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U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, DC 20555

Gentlemen:

Subject: Oyster Creek Nuclear Generating Station
Docket No. 50-219
License No. DPR-16
Containment Spray System Design Deficiency

Your letter from the Director, Division of Reactor Projects, Region I, dated April 8, 1990, which forwarded a Notice of Violation (NOV), also requested our evaluation of the ability of Oyster Creek to have met the acceptance criteria for Emergency Core Cooling Systems, as specified in 10 CFR 50.46, with a design deficiency which existed in the Containment Spray System. Our letter dated May 9, 1990, which forwarded the NOV reply, indicated that our evaluation would be submitted within 60 days. This letter provides the results of our evaluation. The evaluation is based on Containment Spray System configuration at the time the design deficiency was discovered.

The Containment Spray System is designed to remove energy from primary containment. It is used with the Core Spray System to remove reactor decay heat from containment to the ultimate heat sink following a loss of coolant accident (LOCA). It has two modes of operation. In the containment spray mode, the drywell and torus are sprayed following a LOCA. System pumps would have tripped automatically when containment pressure decreased to 2 psig. In the dynamic test (torus cooling) mode water recirculates from the torus through the containment spray heat exchangers. This permits containment spray loop operation for test purposes and for controlling torus temperature during normal station operation.

The original safety analysis for containment response following a design basis LOCA did not address the automatic containment spray pump trip as pressure drops in containment. The analysis assumed Containment Spray System operation in the containment spray mode throughout the accident. The dynamic test mode of operation was only expected to be used for testing and heat removal during normal operation and not for providing long term decay heat removal. Subsequent analyses show, based on initial conditions assumed, that containment sprays can depressurize containment to the pump trip setpoint following a LOCA much faster than the original analysis indicated. The emergency operating procedures have also evolved to require dynamic test mode operation if torus cooling is required after containment spray pump trip.

A review of Containment Spray System logic in March 1989 revealed that the system would not perform as expected. Following the design basis LOCA, the logic would have prevented system operation in the torus cooling mode, due to the water level in the reactor being lower than the low low water level setpoint for Containment Spray System initiation. Upon pump trip the Containment Spray System valves could not be realigned to the torus cooling mode. This is consistent with the original design basis. However, this containment spray logic feature is a deficiency which would have prevented the operator from establishing the primary means of decay heat removal required by emergency operating procedures.

There are five acceptance criteria for Emergency Core Cooling Systems contained in 10 CFR 50.46:

1. Peak cladding temperature < 2200°F
2. Maximum cladding oxidation < 17%
3. Maximum hydrogen generation < 1%
4. Maintain coolable geometry (< 1% plastic strain in cladding)
5. Long term cooling

The first four requirements are satisfied within the first 20 minutes following the design basis LOCA when requenching of the fuel rods occurs and are uneffected by the Containment Spray System valve logic deficiency discussed above.

In order to meet the fifth requirement, long term cooling, operator action would be required even if the containment spray valve logic deficiency was absent. If the valve logic did not have the deficiency associated with the reactor low low water level condition, the operator would still be required to take a manual action to transfer the Containment Spray System to the torus cooling mode after the containment spray pumps tripped on low drywell pressure. With the presence of the valve logic problem, the operator would be required to take a manual action to override the logic or establish another water injection source to the core.

Our analysis shows that the operator has over 2 hours from the time of containment spray pump trip at 2.0 psig drywell pressure until the torus pool temperature reaches the point at which there is insufficient net positive suction head available to the core spray pumps for the maximum flow rate assumed in the 10 CFR 50, Appendix K LOCA analyses (4100 gpm). This is approximately 2.5 hours from the start of the LOCA. Based on engineering judgement, this period of time is adequate for operators and technical support staff to take action to assure that continued long term core cooling will be maintained. Manual action is not prohibited by 10 CFR 50.46 in order to meet the long term cooling requirement.

There are alternatives to restoration of the torus cooling mode of Containment Spray System operation within the 2 hour time frame. These have existed since original plant design and operation and involve establishing a reactor pressure vessel (RPV) injection source which is not affected by torus water temperature. One method is to align the Core Spray System to take suction from the condensate storage tank. Another method utilizes a tie-in to core spray from the Fire Suppression Water System. Each of two diesel-driven fire pumps can provide approximately 1650 gpm flow to the RPV. As described in the original analysis of the core cooling capability of this method, one fire pump is adequate to ensure core cooling 20 minutes after the onset of a LOCA. Although this analysis has not been recently updated, it suggests that the fire pump source should be adequate after 2 hours when the decay heat removal requirement is significantly reduced. Both of the above core injection methods are already provided in the emergency operating procedures. It should be noted that the containment spray mode remains available to keep containment pressure low, i.e. the pumps would have cycled on and off between 3.5 and 2.0 psig, respectively.

In conclusion, Oyster Creek meets the acceptance criteria contained in 10 CFR 50.46 with the valve logic design deficiency in the Containment Spray System. Manual action is required to satisfy the long term cooling criterion. Sufficient time is available to take the manual action. Currently, operators are aware of this design deficiency, trained in the method to override the valve control logic and are provided instructions in procedures to override the valve logic should it be required. In addition, the containment spray pump trip setpoint was reduced to 0.6 psig, which allows the pumps to operate longer.

Very truly yours,

E. E. Fitzpatrick

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