CONTAINMENT SYSTEMS BRANCH

SAFETY EVALUATION REPORT

CONCERNING ADEQUACY OF TESTING FOR CONTAINMENT SPRAY

ADDITIVE SYSTEMS FOR

THE DONALD C. COOK NUCLEAR PLANT, UNIT NO. 2

Docket No. 50-316

I. INTRODUCTION

Inspection Report No. 316/83/04 addressed the Special Safety Inspection conducted by the NRC Region III resident inspector at the Donald C. Cook Nuclear Plant, Unit No. 2, during the period January 1 through February 14, 1983, and April 26 through May 20, 1983. The report indicated that the licensee failed to obtain the expected spray additive flow in either train of the containment spray (CTS) system during the testing of the CTS additive system. This non-conformance of the test results is attributed to test program inadequacies.

The plant's containment spray additive system is designed to deliver sodium hydroxide (NaOH) solution to the CTS to help remove radioactive iodine from the containment atmosphere following onset of an accident. NaOH solution is metered into the spray water from the spray additive tank by an eductor system which works as a jet pump to produce a uniformly mixed solution in the spray with the CTS pump flow as the motive force.

Surveillance tests are conducted at five-year intervals to assure the operability of the CTS System. The surveillance testing performed in January 1983 was different from the preoperational test in the manner in which the test was set up. Consequently, confirmation of CTS additive system's operability by direct comparison of preoperational and surveillance test results could not be readily determined. The following is our evaluation on the licensee's CTS additive system testing program.

II. EVALUATION

The Technical Specifications (T.S.) for the D. C. Cook Plant require that the operability of the spray additive system be verified at least once per five years. This is to be accomplished by verifying a flow rate of 20 to 50 gpm from the spray additive tank to each CTS train with the CTS pump operating at a discharge pressure of 255 psig or greater. The spray additive system flow rate was established, during the preoperational test, by adjusting the spray additive control valve; and this valve line-up was to be maintained for the subsequent surveillance tests.

The preoperational test was performed for the purpose of testing the CTS system under post-accident conditions. The test was set up with a 10" test line connected to a same size CTS pump discharge line, while the CTS headers were shut off during the test. The CTS pump drew water from the refueling water storage tank (RWST) at design capacity and discharged the water to the bottom part of the containment through the test line. The eductor inlet valve was adjusted to obtain a spray additive flow rate that meets the design requirements. After the test, the licensee removed the test connection.

The test connections used for the five-year surveillance test vary considerably from those of the preoperational test. The licensee set up the test program by using a 3" test line and connected the line between CTS pump discharge and the RWST. The CTS pump drew water from the RWST through a 10" intake line and discharged back to the RWST through the 3" test line instead of flooding the containment. Therefore, the CTS pump discharge pressure was increased and the pressure head of the eductor to draw solution was decreased relative to the preoperational test. As a result, there was insufficient simulated spray additive flow. The licensee then changed the eductor inlet valve throttle position from the previously established position during the preoperational test, to regulate differential pressure and increase spray additive flow. Since the test conditions were different between the preoperational and the surveillance tests and since the actual spray additive flow was not measured during the surveillance tests, the results could not be correlated with the requirements and acceptance limits contained in the Technical Specifications.

The licensee subsequently submitted calculations to demonstrate that adequate NaOH would be metered into the CTS during an accident condition. The staff has reviewed the licensee's calculations and finds the theoretical basis acceptable. However, the actual system performance characteristics can only be confirmed through testing. Since the licensee's calculations were not based on the surveillance test set-up and test results were not verified, the licensee should provide analyses based on the surveillance test set-up to calculate a new spray additive flow rate. Since the T.S. requirements are based on the preoperational test connections that differed from the surveillance test set-up, the licensee should revise the T.S. to include surveillance test requirements. Furthermore, the licensee should develop a methodology for relating the actual system performance to the test results through proportionality. This is necessary since the surveillance test procedure does not allow actual spray additive discharge but rather simulates the discharge from the spray additive tank.

III. CONCLUSIONS

Since the surveillance test cannot be performed under design basis conditions and the current T.S. requirements cannot be verified with the test results, the licensee should demonstrate the adequacy of the surveillance test procedure. Based on our review, the staff concludes that: (1) the licensee should calculate a new spray additive flow rate based on the surveillance test program set-up; (2) the licensee should revise the T.S. to include the surveillance test program; (3) the licensee should demonstrate that actual system performance may be adjusted in accordance with proportionality principles; and (4) the licensee should provide emergency procedures for operation of the spray additive system in the case of system malfunction during an accident, because the sensitivity of the system is not determined through the test.