

MANUAL HARD COPY DISTRIBUTION  
DOCUMENT TRANSMITTAL 2022-7683

---

USER INFORMATION:

GERLACH\*ROSEY M            EMPL#:028401    CA#: 0363

Address: NUCSA2

Phone#: 542-3194

TRANSMITTAL INFORMATION:

TO:    GERLACH\*ROSEY M            06/10/2022

LOCATION: USNRC

FROM: NUCLEAR RECORDS DOCUMENT CONTROL CENTER (NUCSA-2)

THE FOLLOWING CHANGES HAVE OCCURRED TO THE HARDCOPY OR ELECTRONIC MANUAL ASSIGNED TO YOU. HARDCOPY USERS MUST ENSURE THE DOCUMENTS PROVIDED MATCH THE INFORMATION ON THIS TRANSMITTAL. WHEN REPLACING THIS MATERIAL IN YOUR HARDCOPY MANUAL, ENSURE THE UPDATE DOCUMENT ID IS THE SAME DOCUMENT ID YOU'RE REMOVING FROM YOUR MANUAL. TOOLS FROM THE HUMAN PERFORMANCE TOOL BAG SHOULD BE UTILIZED TO ELIMINATE THE CHANCE OF ERRORS.

ATTENTION: "REPLACE" directions do not affect the Table of Contents, Therefore no TOC will be issued with the updated material.

TSB2 - TECHNICAL SPECIFICATIONS BASES UNIT 2 MANUAL

REMOVE MANUAL TABLE OF CONTENTS    DATE: 05/24/2022

ADD    MANUAL TABLE OF CONTENTS    DATE: 06/09/2022

CATEGORY: DOCUMENTS    TYPE: TSB2

A001  
NRR

ID: TEXT 3.3.8.1  
ADD: REV: 6

REMOVE: REV:5

CATEGORY: DOCUMENTS TYPE: TSB2

ID: TEXT 3.5.1  
REMOVE: REV:7

ADD: REV: 8

CATEGORY: DOCUMENTS TYPE: TSB2

ID: TEXT 3.5.2  
ADD: REV: 7

REMOVE: REV:6

CATEGORY: DOCUMENTS TYPE: TSB2

ID: TEXT 3.7.1  
REMOVE: REV:8

ADD: REV: 9

CATEGORY: DOCUMENTS TYPE: TSB2

ID: TEXT 3.7.2  
ADD: REV: 5

REMOVE: REV:4

ANY DISCREPANCIES WITH THE MATERIAL PROVIDED, CONTACT DCS @ X3171 OR X3194 FOR ASSISTANCE. UPDATES FOR HARDCOPY MANUALS WILL BE DISTRIBUTED WITHIN 3 DAYS IN ACCORDANCE WITH DEPARTMENT PROCEDURES. PLEASE MAKE ALL CHANGES AND ACKNOWLEDGE COMPLETE IN YOUR NIMS INBOX UPON COMPLETION OF UPDATES. FOR ELECTRONIC MANUAL

USERS, ELECTRONICALLY REVIEW THE APPROPRIATE DOCUMENTS AND ACKNOWLEDGE COMPLETE IN YOUR NIMS INBOX.

# SSES MANUAL

Manual Name: TSB2

Manual Title: TECHNICAL SPECIFICATIONS BASES UNIT 2 MANUAL

## Table Of Contents

Issue Date: 06/09/2022

<u>Procedure Name</u>	<u>Rev</u>	<u>Issue Date</u>	<u>Change ID</u>	<u>Change Number</u>
TEXT LOES	138	01/03/2019		
Title: LIST OF EFFECTIVE SECTIONS				
TEXT TOC	25	03/05/2019		
Title: TABLE OF CONTENTS				
TEXT 2.1.1	6	03/31/2021		
Title: SAFETY LIMITS (SLS) REACTOR CORE SLS				
TEXT 2.1.2	1	10/04/2007		
Title: SAFETY LIMITS (SLS) REACTOR COOLANT SYSTEM (RCS) PRESSURE SL				
TEXT 3.0	5	03/18/2021		
Title: LIMITING CONDITION FOR OPERATION (LCO) APPLICABILITY				
TEXT 3.1.1	2	03/31/2021		
Title: REACTIVITY CONTROL SYSTEMS SHUTDOWN MARGIN (SDM)				
TEXT 3.1.2	0	11/18/2002		
Title: REACTIVITY CONTROL SYSTEMS REACTIVITY ANOMALIES				
TEXT 3.1.3	3	11/16/2016		
Title: REACTIVITY CONTROL SYSTEMS CONTROL ROD OPERABILITY				
TEXT 3.1.4	5	11/16/2016		
Title: REACTIVITY CONTROL SYSTEMS CONTROL ROD SCRAM TIMES				
TEXT 3.1.5	2	11/16/2016		
Title: REACTIVITY CONTROL SYSTEMS CONTROL ROD SCRAM ACCUMULATORS				
TEXT 3.1.6	5	03/31/2021		
Title: REACTIVITY CONTROL SYSTEMS ROD PATTERN CONTROL				

# SSES MANUAL

Manual Name: TSB2

Manual Title: TECHNICAL SPECIFICATIONS BASES UNIT 2 MANUAL

TEXT 3.1.7 4 11/16/2016  
Title: REACTIVITY CONTROL SYSTEMS STANDBY LIQUID CONTROL (SLC) SYSTEM

TEXT 3.1.8 4 11/16/2016  
Title: REACTIVITY CONTROL SYSTEMS SCRAM DISCHARGE VOLUME (SDV) VENT AND DRAIN VALVES

TEXT 3.2.1 6 03/31/2021  
Title: POWER DISTRIBUTION LIMITS AVERAGE PLANAR LINEAR HEAT GENERATION RATE (APLHGR)

TEXT 3.2.2 5 03/31/2021  
Title: POWER DISTRIBUTION LIMITS MINIMUM CRITICAL POWER RATIO (MCPD)

TEXT 3.2.3 4 03/31/2021  
Title: POWER DISTRIBUTION LIMITS LINEAR HEAT GENERATION RATE LHGR

TEXT 3.3.1.1 6 11/16/2016  
Title: INSTRUMENTATION REACTOR PROTECTION SYSTEM (RPS) INSTRUMENTATION

TEXT 3.3.1.2 4 01/23/2018  
Title: INSTRUMENTATION SOURCE RANGE MONITOR (SRM) INSTRUMENTATION

TEXT 3.3.2.1 4 11/16/2016  
Title: INSTRUMENTATION CONTROL ROD BLOCK INSTRUMENTATION

TEXT 3.3.2.2 3 11/16/2016  
Title: INSTRUMENTATION FEEDWATER - MAIN TURBINE HIGH WATER LEVEL TRIP INSTRUMENTATION

TEXT 3.3.3.1 9 11/16/2016  
Title: INSTRUMENTATION POST ACCIDENT MONITORING (PAM) INSTRUMENTATION

TEXT 3.3.3.2 2 11/16/2016  
Title: INSTRUMENTATION REMOTE SHUTDOWN SYSTEM

TEXT 3.3.4.1 2 11/16/2016  
Title: INSTRUMENTATION END OF CYCLE RECIRCULATION PUMP TRIP (EOC-RPT) INSTRUMENTATION

# SSES MANUAL

Manual Name: TSB2

Manual Title: TECHNICAL SPECIFICATIONS BASES UNIT 2 MANUAL

TEXT 3.3.4.2 1 11/16/2016  
Title: INSTRUMENTATION ANTICIPATED TRANSIENT WITHOUT SCRAM RECIRCULATION PUMP TRIP (ATWS-RPT) INSTRUMENTATION

TEXT 3.3.5.1 7 03/05/2019  
Title: INSTRUMENTATION EMERGENCY CORE COOLING SYSTEM (ECCS) INSTRUMENTATION

TEXT 3.3.5.2 3 03/18/2021  
Title: REACTOR PRESSURE VESSEL (RPV) WATER INVENTORY CONTROL INSTRUMENTATION

TEXT 3.3.5.3 0 03/05/2019  
Title: INSTRUMENTATION REACTOR CORE ISOLATION COOLING (RCIC) SYSTEM INSTRUMENTATION (PREVIOUSLY TEXT 3.3.5.2 REVISION 1)

TEXT 3.3.6.1 9 03/05/2019  
Title: INSTRUMENTATION PRIMARY CONTAINMENT ISOLATION INSTRUMENTATION

TEXT 3.3.6.2 6 03/05/2019  
Title: INSTRUMENTATION SECONDARY CONTAINMENT ISOLATION INSTRUMENTATION

TEXT 3.3.7.1 4 03/05/2019  
Title: INSTRUMENTATION CONTROL ROOM EMERGENCY OUTSIDE AIR SUPPLY (CREOAS) SYSTEM INSTRUMENTATION

TEXT 3.3.8.1 6 06/09/2022  
Title: INSTRUMENTATION LOSS OF POWER (LOP) INSTRUMENTATION

TEXT 3.3.8.2 1 11/16/2016  
Title: INSTRUMENTATION REACTOR PROTECTION SYSTEM (RPS) ELECTRIC POWER MONITORING

TEXT 3.4.1 6 03/31/2021  
Title: REACTOR COOLANT SYSTEM (RCS) RECIRCULATION LOOPS OPERATING

TEXT 3.4.2 4 11/16/2016  
Title: REACTOR COOLANT SYSTEM (RCS) JET PUMPS

TEXT 3.4.3 3 01/13/2012  
Title: REACTOR COOLANT SYSTEM (RCS) SAFETY/RELIEF VALVES (S/RVS)

## SSSES MANUAL

Manual Name: TSB2

Manual Title: TECHNICAL SPECIFICATIONS BASES UNIT 2 MANUAL

TEXT 3.4.4 1 11/16/2016  
Title: REACTOR COOLANT SYSTEM (RCS) RCS OPERATIONAL LEAKAGE

TEXT 3.4.5 3 03/10/2010  
Title: REACTOR COOLANT SYSTEM (RCS) RCS PRESSURE ISOLATION VALVE (PIV) LEAKAGE

TEXT 3.4.6 5 11/16/2016  
Title: REACTOR COOLANT SYSTEM (RCS) RCS LEAKAGE DETECTION INSTRUMENTATION

TEXT 3.4.7 3 11/16/2016  
Title: REACTOR COOLANT SYSTEM (RCS) RCS SPECIFIC ACTIVITY

TEXT 3.4.8 3 11/16/2016  
Title: REACTOR COOLANT SYSTEM (RCS) RESIDUAL HEAT REMOVAL (RHR) SHUTDOWN COOLING SYSTEM  
- HOT SHUTDOWN

TEXT 3.4.9 2 11/16/2016  
Title: REACTOR COOLANT SYSTEM (RCS) RESIDUAL HEAT REMOVAL (RHR) SHUTDOWN COOLING SYSTEM  
- COLD SHUTDOWN

TEXT 3.4.10 6 05/14/2019  
Title: REACTOR COOLANT SYSTEM (RCS) RCS PRESSURE AND TEMPERATURE (P/T) LIMITS

TEXT 3.4.11 1 11/16/2016  
Title: REACTOR COOLANT SYSTEM (RCS) REACTOR STEAM DOME PRESSURE

TEXT 3.5.1 8 06/09/2022  
Title: EMERGENCY CORE COOLING SYSTEMS (ECCS) REACTOR PRESSURE VESSEL (RPV) WATER  
INVENTORY CONTROL AND REACTOR CORE ISOLATION COOLING (RCIC) SYSTEM ECCS  
OPERATING

TEXT 3.5.2 7 06/09/2022  
Title: EMERGENCY CORE COOLING SYSTEMS (ECCS) REACTOR PRESSURE VESSEL (RPV) WATER  
INVENTORY CONTROL AND REACTOR CORE ISOLATION COOLING (RCIC) SYSTEM ECCS  
OPERATING

TEXT 3.5.3 6 03/05/2019  
Title: EMERGENCY CORE COOLING SYSTEMS (ECCS) REACTOR PRESSURE VESSEL (RPV) WATER  
INVENTORY CONTROL AND REACTOR CORE ISOLATION COOLING (RCIC) SYSTEM ECCS  
OPERATING

