

April 30, 2008

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

SUBJECT: ARKANSAS NUCLEAR ONE, UNIT NO. 1 - APPROVAL OF RELIEF REQUEST
FOR ARKANSAS NUCLEAR ONE UNIT 1 FOURTH 10-YEAR PUMP AND
VALVE INSERVICE TESTING PROGRAM (TAC NOS. MD7709 AND MD7710)

Dear Sir or Madam:

By letter dated November 29, 2007, Entergy Operations, Inc., (Entergy, the licensee), submitted relief requests VRR-ANO1-2007-1 and PRR-ANO1-2007-1 for the fourth 10-year interval inservice testing (IST) program at Arkansas Nuclear One, Unit No. 1. The licensee requested relief from certain IST requirements of the American Society of Mechanical Engineers Code for Operation and Maintenance of Nuclear Power Plants. In a letter dated March 13, 2008, the licensee resubmitted relief request PRR-ANO1-2007-1 with minor revisions.

The U.S. Nuclear Regulatory Commission (NRC) staff has completed its review of the subject relief requests. The NRC staff has reviewed relief request VRR-ANO1-2007-1 and concluded that the proposed alternative would provide an acceptable level of quality and safety and therefore, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) 50.55a(a)(3)(i), relief request VRR-ANO1-2007-1 is authorized for the fourth 10 year IST interval. The NRC staff has reviewed relief request PRR-ANO1-2007-1, for which Entergy requested relief pursuant to 10 CFR 50.55a(a)(3)(ii). The NRC staff has concluded that the Code requirements are impractical for the facility. Therefore, the NRC staff has authorized the relief request PRR-ANO1-2007-1 pursuant to 10 CFR 50.55a(f)(6)(i), rather than 10 CFR 50.55a(a)(3)(ii). The proposed alternative imposed for the fourth 10 year IST interval provides reasonable assurance that the component is operationally ready.

If you have any questions regarding the SE, please contact Alan B. Wang at (301) 415-1445.

Sincerely,

/RA/

Thomas G. Hiltz, Chief
Plant Licensing Branch IV
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-313

Enclosure: Safety Evaluation

cc w/encl: See next page

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DATE	4/23/08	4/23/08	04/02/2008	4/28/08	4/30/08

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Arkansas Nuclear One

(2/25/08)

cc:

Senior Vice President
Entergy Nuclear Operations
P.O. Box 31995
Jackson, MS 39286-1995

Vice President, Oversight
Entergy Nuclear Operations
P.O. Box 31995
Jackson, MS 39286-1995

Senior Manager, Nuclear Safety
& Licensing
Entergy Nuclear Operations
P.O. Box 31995
Jackson, MS 39286-1995

Senior Vice President
& Chief Operating Officer
Entergy Operations, Inc.
P.O. Box 31995
Jackson, MS 39286-1995

Associate General Counsel
Entergy Nuclear Operations
P.O. Box 31995
Jackson, MS 39286-1995

Manager, Licensing
Entergy Operations, Inc.
Arkansas Nuclear One
1448 SR 333
Russellville, AR 72802

Section Chief, Division of Health
Radiation Control Section
Arkansas Department of Health and
Human Services
4815 West Markham Street, Slot 30
Little Rock, AR 72205-3867

Section Chief, Division of Health
Emergency Management Section
Arkansas Department of Health and
Human Services
4815 West Markham Street, Slot 30
Little Rock, AR 72205-3867

Pope County Judge
Pope County Courthouse
100 W. Main Street
Russellville, AR 72801

Senior Resident Inspector
U.S. Nuclear Regulatory Commission
P.O. Box 310
London, AR 72847

Regional Administrator, Region IV
U.S. Nuclear Regulatory Commission
611 Ryan Plaza Drive, Suite 400
Arlington, TX 76011-8064

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION
RELATED TO THE INSERVICE TESTING PROGRAM, FOURTH 10-YEAR INTERVAL
ENTERGY OPERATIONS, INC.
ARKANSAS NUCLEAR ONE, UNIT NO. 1
DOCKET NUMBER 50-313

1.0 INTRODUCTION

By letter dated November 29, 2007, Entergy Operations, Inc. (Entergy, the licensee), submitted relief requests VRR-ANO1-2007-1 and PRR-ANO1-2007-1 for the fourth 10-year inservice testing (IST) program interval at Arkansas Nuclear One, Unit No. 1 (ANO-1). The licensee requested 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). In a letter dated March 13, 2008, the licensee resubmitted relief request PRR-ANO1-2007-1 with minor revisions. The ANO-1 fourth 10-year IST interval commenced on December 2, 2007.

