3.5 EMERGENCY CORE COOLING SYSTEMS (ECCS)

3.5.2 ECCS - Operating

LCO 3.5.2 Two ECCS trains shall be OPERABLE.

APPLICABILITY: MODES 1, 2, and 3.

---NOTE---
In MODE 3, both safety injection (SI) pump flow paths may be isolated by closing the isolation valve(s) for up to 2 hours to perform pressure isolation valve testing per SR 3.4.14.1.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more trains inoperable. AND At least 100% of the ECCS flow equivalent to a single OPERABLE ECCS train available.	A.1 Restore train(s) to OPERABLE status	72 hours ----------NOTE---------- The Required Action A.1 Completion Time is to be used for planned maintenance or inspections. The Completion Times of Required Actions A.2.1, A.2.2, and A.2.3 are for unplanned corrective maintenance or inspections. ------------------------------
	OR	
	A.2.1 Verify only one subsystem in one ECCS train is inoperable.	72 hours
	AND	
	A.2.2 Determine there is no common cause failure in the same subsystem in the OPERABLE ECCS train.	72 hours
	AND	
	A.2.3 Restore train to OPERABLE status.	14 days
B. Required Action and associated Completion Time not met.	B.1 Be in MODE 3.	6 hours
	AND	
	B.2 Be in MODE 4.	12 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE				FREQUENCY
SR 3.5.2.1	Verify the following valves are in the listed position with power to the valve operator removed.			In accordance with the Surveillance Frequency Control Program
	<u>Number</u>	<u>Position</u>	<u>Function</u>	
	8703	Closed	RHR to RCS Hot Legs	
	8802A	Closed	Safety Injection to RCS Hot Legs	
	8802B	Closed	Safety Injection to RCS Hot Legs	
	8809A	Open	RHR to RCS Cold Legs	
	8809B	Open	RHR to RCS Cold Legs	
	8835	Open	Safety Injection to RCS Cold Legs	
	8974A	Open	Safety Injection Pump Recirc. to RWST	
	8974B	Open	Safety Injection Pump Recirc. to RWST	
	8976	Open	RWST to Safety Injection Pumps	
	8980	Open	RWST to RHR Pumps	
	8982A	Closed	Containment Sump to RHR Pumps	
	8982B	Closed	Containment Sump to RHR Pumps	
	8992	Open	Spray Additive Tank to Eductor	
	8701	Closed	RHR Suction	
	~~8702~~	~~Closed~~	~~RHR Suction~~	
SR 3.5.2.2	Verify each ECCS 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.			In accordance with the Surveillance Frequency Control Program
SR 3.5.2.3	Verify ECCS piping is full of water.			In accordance with the Surveillance Frequency Control Program

(continued)

SURVEILLANCE REQUIREMENTS (continued)

	SURVEILLANCE	FREQUENCY
SR 3.5.2.4	Verify each ECCS pump's developed head at the test flow point is greater than or equal to the required developed head.	In accordance with the Inservice Testing Program.
SR 3.5.2.5	Verify each ECCS automatic valve in the flow path that is not locked, sealed, or otherwise secured in position, actuates to the correct position on an actual or simulated actuation signal.	In accordance with the Surveillance Frequency Control Program
SR 3.5.2.6	Verify each ECCS pump starts automatically on an actual or simulated actuation signal.	In accordance with the Surveillance Frequency Control Program
SR 3.5.2.7	Verify, for each ECCS throttle valve listed below, each mechanical position stop is in the correct position. Charging Injection <u>Throttle Valves</u>: 8810A, 8810B, 8810C, 8810D Safety Injection <u>Throttle Valves</u>: 8822A, 8822B, 8822C, 8822D	In accordance with the Surveillance Frequency Control Program
SR 3.5.2.8	Verify, by visual inspection, each ECCS train containment recirculation sump suction inlet is not restricted by debris and the suction inlet trash racks and screens show no evidence of structural distress or abnormal corrosion.	In accordance with the Surveillance Frequency Control Program

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.5.1.4

The boron concentration should be verified to be within required limits for each accumulator since the static design of the accumulators limits the ways in which the concentration can be changed. The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program. Sampling the affected accumulator within 6 hours after a solution volume increase of 5.6% (101 gallon) narrow range indicated level will identify whether in-leakage has caused a reduction in boron concentration to below the required limit. It is not necessary to verify boron concentration if the added water inventory is from the refueling water storage tank (RWST), and the RWST has not been diluted since verifying that its boron concentration satisfies SR 3.5.4.3, because the water contained in the RWST is nominally within the accumulator boron concentration requirements as verified by SR 3.5.4.3. This is consistent with the recommendation of GL 93-05 (Ref. 4).