# SSSES MANUAL

Manual Name: TSB2

Manual Title: TECHNICAL SPECIFICATIONS BASES UNIT 2 MANUAL

TEXT 3.6.1.1	6	11/16/2016	Title: PRIMARY CONTAINMENT
TEXT 3.6.1.2	2	11/16/2016	Title: CONTAINMENT SYSTEMS PRIMARY CONTAINMENT AIR LOCK
TEXT 3.6.1.3	19	03/18/2021	Title: CONTAINMENT SYSTEMS PRIMARY CONTAINMENT ISOLATION VALVES (PCIVS)
TEXT 3.6.1.4	2	11/16/2016	Title: CONTAINMENT SYSTEMS CONTAINMENT PRESSURE
TEXT 3.6.1.5	2	11/16/2016	Title: CONTAINMENT SYSTEMS DRYWELL AIR TEMPERATURE
TEXT 3.6.1.6	1	11/16/2016	Title: CONTAINMENT SYSTEMS SUPPRESSION CHAMBER-TO-DRYWELL VACUUM BREAKERS
TEXT 3.6.2.1	3	11/16/2016	Title: CONTAINMENT SYSTEMS SUPPRESSION POOL AVERAGE TEMPERATURE
TEXT 3.6.2.2	2	03/05/2019	Title: CONTAINMENT SYSTEMS SUPPRESSION POOL WATER LEVEL
TEXT 3.6.2.3	2	11/16/2016	Title: CONTAINMENT SYSTEMS RESIDUAL HEAT REMOVAL (RHR) SUPPRESSION POOL COOLING
TEXT 3.6.2.4	1	11/16/2016	Title: CONTAINMENT SYSTEMS RESIDUAL HEAT REMOVAL (RHR) SUPPRESSION POOL SPRAY
TEXT 3.6.3.1	2	06/13/2006	Title: CONTAINMENT SYSTEMS INTENTIONALLY LEFT BLANK
TEXT 3.6.3.2	4	08/02/2021	Title: CONTAINMENT SYSTEMS DRYWELL AIR FLOW SYSTEM



## SSSES MANUAL

Manual Name: TSB2

Manual Title: TECHNICAL SPECIFICATIONS BASES UNIT 2 MANUAL

TEXT 3.8.1	16	05/26/2021	Title: ELECTRICAL POWER SYSTEMS AC SOURCES - OPERATING
TEXT 3.8.2	2	03/18/2021	Title: ELECTRICAL POWER SYSTEMS AC SOURCES - SHUTDOWN
TEXT 3.8.3	7	08/07/2019	Title: ELECTRICAL POWER SYSTEMS DIESEL FUEL OIL LUBE OIL AND STARTING AIR
TEXT 3.8.4	4	11/16/2016	Title: ELECTRICAL POWER SYSTEMS DC SOURCES - OPERATING
TEXT 3.8.5	2	03/05/2019	Title: ELECTRICAL POWER SYSTEMS DC SOURCES - SHUTDOWN
TEXT 3.8.6	2	11/16/2016	Title: ELECTRICAL POWER SYSTEMS BATTERY CELL PARAMETERS
TEXT 3.8.7	8	01/17/2022	Title: ELECTRICAL POWER SYSTEMS DISTRIBUTION SYSTEMS - OPERATING
TEXT 3.8.8	2	03/05/2019	Title: ELECTRICAL POWER SYSTEMS DISTRIBUTION SYSTEMS - SHUTDOWN
TEXT 3.9.1	1	11/16/2016	Title: REFUELING OPERATIONS REFUELING EQUIPMENT INTERLOCKS
TEXT 3.9.2	2	11/16/2016	Title: REFUELING OPERATIONS REFUEL POSITION ONE-ROD-OUT INTERLOCK
TEXT 3.9.3	1	11/16/2016	Title: REFUELING OPERATIONS CONTROL ROD POSITION
TEXT 3.9.4	0	11/18/2002	Title: REFUELING OPERATIONS CONTROL ROD POSITION INDICATION

## SSES MANUAL

Manual Name: TSB2

Manual Title: TECHNICAL SPECIFICATIONS BASES UNIT 2 MANUAL

TEXT 3.9.5	1	11/16/2016	Title: REFUELING OPERATIONS CONTROL ROD OPERABILITY - REFUELING
TEXT 3.9.6	2	11/16/2016	Title: REFUELING OPERATIONS REACTOR PRESSURE VESSEL (RPV) WATER LEVEL
TEXT 3.9.7	1	11/16/2016	Title: REFUELING OPERATIONS RESIDUAL HEAT REMOVAL (RHR) - HIGH WATER LEVEL
TEXT 3.9.8	1	11/16/2016	Title: REFUELING OPERATIONS RESIDUAL HEAT REMOVAL (RHR) - LOW WATER LEVEL
TEXT 3.10.1	2	03/05/2019	Title: SPECIAL OPERATIONS INSERVICE LEAK AND HYDROSTATIC TESTING OPERATION
TEXT 3.10.2	1	11/16/2016	Title: SPECIAL OPERATIONS REACTOR MODE SWITCH INTERLOCK TESTING
TEXT 3.10.3	1	11/16/2016	Title: SPECIAL OPERATIONS SINGLE CONTROL ROD WITHDRAWAL - HOT SHUTDOWN
TEXT 3.10.4	1	11/16/2016	Title: SPECIAL OPERATIONS SINGLE CONTROL ROD WITHDRAWAL - COLD SHUTDOWN
TEXT 3.10.5	1	11/16/2016	Title: SPECIAL OPERATIONS SINGLE CONTROL ROD DRIVE (CRD) REMOVAL - REFUELING
TEXT 3.10.6	1	11/16/2016	Title: SPECIAL OPERATIONS MULTIPLE CONTROL ROD WITHDRAWAL - REFUELING
TEXT 3.10.7	2	03/31/2021	Title: SPECIAL OPERATIONS CONTROL ROD TESTING - OPERATING
TEXT 3.10.8	4	03/31/2021	Title: SPECIAL OPERATIONS SHUTDOWN MARGIN (SDM) TEST - REFUELING

## B 3.3 INSTRUMENTATION

### B 3.3.8.1 Loss of Power (LOP) Instrumentation

#### BASES

---

#### BACKGROUND

Successful operation of the required safety functions of the Emergency Core Cooling Systems (ECCS) is dependent upon the availability of adequate power sources for energizing the various components such as pump motors, motor operated valves, and the associated control components. The LOP instrumentation monitors the 4.16 kV emergency buses. Offsite power is the preferred source of power for the 4.16 kV emergency buses. If the monitors determine that insufficient power is available, the buses are disconnected from the offsite power sources and connected to the onsite diesel generator (DG) power sources.

Each 4.16 kV emergency bus has its own independent LOP instrumentation and associated trip logic. The voltage for each bus is monitored at three levels, which can be considered as three different undervoltage Functions: Loss of Voltage (< 20%), 4.16 kV Emergency Bus Undervoltage Degraded Voltage LOCA (< 93%), and 4.16 kV Emergency Bus Undervoltage Low Setting (Degraded Voltage) (< 65%). Each Function, with the exception of the Loss of Voltage relays is monitored by two undervoltage relays for each emergency bus, whose outputs are arranged in a two-out-of-two logic configuration. The Loss of Voltage Function is monitored by one undervoltage relay for each emergency bus, whose output is arranged in a one-out-of-one logic configuration. When voltage degrades below the setpoint, the channel output relay actuates, which then outputs a LOP trip signal to the trip logic.

---

#### APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY

The LOP instrumentation is required for Engineered Safety Features to function in any accident with a loss of offsite power. The Unit 1 LOP instrumentation is required to be operable for Unit 2 when the associated Unit 1 4.16 kV emergency buses are required to be operable per Unit 2 T.S. 3.8.7 and 3.8.8. The required channels of LOP instrumentation ensure that the ECCS and other assumed systems powered from the DGs, provide plant protection in the event of any of the Reference 1 and 2 analyzed accidents in which a loss of offsite power is assumed. The initiation of the DGs on loss of offsite power, and subsequent initiation of the ECCS, ensure that the fuel peak cladding temperature remains below the limits of 10 CFR 50.46.

BASES

---

APPLICABLE  
SAFETY  
ANALYSES,  
LCO, and  
APPLICABILITY  
(continued)

Accident analyses credit the loading of the DG based on the loss of offsite power during a loss of coolant accident. The diesel starting and loading times have been included in the delay time associated with each safety system component requiring DG supplied power following a loss of offsite power.

The LOP instrumentation satisfies Criterion 3 of the NRC Policy Statement. (Ref. 3)

The OPERABILITY of the LOP instrumentation is dependent upon the OPERABILITY of the individual instrumentation channel Functions specified in Table 3.3.8.1-1. Each Function must have a required number of OPERABLE channels per 4.16 kV emergency bus, with their setpoints within the specified Allowable Values. A channel is inoperable if its actual trip setpoint is not within its required Allowable Value. The actual setpoint is calibrated consistent with applicable setpoint methodology assumptions.

The Allowable Values are specified for each Function in the Table. Trip setpoints are specified in the system calculations. The setpoints are selected to ensure that the setpoints do not exceed the Allowable Value. Operation with a trip setpoint less conservative than the nominal trip setpoint, but within the Allowable Value, is acceptable. Trip setpoints are those predetermined values of output at which an action should take place. The setpoints are compared to the actual process parameter (e.g., degraded voltage), and when the measured output value of the process parameter reaches the setpoint, the associated device changes state. The Allowable Values are derived from the limiting values of the process parameters obtained from the safety analysis. The trip setpoints are then derived based on engineering judgment.

The specific Applicable Safety Analyses, LCO, and Applicability discussions are listed below on a Function by Function basis.

1. 4.16 kV Emergency Bus Undervoltage (Loss of Voltage < 20%)

Loss of voltage on a 4.16 kV emergency bus indicates that offsite power may be completely lost to the respective emergency bus and is unable to supply sufficient power for proper operation of the applicable equipment. Therefore, the power supply to the bus is transferred from offsite power to DG power when the voltage on the bus drops below the Loss of Voltage Function Allowable Values (loss of voltage with a short time delay). This ensures that adequate power will be available to the required equipment.

BASES

APPLICABLE  
SAFETY  
ANALYSES,  
LCO, and  
APPLICABILITY  
(continued)

1. 4.16 kV Emergency Bus Undervoltage (Loss of Voltage < 20%)  
(continued)

The Bus Undervoltage Allowable Values are low enough to prevent inadvertent power supply transfer, but high enough to ensure that power is available to the required equipment. The Time Delay Allowable Values are long enough to provide time for the offsite power supply to recover to normal voltages, but short enough to ensure that power is available to the required equipment.

One channel of 4.16 kV Emergency Bus Undervoltage (Loss of Voltage) Function per associated emergency bus is required to be OPERABLE when the associated DG is required to be OPERABLE to ensure that no single instrument failure can preclude the DG function. 4.16 kV Emergency Bus Undervoltage (Loss of Voltage) relay controls and provides a permissive to allow closure of the associated alternate source breaker and the associated DG breaker. (one channel input to each of the four DGs.) Refer to LCO 3.8.1, "AC Sources—Operating," for Applicability Bases for the DGs.

2., 3. 4.16 kV Emergency Bus Undervoltage (Degraded Voltage)

A reduced voltage condition on a 4 kV emergency bus indicates that, while offsite power may not be completely lost to the respective emergency bus, available power may be insufficient for starting large ECCS motors without risking damage to the motors that could disable the ECCS function. Therefore, power supply to the bus is transferred from offsite power to onsite DG power when there is no offsite power or a degraded power supply to the bus. This transfer will occur only if the voltage of the primary and alternate power sources drop below the Degraded Voltage Function

Allowable Values (degraded voltage with a time delay) and the source breakers trip which causes the DG to start. This ensures that adequate power will be available to the required equipment.

