between cool winter months and hot summer months. In order to increase primary CCW flow to a reference value during cold winter months, the throttled manual valves at the discharge of the residual heat

removal (RHR) heat exchangers would require additional throttling in the open position. These valves are located in the reactor containment building, which would require personnel to make a containment entry to facilitate valve manipulation. Since the radiation levels and air temperature inside containment are high during power operation, this would involve excessive dose rates and heat stress to plant personnel. This presents a working environment that is not considered practicable for routine surveillance tests conducted at power. Surveillance testing that requires reactor containment entry is normally performed at refueling.

The licensee also stated, "In order to throttle primary CCW flow to a reference value during warm summer months, a manual valve at the discharge of the pumps would need to be used since the RHR heat exchanger discharge throttle valves are located inside containment. Operating experience has shown that any throttling of the pump discharge valves results in a large reduction in cooling water flow to the reactor coolant pump thermal barrier heat exchangers, bearing lube oil coolers, and motor stator air coolers resulting in low flow alarms. This could result in heat up the reactor coolant pumps to near required manual pump trip set points, which could ultimately result in a plant trip. In addition, the added thermal cycling of these coolers for pump testing could prematurely degrade these heat exchangers."

3.2.3 Licensee's Proposed Alternative

A pump curve (developed per the guidelines provided in NUREG-1482, Revision 1, Section 5.2.2, "Reference Curves") will be used to compare flow rate with developed pump head at the flow conditions dictated by plant seasonal heat load requirements in accordance with Operating Surveillance Tests 2OST-15.1, 2OST-15.2, and 2OST-15.3 (Primary CCW Pump Tests) during each quarterly Group A test and in accordance with 2OST-15.1, 2OST-15.2, and 2OST-15.3 or 2OST-15.5 (Primary CCW Pump Refueling Test) during the biennial comprehensive test. Since normal flow varies, the most limiting vibration acceptance criteria will be used over this range of flows based on baseline vibration data obtained at various flow points on the pump curve.

ISTB-3320 provides for multiple sets of reference values. Flow will be permitted to vary as system conditions require. Differential pressure will be calculated and converted to a developed head for the ranges included in Table ISTB-5100-1.

3.2.4 Staff Evaluation

ISTB-5121 and ISTB-5123 require that flow rate and differential pressure be evaluated against reference values to monitor pump condition and to allow detection of hydraulic degradation. Primary CCW pumps 2CC*P1A, 2CC*P1B, and 2CC*P1C operate under varying flow and differential pressure conditions, depending on the load requirements. It would not be practical to establish a fixed reference point for testing the pumps because of system constraints that could result in a plant trip and damage to equipment.

When it is impractical 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 is an acceptable alternative. Pump curves represent a set of infinite reference points of flow rate and differential pressure. Establishing a reference curve for the pump when it is known to be operating acceptably, and basing the acceptance criteria on this curve, can permit evaluation of pump condition and detection of degradation.

The licensee proposes to follow the NRC guidelines specified in NUREG-1482, Revision 1, Section 5.2 for the use of pump curves. Therefore, the NRC staff finds that the licensee's proposed alternative testing for the pumps provides reasonable assurance of the operational readiness of the pumps.

3.2.5 Conclusion

Based on the above evaluation, the NRC staff has concluded that compliance with the ASME Code requirement to establish a fixed flow or differential pressure reference value during primary CCW pump testing is impractical, relief is granted and the alternative is imposed, pursuant to 10 CFR 50.55a(f)(6)(i). The relief granted is authorized by law and will not endanger life or property or the common defense and security and is otherwise in the public interest giving due consideration to the burden upon the licensee that could result if the requirements were imposed on the facility. The alternative is authorized for the third 10-year IST program interval of BVPS-2.

3.3 Relief Request No. PRR4

3.3.1 Code Requirements/Components Affected

The licensee requested relief from the requirements of ISTB-5121, ISTB-5121(b), ISTB-5123, and ISTB-5123(b) for SW pumps 2SWS*P21A, 2SWS*P21B, and 2SWS*P21C.

ISTB-5121 requires that Group A tests shall be conducted with the pump operating at a specified reference point. ISTB-5121(b) requires 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 its reference value. Alternatively, the flow rate shall be varied until the differential pressure equals the reference point and the flow rate determined and compared to the reference flow rate value.

ISTB-5123 requires that comprehensive tests be conducted with the pump operating at a specified reference point. ISTB-5123(b) requires that for centrifugal and vertical line shaft pumps, 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 its reference value. Alternatively, the flow rate shall be varied until the differential pressure equals the reference point and the flow rate determined and compared to the reference flow rate value.

3.3.2 Licensee's Basis for Request

In part, the licensee stated:

> Operating experience has shown that plant conditions due to heat loads requiring cooling by the SW system may preclude returning the SW pumps to an exact flow rate or differential pressure during pump surveillance testing. The SW system is dependent on seasonal Ohio River water temperatures and flow may vary from approximately 6,000 gpm in the cool winter months to approximately 14,000 gpm in the warm summer months.

> In order to increase flow to a reference value during cold winter months, idle heat exchangers would need to be placed into service or additional flow would be needed through heat exchangers already in service. Increased cooling flow through primary and secondary component cooling and chiller unit heat exchangers already in service could result in a thermal transient and potential plant trip.
>
> In order to throttle flow to a reference value during warm summer months, any inservice primary and secondary component cooling and chiller unit heat exchangers would need flow reduced or isolated which could interrupt flow of cooling water to Train A or Train B cooling loads resulting in a thermal transient and potential plant trip. In addition, the added thermal cycling due to placement and/or removal of heat exchangers from service for pump testing could prematurely degrade the heat exchangers.

The thermal transients created by increasing or throttling SW system flow to the turbine plant cooling loads raises operational concerns of the following stability problems: (1) changes in oil temperature from the turbine generator lube oil system create vibration problems, (2) changes in the hydrogen cooler temperatures could create problems or mask a real problem with the generator, and (3) chiller unit heat exchanger flow disturbances often result in a trip of the chiller unit that can cause reactor containment temperature to exceed the technical specification limit.

