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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO THE INSERVICE TESTING PROGRAM RELIEF REQUESTS

ENTERGY OPERATIONS, INC.

RIVER BEND STATION, UNIT 1

DOCKET NO. 50-458

1.0 INTRODUCTION

The Code of Federal Regulations, 10 CFR 50.55a, requires that inservice testing (IST) of certain American Society of Mechanical Engineers (ASME) Code Class 1, 2, and 3 pumps and valves be performed in accordance with Section XI of the ASME Boiler and Pressure Vessel Code and applicable addenda, except where alternatives have been authorized or relief has been requested by the licensee and granted by the Commission pursuant to Sections (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; (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 its facility. NRC guidance contained in Generic Letter (GL) 89-04, "Guidance on Developing Acceptable Inservice Testing Programs," provides alternatives to the Code requirements determined acceptable to the staff. Alternatives that conform with the guidance in GL 89-04 may be implemented without additional NRC approval, but are subject to review during inspections. Section 50.55a authorizes the Commission to approve alternatives and to grant relief from ASME Code requirements upon making the necessary findings. The NRC staff's findings with respect to authorizing alternatives and granting or not granting the relief requested as part of the licensee's IST program are contained in this safety evaluation (SE).

This SE provides the evaluations of relief requests from the IST program submitted by Entergy Operations, Inc. (EOI) in their letter dated November 14, 1994. The River Bend IST Program was developed in accordance with the 1980 Edition of ASME Section XI to the winter 1981 Addenda. The licensee's IST program covers the first 10-year interval from June 16, 1986, to June 16, 1996.

ENCLOSURE

2.0 NEW RELIEF REQUESTS

2.1 RELIEF REQUEST VRR-71

The licensee is requesting relief from ASME Section XI Subsection IWV-3500, Inservice Tests, Category C Valves," paragraph IWV-3522, "Exercising Procedure," which states, in part, that for other types of check valves it shall be shown that disk movement is sufficient to permit flow adequate for the function of the valve. The functional test of the associated component currently performed shows that the disk movement is sufficient to permit adequate flow for the open function of check valves in air and/or gas systems. Relief is requested from defining and verifying maximum accident condition flow for all air supply check valves.

2.1.1 LICENSEE'S BASIS FOR RELIEF

The licensee states:

> Defining and verifying the maximum accident flow through the check valve would not provide additional assurance of the associated component's operability. In addition, it is typically impractical to do this in air systems. These valves do not have an external/remote means to verify valve position.
>
> Air supply check valves installed in systems are to regulate pressure not flow. These valves will only open when a differential pressure exists across the valve, in which case the valve is only required to open enough to re-establish the pressure. The valves are functionally tested during their associated component and/or system tests. IWV-3522 states, in part, for other types of check valves, it shall be shown that disk movement is sufficient to permit flow adequate for the function of the valve. The functional test of the associated component shows that the disk movement is sufficient to permit adequate flow for the function of check valves in air and/or gas systems. Defining and verifying maximum accident flow through the check valve would not provide additional assurance of the associated components' operability.

2.1.2 ALTERNATIVE TESTING

The licensee proposes:

> All safety-related air supply check valves in the service air, instrument air, main steam, penetration valve leakage control, diesel starting air, containment atmosphere, leakage monitoring, and standby service water systems will be functionally tested during their associated component and/or systems test. Forward flow testing of these valves will be verified during these tests.

2.1.3 EVALUATION

The ASME Boiler and Pressure Vessel Code requires check valves that are normally closed and whose safety function is to open on reversal of pressure differential to be exercised open by proving that the disk moves promptly away from the seat when the closing pressure differential is removed and flow through the valve is initiated.

NRC GL 89-04, "Guidance on Developing Acceptable Inservice Testing Programs," requires that a check valve's full-stroke exercise to the open position be verified by passing the maximum required accident condition flow through the check valve. GL 89-04 defines "maximum required accident condition flow" as at least the largest flow rate for which credit is taken for this component in a safety analysis in any flow condition.

Part 10 of the ASME OM Standards, as referenced in the 1989 Edition of Section XI of the ASME Code approved in paragraph (b) of 10 CFR 50.55a, requires check valves to be exercised in a manner which verifies the obturator travels to the full-open or partially-open position required to fulfill its function.