Two Functions are provided to monitor degraded voltage at two different levels. These Functions are the Degraded Voltage LOCA (< 93%) and Degraded Voltage Low Setting (< 65%). These relays respond to degraded voltage as follows: 93% for approximately 5 minutes (when no LOCA signal is present) and approximately 10 seconds (with a LOCA signal present), and 65% (Degraded Voltage Low Setting). The Degraded Voltage LOCA Function preserves the assumptions of the LOCA analysis and the Degraded Voltage Low Setting Function preserves the assumptions of the accident sequence analysis in the FSAR. The circuitry is designed such that with the LOCA signal present, the non-LOCA time delay is physically bypassed.

---

BASES

---

APPLICABLE  
SAFETY  
ANALYSES,  
LCO, and  
APPLICABILITY  
(continued)

2., 3. 4.16 kV Emergency Bus Undervoltage (Degraded Voltage)  
(continued)

The Bus Undervoltage Allowable Values are low enough to prevent inadvertent power supply transfer, but high enough to ensure that sufficient power is available to the required equipment. The Time Delay Allowable Values are long enough to provide time for the offsite power supply to recover to normal voltages, but short enough to ensure that sufficient power is available to the required equipment.

Each 4.16 kV bus's LOP instrumentation (i.e., two channels of 4.16 kV Emergency Bus Undervoltage (Degraded Voltage) per Function (Functions 2 and 3)) is required to be OPERABLE when the associated DG is required to be OPERABLE. This ensures no single instrument failure can preclude the start of multiple DGs (each logic inputs to its respective 4.16 kV bus), thereby preserving the overall DG function. Refer to LCO 3.8.1 for Applicability Bases for the DGs.

---

ACTIONS

A Note has been provided to modify the ACTIONS related to LOP instrumentation channels. Section 1.3, Completion Times, specifies that once a Condition has been entered, subsequent divisions, subsystems, components, or variables expressed in the Condition, discovered to be inoperable or not within limits, will not result in separate entry into the Condition. Section 1.3 also specifies that Required Actions of the Condition continue to apply for each additional failure, with Completion Times based on initial entry into the Condition. However, the Required Actions for inoperable LOP instrumentation channels provide appropriate compensatory measures for separate inoperable channels. As such, a Note has been provided that allows separate Condition entry for each inoperable LOP instrumentation channel.

A.1

Required Action A.1 directs entry into the appropriate Condition referenced in Table 3.3.8.1-1 when LOP instrumentation channels are inoperable for reasons other than for the performance of SR 3.8.1.19 on Unit 1. The applicable Condition specified in the Table is Function dependent. Each time a channel associated with a Unit 1 4.16 kV ESS Bus since the Unit 1 4.16 kV ESS Buses power station common loads such as SGTS, CREOASS, and ESW or a Unit 2 4.16 ESS Bus is discovered inoperable, Condition A is entered for that channel and provides for transfer to the appropriate subsequent Condition.

BASES

---

ACTIONS  
(continued)

B.1

With one or more required channels on the Unit 1 4.16 kV ESS Buses in one Division for the performance of SR 3.8.1.19 in Unit 1 inoperable but not resulting in a loss of safety function, the remaining channels are capable of supporting the minimum safety functions necessary to shut down the reactor and maintain it in a safe shutdown condition, assuming no single failure. The overall reliability is reduced, however, because a single failure in the remaining channels could result in the minimum required ESF functions not being supported. Therefore, the required Unit 1 4.16 kV ESS Bus channels must be restored to OPERABLE status within 8 hours.

C.1

With one or more channels of a Function inoperable, the Function is not capable of performing the intended function. Therefore, only 1 hour is allowed to restore the inoperable channel to OPERABLE status. If the inoperable channel cannot be restored to OPERABLE status within the allowable out of service time, the channel must be placed in the tripped condition per Required Action C.1. Placing the inoperable channel in trip would conservatively compensate for the inoperability, restore capability to accommodate a single failure (within the LOP instrumentation), and allow operation to continue. Alternately, if it is not desired to place the channel in trip (e.g., as in the case where placing the channel in trip would result in a DG initiation), Condition E must be entered and its Required Action taken.

The Completion Time is intended to allow the operator time to evaluate and repair any discovered inoperabilities. The 1 hour Completion Time is acceptable because it minimizes risk while allowing time for restoration or tripping of channels.

D.1

With one channel of the Function inoperable, the Function is not capable of performing the intended function. Therefore, only 1 hour is allowed to restore the inoperable channel to OPERABLE status. If the inoperable channel cannot be restored to OPERABLE status within the allowable out of service time, Condition E must be entered and its Required Action taken.

The Completion Time is intended to allow the operator time to evaluate and repair any discovered inoperabilities. The 1 hour Completion Time is acceptable because it minimizes risk while allowing time for restoration of channels.

BASES

---

ACTIONS  
(continued)

E.1

If the Required Action and associated Completion Times of Conditions B, C, or D are not met, the associated Function is not capable of performing the intended function. Therefore, the associated DG(s) is declared inoperable immediately for Unit 2 only. This requires entry into applicable Conditions and Required Actions of Unit 2 LCO 3.8.1, which provide appropriate actions for the inoperable DG(s).

---

SURVEILLANCE  
REQUIREMENTS

As noted at the beginning of the SRs, the SRs for each LOP instrumentation Function are located in the SRs column of Table 3.3.8.1-1.

The Surveillances are modified by a Note to indicate that when a channel is placed in an inoperable status solely for performance of required Surveillances, entry into associated Conditions and Required Actions may be delayed for up to 6 hours provided the associated Function maintains DG initiation capability. Upon completion of the Surveillance, or expiration of the 6 hour allowance, the channel must be returned to OPERABLE status or the applicable Condition entered and Required Actions taken.

SR 3.3.8.1.1

Performance of the CHANNEL CHECK ensures that a gross failure of instrumentation has not occurred. A CHANNEL CHECK is normally a comparison of the parameter indicated on one channel to a similar parameter on other channels. It is based on the assumption that instrument channels monitoring the same parameter should read approximately the same value. Significant deviations between the instrument channels could be an indication of excessive instrument drift in one of the channels or something even more serious. A CHANNEL CHECK will detect gross channel failure; thus, it is key to verifying the instrumentation continues to operate properly between each CHANNEL CALIBRATION.

Agreement criteria which are determined by the plant staff based on an investigation of a combination of the channel instrument uncertainties may be used to support this parameter comparison and include indication and readability. If a channel is outside the criteria, it may be an indication that the instrument has drifted outside its limit.

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program. The CHANNEL CHECK supplements less formal checks of channels during normal operational use of the displays associated with channels required by the LCO.

---

BASES

---

SURVEILLANCE  
REQUIREMENTS  
(continued)

SR 3.3.8.1.2

A CHANNEL FUNCTIONAL TEST is performed on each required channel to ensure that the entire channel will perform the intended function.

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

SR 3.3.8.1.3

A CHANNEL CALIBRATION verifies that the channel responds to the measured parameter within the necessary range and accuracy. CHANNEL CALIBRATION leaves the channel adjusted to account for instrument drifts between successive calibrations consistent with the plant specific setpoint methodology.

Any setpoint adjustment shall be consistent with the assumptions of the current plant specific setpoint methodology.

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

SR 3.3.8.1.4

The LOGIC SYSTEM FUNCTIONAL TEST demonstrates the OPERABILITY of the required actuation logic for a specific channel. The system functional testing performed in LCO 3.8.1 and LCO 3.8.2 overlaps this Surveillance to provide complete testing of the assumed safety functions.

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

---

REFERENCES

1. FSAR, Section 6.3.
2. FSAR, Chapter 15.
3. Final Policy Statement on Technical Specifications Improvements, July 22, 1993 (58 FR 32193)

BASES

---

THIS PAGE INTENTIONALLY LEFT BLANK

## B 3.5 EMERGENCY CORE COOLING SYSTEMS (ECCS), REACTOR PRESSURE VESSEL (RPV) WATER INVENTORY CONTROL, AND REACTOR CORE ISOLATION COOLING (RCIC) SYSTEM

### B 3.5.1 ECCS-Operating

#### BASES

---

#### BACKGROUND

The ECCS is designed, in conjunction with the primary and secondary containment, to limit the release of radioactive materials to the environment following a loss of coolant accident (LOCA). The ECCS uses two independent methods (flooding and spraying) to cool the core during a LOCA. The ECCS network consists of the High Pressure Coolant Injection (HPCI) System, the Core Spray (CS) System, the low pressure coolant injection (LPCI) mode of the Residual Heat Removal (RHR) System, and the Automatic Depressurization System (ADS). The suppression pool provides the required source of water for the ECCS. Although no credit is taken in the safety analyses for the condensate storage tank (CST), it is capable of providing a source of water for the HPCI and CS systems.

On receipt of an initiation signal, ECCS pumps automatically start; simultaneously, the system aligns and the pumps inject water, taken either from the CST or suppression pool, into the Reactor Coolant System (RCS) as RCS pressure is overcome by the discharge pressure of the ECCS pumps. Although the system is initiated, ADS action is delayed, allowing the operator to interrupt the timed sequence if the system is not needed. The HPCI pump discharge pressure quickly exceeds that of the RCS, and the pump injects coolant into the vessel to cool the core. If the break is small, the HPCI System will maintain coolant inventory as well as vessel level while the RCS is still pressurized. If HPCI fails, it is backed up by ADS in combination with LPCI and CS. In this event absent operator action, the ADS timed sequence would time out and open the selected safety/relief valves (S/RVs) depressurizing the RCS, thus allowing the LPCI and CS to overcome RCS pressure and inject coolant into the vessel. If the break is large, RCS pressure initially drops rapidly and the LPCI and CS cool the core.

Water from the break returns to the suppression pool where it is used again and again. Water in the suppression pool is circulated through a heat exchanger cooled by the RHR Service Water System. Depending on the location and size of the break, portions of the ECCS may be ineffective; however, the overall design is effective in cooling the core regardless of the size or location of the piping break. Although no credit is taken in the safety analysis for the RCIC System, it performs a similar function as HPCI,

## BASES

---

### BACKGROUND (continued)

but has reduced makeup capability. Nevertheless, it will maintain inventory and cool the core while the RCS is still pressurized following a reactor pressure vessel (RPV) isolation.

All ECCS subsystems are designed to ensure that no single active component failure will prevent automatic initiation and successful operation of the minimum required ECCS equipment.

The CS System (Ref. 1) is composed of two independent subsystems. Each subsystem consists of two motor driven pumps, a spray sparger above the core, and piping and valves to transfer water from the suppression pool to the sparger. The CS System is designed to provide cooling to the reactor core when reactor pressure is low. Upon receipt of an initiation signal, the CS pumps in both subsystems are automatically started when AC power is available. When the RPV pressure drops sufficiently, CS System flow to the RPV begins. A full flow test line is provided to route water from and to the suppression pool to allow testing of the CS System without spraying water in the RPV.

LPCI is an independent operating mode of the RHR System. There are two LPCI subsystems (Ref. 2), each consisting of two motor driven pumps and piping and valves to transfer water from the suppression pool to the RPV via the corresponding recirculation loop. The two LPCI subsystems can be interconnected via the RHR System cross tie valves; however, at least one of the two cross tie valves is maintained closed with its power removed to prevent loss of both LPCI subsystems during a LOCA. The LPCI subsystems are designed to provide core cooling at low RPV pressure. Upon receipt of an initiation signal, all four LPCI pumps are automatically started. RHR System valves in the LPCI flow path are automatically positioned to ensure the proper flow path for water from the suppression pool to inject into the recirculation loops. When the RPV pressure drops sufficiently, the LPCI flow to the RPV, via the corresponding recirculation loop, begins. The water then enters the reactor through the jet pumps.

Full flow test lines are provided for each LPCI subsystem to route water from the suppression pool, to allow testing of the LPCI pumps without injecting water into the RPV. These test lines also provide suppression pool cooling capability, as described in LCO 3.6.2.3, "RHR Suppression Pool Cooling."