3.3.3 Licensee's Proposed Alternative Testing

The licensee stated:

> A pump curve (developed per the guidelines provided in NUREG-1482, Revision 1, Section 5.2.2, "Reference Curves") will be used to compare SW pump flow rate with developed pump head at the flow conditions dictated by plant seasonal heat load requirements in accordance with 2OST-30.2, 2OST-30.3, and 2OST-30.6A or 6B (SW pump tests) during each quarterly Group A test and biennial comprehensive test. Since normal SW flow varies, the most limiting vibration acceptance criteria will be used over this range of flows based on baseline vibration data obtained at various flow points on the pump curve. SW flow will be permitted to vary as system conditions require..... Differential pressure will be calculated and converted to a developed head for the ranges included in Table ISTB-5100-1.

3.3.4 Staff Evaluation

ISTB-5121 and ISTB-5123 require that flow rate and differential pressure be evaluated against reference values to monitor pump condition and to allow detection of hydraulic degradation. SW pumps 2SWS*P21A, 2SWS*P21B, and 2SWS*P21C operate under varying flow and differential pressure conditions, depending on the load requirements. It would not be practical to establish a fixed reference point for testing the pumps because of system constraints that could result in a plant trip and damage to equipment.

When it is impractical 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 is an acceptable alternative. Pump curves represent a set of infinite reference points of flow rate and differential pressure. Establishing a reference curve for the pump when it is known to be operating acceptably, and basing the acceptance criteria on this curve, permits evaluation of the pump condition and detection of degradation.

The licensee proposes to follow the NRC guidelines specified in NUREG-1482, Revision 1, Section 5.2 for the use of pump curves. Therefore, the NRC staff finds that the licensee's proposed alternative testing for the pumps provides reasonable assurance of the operational readiness of the pumps.

3.3.5 Conclusion

Based on the above evaluation, the NRC staff has concluded that compliance with the ASME Code requirement to establish a fixed flow or differential pressure reference value during SW pump testing is impractical, relief is granted and the alternative is imposed, pursuant to 10 CFR 50.55a(f)(6)(i). The relief granted is authorized by law and will not endanger life or property or the common defense and security and is otherwise in the public interest giving due consideration to the burden upon the licensee that could result if the requirements were imposed on the facility. The alternative is authorized for the third 10-year IST program interval of BVPS-2.

3.4 Relief Request No. PRR5

3.4.1 Code Requirements/Components Affected

The licensee requested relief from the requirements of ISTB-3540(b) for SW pumps 2SWS*P21A, 2SWS*P21B, and 2SWS*P21C.

ISTB-3540(b) requires that vibration measurements be taken on the upper motor-bearing housing in three approximately orthogonal directions, one of which is the axial direction when testing vertical line shaft pumps.

3.4.2 Licensee's Basis for Request

SW system pumps 2SWS*P21A, 2SWS*P21B, and 2SWS*P21C are vertical line shaft pumps. Access to the upper motor-bearing housing on the SW pumps, for the purpose of measuring vibration in axial direction, cannot be obtained due to the presence of a permanently installed non-rigid metal top hat covering the entire top of the motor-bearing. Vibration measurements in the axial direction are accessible at the lower motor-bearing housing of each pump which will provide additional information for trending of pump/motor performance. In addition, the vibration measurements in the orthogonal directions typically provide a better predictor of vibration problems for vertical line shaft pumps. The proposed locations for taking vibration measurements should not be subject to dampening effects of non-rigid structural contact that could mask potential degradation. In recognition of inherent deficiencies in the vibration testing for vertical line shaft pumps, hydraulic performance requirements are more stringent for vertical line shaft pumps than for horizontal centrifugal pumps.

3.4.3 Licensee's Proposed Alternative Testing

Vibration will be measured on the upper motor-bearing housing in two orthogonal directions (excluding the axial direction), and vibration will be measured on the lower motor-bearing housing in three orthogonal directions (including the axial direction) during each quarterly Group A test and biennial Comprehensive test using Operating Surveillance Tests 2OST-30.2, 2OST-30.3 and 2OST-30.6A or 6B for SW pumps.

3.4.4 Staff Evaluation

The licensee requested relief from the ASME Code vibration measurement requirements of ISTB-3540(b) because the upper motor-bearing housing in the axial direction for SW pumps is impeded by a permanently installed non-rigid top hat. ISTB-3540(b) requires that vibration measurements on vertical line shaft pumps be taken on the upper motor-bearing housing in three orthogonal directions, one of which is in the axial direction.

The vibration measurements of vertical line shaft pump upper motor-bearings in the axial direction cannot be measured directly without modification of the pump assembly. The licensee has proposed to measure vibration on the upper motor-bearing housing in two orthogonal directions (excluding the axial direction), along with additional measurements of vibration at the lower motor-bearing housing in three orthogonal directions (including the axial direction) during each quarterly Group A test and biennial Comprehensive test using 2OST-30.2, 2OST-30.3 and 2OST-30.6A or 6B for SW pumps.

Based on the information provided, the NRC staff finds that it would be impracticable to modify these pumps to measure axial vibration at the upper motor-bearing housing. The licensee will be taking measurements in (1) three orthogonal directions at the lower motor-bearing housing, and (2) two orthogonal directions, which are non-axial, at the upper motor-bearing housing. The licensee's proposed locations for taking vibration measurement should not be subject to the dampening effect of non-rigid structural contact that could mask potential degradation. Furthermore, in recognition of inherent deficiencies in the vibration testing for vertical line shaft pumps, hydraulic performance requirements are more stringent for vertical line shaft pumps than for horizontal centrifugal pumps. Therefore, the proposed alternative locations for taking vibration measurements should provide reasonable assurance of operational readiness.