SR 3.5.1.5

Verification that power is removed from each accumulator isolation valve operator (8808A, B, C, and D) when the RCS pressure is greater than 1000 psig ensures that an active failure could not result in the undetected closure of an accumulator motor operated isolation valve. If this were to occur, only two accumulators would be available for injection given a single failure coincident with a LOCA. The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.

This SR allows power to be supplied to the motor operated isolation valves when RCS pressure is less than or equal to 1000 psig, thus allowing the valves to be closed to enable plant shutdown without discharging the accumulators into the RCS.

REFERENCES

1. FSAR, Chapter 6.
2. 10 CFR 50.46.
3. FSAR, Chapter 15.
4. GL 93-05, Item 7.1.
5. DCM S-38A.
6. License Amendment 147/147, May 3, 2001.
7. WCAP-15049-A, Rev 1, April, 1999.

B 3.5 EMERGENCY CORE COOLING SYSTEMS (ECCS)

B 3.5.2 ECCS - Operating

BASES

BACKGROUND

The function of the ECCS is to provide core cooling and negative reactivity to ensure that the reactor core is protected after any of the following accidents:

a. Loss of coolant accident (LOCA), non-isolable coolant leakage greater than the capability of the normal charging system;

b. Rod ejection accident;

c. Loss of secondary coolant accident, including uncontrolled steam release or loss of feedwater; and

d. Steam generator tube rupture (SGTR).

The addition of negative reactivity is designed primarily for the loss of secondary coolant accident where primary cooldown could add enough positive reactivity to achieve criticality and return to significant power.

The ECCS consists of three separate subsystems: centrifugal charging (high head), safety injection (SI) (intermediate head), and residual heat removal (RHR) (low head). Each subsystem consists of two redundant, 100% capacity trains. The ECCS accumulators and the Refueling Water Storage Tank (RWST) are also part of the ECCS, but are not considered part of an ECCS flow path as described by this LCO.

The ECCS components are divided into two trains, A and B. The following are the train assignments for the ECCS pumps.

Train A:	RHR Pump 2 SI Pump 1 Centrifugal Charging Pump (CCP) 1	Train B:	RHR Pump 1 SI Pump 2 Centrifugal Charging Pump (CCP) 2

The ECCS flow paths consist of piping, valves, heat exchangers, and pumps such that water from the RWST can be injected into the RCS following the accidents described in this LCO. The major components of each subsystem are the CCPs, the RHR pumps, heat exchangers, and the SI pumps.

Each of the three subsystems consists of two 100% capacity trains that are interconnected and redundant such that either train is capable of supplying 100% of the flow required to mitigate the accident consequences. This interconnecting and redundant subsystem design provides the operators with the ability to utilize components from opposite trains to achieve the required 100% flow to the core.

(continued)

BASES

BACKGROUND (continued)

The containment recirculation sump consists of a front strainer section anchored at El, 91' and a second rear strainer section at El 88'. Each of the strainer sections is made up of a series of plenums which are connected together to form a central supply chamber and connected at the entry to each of the two 14" RHR pump suction lines through interconnecting chambers. Into these plenums are installed disks which comprise the actual strainer surfaces. The entire strainer system is designed to filter out any material greater than 3/32" in diameter. The trash rack extends around the sides and top portion of the strainer located outside the sump to protect the strainer sections from damage due to traffic during outages.

There are three phases of ECCS operation following a LOCA: injection, cold leg recirculation, and hot leg recirculation. In the injection phase, water is taken from the RWST and injected into the Reactor Coolant System (RCS) through the cold legs. When sufficient water is removed from the RWST to ensure that enough boron has been added to maintain the reactor subcritical and the containment recirculation sump has enough water to supply the required net positive suction head to the RHR pumps, suction is switched to the containment recirculation sump for cold leg recirculation. After several hours, the ECCS operation is shifted to the hot leg recirculation phase to provide reverse flow through the core to backflush out the high boron concentration that could result from core boiling after a cold leg break.