## BASES

---

### BACKGROUND (continued)

The HPCI System (Ref. 3) consists of a steam driven turbine pump unit, piping, and valves to provide steam to the turbine, as well as piping and valves to transfer water from the suction source to the core via the feedwater system line, where the coolant is distributed within the RPV through the feedwater sparger. Suction piping for the system is provided from the CST and the suppression pool. Pump suction for HPCI is normally aligned to the CST source to minimize injection of suppression pool water into the RPV. Whenever the CST water supply is low, an automatic transfer to the suppression pool water source ensures an adequate suction head for the pump and an uninterrupted water supply for continuous operation of the HPCI System. The steam supply to the HPCI turbine is piped from a main steam line upstream of the associated inboard main steam isolation valve.

The HPCI System is designed to provide core cooling for a wide range of reactor pressures (165 psia to 1225 psia). Upon receipt of an initiation signal, the HPCI turbine stop valve and turbine control valve open and the turbine accelerates to a specified speed. As the HPCI flow increases, the turbine control valve is automatically adjusted to maintain design flow. Exhaust steam from the HPCI turbine is discharged to the suppression pool. A full flow test line is provided to route water to the CST to allow testing of the HPCI System during normal operation without injecting water into the RPV.

The ECCS pumps are provided with minimum flow bypass lines, which discharge to the suppression pool. The valves in these lines automatically open to prevent pump damage due to overheating when other discharge line valves are closed. To ensure rapid delivery of water to the RPV and to minimize water hammer effects, all ECCS pump discharge lines are filled with water. The HPCI, LPCI and CS System discharge lines are kept full of water using a "keep fill" system that is supplied using the condensate transfer system.

The ADS (Ref. 4) consists of 6 of the 16 S/RVs. It is designed to provide depressurization of the RCS during a small break LOCA if HPCI fails or is unable to maintain required water level in the RPV. ADS operation reduces the RPV pressure to within the operating pressure range of the low pressure ECCS subsystems (CS and LPCI), so that these subsystems can provide coolant inventory makeup. Each of the S/RVs used for automatic depressurization is equipped with two gas accumulators and associated inlet check valves. The accumulators provide the pneumatic power to actuate the valves.

BASES

---

APPLICABLE  
SAFETY  
ANALYSES

The ECCS performance is evaluated for the entire spectrum of break sizes for a postulated LOCA. The accidents for which ECCS operation is required are presented in References 5, 6, and 7. The required analyses and assumptions are defined in Reference 8. The results of these analyses are also described in Reference 9.

This LCO helps to ensure that the following acceptance criteria for the ECCS, established by 10 CFR 50.46 (Ref. 10), will be met following a LOCA, assuming the worst case single active component failure in the ECCS:

- a. Maximum fuel element cladding temperature is  $\leq 2200^{\circ}\text{F}$ ;
- b. Maximum cladding oxidation is  $\leq 0.17$  times the total cladding thickness before oxidation;
- c. Maximum hydrogen generation from a zirconium water reaction is  $\leq 0.01$  times the hypothetical amount that would be generated if all of the metal in the cladding surrounding the fuel, excluding the cladding surrounding the plenum volume, were to react;
- d. The core is maintained in a coolable geometry; and
- e. Adequate long term cooling capability is maintained.

The fuel vendor performed LOCA calculations for the ATRIUM 10 and ATRIUM 11 fuel designs. The limiting single failures for the analyses are discussed in Reference 9. The LOCA analyses examine both recirculation pipe and non-recirculation pipe breaks. For the recirculation pipe breaks, breaks on both the discharge and suction side of the recirculation pump are performed for two geometries; double-ended guillotine break and split break.

The LOCA calculations demonstrate the limiting fuel type (highest PCT) is ATRIUM 10 fuel. The most limiting (highest PCT) break is a double-ended guillotine break in the recirculation pump suction piping. The limiting single failure is the failure of the LPCI injection valve in the intact recirculation loop to open.

One ADS valve failure is analyzed as a limiting single failure for events requiring ADS operation. The remaining OPERABLE ECCS subsystems provide the capability to adequately cool the core and prevent excessive fuel damage.

The ECCS satisfy Criterion 3 of the NRC Policy Statement (Ref. 15).

---

BASES

---

LCO

Each ECCS injection/spray subsystem and six ADS valves are required to be OPERABLE. The ECCS injection/spray subsystems are defined as the two CS subsystems, the two LPCI subsystems, and one HPCI System. The low pressure ECCS injection/spray subsystems are defined as the two CS subsystems and the two LPCI subsystems.

With less than the required number of ECCS subsystems OPERABLE, the potential exists that during a limiting design basis LOCA concurrent with the worst case single failure, the limits specified in Reference 10 could be exceeded. All ECCS subsystems must therefore be OPERABLE to satisfy the single failure criterion required by Reference 10.

LPCI subsystems may be considered OPERABLE during alignment and operation for decay heat removal when below the actual RHR cut in permissive pressure in MODE 3, if capable of being manually realigned (remote or local) to the LPCI mode and not otherwise inoperable. At these low pressures and decay heat levels, a reduced complement of ECCS subsystems should provide the required core cooling, thereby allowing operation of RHR shutdown cooling when necessary.

---

APPLICABILITY

All ECCS subsystems are required to be OPERABLE during MODES 1, 2, and 3, when there is considerable energy in the reactor core and core cooling would be required to prevent fuel damage in the event of a break in the primary system piping. In MODES 2 and 3, when reactor steam dome pressure is  $\leq 150$  psig, ADS and HPCI are not required to be OPERABLE because the low pressure ECCS subsystems can provide sufficient flow below this pressure. Requirements for MODES 4 and 5 are specified in LCO 3.5.2, Reactor Pressure Vessel (RPV) Water Inventory Control."

---

ACTIONS

A Note prohibits the application of LCO 3.0.4.b to an inoperable HPCI subsystem. There is an increased risk associated with entering a MODE or other specified condition in the Applicability with an inoperable HPCI subsystem and the provisions of LCO 3.0.4.b, which allow entry into a MODE or other specified condition in the Applicability with the LCO not met after performance of a risk assessment addressing inoperable systems and components, should not be applied in this circumstance.

BASES

---

ACTIONS  
(continued)

A.1

If any one low pressure ECCS injection/spray subsystem is inoperable for reasons other than Condition B, the inoperable subsystem must be restored to OPERABLE status within 7 days. In this Condition, the remaining OPERABLE subsystems provide adequate core cooling during a LOCA. However, overall ECCS reliability is reduced, because a single failure in one of the remaining OPERABLE subsystems, concurrent with a LOCA, may result in the ECCS not being able to perform its intended safety function. The 7 day Completion Time is based on a reliability study (Ref. 12) that evaluated the impact on ECCS availability, assuming various components and subsystems were taken out of service. The results were used to calculate the average availability of ECCS equipment needed to mitigate the consequences of a LOCA as a function of allowed outage times (i.e., Completion Times).

B.1

If one LPCI pump in one or both LPCI subsystems is inoperable, the inoperable LPCI pumps must be restored to OPERABLE status within 7 days. In this Condition, the remaining OPERABLE LPCI pumps and at least one CS subsystem provide adequate core cooling during a LOCA. However, overall ECCS reliability is reduced, because a single failure in one of the remaining OPERABLE subsystems, concurrent with a LOCA, may result in the ECCS not being able to perform its intended safety function. A 7 day Completion Time is based on a reliability study cited in Reference 12 and has been found to be acceptable through operating experience.

C.1 and C.2

If the inoperable low pressure ECCS subsystem or LPCI pump(s) 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.

BASES

---

ACTIONS  
(continued)

D.1 and D.2

If the HPCI System is inoperable and the RCIC System is verified to be OPERABLE, the HPCI System must be restored to OPERABLE status within 14 days. In this Condition, adequate core cooling is ensured by the OPERABILITY of the redundant and diverse low pressure ECCS injection/spray subsystems in conjunction with ADS. Also, the RCIC System will automatically provide makeup water at most reactor operating pressures. Verification of RCIC OPERABILITY is therefore required when HPCI is inoperable. This may be performed as an administrative check by examining logs or other information to determine if RCIC is out of service for maintenance or other reasons. It does not mean to perform the Surveillances needed to demonstrate the OPERABILITY of the RCIC System. If the OPERABILITY of the RCIC System cannot be verified, however, Condition H must be immediately entered. If a single active component fails concurrent with a design basis LOCA, there is a potential, depending on the specific failure, that the minimum required ECCS equipment will not be available. A 14 day Completion Time is based on a reliability study cited in Reference 12 and has been found to be acceptable through operating experience.

E.1 and E.2

If Condition A or Condition B exists in addition to an inoperable HPCI System, the inoperable low pressure ECCS injection/spray subsystem or the LPCI pump(s) or the HPCI System must be restored to OPERABLE status within 72 hours. In this Condition, adequate core cooling is ensured by the OPERABILITY of the ADS and the remaining low pressure ECCS subsystems. However, the overall ECCS reliability is significantly reduced because a single failure in one of the remaining OPERABLE subsystems concurrent with a design basis LOCA may result in the ECCS not being able to perform its intended safety function. Since both a high pressure system (HPCI) and a low pressure subsystem are inoperable, a more restrictive Completion Time of 72 hours is required to restore either the HPCI System or the low pressure ECCS injection/spray subsystem to OPERABLE status. This Completion Time is based on a reliability study cited in Reference 12 and has been found to be acceptable through operating experience.

BASES

---

ACTIONS  
(continued)

F.1

The LCO requires six ADS valves to be OPERABLE in order to provide the ADS function. Reference 9 contains the results of an analysis that evaluated the effect of one ADS valve being out of service. Per this analysis, operation of only five ADS valves will provide the required depressurization. However, overall reliability of the ADS is reduced, because a single failure in the OPERABLE ADS valves could result in a reduction in depressurization capability. Therefore, operation is only allowed for a limited time. The 14 day Completion Time is based on a reliability study cited in Reference 12 and has been found to be acceptable through operating experience.

G.1 and G.2

If Condition A or Condition B exists in addition to one inoperable ADS valve, adequate core cooling is ensured by the OPERABILITY of HPCI and the remaining low pressure ECCS injection/spray subsystem. However, overall ECCS reliability is reduced because a single active component failure concurrent with a design basis LOCA could result in the minimum required ECCS equipment not being available. Since both a high pressure system (ADS) and a low pressure subsystem are inoperable, a more restrictive Completion Time of 72 hours is required to restore either the low pressure ECCS subsystem or the ADS valve to OPERABLE status. This Completion Time is based on a reliability study cited in Reference 12 and has been found to be acceptable through operating experience.

H.1 and H.2

If any Required Action and associated Completion Time of Condition D, E, F, or G is not met, or if two or more ADS valves are inoperable, the plant must be brought to a condition 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 reactor steam dome pressure reduced to  $\leq 150$  psig 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.

I.1

When multiple ECCS subsystems are inoperable, as stated in Condition I, LCO 3.0.3 must be entered immediately.

BASES

---

SURVEILLANCE  
REQUIREMENTS

SR 3.5.1.1

The flow path piping has the potential to develop voids and pockets of entrained air. Maintaining the pump discharge lines of the HPCI System, CS System, and LPCI subsystems full of water ensures that the ECCS will perform properly, injecting its full capacity into the RCS upon demand. This will also prevent a water hammer following an ECCS initiation signal. One acceptable method of ensuring that the lines are full is to vent at the high points. The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

SR 3.5.1.2

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. 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 locking, sealing, or securing. A valve that receives an initiation signal is allowed to be in a nonaccident position provided the valve will automatically reposition in the proper stroke time. This SR does not require any testing or valve manipulation; rather, it involves verification that those valves capable of potentially being mispositioned are in the correct position. This SR does not apply to valves that cannot be inadvertently misaligned, such as check valves. For the HPCI System, this SR also includes the steam flow path for the turbine and the flow controller position.

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

This SR is modified by a Note that allows LPCI subsystems to be considered OPERABLE during alignment and operation for decay heat removal with reactor steam dome pressure less than the RHR cut in permissive pressure in MODE 3, if capable of being manually realigned (remote or local) to the LPCI mode and not otherwise inoperable. This allows operation in the RHR shutdown cooling mode during MODE 3, if necessary.