3.4.5 Conclusion

Based on the above evaluation, the NRC staff has concluded that compliance with the ASME Code requirement to measure axial vibration at the SW pump upper motor-bearing housing is impractical, relief is granted and the alternative is imposed pursuant to 10 CFR 50.55a(f)(6)(i). The relief granted is authorized by law and will not endanger life or property or the common defense and security and is otherwise in the public interest giving due consideration to the burden upon the licensee that could result if the requirements were imposed on the facility. The alternative is authorized for the third 10-year IST program interval of BVPS-2.

3.5 Relief Request No. PRR6

3.5.1 Code Requirements/Components Affected

The licensee requested relief from the requirements of ISTB-3510(a) and ISTB-3550 of the ASME OM Code for the emergency diesel generator (EDG) diesel fuel oil transfer pumps 2EGF*P21A, 2EGF*P21B, 2EGF*P21C, and 2EGF*P21D. These pumps are vertical line shaft centrifugal pumps.

ISTB-3510(a) requires that flow rate instrumentation be accurate to within ± 2% of actual flow. If the flow is determined by analytical method instead of measurement, then the determination must also be within ± 2% of actual flow.

ISTB-3550 requires that a rate or quantity meter be installed in the pump test circuit to measure flow rate.

3.5.2 Licensee's Basis for Request

Flow instrumentation is not installed in the EDG diesel fuel oil transfer system. A level sight glass does exist on the side of the EDG fuel oil day tank which can be used to measure a change in level over time as pump 2EGF*P21A, 2EGF*P21B, 2EGF*P21C, or 2EGF*P21D transfers fuel oil from the underground storage tank to the day tank.

3.5.3 Licensee's Proposed Alternative Testing

The flow rates for pumps 2EGF*P21A, 2EGF*P21B, 2EGF*P21C, and 2EGF*P21D will be determined by measuring level change in the EDG fuel oil day tank sight glass, and converting this data into fuel oil transfer pump flow rate during both the Group B tests and comprehensive tests per 2OST-36.1 and 2OST-36.2 (EDG and Fuel Oil Transfer Pump Tests). The method used to measure flow rate for each pump is accurate to ± 2.93% (square root of the sum of the squares of the decrease in pump flow rate due to increased discharge pressure, and stop watch and sight glass accuracies). This accuracy exceeds the requirement in ISTB-3510(a) that the determination be accurate to within ± 2% of actual flow by 0.93%.

Table ISTB-5200-1 of the ASME OM Code specifies the acceptance criteria for Group B and comprehensive centrifugal pump tests. The licensee will use acceptance criteria for pump flow that are more conservative than the acceptance criteria in Table ISTB-5200-1 when testing pumps 2EGF*P21A, 2EGF*P21B, 2EGF*P21C, or 2EGF*P21D to compensate for the 1% less accurate flow rate determination.

3.5.4 Staff Evaluation

The licensee will determine flow rate for each EDG fuel oil transfer pump (2EGF*P21A, 2EGF*P21B, 2EGF*P21C, and 2EGF*P21D) by measuring the level change in the EDG fuel oil day tank site glass. The period of pump operation will be measured with a stop watch. This data will be used to determine pump flow rate during Group B and comprehensive pump tests.

In part, the licensee stated:

> Each pump is operated with a fixed flow path from the underground storage tank (pump suction) to the day tank (pump discharge). Pump suction pressure is nearly constant because of the very small change in storage tank level (approximately 1.5 inch drop in level during pump operation). This results in no more than a 0.05 psig change in suction pressure during pump operation and the change is considered to be negligible. The normal rise in day tank level is approximately 12 inches, which corresponds to a quantity of approximately 350 gallons pumped during the 10 minutes of pump operation, resulting in a typical flow rate of approximately 35 [gallons per minute] gpm. This small rise in day tank level during pump operation could increase pump discharge pressure by as much as 0.4 psig. The resulting increase in pump differential pressure or head (approximately 1 foot) could also decrease pump discharge flow rate by as much as 2 gpm over the course of the pump test based on the shape of the pumps' curves at approximately 35 gpm for these centrifugal pumps. Therefore, an initial flow rate of approximately 36 gpm would decrease to approximately 34 gpm as the level in the day tank rises during the

course of the test. This results in an average flow rate of approximately 35 gpm over the course of the test. Because flow rate can vary by as much as ± 1 gpm from the average flow obtained, the corresponding calculated flow rate is only accurate to within ± 2.86%. In addition, the level sight glass on the side of the day tank ranges from 12 inches to 47.25 inches and is in 0.125 inch increments for an indication accuracy of ± 0.355%. The stopwatch used to measure the time the pump is operating and pumping fuel oil is accurate to within ± 0.3 seconds per minute for a calibrated accuracy of ± 0.5%. Combining the accuracies of the flow rate reading, level sight glass, and stopwatch, using the square root of the sum of the squares method, results in an overall indicated accuracy of ± 2.93%.

Table ISTB-5200-1 of the ASME OM Code specifies the following flow (Qr) acceptance criteria for Group B pump tests and comprehensive pump tests (CPT) for centrifugal pumps.

Test	Acceptable Range	Alert Range	Required Action Range	
			Low	high
Group B	0.90 to 1.10Qr	None	<0.90Qr	>1.10Qr
CPT	0.95 to 1.03Qr	0.93 to <0.95Qr	<0.93Qr	>1.03Qr

The licensee will use the following acceptance criteria for flow instead of the above acceptance criteria for flow in Table ISTB-5200-1. The acceptance criteria below are generally 1% more conservative than the acceptance criteria in Table ISTB-5200-1 and compensate for exceeding the 2% accuracy requirement in ISTB-3510(a) by 0.93%.

