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

August 19, 2010

Vice President, Operations
Arkansas Nuclear One
Entergy Operations, Inc.
1448 S.R. 333
Russellville, AR 72802

SUBJECT: ARKANSAS NUCLEAR ONE, UNIT 2 – REQUEST FOR RELIEF PRR-ANO2-2010-1, RELIEF FROM THE REQUIREMENTS OF ASME OM CODE SECTIONS ISTB-5221 AND ISTB-5223 FOR SERVICE WATER PUMPS (TAC NO. ME3367)

Dear Sir or Madam:

By letter dated February 17, 2010, Entergy Operations, Inc. (the licensee), submitted a request for relief for the Arkansas Nuclear One, Unit 2 (ANO-2), pursuant to paragraph 50.55a(a)(3)(i) of Title 10 of the *Code of Federal Regulations* (10 CFR), for service water pumps 2P-4A, 2P-4B, and 2P-4C. The licensee requested relief from certain inservice testing (IST) requirements of the American Society of Mechanical Engineers Code for Operation and Maintenance of Nuclear Power Plants (ASME OM Code), 2004 Edition. Specifically, the licensee proposed an alternative to ASME OM Code Sections ISTB-5221 and ISTB-5223 related to an inservice test that requires the pump flow rate and differential pressure be evaluated against reference values to monitor pump condition and to allow detection of hydraulic degradation. The proposed alternative is applicable to ANO-2's fourth 10-year IST program interval.

The U.S. Nuclear Regulatory Commission (NRC) staff has reviewed the licensee's submittal and determined that compliance with the Code requirements is impractical, and that the proposed alternative meets the guidance of NUREG-1482 and provides reasonable assurance that the pumps are operationally ready. Further, it has been determined that the granting of relief request PRR-ANO2-2010-1 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 Entergy that could result if the requirements were imposed on the facility. Therefore, pursuant to 10 CFR 50.55a(f)(6)(i), the NRC staff grants relief request PRR-ANO2-2010-1 for the remainder of the fourth 10-year IST interval at ANO-2, which began on March 26, 2010.

All other ASME OM Code requirements for which relief was not specifically requested and approved remain applicable.

The NRC staff's safety evaluation is enclosed. If you have any questions, please contact Kaly Kalyanam at (301) 415-1480 or via e-mail at kaly.kalyanam@nrc.gov.

Sincerely,

CFlynn for

Michael T. Markley, Chief
Plant Licensing Branch IV
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-368

Enclosure:
Safety Evaluation

cc w/encl: Distribution via ListServ

UNITED STATES
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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELIEF REQUEST PRR-ANO2-2010-1

ENTERGY OPERATIONS, INC.

ARKANSAS NUCLEAR ONE, UNIT 2

DOCKET NO. 50-382

1.0 INTRODUCTION

By letter dated February 17, 2010 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML100490259), Entergy Operations, Inc. (the licensee), submitted a request for relief for the Arkansas Nuclear One, Unit 2 (ANO-2), pursuant to paragraph 50.55a(a)(3)(i) of Title 10 of the *Code of Federal Regulations* (10 CFR), for service water (SW) pumps 2P-4A, 2P-4B, and 2P-4C. The licensee requested relief from certain inservice testing (IST) requirements of the American Society of Mechanical Engineers Code for Operation and Maintenance of Nuclear Power Plants (ASME OM Code), 2004 Edition. Specifically, the licensee proposed an alternative to ASME OM Code Sections ISTB-5221 and ISTB-5223 related to an inservice test that requires the pump flow rate and differential pressure be evaluated against reference values to monitor pump condition and to allow detection of hydraulic degradation. The proposed alternative is applicable to ANO-2's fourth 10-year IST program interval.

2.0 REGULATORY EVALUATION

The regulations in 10 CFR 50.55a, "Codes and standards," require 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 OM 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 U.S. Nuclear Regulatory Commission (NRC) pursuant to paragraphs (a)(3)(i), (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, or, (2) compliance would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety. Guidance related to the development and implementation of IST programs is given in NUREG-1482, "Guidelines for Inservice Testing at Nuclear Power Plants."