BASES

---

SURVEILLANCE  
REQUIREMENTS  
(continued)

SR 3.5.1.3

Verification that ADS gas supply header pressure is  $\geq 135$  psig ensures adequate gas pressure for reliable ADS operation. The accumulator on each ADS valve provides pneumatic pressure for valve actuation. The design pneumatic supply pressure requirements for the accumulator are such that, following a failure of the pneumatic supply to the accumulator, at least one valve actuations can occur with the drywell at 70% of design pressure.

The ECCS safety analysis assumes only one actuation to achieve the depressurization required for operation of the low pressure ECCS. This minimum required pressure of  $\geq 135$  psig is provided by the containment instrument gas system. The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

SR 3.5.1.4

Verification that at least one RHR System cross tie valve is closed and power to its operator is disconnected ensures that each LPCI subsystem remains independent and a failure of the flow path in one subsystem will not affect the flow path of the other LPCI subsystem. Acceptable methods of removing power to the operator include opening the breaker, or racking out the breaker, or removing the breaker. If both RHR System cross tie valves are open or power has not been removed from at least one closed valve operator, both LPCI subsystems must be considered inoperable. The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

SR 3.5.1.5

Verification that each 480 volt AC swing bus transfers automatically from the normal source to the alternate source on loss of power while supplying its respective bus demonstrates that electrical power is available to ensure proper operation of the associated LPCI inboard injection and minimum flow valves and the recirculation pump discharge and bypass valves. Therefore, each 480 volt AC swing bus must be OPERABLE for the associated LPCI subsystem to be OPERABLE. The test is performed by actuating the load test switch or by disconnecting the preferred power source to the transfer switch and verifying that swing bus automatic transfer is accomplished. The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

BASES

---

SURVEILLANCE  
REQUIREMENTS  
(continued)

SR 3.5.1.6

Cycling the recirculation pump discharge and bypass valves through one complete cycle of full travel demonstrates that the valves are mechanically OPERABLE and provides assurance that the valves will close when required to ensure the proper LPCI flow path is established. Upon initiation of an automatic LPCI subsystem injection signal, these valves are required to be closed to ensure full LPCI subsystem flow injection in the reactor via the recirculation jet pumps. De-energizing the valve in the closed position will also ensure the proper flow path for the LPCI subsystem. Acceptable methods of de-energizing the valve include opening the breaker, or racking out the breaker, or removing the breaker.

The specified Frequency is once during reactor startup before THERMAL POWER is > 25% RTP. However, this SR is modified by a Note that states the Surveillance is only required to be performed if the last performance was more than 31 days ago. Therefore, implementation of this Note requires this test to be performed during reactor startup before exceeding 25% RTP. Verification during reactor startup prior to reaching > 25% RTP is an exception to the normal Inservice Testing Program generic valve cycling Frequency, but is considered acceptable due to the demonstrated reliability of these valves. If the valve is inoperable and in the open position, the associated LPCI subsystem must be declared inoperable.

SR 3.5.1.7, SR 3.5.1.8, and SR 3.5.1.9

The performance requirements of the low pressure ECCS pumps are determined through application of the 10 CFR 50, Appendix K criteria (Ref. 8). This periodic Surveillance is performed (in accordance with the ASME OM Code requirements for the ECCS pumps) to verify that the ECCS pumps will develop the flow rates required by the respective analyses. The low pressure ECCS pump flow rates ensure that adequate core cooling is provided to satisfy the acceptance criteria of Reference 10. The pump flow rates are verified against a system head equivalent to the RPV pressure expected during a LOCA. The total system pump outlet pressure is adequate to overcome the elevation head pressure between the pump suction and the vessel discharge, the piping friction losses, and RPV pressure present during a LOCA. These values may be established during preoperational testing.

BASES

---

SURVEILLANCE  
REQUIREMENTS  
(continued)

SR 3.5.1.7, SR 3.5.1.8, and SR 3.5.1.9 (continued)

The flow tests for the HPCI System are performed at two different pressure ranges such that system capability to provide rated flow is tested at both the higher and lower operating ranges of the system. Additionally, adequate steam flow must be passing through the main turbine or turbine bypass valves to continue to control reactor pressure when the HPCI System diverts steam flow. Reactor steam pressure is considered adequate when  $\geq 920$  psig to perform SR 3.5.1.8 and  $\geq 150$  psig to perform SR 3.5.1.9. However, the requirements of SR 3.5.1.9 are met by a successful performance at any pressure  $< 165$  psig. Adequate steam flow is represented by at least 1.25 turbine bypass valves open. Therefore, sufficient time is allowed after adequate pressure and flow are achieved to perform these tests. Reactor startup is allowed prior to performing the low pressure Surveillance test because the reactor pressure is low and the time allowed to satisfactorily perform the Surveillance test is short. The reactor pressure is allowed to be increased to normal operating pressure since it is assumed that the low pressure test has been satisfactorily completed and there is no indication or reason to believe that HPCI is inoperable. Therefore, SR 3.5.1.8 and SR 3.5.1.9 are modified by Notes that state the Surveillances are not required to be performed until 12 hours after the reactor steam pressure and flow are adequate to perform the test.

The Frequency for SR 3.5.1.7 and SR 3.5.1.8 is in accordance with the Inservice Testing Program requirements. The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

SR 3.5.1.10

The ECCS subsystems are required to actuate automatically to perform their design functions. This Surveillance verifies that, with a required system initiation signal (actual or simulated), the automatic initiation logic of HPCI, CS, and LPCI will cause the systems or subsystems to operate as designed, including actuation of the system throughout its emergency operating sequence, automatic pump startup and actuation of all automatic valves to their required positions. This functional test includes the LPCI and CS interlocks between Unit 1 and Unit 2 and specifically requires the following:

A functional test of the interlocks associated with the LPCI and CS pump starts in response to an automatic initiation signal in Unit 1 followed by a false automatic initiation signal in Unit 2:

BASES

---

SURVEILLANCE  
REQUIREMENTS  
(continued)

SR 3.5.1.10 (continued)

A functional test of the interlocks associated with the LPCI and CS pump starts in response to an automatic initiation signal in Unit 2 followed by a false automatic initiation signal in Unit 1; and

A functional test of the interlocks associated with the LPCI and CS pump starts in response to simultaneous occurrences of an automatic initiation signal in both Unit 1 and Unit 2 and a loss of Offsite power condition affecting both Unit 1 and Unit 2.

The purpose of this functional test (preferred pump logic) is to assure that if a false LOCA signal were to be received on one Unit simultaneously with an actual LOCA signal on the second Unit, the preferred LPCI and CS pumps are started and the non-preferred LPCI and CS pumps are tripped for each Unit. This functional test is performed by verifying that the non-preferred LPCI and CS pumps are tripped. The verification that preferred LPCI and CS pumps start is performed under a separate surveillance test. Only one division of LPCI preferred pump logic is required to be OPERABLE for each Unit, because no additional failures needs to be postulated with a false LOCA signal. If the preferred or non-preferred pump logic for CS is inoperable, the associated CS pumps shall be declared inoperable and the pumps should not be operated to ensure that the opposite Unit's CS pumps or 4.16 kV ESS Buses are protected.

This SR also ensures that the HPCI System will automatically restart on an RPV low water level (Level 2) signal received subsequent to an RPV high water level (Level 8) trip and that the suction is automatically transferred from the CST to the suppression pool. The LOGIC SYSTEM FUNCTIONAL TEST performed in LCO 3.3.5.1 overlaps this Surveillance. This SR can be accomplished by any series of sequential overlapping or total steps such that the entire channel is tested.

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

This SR is modified by a Note that excludes vessel injection/spray during the Surveillance. Since all active components are testable and full flow can be demonstrated by recirculation through the test line, coolant injection into the RPV is not required during the Surveillance.

BASES

---

**SURVEILLANCE  
REQUIREMENTS**  
(continued)

SR 3.5.1.11

The ADS designated S/RVs are required to actuate automatically upon receipt of specific initiation signals. A system functional test is performed to demonstrate that the mechanical portions of the ADS function (i.e., solenoids) operate as designed when initiated either by an actual or simulated initiation signal, causing proper actuation of all the required components. SR 3.5.1.12 and the LOGIC SYSTEM FUNCTIONAL TEST performed in LCO 3.3.5.1 overlap this Surveillance to provide complete testing of the assumed safety function.

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

This SR is modified by a Note that excludes valve actuation. This prevents an RPV pressure blowdown.

SR 3.5.1.12

A manual actuation of each ADS valve actuator is performed to verify that the valve and solenoid are functioning properly. This is demonstrated by the method described below. Proper operation of the valve tailpipes is ensured through the use of foreign material exclusion during maintenance.

Valve OPERABILITY and the setpoints for overpressure protection are verified, per ASME requirements, prior to valve installation.

Manual actuation of the actuator at atmospheric temperature and pressure during cold shutdown is performed. Proper functioning of the valve actuator is demonstrated by visual observation of actuator movement. Each solenoid is independently tested and ensures the valve would remain open. The ADS actuator will be disconnected from the valve to ensure no damage is done to the valve seat or to the valve internals. Each valve shall be bench-tested prior to reinstallation. The bench-test along with the test on the ADS actuator establishes the OPERABILITY of the valves.

SR 3.5.1.11 and the LOGIC SYSTEM FUNCTIONAL TEST performed in LCO 3.3.5.1 overlap this Surveillance to provide complete testing of the assumed safety function. The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

BASES

---

SURVEILLANCE  
REQUIREMENTS  
(continued)

SR 3.5.1.13

This SR ensures that the ECCS RESPONSE TIME for each ECCS injection/spray subsystem is less than or equal to the maximum value assumed in the accident analysis. Response Time testing acceptance criteria are included in Reference 13. This SR is modified by a Note that allows the instrumentation portion of the response time to be assumed to be based on historical response time data and therefore, is excluded from the ECCS RESPONSE TIME testing. This is allowed since the instrumentation response time is a small part of the ECCS RESPONSE TIME (e.g., sufficient margin exists in the diesel generator start time when compared to the instrumentation response time) (Ref. 14).

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

---

REFERENCES

1. FSAR, Section 6.3.2.2.3.
2. FSAR, Section 6.3.2.2.4.
3. FSAR, Section 6.3.2.2.1.
4. FSAR, Section 6.3.2.2.2.
5. FSAR, Section 15.2.8.
6. FSAR, Section 15.6.4.
7. FSAR, Section 15.6.5.
8. 10 CFR 50, Appendix K.
9. FSAR, Section 6.3.3.
10. 10 CFR 50.46.
11. Not used.
12. Memorandum from R.L. Baer (NRC) to V. Stello, Jr. (NRC), "Recommended Interim Revisions to LCOs for ECCS Components," December 1, 1975.

BASES

---

REFERENCES  
(continued)

13. FSAR, Section 6.3.3.3.
  14. NEDO 32291-A, "System Analysis for the Elimination of Selected Response Time Testing Requirements, October 1995.
  15. Final Policy Statement on Technical Specifications Improvements, July 22, 1993 (58 FR 39132).
-

B 3.5 EMERGENCY CORE COOLING SYSTEMS (ECCS), REACTOR PRESSURE VESSEL (RPV) WATER INVENTORY CONTROL, AND REACTOR CORE ISOLATION COOLING (RCIC) SYSTEM

B 3.5.2 Reactor Pressure Vessel (RPV) Water Inventory Control

BASES

---

**BACKGROUND** The RPV contains penetrations below the top of the active fuel (TAF) that have the potential to drain the reactor coolant inventory to below the TAF. If the water level should drop below the TAF, the ability to remove decay heat is reduced, which could lead to elevated cladding temperatures and clad perforation. Safety Limit 2.1.1.3 requires the RPV water level to be above the top of the active irradiated fuel at all times to prevent such elevated cladding temperatures.

---

**APPLICABLE SAFETY ANALYSES**

With the unit in MODE 4 or 5, RPV water inventory control is not required to mitigate any events or accidents evaluated in the safety analyses. RPV water inventory control is required in MODES 4 and 5 to protect Safety Limit 2.1.1.3 and the fuel cladding barrier to prevent the release of radioactive material to the environment should an unexpected draining event occur.