Test	Acceptable Range	Alert Range	Required Action Range	
			Low	high
Group B	0.91 to 1.09Qr	None	<0.91Qr	>1.09Qr
CPT	0.96 to 1.02Qr	0.94 to <0.96Qr	<0.94Qr	>1.02Qr

The NRC staff has reviewed the licensee's method for determining the flow rate for EDG diesel fuel oil transfer pumps 2EGF*P21A, 2EGF*P21B, 2EGF*P21C, and 2EGF*P21D during Group B and comprehensive pump tests along with the acceptance criteria that will be used to evaluate test results. The acceptance criteria that will be used to evaluate test results adequately compensate for the accuracy of the method. The NRC staff finds that the proposed alternative, as specified in this relief request; (1) provides an acceptable level of quality and safety (2) provides an accurate method for determining flow, and (3) provides reasonable assurance of the operational readiness of the pumps.

3.5.5 Conclusion

Based on the above evaluation, the NRC staff has concluded that the alternative to the requirements of the ASME OM Code is authorized pursuant to 10 CFR 50.55a(a)(3)(i) based on the alternative providing an acceptable level of quality and safety. This relief request is authorized for EDG fuel oil transfer pumps 2EGF*P21A, 2EGF*P21B, 2EGF*P21C, and 2EGF*P21D. The alternative is authorized for the third 10-year IST program interval of BVPS-2.

3.6 Relief Request No. PRR7

3.6.1 Code Requirements/Components Affected

The licensee requested relief from ISTB-3400 and Table ISTB-3400-1, which require Group A pumps be tested on a quarterly frequency. Relief was requested for RHR pump 2RHS*P21A and RHR pump 2RHS*P21B.

3.6.2 Licensee's Basis for Request

The residual heat removal (RHR) pumps are in a standby condition during power operation, and are not required to be in service until the reactor coolant system (RCS) temperature is less than or equal to 350 °Fahrenheit and the RCS pressure is less than or equal to 360 psig. Therefore, they are not exposed to operational wear except when the RCS is at low temperature and pressure and the RHR system is in operation for normal shutdown cooling.

The RHR pumps have a design pressure of 600 psig. They take suction from the RCS, pass flow through the RHR heat exchangers, and then discharge back to the RCS. The RHR system is considered to be a low pressure system that could be damaged if exposed to the normal operating RCS pressure of approximately 2235 psig. In order to prevent this, the RHR inlet and return isolation valves are interlocked with an output signal from the RCS pressure transmitters, which prevent the valves from being opened when RCS pressure exceeds 360 psig. In addition, these valves are also maintained shut with their breakers de-energized and administratively controlled (caution tagged). Therefore, testing of the RHR pumps during normal operation is not practical since there are no alternate supply sources, and aligning the RCS to the suction of the RHR pumps during operation at power would result in damage to piping and components due to overpressurrization. Major plant and system modifications would be needed to allow quarterly Group A testing of the RHR pumps according to ASME OM Code requirements.

In addition, although overpressure precludes testing of the RHR pumps, they are also located inside the containment. Testing at power, subsequent to system modification, would require test personnel to make a containment entry in order to monitor pump operation. Since radiation levels and air temperature inside the containment are high during normal power operation, this would involve higher radiological dose rates and heat stress risk to plant personnel. This presents a working environment that is not considered practical for quarterly surveillance testing on a routine basis while online.

Based on the above, compliance with the ASME OM Code test frequency requirement for Group A pump tests is impractical. Testing is only possible during a surveillance interval frequency of cold shutdown and refueling unless major plant and system modifications are made.

3.6.3 Licensee's Proposed Alternative Testing

These pumps will be tested during cold shutdowns and refueling outages, not more than once every 92 days, per 2OST-10.1 and 2OST-10.2 (RHR Pumps Performance Test). For a cold shutdown or refueling outage that extends longer than 3 months, the pumps

will be tested every 3 months in accordance with Table ISTB-3400-1. In the instance of an extended outage, a Group A test may be performed; otherwise, a comprehensive test will be performed each refueling outage.

3.6.4 Staff Evaluation

ISTB-3400 of the ASME OM Code states that an IST be performed for each pump as specified in Table ISTB-3400-1, which requires Group A pumps to be tested on a quarterly frequency. The licensee has requested relief from the above ASME OM Code requirements because they have determined that quarterly testing of the RHR pumps is impractical. As such, the licensee has proposed an alternative to the requirements that would test the RHR pumps during cold shutdown or refueling outages, but not more than once every 92 days. As the licensee stated, "For a cold shutdown or refueling outage that extends longer than 3 months, the pumps will be tested every 3 months in accordance with Table ISTB-3400-1. In the instance of an extended outage, a Group A test may be performed; otherwise, a comprehensive test will be performed each refueling outage."

The RHR pumps are low-pressure (600 psig design pressure) pumps which take suction from the RCS hot leg, pass flow through the RHR heat exchangers, and discharge to the RCS cold leg. These pumps are in a standby condition during power operation and only activated when the RCS is at a low pressure (360 psig or less) and the RHR system is needed for decay heat removal. The RHR system is a low pressure system with motor-operated inlet and return isolation valves that are interlocked with RCS pressure transmitters to prevent the valves from being opened whenever the RCS pressure exceeds 360 psig. The normal operating pressure of the RCS is approximately 2235 psig.

Major plant and system modifications would be needed to allow quarterly testing of the RHR pumps in accordance with the ASME Code requirements. These pumps are located in the reactor containment building, which would require personnel to make a containment entry in order to monitor pump operation. Since the radiation levels and air temperature inside containment are high during power operation, this would involve excessive dose rates and heat stress to plant personnel. This presents a working environment that is not considered practicable for routine surveillance tests conducted at power. Surveillance testing that requires reactor containment entry is normally performed at refueling.

The NRC staff has reviewed the ASME OM Code requirements with respect to the licensee's request for relief and finds that due to the standby condition of the RHR pumps and the isolation of the RHR system during power operation, compliance with the quarterly testing requirements is not practical. The licensee's proposed alternatives provide reasonable assurance of the operational readiness of the pumps.

3.6.5 Conclusion

Based on the above evaluation, the NRC staff has concluded that compliance with the ASME Code requirement for quarterly testing is impractical for the RHR pumps, relief is granted from the Code requirement and the alternative is imposed, pursuant to 10 CFR 50.55a(f)(6)(i). The relief granted is authorized by law and will not endanger life or property or the common defense and security and is otherwise in the public interest giving due consideration to the burden upon the licensee that could result if the requirements were imposed on the facility. The alternative is authorized for the third 10-year IST program interval of BVPS-2.