The licensee stated that the design function of air supply check valves installed in systems is to regulate pressure, not flow. These valves will only open when a pressure differential exists across the valve, in which case the valve is only required to open enough to re-establish the pressure. These check valves have no external/remote means to verify obturator position.

The proposed testing is consistent with the exercising requirements specified in OM-10, Paragraph 4.3.2.2(e). Therefore, relief is no longer required to conduct this testing in accordance with OM-10, provided the licensee implements all related requirements.

The staff agrees with the licensee that functionally testing all safety-related air supply check valves during their associated component and/or system test provides reasonable assurance of operational readiness and verifies that these valves stroke to the position required to fulfill their safety function. The licensee may also wish to consider valve degradation during their associated component/system test by following some type of a maintenance program. Based on the above evaluation, the staff agrees with EOI, that the subject relief does not constitute a reduction in the overall protection of the public health and safety.

2.1.4 CONCLUSION

Use of this portion of OM-10 is approved, pursuant to 10 CFR 50.55a(f)(4)(iv), provided the licensee implement all related requirements including Paragraph 4.3.2.2(h) of OM-10. Compliance with all related requirements is subject to NRC inspection.

2.2 RELIEF REQUEST VRR-72

The licensee is requesting relief from the Code valve exercising test requirements of ASME Section XI, Paragraph IWV-3400, for the requirement to full-stroke exercise and Paragraph IWV-3413, for the requirement to measure quarterly the limiting value of full-stroke time of sixteen safety/relief valves (SRVs) that protect against overpressure of the nuclear system. These valves are located on the main steam lines between the reactor vessel and the first isolation valve within the drywell. Each of these valves has its own separate discharge line which discharges into the suppression pool. The SRVs are balance-type, spring-loaded safety valves provided with an auxiliary power actuated device which allows opening of the valve even when pressure is less than the safety-set pressure of the valve.

2.2.1 LICENSEE'S BASIS FOR RELIEF

The licensee states:

Stroke time testing of the SRVs at River Bend is impractical since acceptable stroke times approach milliseconds. Instead, each valve will be exercised at least once per 18 months; (a) by bench testing, or (b) by stroking if the reactor vessel is at a pressure which supports the stroking of the SRVs. When stroking the SRV with the reactor vessel at pressure, steam flow measurements, reactor vessel pressure drop, or acoustic monitoring of the SRV tailpipe would be used to demonstrate that the valve opens. Several methods are provided for reliable position indication of the main steam SRVs. These include:

1. SRV Discharge Pipe Temperature - One thermocouple is provided on each SRV discharge pipe. A high temperature reading is caused by steam flow in the pipe, and is indicative of the opening of an SRV. The thermocouple outputs are recorded in the main control room. The recorder and thermocouples are powered from a non-essential bus.

2. Acoustic monitoring of SRV Discharge Pipe - Positive indication of SRV position is provided by acoustic sensors strapped to each SRV discharge pipe. This accelerometer-type sensor detects vibration generated by flow through an open SRV. By using the relationship between valve flow rate and the corresponding vibration level produced by the flow, the valve status is assessed. The acoustic signals are conditioned and preamplified before being fed to the acoustic monitoring panel in the control building. This panel provides individual contact outputs for main control room indicating lights for SRV Open indication, and a common output relay for annunciation in the main control room, when any one of the 16 SRVs is not full closed. Additional features of the acoustic monitoring system are: the system is seismically and environmentally qualified in accordance with IEEE 344-1075 and IEEE 323-1974, respectively, the monitoring system and associated main control room indicating

lights are powered from a Class 1E power supply, and their system has provisions for periodic testing while in operation.

3. Drop in Reactor Pressure - The opening of an SRV allows steam to be discharged into the suppression pool. The sudden increase in the rate of steam flow leaving the reactor vessel causes a mild depressurization transient. This drop in reactor pressure may be used as an indicator that the SRV being tested has opened.

The SRV acoustic monitoring system provides a highly reliable indication of SRV position, while the SRV discharge pipe temperature recorder provides confirmation. Several systems can be used by the operator in conjunction with the SRV pilot-actuation indicating lights to assess proper SRV operation. In addition, SRV control circuitry is tested per VRR-22 which requires that exercise testing of the valves be performed following every refueling outage.