A double-ended guillotine break of the Reactor Coolant System (RCS) is not considered in MODES 4 and 5 due to the reduced RCS pressure, reduced piping stresses, and ductile piping systems. Instead, an event is considered in which an initiating event allows draining of the RPV water inventory through a single penetration flow path with the highest flow rate, or the sum of the drain rates through multiple penetration flow paths susceptible to a common mode failure (an event that creates a drain path through multiple vessel penetrations located below top of active fuel, such as loss of normal power, or a single human error). It is assumed, based on engineering judgement, that while in MODES 4 and 5, one low pressure ECCS injection/spray subsystem can maintain adequate reactor vessel water level.

As discussed in References 1, 2, 3, 4, and 5, operating experience has shown RPV water inventory to be significant to public health and safety. Therefore, RPV Water Inventory Control satisfies Criterion 4 of 10 CFR 50.36(c)(2)(ii).

BASES

---

LCO

The RPV water level must be controlled in MODES 4 and 5 to ensure that if an unexpected draining event should occur, the reactor coolant water level remains above the top of the active irradiated fuel as required by Safety Limit 2.1.1.3.

The Limiting Condition for Operation (LCO) requires the DRAIN TIME of RPV water inventory to the TAF to be  $\geq 36$  hours. A DRAIN TIME of 36 hours is considered reasonable to identify and initiate action to mitigate unexpected draining of reactor coolant. An event that could cause loss of RPV water inventory and result in the RPV water level reaching the TAF in greater than 36 hours does not represent a significant challenge to Safety Limit 2.1.1.3 and can be managed as part of normal plant operation.

One low pressure ECCS injection/spray subsystem is required to be OPERABLE and capable of being manually aligned and started from the control room to provide defense-in- depth should an unexpected draining event occur. OPERABILITY of the ECCS injection/spray subsystem includes any necessary valves, instrumentation, or controls needed to manually align and start the subsystem from the control room. A low pressure ECCS injection/spray subsystem consists of either one Core Spray (CS) subsystem or one Low Pressure Coolant Injection (LPCI) subsystem. Each CS subsystem consists of one motor driven pump, piping, and valves to transfer water from the suppression pool or condensate storage tank (CST) to the RPV. Each LPCI subsystem consists of one motor driven pump, piping, and valves to transfer water from the suppression pool to the RPV. In MODES 4 and 5, the RHR System cross tie valves are not required to be closed.

The LCO is modified by a Note which allows a required LPCI subsystem to be considered OPERABLE during alignment and operation for decay heat removal if capable of being manually realigned to the LPCI mode and is not otherwise inoperable. Alignment and operation for decay heat removal includes when the required RHR pump is not operating or when the system is realigned from or to the RHR shutdown cooling mode. This allowance is necessary since the RHR System may be required to operate in the shutdown cooling mode to remove decay heat and sensible heat from the reactor. Because of the restrictions on DRAIN TIME, sufficient time will be available following an unexpected draining event to manually align and initiate LPCI subsystem operation to maintain RPV water inventory prior to the RPV water level reaching the TAF.

BASES

---

**APPLICABILITY**      RPV water inventory control is required in MODES 4 and 5. Requirements on water inventory control in other MODES are contained in LCOs in Section 3.3, "Instrumentation," and other LCOs in Section 3.5, "ECCS, RPV Water Inventory Control, and RCIC System." RPV water inventory control is required to protect Safety Limit 2.1.1.3 which is applicable whenever irradiated fuel is in the reactor vessel.

---

**ACTIONS**

A.1 and B.1

If the required low pressure ECCS injection/spray subsystem is inoperable, it must be restored to OPERABLE status within 4 hours. In this Condition, the LCO controls on DRAIN TIME minimize the possibility that an unexpected draining event could necessitate the use of the ECCS injection/spray subsystem, however the defense-in-depth provided by the ECCS injection/spray subsystem is lost. The 4 hour Completion Time for restoring the required low pressure ECCS injection/spray subsystem to OPERABLE status is based on engineering judgment that considers the LCO controls on DRAIN TIME and the low probability of an unexpected draining event that would result in loss of RPV water inventory.

If the inoperable ECCS injection/spray subsystem is not restored to OPERABLE status within the required Completion Time, action must be initiated immediately to establish a method of water injection capable of operating without offsite electrical power. The method of water injection includes the necessary instrumentation and controls, water sources, and pumps and valves needed to add water to the RPV or refueling cavity should an unexpected draining event occur. The method of water injection may be manually initiated and may consist of one or more systems or subsystems, and must be able to access water inventory capable of maintaining the RPV water level above the TAF for  $\geq 36$  hours. If recirculation of injected water would occur, it may be credited in determining the necessary water volume.

C.1, C.2, and C.3

With the DRAIN TIME less than 36 hours but greater than or equal to 8 hours, compensatory measures should be taken to ensure the ability to implement mitigating actions should an unexpected draining event occur. Should a draining event lower the reactor coolant level to below the TAF, there is potential for damage to the reactor fuel cladding and release of radioactive material. Additional actions are taken to ensure that radioactive material will be contained, diluted, and processed prior to being released to the environment.

BASES

---

ACTIONS  
(continued)

C.1, C.2, and C.3 (continued)

The secondary containment provides a controlled volume in which fission products can be contained, diluted, and processed prior to release to the environment. Required Action C.1 requires verification of the capability to establish the secondary containment boundary in less than the DRAIN TIME.

The required verification confirms actions to establish the secondary containment boundary are preplanned and necessary materials are available. The secondary containment boundary is considered established when one Standby Gas Treatment (SGT) subsystem is capable of maintaining a negative pressure in the secondary containment with respect to the environment. Verification that the secondary containment boundary can be established must be performed within 4 hours. The required verification is an administrative activity and does not require manipulation or testing of equipment. Secondary containment penetration flow paths form a part of the secondary containment boundary. Required Action C.2 requires verification of the capability to isolate each secondary containment penetration flow path in less than the DRAIN TIME. The required verification confirms actions to isolate the secondary containment penetration flow paths are preplanned and necessary materials are available. Power operated valves are not required to receive automatic isolation signals if they can be closed manually within the required time. Verification that the secondary containment penetration flow paths can be isolated must be performed within 4 hours. The required verification is an administrative activity and does not require manipulation or testing of equipment.

One SGT subsystem is capable of maintaining the secondary containment at a negative pressure with respect to the environment and filter gaseous releases. Required Action C.3 requires verification of the capability to place one SGT subsystem in operation in less than the DRAIN TIME. The required verification confirms actions to place a SGT subsystem in operation are preplanned and necessary materials are available. Verification that a SGT subsystem can be placed in operation must be performed within 4 hours. The required verification is an administrative activity and does not require manipulation or testing of equipment.

Required Actions C.1, C.2, and C.3 are considered to be met when secondary containment, secondary containment penetrations, and the SGT System are OPERABLE in accordance with LCO 3.6.4.1, LCO 3.6.4.2, and LCO 3.6.4.3.

BASES

---

ACTIONS  
(continued)

D.1, D.2, D.3, and D.4

With the DRAIN TIME less than 8 hours, mitigating actions are implemented in case an unexpected draining event should occur. Note that if the DRAIN TIME is less than 1 hour, Required Action E.1 is also applicable.

Required Action D.1 requires immediate action to establish an additional method of water injection augmenting the ECCS injection/spray subsystem required by the LCO. The additional method of water injection includes the necessary instrumentation and controls, water sources, and pumps and valves needed to add water to the RPV or refueling cavity should an unexpected draining event occur. The Note to Required Action D.1 states that either the ECCS injection/spray subsystem or the additional method of water injection must be capable of operating without offsite electrical power. The additional method of water injection may be manually initiated and may consist of one or more systems or subsystems. The additional method of water injection must be able to access water inventory capable of being injected to maintain the RPV water level above the TAF for  $\geq 36$  hours. The additional method of water injection and the ECCS injection/spray subsystem may share all or part of the same water sources. If recirculation of injected water would occur, it may be credited in determining the required water volume.

Should a draining event lower the reactor coolant level to below the TAF, there is potential for damage to the reactor fuel cladding and release of radioactive material. Additional actions are taken to ensure that radioactive material will be contained, diluted, and processed prior to being released to the environment.

The secondary containment provides a control volume in which fission products can be contained, diluted, and processed prior to release to the environment. Required Action D.2 requires that actions be immediately initiated to establish the secondary containment boundary. With the secondary containment boundary established, one SGT subsystem is capable of maintaining a negative pressure in the secondary containment with respect to the environment.

The secondary containment penetrations form a part of the secondary containment boundary. Required Action D.3 requires that actions be immediately initiated to verify that each secondary containment penetration flow path is isolated or to verify that it can be automatically or manually isolated from the control room.

BASES

---

ACTIONS  
(continued)

D.1, D.2, D.3, and D.4 (continued)

One SGT subsystem is capable of maintaining the secondary containment at a negative pressure with respect to the environment and filter gaseous releases. Required Action D.4 requires that actions be immediately initiated to verify that at least one SGT subsystem is capable of being placed in operation. The required verification is an administrative activity and does not require manipulation or testing of equipment.

Required Actions D.2, D.3, and D.4 are considered to be met when secondary containment, secondary containment penetrations, and the SGT System are OPERABLE in accordance with LCO 3.6.4.1, LCO 3.6.4.2, and LCO 3.6.4.3.

E.1

If the Required Actions and associated Completion times of Conditions C or D are not met or if the DRAIN TIME is less than 1 hour, actions must be initiated immediately to restore the DRAIN TIME to  $\geq 36$  hours. In this condition, there may be insufficient time to respond to an unexpected draining event to prevent the RPV water inventory from reaching the TAF. Note that Required Actions D.1, D.2, D.3, and D.4 are also applicable when DRAIN TIME is less than 1 hour.

---

SURVEILLANCE  
REQUIREMENTS

SR 3.5.2.1

This Surveillance verifies that the DRAIN TIME of RPV water inventory to the TAF is  $\geq 36$  hours. The period of 36 hours is considered reasonable to identify and initiate action to mitigate draining of reactor coolant. Loss of RPV water inventory that would result in the RPV water level reaching the TAF in greater than 36 hours does not represent a significant challenge to Safety Limit 2.1.1.3 and can be managed as part of normal plant operation.

The definition of DRAIN TIME states that realistic cross-sectional areas and drain rates are used in the calculation. A realistic drain rate may be determined using a single, step-wise, or integrated calculation considering the changing RPV water level during a draining event. For a Control Rod RPV penetration flow path with the Control Rod Drive Mechanism removed and not replaced with a blank flange, the realistic cross-sectional area is based on the control rod blade seated in the control rod guide tube. If the control rod blade will be raised from the penetration to adjust or verify seating of the blade, the exposed cross-sectional area of the RPV penetration flow path is used.

BASES

---

SURVEILLANCE  
REQUIREMENTS  
(continued)

SR 3.5.2.1 (continued)

The definition of DRAIN TIME excludes from the calculation those penetration flow paths connected to an intact closed system, or isolated by manual or automatic valves that are closed and administratively controlled, blank flanges, or other devices that prevent flow of reactor coolant through the penetration flow paths. A blank flange or other bolted device must be connected with a sufficient number of bolts to prevent draining. Normal or expected leakage from closed systems or past isolation devices is permitted. Determination that a system is intact and closed or isolated must consider the status of branch lines.

The Residual Heat Removal (RHR) Shutdown Cooling System is only considered an intact closed system when misalignment issues (Reference 6) have been precluded by functional valve interlocks or by isolation devices, such that redirection of RPV water out of an RHR subsystem is precluded. Further, RHR Shutdown Cooling System is only considered an intact closed system if its controls have not been transferred to Remote Shutdown, which disables the interlocks and isolation signals.

The exclusion of a single penetration flow path, or multiple penetration flow paths susceptible to a common mode failure, from the determination of DRAIN TIME should consider the effects of temporary alterations in support of maintenance (rigging, scaffolding, temporary shielding, piping plugs, freeze seals, etc.). If reasonable controls are implemented to prevent such temporary alterations from causing a draining event from a closed system or between the RPV and the isolation device, the effect of the temporary alterations on DRAIN TIME need not be considered. Reasonable controls include, but are not limited to, controls consistent with the guidance in NUMARC 93-01, "Industry Guideline for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants," Revision 4, NUMARC 91-06, "Guidelines for Industry Actions to Assess Shutdown Management," or commitments to NUREG-0612, "Control of Heavy Loads at Nuclear Power Plants."