3.7 Relief Request No. PRR8

3.7.1 Code Requirements/Components Affected

ISTB-3300, “Reference Values”

ISTB-3300(a) requires that initial reference values shall be determined from the results of testing meeting the requirements of ISTB-3100, “Preservice Testing,” or from the results of the first inservice test.

ISTB-3300(d) requires that reference values shall be established at a point(s) of operation (reference point) readily duplicated during subsequent tests.

ISTB-3300(f) requires that all subsequent test results shall be compared to these initial reference values or to new reference values established in accordance with ISTB-3310, ISTB-3320, or ISTB-6200(c).

ISTB-5120, “Inservice Testing” (Centrifugal Pumps, Except Vertical Line Shaft Centrifugal Pumps)

ISTB-5121(e) and ISTB-5123(e), “Group A Test Procedure and Comprehensive Test Procedure”, require that all deviations from the reference values shall be compared with the ranges of Table ISTB-5100-1 and corrective action taken as specified in ISTB-6200. Vibration measurements shall be compared to both the relative and absolute criteria shown in the alert and required action ranges of Table ISTB-5100-1. For example, if vibration exceeds either $6V_r$, or 0.7 in/sec, the pump is in the required action range.

ISTB-5220, “Inservice Testing” (Vertical Line Shaft Centrifugal Pumps)

ISTB-5221(e) and ISTB-5223(e), “Group A Test Procedure and Comprehensive Test Procedure”, require that all deviations from the reference values shall be compared with the ranges of Table ISTB-5200-1 and corrective action taken as specified in ISTB-6200. Vibration measurements shall be compared to both the relative and absolute criteria shown in the alert and required action ranges of Table ISTB-5200-1.

ISTB-5320, “Inservice Testing” (Positive Displacement Pumps, Except Reciprocating)

ISTB-5321(e) and ISTB-5323(e), “Group A Test Procedure and Comprehensive Test Procedure”, require that all deviations from the reference values shall be compared with the ranges of Table ISTB-5300-1 and corrective action taken as specified in ISTB-6200. Vibration measurements shall be compared to both the relative and absolute criteria shown in the alert and required action ranges of Table ISTB-5200-1.

Note: There are no reciprocating positive displacement pumps in the BVPS-2 IST Program.

The licensee requested relief from the above OM Code requirements for the pumps below.

Pump No.	Description
2CHS*P21A	Charging Pump
2CHS*P21B	Charging Pump
2CHS*P21C	Charging Pump
2CHS*P22A	Boric Acid Transfer Pump
2CHS*P22B	Boric Acid Transfer Pump
2RHS*P21A	RHR Pump
2QSS*P24A	Chemical Injection Pump
2FWE*P23A	Motor-Driven Auxiliary Feedwater Pump
2FWE*P23B	Motor-Driven Auxiliary Feedwater Pump
2SWS*P21B	Service Water Pump
2EGF*P21A	Fuel Oil Transfer Pump
2EGF*P21B	Fuel Oil Transfer Pump
2EGF*P21C	Fuel Oil Transfer Pump
2EGF*P21D	Fuel Oil Transfer Pump

3.7.2 Licensee's Basis for Request

The pumps listed in Section 3.7.1 are in the IST program and have at least one vibration reference value (V_r) that is currently less than 0.05 in/sec.

A small value for V_r produces a small acceptable range for pump operation. The ASME OM Code acceptable range limit for pump vibrations from Table ISTB-5100-1, Table ISTB-5200-1, and Table ISTB-5300-1 for both the Group A test and comprehensive test is ≤2.5 V_r. Based on a small acceptable range, a smooth running pump could be subject to unnecessary corrective action if it exceeds this limit. ISTB-6200(a), "Corrective Action - Alert Range," states: If the measured test parameter values fall within the alert range of Table ISTB-5100-1, Table ISTB-5200-1, or Table ISTB-5300-1, as applicable, the frequency of testing specified in ISTB-3400 shall be doubled until the cause of the deviation is determined and the condition is corrected.

For very small reference values for vibrations, flow variations, hydraulic noise, and instrument error can be a significant portion of the reading and affect the repeatability of subsequent measurements. Also, experience shows that changes in vibration levels in the range of 0.05 in/sec do not normally indicate significant degradation in pump performance.

In order to avoid unnecessary corrective actions, a minimum value for V_r of 0.05 in/sec is proposed. This minimum value would be applied to individual vibration locations for those pumps with reference vibration values less than 0.05 in/sec. Therefore, the smallest ASME OM Code acceptable range limit for any IST pump vibration location would be no lower than 2.5 times V_r, or 0.125 inc/sec. The smallest ASME OM Code alert range limit for any IST Pump vibration location for which the pump would be inoperable would be no lower than 6 times V_r, or 0.300 in/sec.

The effective minimum reference value proposed (0.05 in/sec) for smooth running pumps is roughly equal to the ASME XI [Subsection] IWP reference value for an 1800 [revolutions per minute] rpm pump and more conservative than the reference value for a 3600 rpm pump. Without this relief, the ASME XI acceptable range limit for some extremely smooth running pumps is reduced by as much as a factor of 10.

In addition to the requirements of ISTB for IST, the pumps in the BVPS-2 IST program are also included in the BVPS PdM program. The BVPS PdM program currently employs predictive monitoring techniques such as: vibration monitoring and analysis beyond that required by ISTB, bearing temperature trending, oil sampling and analysis, and/or thermography analysis as applicable.

If the measured parameters are outside the normal operating range or are determined by analysis to be trending toward an unacceptable degraded state, appropriate actions are taken that may include: a condition report initiated, increased monitoring to establish a rate of change, review of component specific information to identify the cause of the condition, and removal of the pump from service to perform maintenance.

