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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO THE INSERVICE TESTING PROGRAM

AND REQUESTS FOR RELIEF

H. B. ROBINSON STEAM ELECTRIC PLANT, UNIT NO. 2

DOCKET NO. 50-261

INTRODUCTION

By letter dated September 16, 1988, Carolina Power & Light Company (CP&L), the licensee for H. B. Robinson Steam Electric Plant, Unit No. 2 (HBR-2), submitted a proposed plan and schedule for implementing flow rate monitoring during inservice testing (IST) of the Containment Spray (CS) and Component Cooling Water (CCW) Pumps. The licensee also proposed a similar alternate means for measuring flow during the testing of the Safety Injection (SI) System check valves. The licensee's letter was in response to NRC's letter dated July 20, 1988, granting interim relief for IST of the CS pumps for 60 days pending receipt and evaluation of a plan and schedule for implementation of flow monitoring during IST of these pumps. In addition, the licensee was informed that the proposed method of testing SI check valves in their March 8, 1988, letter and in the April 15, 1988 revised program did not comform to the ASME Code requirements. Also, the NRC letter dated July 20, 1988, contained an error with regard to SI valve numbering. The valve numbers should have been numbered SI-875A-F, and SI-876A and C instead of SI-875A and C and SI-876A-F.

To measure the hydraulic parameters of the CCW and CS pumps the licensee proposes to use an ultrasonic flow instrument called Uniflow Model 990 by Controlotron Corporation. It is an ultrasonic clamp-on multipulse transit-time flow measuring system and was designed for clean water application, as compared to a doppler-type instrument requiring sufficient particulate in the fluid for optimum performance. A demonstration of the Uniflow devise was conducted at HBR-2 on the 2-inch return line to the Refueling Water Storage Tank during the surveillance testing of CS Pumps A and B. Flow rate measurements were taken for each pump and compared to the manufacturer's pump performance data. The demonstration revealed that the data measurements taken with the Uniflow device and compared to the manufacturer's pump data were consistent.

The licensee has established plans and schedules for implementing flow monitoring on the CS and CCW pumps to meet the ASME Code requirements; they are as follows:

1. The schedule to implement the proposed program is during Refueling Outage 12, beginning in November 1988.

2. The Uniflow Model 990 ultrasonic flow instrument with appropriate tracks and transducers to perform flow monitoring on CCW and CS pumps were acquired prior to the 1988 Refueling Outage. The equipment was certified

to the National Bureau of Standard's Standards by the manufacturer to provide ±2% accuracy in flow measurement, in accordance with Section XI of the ASME Code.

3. The licensee will use the Controlotron Corporation's engineering recommendations for establishing permanent sites for the Uniflow tranducer tracks on the CCW and CS systems during the Refueling Outage. Site locations will be chosen based on obtaining accurate and repeatable flow measurements during surevillance testing of the CCW and CS pumps. In addition, special test procedures will be developed and performed on the CCW and CS pumps to establish flow rate reference values. These special test procedures will also be used to qualify the technique of measuring flow rate with the Uniflow devices to the satisfaction of the Authorized Nuclear In-Service Inspector.

4. The sureveillance procedures for the CCW and CS pumps will be revised to reflect flow rate reference values obtained during the performace of the special test procedures.

The licensee has also proposed an alternate flow rate measurement method to verify full disc travel for check valves 875A, B and C and 876A and C. The test method would employ the Uniflow Model 990 ultrasonic device to measure actual flow rates downstream of SI-875A, B and C and SI-876A and C valves. Using a dual channel Uniflow instrument, flow rate will be measured simultaneously on the "A" and "C" trains. To generate the necessary flow, both RHR pumps A and B, rated at 3750 gpm each, will be used to test the valves. The licensee calculated that a flow of 1,080 gpm would be required for the testing to ensure full disc lift for the SI valves. Based on this calculation, the acceptance criterion for this test method accounting for measurement uncertainties would be 1,150 gpm. If the measured flow rates are less than 1,150 gpm, the licensee, as a corrective action, will revert to disassembly and inspection of the valves.

EVALUATION

The CP&L letter dated September 16, 1988, has been reviewed by the staff and is evaluated below.

1.0 PUMPS

1.0.1. The ASME Code, Section XI, (the Code) does not specify the type of equipment or measuring devices used in the testing of pump flowrates. The Code does specify the accuracy of the instrumentation used. Therefore, the staff finds acceptable the proposal to use ultrasonic flow instrumentation to measure Containment Spray pump and Component Cooling Water pump flowrates quarterly, provided the accuracy as stated in the requirements of the ASME Code, Section XI, are followed.

2.0 VALVES

To correct any past typographical errors and to avoid any further confusion concerning the testing of some Safety Injection System check valves, this SER will address the testing of nine check valves in three sets of three valves each, as follows:

SI-875A, B, and C

SI-876A, B, and C

SI-875D, E, and F

2.0.1. The licensee's proposal to use ultrasonic flow instrumentation to measure flow through check valves 875A, B, and C is acceptable to the staff. However, the staff's position on testing check valves is that full stroke open may be verified by passing the maximum required flow through the check valves, even if the maximum required flow does not result in the valve stroking to the 100% open position. Any flow less than this will be considered a part-stroke exercise unless it can be shown, by some means such as measurement of the differential pressure across the valve, that the check valves' disc positions at the lower flow rate would permit maximum required flow through the valve. Using the calculated flow or full disc lift does not necessarily result in a valid test of the operability of the valve.