Surveillance Requirement 3.0.1 requires SRs to be met between performances. Therefore, any changes in plant conditions that would change the DRAIN TIME requires that a new DRAIN TIME be determined.

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

BASES

---

SURVEILLANCE  
REQUIREMENTS  
(continued)

SR 3.5.2.2 and SR 3.5.2.3

The minimum water level of 20 ft. 0 inches required for the suppression pool is periodically verified to ensure that the suppression pool will provide adequate net positive suction head (NPSH) for the CS subsystem or LPCI subsystem pump, recirculation volume, and vortex prevention. With the suppression pool water level less than the required limit, the required ECCS injection/spray subsystem is inoperable unless aligned to an OPERABLE CST.

The required CS System is considered OPERABLE if it can take suction from the CST, and the CST water level is sufficient to provide the required NPSH for the CS pump. Therefore, a verification that either the suppression pool water level is  $\geq 20$  ft. 0 inches or that a required CS subsystem is aligned to take suction from the CST and the CST contains  $\geq 135,000$  gallons of water, equivalent to 49% of capacity, ensures that the CS Subsystem can supply at least 135,000 gallons of makeup water to the RPV.

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

SR 3.5.2.4

The flow path piping has the potential to develop voids and pockets of entrained air. Maintaining the pump discharge lines of the required ECCS injection/spray subsystems full of water ensures that the ECCS subsystem will perform properly. This may also prevent a water hammer following an ECCS actuation. One acceptable method of ensuring that the lines are full is to vent at the high points.

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

SR 3.5.2.5

Not used

BASES

---

SURVEILLANCE  
REQUIREMENTS  
(continued)

SR 3.5.2.6

Verifying that the required ECCS injection/spray subsystem can be manually aligned, and the pump started and operated for at least 10 minutes demonstrates that the subsystem is available to mitigate a draining event. This SR is modified by two Notes. Note 1 states that testing the ECCS injection/spray subsystem may be done through the test return line to avoid overfilling the refueling cavity. Note 2 states that credit for meeting the SR may be taken for normal system operation that satisfies the SR, such as using the RHR mode of LPCI for  $\geq 10$  minutes. The minimum operating time of 10 minutes was based on engineering judgment.

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

SR 3.5.2.7

Verifying that each valve credited for automatically isolating a penetration flow path actuates to the isolation position on an actual or simulated RPV water level isolation signal is required to prevent RPV water inventory from dropping below the TAF should an unexpected draining event occur.

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

SR 3.5.2.8

This Surveillance verifies that a required CS subsystem or LPCI subsystem can be manually aligned and started from the control room, including any necessary valve alignment, instrumentation, or controls, to transfer water from the suppression pool or CST to the RPV.

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

This SR is modified by a Note that excludes vessel injection/spray during the Surveillance. Since all active components are testable and full flow can be demonstrated by recirculation through the test line, coolant injection into the RPV is not required during the Surveillance.

BASES

---

REFERENCES

1. Information Notice 84-81 "Inadvertent Reduction in Primary Coolant Inventory in Boiling Water Reactors During Shutdown and Startup," November 1984.
  2. Information Notice 86-74, "Reduction of Reactor Coolant Inventory Because of Misalignment of RHR Valves," August 1986.
  3. Generic Letter 92-04, "Resolution of the Issues Related to Reactor Vessel Water Level Instrumentation in BWRs Pursuant to 10 CFR 50.54(f)," August 1992.
  4. NRC Bulletin 93-03, "Resolution of Issues Related to Reactor Vessel Water Level Instrumentation in BWRs," May 1993.
  5. Information Notice 94-52, "Inadvertent Containment Spray and Reactor Vessel Draindown at Millstone 1," July 1994.
  6. General Electric Service Information Letter No. 388, "RHR Valve Misalignment During Shutdown Cooling Operation for BWR 3/4/5/6," February 1983.
-

## B 3.7 PLANT SYSTEMS

### B 3.7.1 Residual Heat Removal Service Water (RHRSW) System and the Ultimate Heat Sink (UHS)

#### BASES

---

#### BACKGROUND

The RHRSW System is designed to provide cooling water for the Residual Heat Removal (RHR) System heat exchangers, required for a safe reactor shutdown following a Design Basis Accident (DBA) or transient. The RHRSW System is operated whenever the RHR heat exchangers are required to operate in the shutdown cooling mode or in the suppression pool cooling or spray mode of the RHR System.

The RHRSW System consists of two independent and redundant subsystems. Each subsystem is made up of a header, one pump, a suction source, valves, piping, heat exchanger, and associated instrumentation. Either of the two subsystems is capable of providing the required cooling capacity to maintain safe shutdown conditions. The two subsystems are separated so that failure of one subsystem will not affect the OPERABILITY of the other subsystem. One Unit 1 RHRSW subsystem and the associated (same division) Unit 2 RHRSW subsystem constitute a single RHRSW loop. The two RHRSW pumps in a loop can each, independently, be aligned to either Unit's heat exchanger. The RHRSW System is designed with sufficient redundancy so that no single active component failure can prevent it from achieving its design function. The RHRSW System is described in the FSAR, Section 9.2.6, Reference 1.

Cooling water is pumped by the RHRSW pumps from the UHS through the tube side of the RHR heat exchangers. After removing heat from the RHRSW heat exchanger, the water is discharged to the spray pond (UHS) by way of the UHS return loops. The UHS return loops direct the return flow to a network of sprays that dissipate the heat to the atmosphere or directly to the UHS via a bypass header.

The system is initiated manually from the control room except for the spray array bypass manual valves that are operated locally in the event of a failure of the spray array bypass valves. The system can be started any time the LOCA signal is manually overridden or clears.

BASES

---

BACKGROUND  
(continued)

The ultimate heat sink (UHS) system is composed of approximately 3,300,000 cubic foot spray pond and associated piping and spray risers. Each UHS return loop contains a bypass line, a large spray array and a small spray array. The purpose of the UHS is to provide both a suction source of water and a return path for the RHRSW and ESW systems. The function of the UHS is to provide water to the RHRSW and ESW systems at a temperature less than the 97°F design temperature of the RHRSW and ESW systems. UHS temperature is maintained less than the design temperature by introducing the hot return fluid from the RHRSW and ESW systems into the spray loops and relying on spray cooling to maintain temperature. The UHS is designed to supply the RHRSW and ESW systems with all the cooling capacity required during a combination LOCA/LOOP for thirty days without fluid addition. The UHS is described in the FSAR, Section 9.2.7 (Reference 1).

---

APPLICABLE  
SAFETY  
ANALYSES

The RHRSW System removes heat from the suppression pool to limit the suppression pool temperature and primary containment pressure following a LOCA. This ensures that the primary containment can perform its function of limiting the release of radioactive materials to the environment following a LOCA. The ability of the RHRSW System to support long term cooling of the reactor or primary containment is discussed in the FSAR, Chapters 6 and 15 (Refs. 2 and 3, respectively). These analyses explicitly assume that the RHRSW System will provide adequate cooling support to the equipment required for safe shutdown. These analyses include the evaluation of the long term primary containment response after a design basis LOCA.

The safety analyses for long term cooling were performed for various RHRSW and UHS configurations combinations of RHR System failures. As discussed in the FSAR, Section 6.2.2 (Ref. 2) for these analyses, manual initiation of the OPERABLE RHRSW subsystem and the associated RHR System is required. The maximum suppression chamber water temperature and pressure are analyzed to be below the design temperature of 220°F and maximum allowable pressure of 53 psig.

The UHS design takes into account the cooling efficiency of the spray arrays and the evaporation losses during design basis environmental conditions. The spray array bypass header provides the flow path for the ESW and RHRSW system to keep the spray array headers from freezing. The small and/or large spray arrays are placed in service to dissipate heat returning from the plant. The UHS return header is comprised of the spray array bypass header, the large spray array, and the small spray array.

---

BASES

---

APPLICABLE  
SAFETY  
ANALYSES  
(continued)

The spray array bypass header is capable of passing full flow from the RHRWS and ESW systems in each loop. The large spray array is capable of passing full flow from the RHRWS and ESW systems in each loop. The small spray array supports heat dissipation when low system flows are required.

The RHRWS System, together with the UHS, satisfy Criterion 3 of the NRC Policy Statement. (Ref. 4)

---

LCO

Two RHRWS subsystems are required to be OPERABLE to provide the required redundancy to ensure that the system functions to remove post accident heat loads, assuming the worst case single active failure occurs coincident with the loss of offsite power.

An RHRWS subsystem is considered OPERABLE when:

- a. One pump is OPERABLE; and
- b. An OPERABLE flow path is capable of taking suction from the UHS and transferring the water to the RHR heat exchanger and returning it to the UHS at the assumed flow rate, and
- c. An OPERABLE UHS.

The OPERABILITY of the UHS is based on having a minimum water level at the overflow weir of 678 feet 1 inch above mean sea level and a maximum water temperature of 85°F; unless either unit is in MODE 3. If a unit enters MODE 3, the time of entrance into this condition determines the appropriate maximum ultimate heat sink fluid temperature. If the earliest unit to enter MODE 3 has been in that condition for less than twelve (12) hours, the peak temperature to maintain OPERABILITY of the ultimate heat sink remains at 85°F. If either unit has been in MODE 3 for more than twelve (12) hours but less than twenty-four (24) hours, the OPERABILITY temperature of the ultimate heat sink becomes 87°F. If either unit has been in MODE 3 for twenty-four (24) hours or more, the OPERABILITY temperature of the ultimate heat sink becomes 88°F.

In addition, the OPERABILITY of the UHS is based on having sufficient spray capacity in the UHS return loops. Sufficient spray capacity is defined as one large and one small spray array in one loop.

This OPERABILITY definition is supported by analysis and evaluations performed in accordance with the guidance given in Regulatory Guide 1.27.

---

BASES

---

APPLICABILITY In MODES 1, 2, and 3, the RHRSW System and the UHS are required to be OPERABLE to support the OPERABILITY of the RHR System for primary containment cooling (LCO 3.6.2.3, "Residual Heat Removal (RHR) Suppression Pool Cooling," and LCO 3.6.2.4, "Residual Heat Removal (RHR) Suppression Pool Spray") and decay heat removal (LCO 3.4.8, "Residual Heat Removal (RHR) Shutdown Cooling System-Hot Shutdown"). The Applicability is therefore consistent with the requirements of these systems.

Although the LCO for the RHRSW System and the UHS is not applicable in MODES 4 and 5, the capability of the RHRSW System and UHS to perform their necessary related support functions may be required for OPERABILITY of supported systems.

---

ACTIONS

The ACTIONS are modified by a Note indicating that the applicable Conditions of LCO 3.4.8, be entered and Required Actions taken if the inoperable RHRSW subsystem results in inoperable RHR shutdown cooling (SDC) (i.e., both the Unit 1 and Unit 2 RHRSW pumps in a loop are inoperable resulting in the associated RHR SDC system being inoperable). This is an exception to LCO 3.0.6 because the Required Actions of LCO 3.7.1 do not adequately compensate for the loss of RHR SDC Function (LCO 3.4.8).

Condition A is modified by a separate note to allow separate Condition entry for each valve. This is acceptable since the Required Action for this Condition provide appropriate compensatory actions.

A.1, A.2 and A.3

With one spray loop bypass valve not capable of being closed on demand, the associated Unit 1 and Unit 2 RHRSW subsystems cannot use the spray cooling function of the affected UHS return loop. As a result, the associated RHRSW subsystem must be declared inoperable.

With one spray loop bypass valve not capable of being opened on demand, a return flow path is not available. As a result, the associated RHRSW subsystems must be declared inoperable.

With one spray array bypass manual valve not capable of being closed, the associated Unit 1 and Unit 2 RHRSW subsystems cannot use the spray cooling function of the affected UHS return path if the spray array bypass valve fails to close. As a result, the associated RHRSW subsystems must be declared inoperable.