All pumps in the IST Program will remain in the PdM program even if certain pumps have very low vibration readings and are considered to be smooth running pumps.

Using the provisions of this relief request as an alternative to the specific requirements of ISTB identified above will provide adequate indication of pump performance and continue to provide an acceptable level of quality and safety without unnecessarily imposing corrective action since changes in vibration levels in the range of 0.05 in/sec do not normally indicate significant degradation in pump performance.

Using the provisions of this relief request as an alternative to the vibration acceptance criteria ranges specified in Tables ISTB-5100-1, ISTB- 5200-1, or ISTB-5300-1 provide an acceptable level of quality and safety since the alternative provides reasonable assurance of pump operational readiness and the ability to detect pump degradation.

3.7.3 Licensee's Proposed Alternative Testing

The licensee stated that an acceptable range limit of 0.125 in/sec and an alert range limit of 0.300 in/sec will be used instead of applying the vibration acceptance criteria ranges specified in ISTB-5100-1, ISTB-5200-1, or ISTB-5300-1 for smooth running pumps (measured reference value below 0.05 in/sec). The licensee also stated, "These proposed ranges shall be applied to vibration test results during both Group A and comprehensive tests. In addition to the [ASME] Code requirements, all pumps in the BVPS-1IST Program are included in and will remain in the BVPS PdM program regardless of their smooth running status."

3.7.4 Staff Evaluation

The ASME OM Code, paragraph ISTB-3540, requires that for centrifugal pumps, vibration measurements shall be taken in a plane approximately perpendicular to the rotating shaft in two approximately orthogonal directions on each accessible pump-bearing housing. Measurements shall also be taken in the axial direction on each accessible pump thrust bearing housing. The paragraph requires that for vertical line shaft pumps the vibration measurements be taken on the upper motor-bearing housing in three orthogonal directions including the axial direction. These measurements are required to be compared with the ASME Code vibration acceptance criteria as specified in Tables ISTB-5100-1, ISTB-5200-1, or ISTB-5300-1, as applicable, to determine if the measured values are acceptable.

Tables ISTB 5100-1, ISTB-5200-1, and ISTB-5300-1 state that, if during an IST, a vibration measurement exceeds 2.5 times the previously established reference value (V_r), the pump is considered in the alert range. The frequency of testing is then doubled, in accordance with paragraph ISTB-6200(a), until the cause of the deviation is determined and the condition is corrected and the vibration level returns to the acceptable range level. Pumps whose vibration is measured as greater than 6 times V_r are considered to be in the required action range, and must be declared inoperable until cause of the deviation has been determined and the condition is corrected. Per ISTB-3300, the vibration reference values shall be established only when the pump is known to be operating acceptably.

For pumps whose absolute magnitude of vibration is an order of magnitude below the absolute vibration limits in Tables ISTB-5100-1, ISTB-5200-1, and ISTB-5300-1, a relatively small increase in vibration magnitude may cause the pump to enter the alert or required action range. These instances may be attributed to variation in flow, instrument accuracy, or other noise sources that would not be associated with degradation of the pump. Pumps that operate in this region are typically referred to as “smooth-running.” Based on a small acceptable range, a smooth running pump could be subjected to unnecessary corrective action.

The licensee’s proposed alternative testing combines the minimum reference value method with a commitment to monitor all the pumps in the IST program with a Predictive Maintenance (PdM) program, even if certain pumps have very low vibration readings and are considered to be smooth-running pumps. The licensee will assign a vibration reference value of 0.05 in/sec to any pump bearing vibration direction where, in the course of determining its reference value, it has a measured value below 0.05 in/sec. Therefore, the acceptable range as defined in Tables ISTB-5100-1, ISTB-5200-1, and ISTB-5300-1 will be less than or equal to 0.125 in/sec and the alert range will be 0.125 to 0.30 in/sec.

The licensee’s proposed alternative testing also describes the predictive monitoring program for all IST program pumps (Section 3.7.1) considered important to safe and reliable plant operation. The licensee stated that the PdM program goes beyond the IST requirements for pumps. The program includes bearing temperature trending, oil sampling and analysis, and thermographic analysis. The licensees also stated that if the measured parameters are outside of the normal operating range or are determined by analysis to be trending towards unacceptable degraded state, appropriate actions will be taken. These actions include increased monitoring to establish the rate of degradation, review of component-specific information to identify cause, and removal of the pump from service to perform maintenance. The proposed alternative is consistent with the objective of IST, which is to monitor degradation in safety-related components.

The objective of the licensee's PdM program is to detect problems involving the mechanical condition well in advance of when the pump reaches its overall vibration alert limit. Therefore, the licensee's proposed alternative will provide reasonable assurance of the operational readiness of the pumps.

3.7.5 Conclusion

Based on the above evaluation, the NRC staff has concluded that the licensee's proposed alternative to the vibration requirements of ISTB-3300, Table ISTB-5100-1, Table ISTB-5200-1, and Table ISTB-5300-1 of the OM Code is authorized pursuant to 10 CFR 50.55a(a)(3)(i) based on the alternative providing an acceptable level of quality and safety. This alternative is authorized for pumps listed in Section 3.7.1 for the third 10-year IST program interval of BVPS-2.

3.8 Relief Request No. PRR9

3.8.1 Code Requirements/Components Affected

Relief from the pressure instrument accuracy requirement of ± 0.5%, in Table ISTB-3500-1, was requested for the Ohio River Level Recorder LR-1CW-101 when conducting comprehensive and preservice pump tests on SW pumps 2SWS*P21A, 2SWS*P21B, and 2SWS*P21C.

ASME OM Code, Paragraph ISTB-3510(a), "Data Collection; General Accuracy," states: "Instrument accuracy shall be within the limits of Table ISTB-3500-1. If the parameter is determined by analytical methods instead of measurement, then the determination shall meet the parameter accuracy requirement of Table ISTB-3500-1. For individual analog instruments, the required accuracy is percent of full scale. For a combination of instruments, the required accuracy is loop accuracy."