In accordance with 10 CFR 50.55a(f)(4)(ii), inservice tests to verify operational readiness of pumps and valves, whose function is required for safety, conducted during successive

120-month intervals must comply with the requirements of the latest edition and addenda of the Code incorporated by reference in paragraph (b) of this section 12 months before the start of the 120-month interval (or the optional ASME Code cases listed in NRC Regulatory Guide (RG) 1.147, Revision 15, "Inservice Inspection Code Case Acceptability, ASME Section XI, Division 1," or RG 1.192, "Operation and Maintenance Code Case Acceptability, ASME OM Code," that are incorporated by reference in paragraph (b) of this section), subject to the limitations and modifications listed in paragraph (b) of this section and subject to NRC approval.

The regulations in 10 CFR 50.55a authorize the NRC to approve alternatives and to grant relief from ASME Code requirements upon making necessary findings. NRC guidance contained in Generic Letter (GL) 89-04, "Guidance on Developing Acceptable Inservice Testing Programs," dated April 3, 1989, provides alternatives to ASME Code requirements which are acceptable. Further guidance is given in GL 89-04, Supplement 1, dated April 4, 1995, and NUREG-1482, Revision 1, "Guidelines for Inservice Testing at Nuclear Power Plants," January 2005.

3.0 TECHNICAL EVALUATION

3.1 Request for Relief PRR-ANO2-2010-1

3.1.1 Code Requirements

The ANO-2 Code of record is the ASME OM Code, 2004 Edition, Sections ISTB-5221 and ITSB-5223 (i.e., an inservice test will be conducted with the pump operating at specified test reference conditions). The relief request is effective for ANO-2's fourth 10-year IST interval which began on March 26, 2010.

3.1.2 Components Affected

PRR-ANO2-2010-1 requests relief for SW pumps 2P-4A, 2P-4B, and 2P-4C.

3.1.3. Reason for Relief Request (As stated by the licensee):

> During normal plant operation, either two or three SW pumps are required to be in operation. The pumps provide cooling water flow to the two safety grade SW loops and to the non-safety grade auxiliary cooling water loop. Interrupting the cooling water flow to certain components would result in an immediate plant transient or a plant trip. The system flow requirements are defined by the service loads of the supplied components. After system operation reaches a degree of stability, perturbation of flow to any of the on-line heat exchangers could have a severe adverse impact on plant operation with the potential for unacceptable flow and temperature transients. This situation precludes flow adjustments on specific heat loads and throttling of pump or header isolation valves. As such, returning the system operating parameters to a prescribed unique reference value (either flow or differential pressure) is impractical and could result in an unreasonable and unwarranted risk to plant operation with little or no apparent gain in plant safety or reliability.

Historical test data indicates that over the operating range of interest there is little or no variation in pump vibration characteristics (e.g., vibration levels are independent of flow rate over the allowed range of flows for these pumps).

3.1.4 Proposed Alternative and Basis (As stated by the licensee):

The proposed relief is in accordance with ASME Code Case OMN-16 ["Use of a Pump Curve for Testing"]. OMN-16 provides an acceptable level of quality and safety for testing the subject pumps, and is an acceptable replacement for OMN-9 which was previously approved for use in Regulatory Guide 1.192.

These pumps will be tested on a quarterly basis with the specific unique test reference values, as described in ISTB-3300, Reference Values, replaced by a set of variable reference values in the form of a representative curve denoting reference differential pressure as a function of pump indicated flow rate for each pump. The reference flow versus differential pressure (dP) curve represents hydraulic performance over the entire flow range of the pump. The reference curve will be determined for each pump as follows:

1. Each reference pump curve will be determined when the pump is known to be operating acceptably.

2. Measurements used to obtain reference points for the curve will use instruments that meet the accuracy and range requirements of ISTB-3500, Data Collection, for both Group A tests and for Comprehensive tests.

3. The reference curve will be constructed in accordance with OMN-16 from at least five measured points over the operating range of pump flow rates. Corresponding dP and flow rate measurements will be recorded after flow stability is achieved at each point.

4. Only those points of the reference curve beyond the flat, low flow region and within the design flow rate of the pump will be used to establish acceptance criteria for quarterly testing. This range will include pump design basis flow rates.

5. Acceptance criteria will be established that do not conflict with operability criteria for flow rate and dP in the Arkansas Nuclear One, Unit 2 (ANO-2) Technical Specifications (TSs) or the ANO-2 Safety Analysis Report (SAR).

6. The acceptance criteria for pump/motor vibration will be those specified in Table ISTB-5221-1, Vertical Line Shaft and Centrifugal Pumps Test Acceptance Criteria, for Group A and Comprehensive tests, based on reference values measured during typical pump operation at or near the

pump's design basis flow rate. Vibration levels have been demonstrated to remain essentially the same over the entire range of flow rates used.