During the injection phase of LOCA recovery, a suction header supplies water from the RWST to the ECCS pumps. The RWST header supplies separate piping for each subsystem. The discharge from the CCPs combines in a common header and then divides again into four supply lines, each of which feeds the injection line to one RCS cold leg. The discharge from the SI and RHR pumps divides and feeds an injection line to each of the RCS cold legs. Throttle/runout valves are set to balance the flow to the RCS. The throttle/runout valves also protect the SI and CCPs from exceeding their runout flow limits. This balance ensures sufficient flow to the core to meet the analysis assumptions following a LOCA in one of the RCS cold legs.

For LOCAs that are too small to depressurize the RCS below the shutoff head of the SI pumps, the CCPs supply water until the RCS pressure decreases below the SI pump shutoff head. During this period, the steam generators are used to provide part of the core cooling function.

(continued)

BASES

BACKGROUND (continued)

During the recirculation phase of LOCA recovery, RHR pump suction is transferred to the containment recirculation sump. The RHR pumps then supply the other ECCS pumps. Initially, recirculation discharge is through the same paths as the injection phase to the cold legs. Subsequently, recirculation provides injection to both the hot and cold legs.

The centrifugal charging subsystem of the ECCS also functions to supply borated water to the reactor core following increased heat removal events, such as a main steam line break (MSLB). The limiting design conditions occur when the negative moderator temperature coefficient is highly negative, such as at the end of each cycle.

During low temperature conditions in the RCS, limitations are placed on the maximum number of ECCS pumps that may be OPERABLE. Refer to the Bases for LCO 3.4.12, "Low Temperature Overpressure Protection (LTOP) System," for the basis of these requirements.

The ECCS subsystems are actuated upon receipt of an SI signal. The actuation of safeguard loads is accomplished in a programmed time sequence. If offsite power is available, the safeguard loads start after a one second sequencer delay in the programmed time sequence. If offsite power is not available, the Engineered Safety Feature (ESF) buses shed normal operating loads and are connected to the emergency diesel generators (EDGs). Safeguard loads are then actuated in the programmed time sequence. The time delay associated with diesel starting, sequenced loading, and pump starting determines the time required before pumped flow is available to the core following a LOCA.

Each ECCS pump is provided with normally open miniflow lines for pump protection. The RHR miniflow isolation valves close on flow to the RCS and have a time delay to prevent them from closing until the RHR pumps are up to speed and capable of delivering fluid to the RCS. The SI pump miniflow isolation valves are closed manually from the control room prior to transfer from injection to recirculation. The CCP miniflow isolation valves are also closed manually from the control room prior to transfer from injection to recirculation.

The active ECCS components, along with the passive accumulators and the RWST covered in LCO 3.5.1, "Accumulators," and LCO 3.5.4, "Refueling Water Storage Tank (RWST)," provide the cooling water necessary to meet GDC 35 (Ref. 1).

(continued)

BASES (continued)

APPLICABLE SAFETY ANALYSES

The LCO helps to ensure that the following acceptance criteria for the ECCS, established by 10 CFR 50.46 (Ref. 2), will be met following a LOCA:

a. Maximum fuel element cladding temperature is ≤ 2200°F;

b. Maximum cladding oxidation is ≤ 0.17 times the total cladding thickness before oxidation;

c. Maximum hydrogen generation from a zirconium water reaction is ≤ 0.01 times the hypothetical amount generated if all of the metal in the cladding cylinders surrounding the fuel, excluding the cladding surrounding the plenum volume, were to react;

d. Core is maintained in a coolable geometry; and

e. Adequate long term core cooling capability is maintained.

The LCO also limits the potential for a post-trip return to power following an MSLB event and ensures that containment temperature limits are met.