Table ISTB-3500-1, "Required Instrument Accuracy," requires pressure instruments to be calibrated to ± 0.5% of full scale when used during the comprehensive and preservice pump tests.

3.8.2 Licensee's Basis for Request

The suction of SW pumps 2SWS*P21A, 2SWS*P21B, and 2SWS*P21C is aligned to the Ohio River. During comprehensive and preservice testing, differential pressure is calculated from a temporary pressure indicator installed at the discharge of each pump and the Ohio River Level Recorder LR-1CW-101 installed at the suction of the SW pumps. The transmitter associated with Level Recorder LR-1CW-101 is calibrated to ± 1.5% of full scale and the recorder associated with Level Recorder LR-1CW-101 is calibrated to ± 1.0% of full scale resulting in a loop accuracy of ± 1.8% (square root of the sum of the squares of 1.5% and 1.0%) of full scale. The overall loop accuracy of the transmitter and recorder for Level Recorder LR-1CW-101 of ± 1.8% exceeds the ± 0.5% accuracy requirement in Table ISTB-3500-1 for comprehensive and preservice tests.

Suction pressure for SW pumps 2SWS*P21A, 2SWS*P21B, and 2SWS*P21C is determined by converting a river elevation reading measured by Level Recorder LR-1CW-101 to a calculated pressure. Level Recorder LR-1CW-101 recorder has a full scale range from 648 to 705 feet (ft) (river elevation above sea level). Normal river elevation is 665 to 666 ft which provides for a

typical suction pressure of approximately 11 psig. The suction pressure reading over the range of the installed Level Recorder LR-1CW-101 is accurate to within ± 0.45 psig. This accuracy is obtained by taking the full scale range of 57 ft [705 feet – 648 feet], converting it to a pressure [(57 ft) / (2.31 ft/psig) = 25 psig], and multiplying it by 0.018 (± 1.8% accuracy). Table ISTB-3500-1 in the ASME OM Code would require this suction pressure reading to be accurate within ± 0.1 psig (25 psig x 0.005 (± 0.5% accuracy)).

Discharge pressure for each SW pump will be obtained from a temporary pressure gauge with a full scale range of 0 to 200 psig. Table ISTB-3500-1 in the ASME OM Code would require this discharge pressure reading to be accurate within ± 1 psig (200 psig x 0.005 (± 0.5% accuracy)). In order to compensate for the ± 1.8% suction pressure loop accuracy, the temporary discharge pressure gauge will be calibrated to ± 0.1% of full scale instead of ± 0.5% of full scale as required by Table ISTB-3500-1. This temporary test pressure gauge will provide a discharge pressure reading over the range of the instrument with an accuracy of ± 0.2 psig (200 psig x 0.001 (± 0.1% accuracy)). The combined accuracy of the temporary pressure gauge and Level Recorder LR-1CW-101 yields an accuracy of ± 0.65 psig (0.45 psig + 0.2 psig).

When the Table ISTB-3500-1 required instrument accuracy of ± 0.5% is applied to Level Recorder LR-1CW-101, the suction pressure reading over the range of the instrument is required to be accurate within ± 0.1 psig (25 psig x 0.005). When the Table ISTB-3500-1 required instrument accuracy of ± 0.5% is applied to the pump discharge pressure reading, the reading is required to be accurate to within ± 1 psig (200 psig x 0.005). Adding these required instrument accuracies together would yield an overall worst case (allowed) error of ± 1.1 psig (0.1 psig + 1.0 psig). The proposed alternative will result in a differential pressure reading accuracy of ± 0.65 psig, which is more accurate than the accuracy requirement in Table ISTB-3500-1 (± 1.1 psig).

3.8.3 Proposed Alternative

The licensee proposed to use the installed Ohio River Level Recorder LR-1CW-101 with a loop accuracy of 1.8% (to determine SW pump suction pressure), and a 0 to 200 psig, 0.1% accurate temporary pressure gauge (to determine SW pump discharge pressure). These instrument readings are used to determine SW pumps differential pressure.

3.8.4 Staff Evaluation

The licensee requested relief from the ASME OM Code instrumentation accuracy requirements of ISTB- 3510(a) and Table ISTB-3500-1 for pressure instrument used to measure SW pump suction pressure. ISTB-3510(a) requires that instrument accuracy shall be within the limits of Table ISTB-3500-1. Table ISTB-3500-1 requires a pressure instrument accuracy of ± 0.5% for comprehensive and preservice tests.

The licensee proposed to use the installed Ohio River Level Recorder LR-1CW-101 with a loop accuracy of ± 1.8% to determine the suction pressure and a temporary pressure gauge with an accuracy of ± 0.1% and range of the 0 to 200 psig to measure discharge pressure. These instrument readings will be used to determine SW pump 2SWS*P21A, 2SWS*P21B, and 2SWS*P21C pump differential pressure during comprehensive and preservice pump tests.

The NRC staff has reviewed the licensee's method and calculations described in Section 3.8.2 above. The NRC staff finds: (1) that the existing Level Recorder LR-1CW-101, with a loop accuracy of ± 1.8%, installed at the suction of the SW pumps, along with a temporary discharge pressure instrument calibrated to ± 0.1% of full scale, with a range of 0 to 200 psig, yield differential pressure readings at least equivalent to the readings achieved from instruments that meet ASME Code requirements and (2) the licensee's proposed alternatives provide reasonable assurance of the operational readiness of the pumps. This is consistent with Section 5.5.1 of NUREG-1482, Revision 1, which allows the NRC staff to grant relief when the proposed alternative yields a reading that is at least equivalent to that achieved using instruments that meet the ASME Code requirements.

3.8.5 Conclusion

Based on the above evaluation, the NRC staff has concluded that the licensee's proposed alternative to the instrument accuracy requirements of ISTB-3510(a) and Table ISTB-3500-1 of the ASME OM Code is authorized pursuant to 10 CFR 50.55a(a)(3)(i) because the alternative provides an acceptable level of quality and safety. The alternative is authorized for Ohio River Level Recorder LR-1CW-101 when conducting comprehensive and preservice pump tests on SW pumps 2SWS*P21A, 2SWS*P21B, and 2SWS*P21C for the third 10-year IST program interval of BVPS-2.