The 1,150 gpm flow rate, as described in the licensee's proposal, to full-stroke exercise check valves SI-875A, B, and C has raised concerns with the staff. The concern is that the flow rate of 1,150 gpm is based on the calculations and measurement uncertainties and may not full-stroke exercise the check valves' discs. Staff review of the Safety Injection System indicates that SI-875A, B, and C must pass the flow rate generated by the Safety Injection accumulators during their injection into the Reactor Coolant System. This accumulator discharge flow rate should be the maximum flow required to verify a full stroke for these check valves. It appears to the staff that the proposed 1,150 gpm flow rate derived by the licensee as a full stroke flow rate is substantially below the maximum required accident flow which could pass through the valve during accumulator discharge. Therefore, the staff considers the proposed full-stroke flow rate of 1,150 gpm unacceptable and a full-stroking of check valves 875A, B, and C is not verified by this test.

The licensee should revise their IST program to include a staff-approved method for full-stroke exercising check valves 875A, B, and C either by flow testing per the staff's position as described above or by disassembly and inspection as stated in paragraph 2.0.3. below.

2.0.2. The staff's review indicates that, with valve manipulation, installed system instrumentation is able to measure flow through SI-876B. The licensee's proposal to use ultrasonic flow instrumentation to measure flow through check valves 876A and C is acceptable to the staff. However, the same staff position for full-stroke exercising check valves using flow as stated in 2.0.1 also applies to check valves 876A, B, and C.

A review of the HBR-2 Safety Injection System P&ID (5379-1082, Sheet 4) has shown that valves SI-876A, B, and C would have to pass the maximum safety injection flow from the Residual Heat Removal pumps when running in their low-head safety injection capacity.

As in paragraph 2.0.1, the 1,150 gpm flow rate, as described in the licensee's proposal to demonstrate full stroke exercise of check valves SI-876A, B, and C has raised concerns with the staff. The proposed 1,150 gpm flow rate derived by the licensee as a full-stroke flow rate is less than the maximum required accident flow which could pass through the valves during low-head safety injection. Therefore, the staff considers the proposed full-stroke flow rate of 1,150 gpm as unacceptable and that full-stroking of check valves 876A, B, and C is not verified by this test.

The licensee should revise their IST program to include a staff-approved method for full-stroke exercising check valves 876A, B, and C either by flow testing per the staff's position as described above or by disassembly and inspection as stated in paragraph 2.0.3 below.

2.0.3. The licensee's proposal for testing valves SI-875D, E, and F is acceptable. However, to ensure that the testing is in accordance with the staff established positions regarding testing check valves by disassembly and inspection, SI-875D, E, and F should be tested in accordance with this position as discussed below:

1. During valve testing by disassembly, the valve internals should be inspected for worn, loose, or corroded parts, and the valve disk should be manually exercised.

2. Due to the scope of this testing, the personnel hazards involved, and system operating restrictions, valve disassembly and inspection will be performed during reactor refueling outages.

3. Where the licensee demonstrates that it is burdensome to disassemble and inspect all applicable valves at each refueling outage, a sample disassembly and inspection plan for groups of identical valves in similar applications may be employed. The NRC guidelines for this plan are explained below:

    a. The sample disassembly and inspection program involves grouping similar valves and testing one valve in each group during each refueling outage. The sampling technique requires that each valve in the group be of the same design (manufacturer, size, model number, and materials of construction) and have the same service conditions. Additionally, at each disassembly, the licensee must verify that the the disassembled valves are structurally sound (no loose or corroded parts). Also, if the disassembly is to verify the full-stroke capability of the valve, the disk should be manually exercised.

b. A different valve within each group is required to be disassembled, inspected, and manually full-stroke exercised at each refueling outage, until the entire group has been tested. If a diassembled valve's full-stroke capability is in question, the remaining valves in that group should also be disassembled, inspected, and manually full-stroke exercised during the same outage.

CONCLUSION

The proposed method of measuring flow during the testing of the CS and CCW pumps is an acceptable method provided the accuracy is as stated and the requirements of the ASME Code, Section XI are followed. The staff has also concluded that check valve SI-876B may be tested with installed system instrumentation and valve manipulation, and the licensee's proposal to use ultrasonic flow instrumentation to measure flow through check valves SI-875A, B, and C and SI-876A and C is acceptable. However, the flow rate through the valves should be the maximum required accident flow as described in Section 2.0.1; or the valves should be tested by disassembly and inspection, as described in Section 2.0.3, if the required flow rate cannot be achieved. The licensee should revise their IST program to include a staff-approved method for full-stroke exercising of valves: SI-875A, B, and C and SI-876A, B, and C.

In addition, the licensee's April 15, 1988 proposal for testing valves SI-875D, E, and F by disassembly and inspection, is acceptable. However, the licensee should ensure that the testing of these valves is in accordance with the staff position in Section 2.0.3.

Principal Contributor: Thomas McLellan

Dated: November 1, 1988