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BASES

APPLICABLE SAFETY ANALYSES (continued)

Each ECCS subsystem is taken credit for in a large break LOCA event at full power (Refs. 3 and 4). This event establishes the requirement to limit runout flow for the ECCS pumps, as well as the maximum response time for their actuation. The centrifugal charging pumps and SI pumps are credited in the injection phase for mitigation of a small break LOCA event. This event establishes the flow and discharge head for the design point of the CCPs. The SGTR and MSLB events also credit the CCPs. The OPERABILITY requirements for the ECCS are based on the following LOCA analysis assumptions:

a. A large break LOCA event, with loss of offsite power and a single failure disabling one RHR pump (all EDG trains are assumed to operate due to requirements for modeling full active containment heat removal system operation); and

b. A small break LOCA event, with a loss of offsite power and a single failure disabling one ECCS train.

During the blowdown stage of a LOCA, the RCS depressurizes as primary coolant is ejected through the break into the containment. The nuclear reaction is terminated either by moderator voiding during large breaks or control rod insertion for small breaks. Following depressurization, emergency cooling water is injected into the cold legs, flows into the downcomer, fills the lower plenum, and refloods the core.

The effects on containment mass and energy releases are accounted for in appropriate analyses (Refs. 3 and 4). The LCO ensures that an ECCS train will deliver sufficient water to match boiloff rates soon enough to minimize the consequences of the core being uncovered following a large break LOCA. It also ensures that the centrifugal charging and SI pumps will deliver sufficient water and boron during a small break LOCA to maintain core subcriticality. For smaller break LOCAs, the centrifugal charging pump delivers sufficient fluid to maintain RCS inventory. For a small break LOCA, the steam generators continue to serve as the heat sink, providing part of the required core cooling.

The ECCS trains satisfy Criterion 3 of 10 CFR 50.36(c)(2)(ii).

(continued)

BASES (continued)

LCO

In MODES 1, 2, and 3, two independent (and redundant) ECCS trains are required to ensure that sufficient ECCS flow is available, assuming a single failure affecting either train. Additionally, individual components within the ECCS trains may be called upon to mitigate the consequences of other transients and accidents.

In MODES 1, 2, and 3, an ECCS train consists of a centrifugal charging subsystem, an SI subsystem, and an RHR subsystem. Each train includes the piping, instruments, and controls to ensure an OPERABLE flow path capable of taking suction from the RWST upon an SI signal. During an event requiring ECCS actuation, a flow path is required to provide an abundant supply of water from the RWST to the RCS via the ECCS pumps and their respective supply headers to each of the four cold legs. The ECCS suction is manually transferred to the containment recirculation sump to place the system in the recirculation mode of operation to supply its flow to the RCS hot and cold legs. During the recirculation operation, the RHR pumps provide suction to the charging and SI pumps.

The containment recirculation sump is considered OPERABLE when all the following conditions are met:

- All strainer disks are bolted in or blanks are installed.
- No structural distress that could impair strainer/trash rack function.
- Covers to all 13 access ports to the strainer system are installed.
- The two expansion joints connecting the rear strainer plenums to the pipe structure are intact.
- Lower plenum drain valve (SI-1-294 for Unit 1 or SI-2-295 for Unit 2) is closed, or the pipe cap or inlet strainer (STR-440) is installed.

During recirculation operation, the flow path for each train must maintain its designed independence to ensure that no single failure can disable both ECCS trains.

(continued)

BASES (continued)

APPLICABILITY

In MODES 1, 2, and 3, the ECCS OPERABILITY requirements for the limiting Design Basis Accident, a large break LOCA, are based on full power operation. Although reduced power would not require the same level of performance, the accident analysis does not provide for reduced cooling requirements in the lower MODES. The centrifugal charging pump performance is based on a small break LOCA, which establishes the pump performance curve and has less dependence on power. The SI pump performance requirements are based on a small break LOCA. MODE 2 and MODE 3 requirements are bounded by the MODE 1 analysis.

This LCO is only applicable in MODE 3 and above. Below MODE 3, the SI signal setpoint is manually bypassed by operator control, and system functional requirements are relaxed as described in LCO 3.5.3, "ECCS—Shutdown."