2.0 REGULATORY EVALUATION

Title 10 of the *Code of Federal Regulations* (10 CFR) 50.55a, 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 NRC 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 10 CFR 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 NRC 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. 10 CFR 50.55(a)(3)(i), (a)(3)(ii), or (f)(6)(i) authorizes the NRC to approve alternatives and to grant relief from ASME OM Code requirements upon making necessary findings. 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."

Enclosure

3.0 TECHNICAL EVALUATION

3.1 Valve Relief Request PRR-ANO1-2007-1

3.1.1 Code Requirements

The licensee requested relief from the requirements of Mandatory Appendix I, Paragraph I-8200, "Seat Tightness Testing" for valve PSV-1617. The valve is an ASME Code Class 3, Category C relief valve.

I-8200 requires that seat tightness testing shall be performed in accordance with the Owner's valve test procedure.

3.1.2 Licensee's Basis for Requesting Relief

The licensee states:

Relief valve PSV-1617 has an active open safety function to relieve overpressure and vacuum conditions in the sodium hydroxide storage tank. Note that although the tank vent valve AV-10 is normally open to perform these functions, PSV-1617 is considered to be the primary and most reliable mechanism for performing this function. The seat leakage testing of this valve produces no useful information since the valve has no significant safety function in the closed position.

3.1.3 Licensee's Proposed Alternative Testing

The licensee states:

Seat leakage testing of this vacuum breaker valve will not be performed.

This vacuum breaker valve has no significant safety function in the closed position. Furthermore, seat leakage is irrelevant since, in effect, the valve is normally bypassed by a line with a normally open valve.

3.1.4 Evaluation

Paragraph I-7380 of Mandatory Appendix I of the Code requires that Class 2 and 3 vacuum relief valves shall be actuated to verify open and close capability, set-pressure, and performance of any pressure and position sensing accessories. Also, compliance with the Owner's seat tightness criteria shall be verified. Paragraph I-8200 requires that seat tightness testing shall be performed in accordance with the Owner's valve test procedure, and provides requirements for the seat tightness test methods.

Valve PSV-1617 opens to relieve overpressure and vacuum conditions in the sodium hydroxide storage tank. Valve PSV-1617 is normally bypassed by a line with a normally open valve, and therefore, it requires no seat tightness acceptance criteria. Also, the valve has no significant safety function when it is in the closed position. Therefore, the performance of seat tightness

testing in accordance with the Code would produce no useful information. Because no useful information would be obtained by performing a seat tightness test, not performing the test would still provide an acceptable level of quality and safety.

3.1.5 Conclusion

Based on the above evaluation, the NRC staff concludes that the licensee's proposed alternative to the Code testing requirements for valve PSV-1617 is authorized pursuant to 10 CFR 50.55a(a)(3)(i), on the basis that the licensee's proposed alternative will provide an acceptable level of quality and safety. The licensee's proposed alternative provides reasonable assurance of the operational readiness of valve PSV-1617. The alternative is authorized for the fourth 10-year IST program interval.

3.2 Pump Relief Request PRR-ANO1-2007-1

3.2.1 Code Requirements

The licensee requested relief from the requirements of ISTB-5221, "Group A Test Procedure," and ISTB-5223, "Comprehensive Test Procedure," for service water pumps P-4A, P-4B, and P-4C. The pumps are vertical line-shaft pumps and are designated as Group A pumps.

ISTB-5221 states that Group A tests shall be conducted with the pump operating at a specified reference point. The test parameters shown in Table ISTB-3000-1 shall be determined and recorded as required by this paragraph. 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-5223 states that comprehensive tests shall be conducted with the pump operating at a specified reference point. The test parameters shown in Table ISTB-3000-1 shall be determined and recorded as required by this paragraph. 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 Requesting Relief

The licensee states:

The service water system provides a continuous supply of cooling water to the two safety-related (essential) service water headers as well as the non-essential header related to the main turbine generator and other plant support auxiliaries. During normal plant operation at power, the heat removal demands of the service water system require the operation of at least two and frequently three pumps. After the system operation reaches a degree of stability, perturbation of flow to any of the on-line heat exchangers 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 certainly 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.

3.2.3 Licensee's Proposed Alternative Testing

The licensee states:

Following maintenance activities and when the pump is known to be operating acceptably, the reference curve will be either reconfirmed or a new curve created as follows:

- a. The subject flow rate will be varied over a specified range with the pump operating at or near its design basis flow rate. Per Safety Analysis Report (SAR) Table 9-8, a service water pump design capacity is 6500 gallons per minute (gpm). This specified range, approximately 4000 gpm to 7500 gpm, will be beyond the theoretical "flat" portion of the pump performance curve.
- b. For at least five points over the test range, corresponding differential pressure and flow rate measurements will be recorded after flow stability is achieved at each point (minimum two minutes run time). The points will include at least one point below 5200 gpm, one point between 5200 gpm to 6500 gpm, and one point greater than 6500 gpm. Instruments used for obtaining pump performance data will satisfy the accuracy and range requirements as set forth in ISTB-3500.
- c. The recorded curve data will be plotted graphically or electronically and an equivalent pump curve will be derived.