7. After any maintenance or repair to a pump that may have affected or significantly altered the previous pump performance curve, a new reference pump curve will be developed or the previous curve revalidated by an appropriate inservice test.

The SW pumps are centrifugal vertical line shaft pumps. The limits for acceptable pump dP at operating flow will be derived from Table ISTB-5221-1, Vertical Line Shaft and Centrifugal Pumps Test Acceptance Criteria. Individual acceptance criteria for each pump will be developed as follows:

1. The "required action range" will be where pump dP, at the operating flow rate, indicates less than 93% [percent] of the value taken from the reference curve for both Group A and Comprehensive tests greater than 110% of the reference value for Group A tests and greater than 103% for Comprehensive tests.

2. An "alert range" will be established where pump dP, at the operating flow rate, indicates ≥ 93% and < 95% of the value taken from the reference curve for both Group A and Comprehensive tests.

3. Each of the pump's acceptance criteria curves shall be compared to the applicable and corresponding requirements for these pumps as set forth in ANO-2 TSs, Safety Evaluation Reports, and SAR. If necessary, adjustments to the required action range limits will be made to ensure that the acceptance criteria are conservative with respect to the requirements of license basis documents.

4. In the event that a pump's operational parameters fall outside of the acceptance criteria, appropriate corrective actions will be implemented consistent with ISTB-6200, Corrective Action.

The proposed alternate testing for these pumps meets or exceeds the requirements as set forth in NUREG-1482, ["Guidelines for Inservice Testing at Nuclear Power Plants"] Revision 1, Section 5.2.

The proposed alternate testing will provide adequate test information and assurance equivalent to that of the Code requirement needed to assess the operational readiness of the subject pumps and adequately detect significant pump degradation.

3.2 NRC Staff Evaluation

The ASME OM Code, 2004 Edition, ISTB-5221 and ISTB-5223, require that pump flow rate and differential pressure be evaluated against reference values to monitor pump condition and to

allow detection of hydraulic degradation. When it is impractical to perform a quarterly test of 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 provide a suitable alternative. Pump curves represent a set of infinite reference points of flow rate and differential pressure. Establishing a reference curve for a 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, though not in accordance with OMN-16. There is, however, a higher degree of uncertainty associated with using a curve to assess operational readiness. Therefore, the development of the reference curve should be as accurate as possible. Section 5.2 of NUREG-1482 allows the use of pump curves as an acceptable alternative to IWP-3100 requirements, provided that certain guidance is followed in preparing the pump curves.

The SW pumps, 2P-4A, 2P-4B, and 2P-4C, operate under a variety of flow rate and differential pressure conditions. Varying the flow rate of these pumps is impractical during normal plant operating conditions because of a potential for loss of adequate flow to heat exchangers. Therefore, it is impractical to perform the quarterly pump test during plant operation, because interruption of cooling water flow could cause a reactor transient or a trip. As a result, the licensee proposes to use the reference flow versus differential pressure curve for testing the pumps. The reference curves are developed in accordance with the guidance of NUREG-1482, Section 5.2, and the acceptance criteria are consistent with ASME OM Code requirements. Based on the above, the NRC concludes that the proposed alternative provides reasonable assurance that the pumps are operationally ready and, therefore, is acceptable.

4.0 CONCLUSION

Based on the above, the NRC staff concludes that compliance with the Code requirements is impractical, and the licensee's proposed alternative to the Code testing requirements of SW pumps 2P-4A, 2P-4B, 2P-4C provides reasonable assurance that the pumps are operationally ready, and meets the guidance of NUREG-1482, "Guidelines for Inservice Testing at Nuclear Power Plants." Therefore, pursuant to 10 CFR 50.55a(f)(6)(i), the NRC staff authorizes the use of the proposed alternative PRR-ANO2-2010-1 for SW pumps 2P-4A, 2-4B, and 2P-4C for the remainder of the fourth 10-year IST interval at ANO-2 which began on March 26, 2010.

All other ASME OM Code requirements for which relief has not been specifically requested remain applicable.

Principal Contributor: M. Orenak

Date: August 19, 2010

The NRC staff's safety evaluation is enclosed. If you have any questions, please contact Kaly Kalyanam at (301) 415-1480 or via e-mail at kaly.kalyanam@nrc.gov.

Sincerely,

/RA by Carl F. Lyon for/

Michael T. Markley, Chief
Plant Licensing Branch IV
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-368

Enclosure:
Safety Evaluation

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