UNITED STATES
NUCLEAR REGULATORY COMMISSION
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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO THE INSERVICE TESTING PROGRAM

ALTERNATE TESTING METHODS FOR SAFETY INJECTION CHECK VALVES

CAROLINA POWER & LIGHT COMPANY

H. B. ROBINSON STEAM ELECTRIC PLANT-UNIT 2

DOCKET NUMBER 50-261

1.0 INTRODUCTION

Section 50.55a of Title 10 of the Code of Federal Regulations, 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 (Code) and applicable addenda, except where relief has been requested and granted or proposed alternatives have been authorized by the Commission pursuant to 10 CFR 50.55a(f)(6)(i), (a)(3)(i), or (a)(3)(ii). In order to obtain authorization or relief, the licensee must demonstrate that: (1) conformance is impractical for its facility; (2) the proposed alternative provides an acceptable level of quality and safety; or (3) compliance would result in a hardship or unusual difficulty without a compensating increase in the level of quality and safety. NRC guidance contained in Generic Letter (GL) 89-04, "Guidance on Developing Acceptable Inservice Testing Programs," provide alternatives to the Code requirements determined to be acceptable to the NRC and authorized the use of the alternatives in Positions 1, 2, 6, 7, 9, and 10 provides the licensee follow the guidance delineated in the applicable position. When an alternative is proposed that is in accordance with GL 89-04 guidance and is documented in the IST program, no further evaluation is required; however, implementation of the alternative is subject to NRC inspection.

The licensee requested in their October 20, 1994, submittal, an evaluation of three proposed alternate testing methods to verify the open safety function of the safety injection (SI) combined cold leg injection check valves SI-875A, SI-875B, and SI-875C. An evaluation of the proposed methods is provided below.

2.0 BACKGROUND

The SI combined cold leg injection valves SI-875A, SI-875B, and SI-875C are 10-inch check valves located on three parallel lines which connect to the cold legs of each loop. These valves have a safety function to open to admit flow from the SI system to the reactor coolant system during a loss of coolant accident (LOCA). These valves also have a safety function to close to prevent an intersystem LOCA.

Relief Request SI-VRR-3 was submitted with the licensee's third ten-year inservice testing (IST) program dated August 1, 1991, requesting relief from the Code test frequency and method requirements of ASME Code, Section XI, Paragraph IWV-3520, for SI combined cold leg injection check valves. The licensee proposed as an acceptance criterion a requirement to conduct a minimum test flow rate of 3000 gallons per minute (gpm), which is below the accident flow rate of 8900 gpm, but above the calculated approximate minimum flow rate of 1700 gpm necessary to open each check valve. Relief was granted in the September 16, 1992, Safety Evaluation (SE), based in part on a phone conversation with the licensee on June 17, 1992, in which the NRC understood that the licensee was using non-intrusive ultrasonic testing techniques to verify disk movement during the flow test. A subsequent letter from the licensee dated December 28, 1992, clarified that the licensee was using an ultrasonic flow meter to verify a minimum flow of 3000 gpm through each check valve, and that the licensee committed to place the check valves in a sample disassembly and inspection program, in accordance with the guidance of Generic Letter (GL) 89-04, Position 2, "Alternate to Full Flow Testing of Check Valves."

3.0 LICENSEE'S REQUEST FOR APPROVING ALTERNATIVE FLOW TESTING

The licensee is currently performing disassembly and inspection of these check valves in accordance with GL 89-04, Position 2. Position 1 of GL 89-04, "Full Flow Testing of Check Valves," states that any flow rate below the accident flow would be considered a partial-flow test. Position 1 also lists the minimum items that should be addressed by the licensee to substantiate an alternate technique for meeting the ASME Code check valve exercise requirements when testing with flow through the valve.