An engineering evaluation of this condition determined that although a stuck open SRV is within the Updated Safety Analysis Report (USAR) accident analysis, the potential consequences of this event are undesirable, i.e., plant shutdown must be initiated if the valve cannot be closed. The proposed alternative would provide an acceptable level of quality and safety. The safety function of the SRVs is to maintain adequate margin below the peak ASME code allowable pressure in the nuclear system. Granting this relief from the ASME testing requirements will not decrease the valves' capability of fulfilling their safety function.

Opening a safety/relief valve (SRV) during normal operation would place the plant in a "mini-LOCA" condition if the SRV(s) were to fail in the open position. The amount of steam injected into the suppression pool could cause a rise in suppression pool temperature beyond the technical specification operating limits.

It is impractical to measure stroke times for the SRVs, since the stroke times are on the order of 100 milliseconds (ms). Steam flow measurements and/or acoustic monitoring of the SRV tailpipe will verify that the SRVs have performed their function in less than or equal to 5 seconds. Time "zero" for this stroke time measurement corresponds to the instant the SRV hand switch is placed in the "open" position.

2.2.2 ALTERNATIVE TESTING

The licensee proposes:

Each valve will be exercised at least once per 18 months: (a) by bench testing, or (b) by stroking if the reactor vessel is at a pressure which supports the stroking of the SRVs. A change in the SRV position can be directly associated with a certain steam flow rate, a certain reactor

vessel pressure drop, or detected by the SRV tailpipe acoustic monitor. No stroke-time measurements will be performed. SRV tailpipe steam flow, reactor vessel pressure drop, or indication on the SRV tailpipe acoustic monitor when the SRV switch is activated will be adequate to demonstrate valve operability.

2.2.3 EVALUATION

The Code requires that power-operated valves be stroke-timed in order to determine the extent of any valve degradation. The licensee has proposed to perform other maintenance activities to determine valve degradation.

The licensee stated that stroke-time testing of the SRVs increases the potential of an SRV becoming stuck open. Although a stuck open SRV is within the USAR accident analysis, the potential consequences of this event, i.e., plant shutdown, make stroke-time testing of the SRVs undesirable. It is also difficult to measure stroke-times for the SRVs since acceptable stroke times approach milliseconds. Instead, each valve will be exercised at least once per 18 months: by bench testing; or by stroking if the reactor vessel is at a pressure which supports the stroking of the SRVs. When stroking the SRV with the reactor vessel at pressure, steam flow measurements, reactor vessel pressure drop, or acoustic monitoring of the SRV tailpipe would be used to demonstrate valve operability. With respect to acoustic monitoring, the licensee may wish to consider problems that could occur as a result of incorrectly calibrating the acoustic monitors. It is recommended that the acoustic flow monitors be calibrated and then verified to assure that the instrumentation will adequately indicate proper operation of the valve. It has been noted that some licensees perform the stroke test with additional temporary instrumentation installed to enhance the monitoring of acoustic levels.

OM-1-1981, Paragraph 3.3.1.1, includes the following tests for main steam pressure relief valves with auxiliary actuation devices which will provide additional means of assessing the condition of these valves: determination of electrical characteristics and pressure integrity of solenoid valve(s); determination of pressure integrity and stroke capability of air actuator; determination of operation and electrical characteristics of position indicators; determination of operation and electrical characteristics of bellows arm switch; and determination of actuating pressure of auxiliary actuating device sensing element, where applicable, and electrical continuity.

The licensee's proposed alternative would provide an acceptable level of quality and safety. Authorizing this alternative to the ASME stroke-time testing requirements will not decrease the valves' capability of maintaining adequate margin below the peak ASME code allowable pressure in the nuclear system.

2.2.4 CONCLUSION

The proposed alternative to the Code stroke-time testing requirements as described in VRR-72 is authorized pursuant to 10 CFR 50.55a(a)(3)(i) based on the alternative providing an acceptable level of quality and safety.

The staff approves the licensee's proposed alternative in that this proposed alternative would provide an acceptable level of quality and safety: when stroking the SRV with the reactor vessel at pressure, steam flow measurements, reactor vessel pressure drop, or acoustic monitoring of the SRV tailpipe would be used to demonstrate valve operability.

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