3.6 CONTAINMENT SYSTEMS

3.6.2.4 Residual Heat Removal (RHR) Wetwell Spray

LCO 3.6.2.4 Two RHR wetwell spray subsystems shall be OPERABLE.

APPLICABILITY: MODES 1, 2, and 3.

ACTIONS

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. One RHR wetwell spray subsystem inoperable.	A.1	Restore RHR wetwell spray subsystem to OPERABLE status.	~~X~~ 30 days
B. Two RHR wetwell spray subsystems inoperable.	B.1	Restore one RHR wetwell spray subsystem to OPERABLE status.	8 hours
C. Required Action and associated Completion Time not met.	C.1	Be in MODE 3.	12 hours
	<u>AND</u>		
	C.2	Be in MODE 4.	36 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.6.2.4.1	Verify each RHR wetwell spray subsystem manual, power operated, and automatic valve in the flow path that is not locked, sealed, or otherwise secured in position is in the correct position or can be aligned to the correct position.	31 days
SR 3.6.2.4.2	Verify each associated (i.e., in subsystems B & C) RHR pump develops a flow rate ≥ 31.5 l/s (500 gpm) through the heat exchanger while operating in the wetwell spray mode.	~~In accordance with the Inservice Testing Program or~~ 92 days

B 3.6 CONTAINMENT SYSTEMS

B 3.6.2.4 Residual Heat Removal (RHR) Wetwell Spray

BASES

BACKGROUND

Replace with INSERT A

~~Following a Design Basis Accident (DBA), the RHR Wetwell Spray System removes heat from the wetwell airspace. The suppression pool is designed to absorb the sudden input of heat from the primary system from a DBA or a rapid depressurization of the reactor pressure vessel (RPV) through safety/relief valves. The heat addition to the suppression pool results in increased steam in the wetwell, which increases primary containment pressure. Steam blowdown from a DBA can also bypass the suppression pool and end up in the wetwell airspace.~~ Some means must be provided to ~~remove heat~~ condense steam from the wetwell so that the pressure ~~and temperature~~ inside primary containment remain within the ~~analyzed~~ design limit. This function is provided by two redundant RHR wetwell spray subsystems. (Only RHR subsystems B and C operate in this mode.) The purpose of this LCO is to ensure that both subsystems are OPERABLE in applicable MODES.

Each of the two RHR wetwell spray subsystems contains a pump and a heat exchanger, which are manually initiated and independently controlled. The two subsystems perform the wetwell spray function by circulating water from the suppression pool through the RHR heat exchangers and returning it to a common wetwell spray sparger. The sparger only accommodates a small portion of the total RHR pump flow; the remainder of the flow ~~returns to either the suppression pool through the suppression pool cooling return line, or can be~~ is routed to the drywell spray sparger. Reactor Building Cooling Water (RCW) circulating through the ~~shell side of the these~~ heat exchangers, exchanges heat with the suppression pool water and discharges this heat to the external heat sink via the reactor service water (RSW) system. Either RHR wetwell spray subsystem is sufficient to condense the steam from ~~small~~ bypass leaks from the drywell to the wetwell airspace during the postulated ~~DBA~~ LOCA.

APPLICABLE SAFETY ANALYSES

Reference 1 contains the results of analyses ~~used to~~ that predict the primary containment pressure ~~and temperature, following large~~ response for a LOCA with the maximum bypass effective leakage area.

(continued)

(A)

The primary containment is designed with a suppression pool so that, in the event of a loss of coolant accident (LOCA), or a rapid depressurization of the reactor pressure vessel (RPV) through safety/relief valves, steam released from the primary system is channeled through the suppression pool water and condensed without producing significant pressurization of the primary containment. The primary containment is designed so that with the pool initially at the minimum water volume and the worst single failure of the primary containment heat removal systems, suppression pool energy absorption combined with subsequent operator controlled pool cooling will prevent the primary containment pressure from exceeding its design value. However, the primary containment must also withstand a postulated bypass leakage pathway that allows the passage of steam from the drywell directly into the wetwell ~~primary containment~~ airspace, bypassing the suppression pool. ~~The primary containment also must withstand a low energy steam release into the primary containment airspace.~~ ~~wetwell.~~

BASES

The effective ~~equivalent~~ flow path area for bypass leakage has been calculated to be 50 cm², assuming operation of one RHR wetwell spray subsystem.