As indicated in the Note, the flow path may be isolated for 2 hours in MODE 3, under controlled conditions, to perform pressure isolation valve testing per SR 3.4.14.1. In MODES 5 and 6, plant conditions are such that the probability of an event requiring ECCS injection is extremely low. Core cooling requirements in MODE 5 are addressed by LCO 3.4.7, "RCS Loops—MODE 5, Loops Filled," and LCO 3.4.8, "RCS Loops—MODE 5, Loops Not Filled." MODE 6 core cooling requirements are addressed by LCO 3.9.5, "Residual Heat Removal (RHR) and Coolant Circulation—High Water Level," and LCO 3.9.6, "Residual Heat Removal (RHR) and Coolant Circulation—Low Water Level."

(continued)

BASES (continued)

ACTIONS

A.1

With one or more trains inoperable and at least 100% of the ECCS flow equivalent to a single OPERABLE ECCS train available (capable of injection into the RCS, if actuated), the inoperable components must be returned to OPERABLE status within 72 hours. The 72 hour Completion Time is based on an NRC reliability evaluation (Ref. 5) and is a reasonable time for repair of many ECCS components.

An ECCS train is inoperable if it is not capable of delivering design flow to the RCS. Individual components are inoperable if they are not capable of performing their safety function or supporting systems are not available.

The LCO requires the OPERABILITY of a number of independent subsystems. Due to the redundancy of trains and the diversity of subsystems, the inoperability of one component in a train does not render the ECCS incapable of performing its function. Neither does the inoperability of two different components, each in a different train, necessarily result in a loss of function for the ECCS. The intent of this Condition is to maintain a combination of equipment such that 100% of the ECCS flow equivalent to a single OPERABLE ECCS train remains available. (i.e. minimum of one OPERABLE CCP, SI, and RHR pump and applicable flow paths capable of drawing from the RWST and injecting into the RCS cold legs). This allows increased flexibility in plant operations under circumstances when components in opposite trains are inoperable.

The intent of this Condition, to maintain a combination of equipment such that 100% of the ECCS flow equivalent to a single OPERABLE ECCS train remains available, applies to both the injection mode and the recirculation mode.

An event accompanied by a loss of offsite power and the failure of an EDG can disable one ECCS train until power is restored. A reliability analysis (Ref. 5) has shown that the impact of having one full ECCS train inoperable is sufficiently small to justify continued operation for 72 hours.

Reference 6 describes situations in which one component, such as an RHR cross-tie valve can disable both ECCS trains. With one or more component(s) inoperable such that 100% of the flow equivalent to a

(continued)

BASES

ACTIONS

A.1 (continued)

single OPERABLE ECCS train is not available, the facility is in a condition outside the accident analysis. Therefore, LCO 3.0.3 must be immediately entered.

Opening the containment recirculation sump strainer system access ports, or lower plenum drain valve (SI-1-294 for Unit 1 or SI-2-295 for Unit 2) without pipe cap or inlet strainer (STR-440) installed in MODES 1 through 3 is considered to be a condition which is outside the accident analysis. Therefore, LCO 3.0.3 must be immediately entered.

A.2.1, A.2.2, and A.2.3

These Required Actions allow restoring one inoperable ECCS train with no more than one inoperable subsystem to OPERABLE status with a CT of 14 days if it is determined that only one subsystem in one ECCS train is inoperable and that the OPERABLE subsystem is not inoperable due to common cause failure. The common cause failure investigation shall be associated with the subsystem failure that prompts the ECCS subsystem to be declared inoperable originally. The common cause failure evaluation can be performed by analyses, inspection, and/or testing. The addition of these Required Actions into this TS was per LA 202 for Unit 1 and LA 203 for Unit 2. The 14-day CT is intended to be used for unplanned corrective maintenance or inspections.

The justification to extend the CT to 14 days is based on risk-informed insight where the evaluation would meet the NRC risk informed criteria assuming only one subsystem in one ECCS train is inoperable and with the elimination of conditional failure probability of the redundant ECCS subsystem due to common cause failure. PRA analysis assumes no more than one subsystem in one ECCS train is inoperable. The PRA risk-insignificance thresholds are not met for the14-day Completion Time when a RHR subsystem component is found to be inoperable as a result of a higher conditional failure probability of the redundant component due to common cause failure. To comply with the assumption in the PRA analysis that only one subsystem in one ECCS train is inoperable and to eliminate the common cause failure concerns, the 14-day Completion Time assumes that actions are to be taken within 72 hours to determine that there is only one subsystem in one ECCS train inoperable and there is no common cause failure in the same subsystem in the OPERABLE ECCS train.