3.9 Relief Request No. VRR1

3.9.1 Code Requirements/Components Affected

Relief was requested to allow the use of Code Case OMN-1, "Alternative Rules for Preservice and Inservice Testing of Certain Electric Motor-Operated Valve Assemblies in LWR Power Plants," as an alternative to the requirements in ISTA-3130(b), ISTC-5120(a), and ISTC-3700.

ISTA-3130(b) requires that code cases be applicable to the edition and addenda specified in the test plan.

ISTC-5120(a) requires that active valves have their stroke-times measured when exercised in accordance with ISTC-3500.

ISTC-3700 requires that valves with remote position indicators be observed locally at least once every 2 years to verify that valve operation is accurately indicated.

3.9.2 Licensee's Basis for Request

NUREG-1482, Revision 1, Section 4.2.5 states in part; as an alternative to motor operated valve (MOV) stroke-time testing, ASME developed Code Case OMN-1, which provides periodic exercising and diagnostic testing for use in assessing the operational readiness of MOVs, may be used. Section 4.2.5 recommends that the licensees implement ASME Code Case OMN-1 as accepted by the NRC (with certain conditions) in the regulations, as an alternative to the MOV stroke-time testing provisions in the ASME OM Code.

The licensee indicated that the 2-year frequency for valve position verification specified in ISTC-3700 does not apply for MOVs being tested in accordance with ASME Code Case OMN-1.

3.9.3 Licensee's Proposed Alternative Testing

The licensee proposed to test all its MOVs in accordance with Code Case OMN-1 subject to the conditions contained in Table 2 of Regulatory Guide (RG) 1.192, "Operation and Maintenance Code Case Acceptability, ASME OM Code."

The valve position verification provisions specified in ISTC-3700 will be implemented in conjunction with the MOV diagnostic test frequency in lieu of once every 2 years.

3.9.4 Staff Evaluation

Application of code cases is addressed in 10 CFR 50.55a(b)(6) through references to RG 1.192, which lists acceptable and conditionally acceptable code cases for implementation in IST programs. RG 1.192, Table 2, conditionally approves the use of Code Case OMN-1 and states that the code case is applicable to the 2000 Addenda and earlier editions and addenda of the Code. There is no technical reason for prohibiting the use of Code Case OMN-1 with the 2001 Edition through the 2003 Addenda of the Code. Code Case OMN-1 provides an acceptable level of quality and safety for testing of MOVs and is an acceptable alternative for use in the licensee's IST program. This conclusion is consistent with the NRC staff's position in NUREG-1482, Revision 1, and RG 1.192.

The NRC staff considers that activities conducted as part of the implementation of Code Case OMN-1 will achieve valve position verification as intended in ISTC-3700. For example, Paragraph 3.6, "MOV Exercising Requirements," in Code Case OMN-1 specifies that MOVs within the scope of the code case are to be exercised on an interval not to exceed 1 year or one refueling cycle (whichever is longer). In particular, paragraph 3.6.3 states that each MOV is to full-stroke exercised to the position(s) required to fulfill its function(s). Furthermore, item (j) of Paragraph 9.1, "Test Information," in Code Case OMN-1 indicates that significant observations, such as abnormal or erratic MOV action noted either during or preceding performance testing, are to be considered.

3.9.5 Conclusion

Based on the above evaluation, the NRC staff has concluded that the licensee's proposed alternative to the Code MOV stroke-time testing requirements is authorized pursuant to 10 CFR 50.55a(a)(3)(i) on the basis that the alternative provides an acceptable level of quality and safety. The licensee's proposed alternative provides reasonable assurance of the operational readiness of the MOVs in the IST program and is authorized for the third 10-year IST program interval of BVPS-2.

4.0 CONCLUSION

Pursuant to 10 CFR 50.55a(a)(3)(i), Relief Request Nos. PRR2, PRR6, PRR8, PRR9, and VRR1 are authorized on the basis that the proposed alternatives would provide an acceptable level of quality and safety. Pursuant to 10 CFR 50.55a(f)(6)(i), Relief Request Nos. PRR3, PRR4, PRR5, and PRR7 are granted and alternative requirements are imposed on the basis that the ASME OM Code requirements are impractical for the facility.

5.0 REFERENCES

U.S. Code of Federal Regulations, Domestic Licensing of Production and Utilization Facilities," Part 50, Chapter I, Title 10, "Energy," Section 50.55a, Codes and standards.

U.S. Nuclear Regulatory Commission, "Guidance for Inservice Testing at Nuclear Power Plants," NUREG-1482, Revision 1, June 2004.

Letter, James H. Lash, First Energy Nuclear Operating Company, to NRC, "Beaver Valley Power Station, Unit No. 2, Docket No. 50-412, License No. NPF-73, Proposed Alternatives and Relief Requests Associated With The Inservice Testing Program Ten-Year Update," dated May 11, 2007 (ADAMS Accession No. ML 071370347).

Letter, James H. Lash, First Energy Nuclear Operating Company, to NRC, "Beaver Valley Power Station, Unit No. 2, Docket No. 50-412, License No. NPF-73, Response to Request for Additional Information Regarding May 11, 2007, Proposed Alternatives and Relief Requests (TAC Nos. MD5595, MD5121, MD5600, MD5602, and MD5603)," dated September 24, 2007 (ADAMS Accession No. ML 072070591).

Letter, James H. Lash, First Energy Nuclear Operating Company, to NRC, "Beaver Valley Power Station, Unit No. 2, Docket No. 50-412, License No. NPF-73, Supplemental Information in Support of ASME Code Relief Request PRR6 (TAC No. MD5600)," dated November 14, 2007 (ADAMS Accession No. ML 073240030).

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