APPLICABLE

~~and small break loss of coolant accidents.~~ ~~The intent of~~ The analyses ~~is to~~ demonstrates that the pressure reduction capacity of the RHR wetwell Spray System is adequate to maintain the primary containment conditions within the design limit~~s~~. ~~The time history for primary containment pressure is calculated to demonstrate that the maximum pressure remains below the design limit.~~

The RHR wetwell spray system satisfies Criterion 3 of the NRC Policy Statement.

LCO

In the event of a ~~DBA~~ LOCA, a minimum of one RHR wetwell spray subsystem is required to mitigate potential bypass leakage paths and maintain the primary containment peak pressure below the design limits (Ref. 1). To ensure that these requirements are met, two RHR wetwell spray subsystems must be OPERABLE with power from two safety related independent power supplies. Therefore, in the event of an accident, at least one subsystem is OPERABLE, assuming the worst case single active failure. An RHR wetwell spray subsystem is OPERABLE when the pump, the heat exchanger, and associated piping, valves, instrumentation, and controls are OPERABLE.

APPLICABILITY

In MODES 1, 2, and 3, a ~~DBA~~ LOCA could cause heatup and pressurization of the primary containment. In MODES 4 and 5, the probability and consequences of these events are reduced due to the pressure and temperature limitations in these MODES. Therefore, maintaining the RHR wetwell spray subsystems OPERABLE is not required in MODE 4 or 5.

ACTIONS

A.1

With one RHR wetwell spray subsystem inoperable, the inoperable subsystem must be restored to OPERABLE status within ~~7~~ 30 days. In this Condition, the remaining OPERABLE RHR wetwell spray subsystem is adequate to perform the primary containment bypass leakage mitigation function. However, the overall reliability is reduced because a single failure in the OPERABLE subsystem ~~cold~~ could result in reduced primary containment bypass mitigation capability. The

(continued)

BASES (continued)

ACTIONS

A.1 (continued)

~~7~~ 30 day Completion Time was chosen in light of the redundant RHR wetwell spray capabilities afforded by the OPERABLE subsystem and the low probability of a ~~DBA~~ LOCA occurring during this period.

B.1

With both RHR wetwell spray subsystems inoperable, at least one subsystem must be restored to OPERABLE status within 8 hours. In this Condition, there is a substantial loss of the primary containment bypass leakage mitigation function. The 8 hour Completion Time is based on this loss of function and is considered acceptable due to the low probability of a DBA and because alternative methods to remove heat from primary containment are available.

C.1

If the inoperable RHR wetwell spray subsystem cannot be restored to OPERABLE status within the associated Completion Time, the plant must be brought to a MODE in which the LCO does not apply. To achieve this status, the plant must be brought to at least MODE 3 within 12 hours and to MODE 4 within 36 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required plant conditions from full power conditions in an orderly manner and without challenging plant systems.

SURVEILLANCE REQUIREMENTS

SR 3.6.2.4.1

Verifying the correct alignment for manual, power operated, and automatic valves in the RHR wetwell spray mode flow path provides assurance that the proper flow paths will exist for system operation. This SR does not apply to valves that are locked, sealed, or otherwise secured in position since these valves were verified to be in the correct position prior to leaking, sealing, or securing. A valve is also allowed to be in the nonaccident position provided it can be aligned to

(continued)

BASES

SURVEILLANCE REQUIREMENTS

SR 3.6.2.4.1 (continued)

the accident position within the time assumed in the accident analysis. This is acceptable since the RHR suppression pool cooling mode is manually initiated. This SR does not require any testing or valve manipulation; rather, it involves verification that those valves capable of being mispositioned are in the correct position. This SR does not apply to valves that cannot be inadvertently misaligned, such as check valves.

The Frequency of 31 days is justified because the valves are operated under procedural control, improper valve position would affect only a single subsystem, the probability of an event requiring initiation of the system is low, and the subsystem is a manually initiated system. This Frequency has been shown to be acceptable based on operating experience.

SR 3.6.2.4.2

Verifying each associated RHR pump develops a flow rate ≥ 31.5 l/s (500 gpm) while operating in the wetwell spray mode with flow through the heat exchanger ensures that pump performance has not degraded during the cycle. Flow is a normal test of centrifugal pump performance required by Section XI of the ASME Code (Ref. 2). This test confirms one point on the pump design curve and is indicative of overall performance. Such inservice inspections confirm component OPERABILITY, trend performance, and detect incipient failures by indicating abnormal performance. The Frequency of this SR is in accordance with the Inservice Testing Program, but the Frequency must not exceed 92 days.

REFERENCES

1. ABWR SSAR, Section 6.2.1.1.5
2. ASME, Boiler and Pressure Vessel Code, Section XI.