(continued)

BASES

ACTIONS

A.2.1, A.2.2, and A.2.3 (continued)

The 72-hour Completion Time in Required Actions A.2.1 and A.2.2 are reasonable and is chosen so that the risk is no worse than the risk associated with the 72 hour Completion Time for Required Action A.1. The Completion Time is modified by a Note stating that the Required Action A.1 Completion Time is to be used for planned maintenance or inspections. The Completion Times of Required Actions A.2.1, A.2.2, and A.2.3 are for unplanned corrective maintenance or inspections. This is to prevent accumulating excessive Maintenance Rule unavailability hours.

B.1 and B.2

If the inoperable trains cannot be returned 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 MODE 3 within 6 hours and MODE 4 within 12 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 3.5.2.1

Verification of proper valve position ensures that the flow path from the ECCS pumps to the RCS is maintained. Valve position is the concern and not indicated position in the control room. Misalignment of these valves could render both ECCS trains inoperable. Securing these valves in position by removal of power ensures that they cannot change position as a result of an active failure or be inadvertently misaligned. The surveillance can be satisfied using indicated position in the control room but may also be satisfied using local observation. These valves are of the type, described in References 6 and 7, that can disable the function of both ECCS trains and invalidate the accident analyses. The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program. As noted in LCO Note 1, both SI pump flow paths may each be isolated for two hours in MODE 3 by closure of one or more of these valves to perform pressure isolation valve testing.

In addition to the valves listed in SR 3.5.2.1, there are other ECCS related valves that must be appropriately positioned. Improper valve position can affect the ECCS performance required to meet the analysis assumptions. These valves are identified in plant documents and are listed in the following table.

(continued)

BASES

SURVEILLANCE REQUIREMENTS (continued)

ECCS Valve Position Table

Valve Number	Valve Function	Required Valve Position	MODES
8105	CCP 1 and 2 Recirc Line Isolation	Open	1, 2, 3
8106	CCP 1 and 2 Recirc Line Isolation	Open	1, 2, 3
8716A	RHR Cross-tie Line	Open	1, 2, 3
8716B	RHR Cross-tie Line	Open	1, 2, 3
9003A	RHR to Containment Spray	Closed	1, 2, 3
9003B	RHR to Containment Spray	Closed	1, 2, 3
8804A	RHR to CCP	Closed	1, 2, 3
8804B**	RHR to SI Pump	Closed	1, 2, 3
8741	RHR to RWST - Manual Valve	Closed	1, 2, 3
SI-1	RWST to ECCS - Manual Valve	Open	1, 2, 3, 4
8923A*	Train "A" SI Pump Suction Valve	Open	1, 2, 3

* Valve can be closed, but not when RHR Train "A" (containing RHR pump 2) is out of service. Closing this valve with RHR Train "A" out of service would result in both trains of ECCS being inoperable due to the ECCS piping configuration.

** 8804B may be opened, using administrative controls approved by PSRC, without entering TS 3.0.3, provided opening 8804B affects the OPERABILITY of only one ECCS subsystem.

SR 3.5.2.2

Verifying the correct alignment for manual, power operated, and automatic valves in the ECCS flow paths provides assurance that the proper flow paths will exist for ECCS operation. The ECCS flow paths consist of the direct flow paths from the fluid source (e.g., RWST, accumulator) to the supplied safety-related component (e.g., reactor vessel, pump) and portions of any branch line flow path off a direct flow path that a valve misposition could result in degradation of the system safety function. This SR does not apply to valves that are locked, sealed, or otherwise secured in position, since these were verified to be in the correct position prior to locking, sealing, or securing. This SR also does not apply to valves which are closed and secured by a cap or blind flange (e.g., manual test, vent, and drain valves), to valves that cannot be inadvertently misaligned (e.g., check valves), or to valves in instrument or sample lines. A valve that receives an actuation signal is allowed to be in a non-accident position provided the valve will automatically reposition within the proper stroke time. This Surveillance does not require any testing or valve manipulation. Rather, it involves verification that those valves capable of being mispositioned are in the correct position.