Individual acceptance criteria will be developed for each pump as follows:

- a. For the Group A test, an acceptable range of operation will be established when pump differential pressure, corresponding to a specific flow rate, deviates by no more than 0.95 times the reference value for the lower limit and 1.10 times the reference value for the upper limit. For the comprehensive test, an acceptable range of operation will be established when pump differential pressure, corresponding to a specific flow rate, deviates by no more than 0.95 times the reference value for the lower limit and 1.03 times the reference value for the upper limit.
- b. For the Group A test and the comprehensive test, an alert range of operation will be established when pump differential pressure, corresponding to a specific flow rate, falls between 0.95 times the reference value to 0.93 times the reference value.
- c. Each of the pump's acceptance criteria curves shall be compared to the applicable and corresponding requirements for these pumps as set fourth in the ANO-1 Technical Specifications, Safety Evaluation Report, and SAR. This review will ensure that a pump cannot be declared operable if it is operating outside the requirements of any of these documents.

- d. In the event that a pump's operational parameters fall outside of these stated ranges (Group A test: 0.93 times the reference value for the lower range and 1.1 times the reference value for the upper range) or greater than 1.03 times the reference value for the comprehensive test in what is known as the "required action range," appropriate corrective actions will be implemented in accordance with ISTB-6200(b).
- e. The acceptance criteria for pump/motor vibration will be derived from Table ISTB-5200-1 based on reference values measured during typical pump operation, e.g., between approximately 4000 gpm and 7500 gpm. A curve of vibration levels versus flow rate is not required to be developed since vibration levels are essentially the same over the flow rates of interest.

Each of these pumps will be Group A and comprehensive tested as follows:

With the subject pump operating at a condition based on the system demands, measurements for pump flow rate, differential pressure, and vibration will be recorded. Should any of the pump's operating points fall outside the plotted areas of acceptability, the appropriate corrective action as prescribed in ISTB-6200 will be applied.

This proposed relief is in accordance with ASME Code Case OMN-16 (OMN-16).

3.2.4 Evaluation

As discussed in OMN-16, in cases when testing a centrifugal or vertical line shaft centrifugal pump where adjustment to a specific reference value is impractical, the establishment of additional pump curves for reference values of flow rate and differential pressure is acceptable. OMN-16 has been reviewed by the NRC staff. The NRC staff determined that OMN-16 is the same as OMN-9 (and has incorporated the NRC staff's caveats to OMN-9 listed in Regulatory Guide (RG) 1.192), which expired on November 25, 2006. OMN-16 is basically a replacement for OMN-9, although it has not yet been incorporated into RG 1.192. The NRC staff finds that 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 RG 1.192.

In the case of service water pumps P-4A, P-4B, and P-4C, it would be impractical to throttle the system in order to achieve a fixed reference value, as resistance is varied in response to the heat loads of the plant. Varying the flow rate presents the potential for loss of adequate flow and cooling to the heat exchangers, resulting in a possible plant transient or trip. This is an impractical condition as defined in NUREG-1412, Revision 1.

The licensee's proposed alternative testing complies with the requirements of ASME Code Case OMN-16 and provides reasonable assurance that the component is operationally ready. The acceptance criteria proposed by the licensee is equivalent to that specified in Table ISTB-5200-1, and the associated corrective action is in accordance with ISTB-6200.

3.2.5 Conclusion

Based on the above evaluation that determined that compliance with the Code requirements is impractical for the pump testing, the proposed testing provides reasonable assurance that the

component is operationally ready, and considering the burden on the licensee if the Code requirements are imposed, relief is granted from the Code requirements and the alternative is imposed, pursuant to 10 CFR 50.55a(f)(6)(i). As the NRC staff has concluded that the Code requirements are impractical for the facility, the NRC staff has authorized the relief request PRR-ANO1-2007-1 pursuant to 10 CFR 50.55a(f)(6)(i), rather than 10 CFR 50.55a(a)(3)(ii). The relief granted is authorized by law and will not endanger the common defense and security and is otherwise in the public interest, giving due consideration to the burden upon the licensee if the Code requirements were imposed on the facility. This alternative is granted for the fourth 10-year IST program interval.

Principal Contributor: Robert J. Wolfgang

Date: April 30, 2008