In the submittal dated October 20, 1994, the licensee requests approval for alternatives to the Code requirements for full-flow testing the safety injection combined injection check valves. In this submittal, the licensee has provided information on items delineated in GL 89-04, Position 1, to substantiate use of alternate techniques. The impracticality of performing a full-flow test was already addressed in the NRC's SE, dated September 16, 1992. The three alternatives proposed by the licensee are discussed and evaluated below.

3.1 Differential Pressure Measurement to Verify Check Valve Position

The licensee has proposed to measure the differential pressure (ΔP) across each of the three check valves to verify the full-stroke open exercise of each valve. The valves would be tested individually, with the other two safety injection lines isolated during flow testing. The ΔP acceptance criteria has been estimated by the licensee to be between 1 and 2 psid at a flow rate of 3000 gpm or greater. No testing has been performed to determine the actual pressure differential across each check valve. The accuracy of the pressure instrumentation used in the test would be ±2 percent at the recorded value.

This alternate testing method has not been qualified by the licensee by a means such as non-intrusive techniques. Determining the pressure differential across the valve at a minimum flow of 3000 gpm would not establish adequate acceptance criteria unless the disk position was determined by a second method such as using a non-intrusive test method (see Section 3.3 of this SE). In addition, the detection of small changes in pressure may require more accurate pressure instrumentation. The licensee's alternative does not contain a discussion of how the pressure instrumentation accuracy will impact the acceptance criteria.

The proposed method is not considered "other positive means" to determine the full-stroke exercise of the check valve which can be used to meet the Code exercise procedure requirements. System response alone cannot determine that the check valve has moved to a position to fulfill its safety function. Therefore, relief from the Code requirements is required to implement this testing method for these check valves. Because the licensee has not discussed how this method is qualified using the guidance in GL 89-04, Position 1, approval of the alternate method from the Code exercise procedure requirements cannot be evaluated in this SE.

3.2 Radiography of Valve Disk Position

The licensee has proposed to use radiography of the valve disk as a means to verify disk position. Radiography to determine the position of the check valve disk is considered a non-intrusive test method which meets the Code exercise procedure requirements of ASME Code, Section XI, Paragraph IWV-3522, and ASME/ANSI Operations and Maintenance Standard, Part 10, Paragraph 4.3.2.4(a), if the results are conclusive and the test is repeatable. Therefore, a request for Code relief is not required.

3.3 Non-Intrusive Testing/Diagnostics

The licensee has proposed to use an ultrasonic flow meter to verify the test flow rate through each check valve is greater than 3000 gpm. The 3000 gpm flow rate is achieved during shutdown cooling operations and would be used as an acceptance criteria to verify the full-stroke open exercise of the check valves. The licensee has indicated that calculations show that there is a margin of 77 percent between this flow rate and the minimum flow required to open the valve. This argument was previously presented by the licensee in Relief Request SI-VRR-3 in their August 1, 1991, program submittal. While the calculated flow rate is below the test flow rate, the calculations do not take into account potential degradation of the valve. The Technical Evaluation Report included with the September 16, 1992, SE concluded that verification of the 3000 gpm flow would qualify as a full-stroke open exercise of the check valve if the obturator position could be determined. However, the licensee has not qualified the alternate method by verifying obturator position using an alternate, independent means.

Because the licensee's proposed method does not verify that the disk has full-stroke exercised to the open position by the use of an alternate method, such as the use of non-intrusive techniques, approval cannot be given.

4.0 CONCLUSION

The licensee's proposed method to measure the ΔP across the check valves to verify open disk position is not approved because the method has not been qualified. Since this testing method does not constitute other positive means, relief would be required to use the test method. For the licensee to use this test method, it must be qualified and the results submitted for approval to the NRC in a relief request. Therefore, the licensee's request to use measured differential pressure across the check valves to verify open disk position is unacceptable.

Use of radiography to determine the disk position does not require approval because this method is recognized as an "other positive means."

The licensee's proposed method to verify a flow rate through the check valves using an ultrasonic flow meter without any additional means to verify the valve disk position is not approved. To use this method, the licensee needs to verify the check valve disk position using a qualified alternate method.

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