(continued)

BASES

SURVEILLANCE REQUIREMENTS

SR 3.5.2.2 (continued)

The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.

SR 3.5.2.3

With the exception of the operating CCP, the ECCS pumps are normally in a standby, nonoperating mode. As such, flow path piping has the potential to develop voids and pockets of entrained gases. Maintaining the piping from the ECCS pumps to the RCS full of water ensures that the system will perform properly, injecting its full capacity into the RCS upon demand. This will also prevent water hammer, pump cavitation, gas binding, and pumping of non-condensable gas (e.g., air, nitrogen, or hydrogen) into the reactor vessel following an SI signal or during shutdown cooling. The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.

The intent of the SR is to assure the ECCS piping is adequately vented. Different means of verification, as alternates to venting the accessible system high points, can be employed to provide this assurance, such as ultrasonic testing the vent lines of the ECCS pump casings and accessible high point vents.

SR 3.5.2.4

Periodic surveillance testing of ECCS pumps to detect gross degradation caused by impeller structural damage or other hydraulic component problems is required by the ASME Code. (Ref. 8) This type of testing may be accomplished by measuring the pump developed head at only one point of the pump characteristic curve. This verifies both that the measured performance is within an acceptable tolerance of the original pump baseline performance and that the performance at the test flow is within the performance assumed in the plant safety analysis. SRs are specified in the applicable portions of the Inservice Testing Program, which encompasses Subsection ISTB of the ASME Code for Operation and Maintenance of Nuclear Power Plants. (Ref. 8). This section of the ASME Code provides the activities and frequencies necessary to satisfy the requirements.

The following ECCS pumps are required to develop the indicated differential pressure when tested on recirculation flow:

CCP ≥ 2400 psid

SI pump ≥ 1455 psid

RHR pump ≥ 165 psid

(continued)

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.5.2.5 and SR 3.5.2.6

These Surveillances demonstrate that each automatic ECCS valve actuates to the required position on an actual or simulated SI signal and that each ECCS pump starts on receipt of an actual or simulated SI signal. This Surveillance is not required for valves that are locked, sealed, or otherwise secured in the required position under administrative controls. The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program. The actuation logic is tested as part of ESF Actuation System testing, and equipment performance is monitored as part of the Inservice Testing Program.

SR 3.5.2.7

The correct position of throttle/runout valves in the ECCS flow paths is necessary for proper ECCS performance. These manual throttle/runout valves are positioned during flow balancing and have mechanical locks and seals to ensure that the proper positioning for restricted flow to a ruptured cold leg is maintained. The verification of proper position of a throttle/runout valve can be accomplished by confirming the seals have not been altered since the last performance of the flow balance test. Restricting the flow to a ruptured cold leg ensures that the other cold legs receive at least the required minimum flow. The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.

SR 3.5.2.8

Periodic inspections of the containment recirculation sump suction inlet ensure that it is unrestricted and stays in proper operating condition. The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.

Opening the containment recirculation sump strainer system access ports, or lower plenum drain valve (SI-1-294 for Unit 1 or SI-2-295 for Unit 2) without pipe cap or inlet strainer (STR-440) installed in MODES 1 through 4 is considered to be a condition which is outside the accident analysis. Therefore, LCO 3.0.3 must be immediately entered.

(continued)

BASES

REFERENCES

1. 10 CFR 50, Appendix A, GDC 35.
2. 10 CFR 50.46.
3. FSAR, Sections 6.3 and 7.3.
4. FSAR, Chapter 15, "Accident Analysis."
5. NRC Memorandum to V. Stello, Jr., from R.L. Baer, "Recommended Interim Revisions to LCOs for ECCS Components," December 1, 1975.
6. IE Information Notice No. 87-01.
7. BTP EICSB-18, Application of the Single Failure Criteria to Manually-Controlled Electrically-Operated Valves.
8. ASME Code for Operation and Maintenance of Nuclear Power Plants, 2001 Edition including 2002 and 2003 Addenda.
9. Design Changes DCP C-49857 (Unit 1), DCP C-50857 (Unit 2).
10. License Amendment 202/203, December 31, 2008.