---

BASES

---

ACTIONS  
(continued)

A.1, A.2 and A.3 (continued)

With one spray array bypass manual valve not open, a return flow path is not available. As a result, the associated RHRSW subsystems must be declared inoperable.

With one large spray array valve not capable of being opened on demand, the associated Unit 1 and Unit 2 RHRSW subsystems cannot use the full required spray cooling capability of the affected UHS return path. With one large spray array valve not capable of being closed on demand, the associated Unit 1 and Unit 2 RHRSW subsystems cannot use the small spray array when loop flows are low as the required spray nozzle pressure is not achievable for the small spray array. As a result, the associated RHRSW subsystems must be declared inoperable.

With one small spray array valve not capable of being opened on demand, the associated Unit 1 and Unit 2 RHRSW subsystems cannot use the spray cooling function of the affected UHS return path for low loop flow rates. For a single failure of the large spray array valve in the closed position, design bases LOCA/LOOP calculations assume that flow is reduced on the affected loop within 3 hours after the event to allow use of the small spray array. With one small spray array valve not capable of being closed on demand, the associated Unit 1 and Unit 2 RHRSW subsystems cannot use the large spray array for a flow path as the required nozzle pressure is not achievable for the large spray array. As a result, the associated RHRSW subsystems must be declared inoperable.

With any UHS return path valve listed in Tables 3.7.1-1, 3.7.1-2, or 3.7.1-3 inoperable, the UHS return path is no longer single failure proof.

For combinations of inoperable valves in the same loop, the UHS spray capacity needed to support the OPERABILITY of the associated Unit 1 and Unit 2 RHRSW subsystems is affected. As a result, the associated RHRSW subsystems must be declared inoperable.

The 8-hour completion time to establish the flow path provides sufficient time to open a path and de-energize the appropriate valve in the open position.

The 72-hour completion time is based on the fact that, although adequate UHS spray loop capability exists during this time period, both units are affected and an additional single failure results in a system configuration that will not meet design basis accident requirements.

BASES

---

ACTIONS  
(continued)

A.1, A.2 and A.3 (continued)

The Completion Time to restore the Unit 2 RHRSW inoperable valves has been extended to 7 days in order to complete the replacement of the Unit 1 480 V ESS Load Center Transformers 1X210 and 1X220. This is a temporary extension of the Completion Time and is applicable during the transformer replacement. In order to cope with the consequences of a LOOP, a LOCA in Unit 2 and the shutdown of Unit 1 during the extended Completion Time, the following compensatory actions are required: 1) the affected loop's spray array bypass valves are in the open position and 2) the affected loop's spray array valves are closed. Upon completion of the transformer replacements, this temporary extension is no longer applicable and will expire on June 15, 2020.

If an additional RHRSW subsystem on either Unit is inoperable, cooling capacity less than the minimum required for response to a design basis event would exist. Therefore, an 8-hour Completion Time is appropriate. The 8-hour Completion Time provides sufficient time to restore inoperable equipment and there is a low probability that a design basis event would occur during this period.

B.1

Required Action B.1 is intended to ensure that appropriate actions are taken if one Unit 2 RHRSW subsystem is inoperable. Although designated and operated as a unitized system, the associated Unit 1 subsystem is directly connected to a common header which can supply the associated RHR heat exchanger in either unit. The associated Unit 1 subsystem is considered capable of supporting the associated Unit 2 RHRSW subsystem when the Unit 1 subsystem is OPERABLE and can provide the assumed flow to the Unit 2 heat exchanger. A Completion time of 72 hours, when the associated Unit 1 RHRSW subsystem is not capable of supporting the associated Unit 2 RHRSW subsystem, is allowed to restore the Unit 2 RHRSW subsystem to OPERABLE status. In this configuration, the remaining OPERABLE Unit 2 RHRSW subsystem is adequate to perform the RHRSW heat removal function. However, the overall reliability is reduced because a single failure in the OPERABLE RHRSW subsystem could result in loss of RHRSW function. The Completion Time is based on the redundant RHRSW capabilities afforded by the OPERABLE subsystem and the low probability of an event occurring requiring RHRSW during this period.

BASES

---

ACTIONS  
(continued)

B.1 (continued)

The Completion Time to restore the Unit 2 RHRSW subsystem has been extended to 7 days in order to complete the replacement of the Unit 1 480 V ESS Load Center Transformers 1X210 and 1X220. This is a temporary extension of the Completion Time and is applicable during the transformer replacement. The Unit 2 RHRSW subsystem remains functional since the subsystem has an operable pump, operable flow path and an operable UHS. Upon completion of the transformer replacements, this temporary extension is no longer applicable and will expire on June 15, 2020.

Additionally, the Completion Time to restore the Unit 2 RHRSW system has been extended to 14 days in order to complete the replacement of a portion of the Unit 1 ESW piping. This is a temporary extension of the Completion Time and is applicable during the Unit 1 ESW piping replacement. When utilizing the temporary Completion Time extension, the 72 hour and 7 day Completion Times do not apply.

In order to cope with the consequences of a LOCA/LOOP in Unit 2 during the extended Completion Time, the following compensatory measure is required: Provisions will be implemented to restore piping integrity to allow use of the Unit 2 RHRSW system within the current LCO Completion Time. Upon completion of the Unit 1 ESW piping replacement, this temporary extension is no longer applicable and will expire on June 25, 2026.

With one RHRSW subsystem inoperable, and the respective Unit 1 RHRSW subsystem capable of supporting the respective Unit 2 RHRSW subsystem, the design basis cooling capacity for both units can still be maintained even considering a single active failure. However, the configuration does reduce the overall reliability of the RHRSW System. Therefore, provided the associated Unit 1 subsystem remains capable of supporting its respective Unit 2 RHRSW subsystem, the inoperable RHRSW subsystem must be restored to OPERABLE status within 7 days. The 7-day Completion Time is based on the remaining RHRSW System heat removal capability.

BASES

---

ACTIONS  
(continued)

C.1

Required Action C.1 is intended to ensure that appropriate actions are taken if both Unit 2 RHRSW subsystems are inoperable. Although designated and operated as a unitized system, the associated Unit 1 subsystem is directly connected to a common header which can supply the associated RHR heat exchanger in either unit. With both Unit 2 RHRSW subsystems inoperable, the RHRSW system is still capable of performing its intended design function. However, the loss of an additional RHRSW subsystem on Unit 1 results in the cooling capacity to be less than the minimum required for response to a design basis event. Therefore, the 8 hour Completion Time is appropriate. The 8-hour Completion Time for restoring one RHRSW subsystem to OPERABLE status, is based on the Completion Times provided for the RHR suppression pool spray function.

With both Unit 2 RHRSW subsystems inoperable, and both of the Unit 1 RHRSW subsystems capable of supporting their respective Unit 2 RHRSW subsystem, if no additional failures occur which impact the RHRSW System, the remaining OPERABLE Unit 1 subsystems and flow paths provide adequate heat removal capacity following a design basis LOCA. However, capability for this alignment is not assumed in long term containment response analysis and an additional single failure in the RHRSW System could reduce the system capacity below that assumed in the safety analysis.

Therefore, continued operation is permitted only for a limited time. One inoperable subsystem is required to be restored to OPERABLE status within 72 hours. The 72 hour Completion Time for restoring one inoperable RHRSW subsystem to OPERABLE status is based on the fact that the alternate loop is capable of providing the required cooling capability during this time period.

D.1 and D.2

If the RHRSW subsystems cannot be restored to OPERABLE status within the associated Completion Times, or the UHS is determined to be inoperable, the unit must be placed in a MODE in which the LCO does not apply. To achieve this status, the unit must be placed in at least MODE 3 within 12 hours and in MODE 4 within 36 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required unit conditions from full power conditions in an orderly manner and without challenging unit systems.

BASES

---

SURVEILLANCE  
REQUIREMENTS

SR 3.7.1.1

This SR verifies the water level to be sufficient for the proper operation of the RHRSW pumps (net positive suction head and pump vortexing are considered in determining this limit). The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

SR 3.7.1.2

Verification of the UHS temperature, which is the arithmetical average of the UHS temperature near the surface, middle and bottom levels, ensures that the heat removal capability of the ESW and RHRSW Systems are within the assumptions of the DBA analysis. The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

SR 3.7.1.3

Verifying the correct alignment for each manual, power operated, and automatic valve in each RHRSW subsystem flow path provides assurance that the proper flow paths will exist for RHRSW operation. This SR does not apply to valves that are locked, sealed, or otherwise secured in position, since these valves are verified to be in the correct position prior to locking, sealing, or securing. A valve is also allowed to be in the nonaccident position, and yet considered in the correct position, provided it can be realigned to its accident position. This is acceptable because the RHRSW System is a manually initiated system.

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 Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

BASES

---

SURVEILLANCE  
REQUIREMENTS  
(continued)

SR 3.7.1.4

The UHS spray array bypass valves are required to actuate to the closed position for the UHS to perform its design function. These valves receive an automatic signal to open upon emergency service water (ESW) or residual heat removal service water (RHRSW) system pump start and are required to be operated from the control room or the remote shutdown panel. A spray bypass valve is considered to be inoperable when it cannot be closed on demand. Failure of the spray bypass valve to close on demand puts the UHS at risk to exceed its design temperature. The failure of the spray bypass valve to open on demand makes one return path unavailable, and therefore the associated RHRSW subsystems must be declared inoperable. This SR demonstrates that the valves will move to their required positions when required. The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

SR 3.7.1.5

The UHS return header large spray array valves are required to open in order for the UHS to perform its design function. These valves are manually actuated from either the control room or the remote shutdown panel, under station operating procedure, when the RHRSW system is required to remove energy from the reactor vessel or suppression pool. This SR demonstrates that the valves will move to their required positions when required. The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

SR 3.7.1.6

The small spray array valves HV-01224A2 and B2 are required to operate in order for the UHS to perform its design function. These valves are manually actuated from the control room or the remote shutdown panel, under station operating procedure, when the RHRSW system is required to remove energy from the reactor vessel or suppression pool. This SR demonstrates that the valves will move to their required positions when required. The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

SR 3.7.1.7

The spray array bypass manual valves 012287A and B are required to operate in the event of a failure of the spray array bypass valves to close in order for the UHS to perform its design function.

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

BASES

---

REFERENCES

1. FSAR, Section 9.2.
  2. FSAR, Chapter 6.
  3. FSAR, Chapter 15.
  4. Final Policy Statement on Technical Specifications Improvements,  
July 22, 1993 (58 FR 39132).
-

## B 3.7. PLANT SYSTEMS

### B 3.7.2 Emergency Service Water (ESW) System

#### BASES

---

**BACKGROUND** The ESW System is designed to provide cooling water for the removal of heat from equipment, such as the diesel generators (DGs), residual heat removal (RHR) pump coolers, and room coolers for Emergency Core Cooling System equipment, required for a safe reactor shutdown following a Design Basis Accident (DBA) or transient. Upon receipt of a loss of offsite power or loss of coolant accident (LOCA) signal, ESW pumps are automatically started after a time delay.

The ESW System consists of two independent and redundant subsystems. Each of the two ESW subsystems is made up of a header, two pumps, a suction source, valves, piping and associated instrumentation. The two subsystems are separated from each other so an active single failure in one subsystem will not affect the OPERABILITY of the other subsystem. A continuous supply of water is provided to ESW from the Service Water System for the keepfill system. This supply is not required for ESW operability.

Cooling water is pumped from the Ultimate Heat Sink (UHS) by the ESW pumps to the essential components through the two main headers. After removing heat from the components, the water is discharged to the spray pond (UHS) by way of a network of sprays that dissipate the heat to the atmosphere or directly to the UHS via a bypass header.

---

**APPLICABLE SAFETY ANALYSES** Sufficient water inventory is available for all ESW System post LOCA cooling requirements for a 30 day period with no additional makeup water source available. The ability of the ESW System to support long term cooling is assumed in evaluations of the equipment required for safe reactor shutdown presented in the FSAR, Chapters 4 and 6 (Refs. 1 and 2, respectively).

The ability of the ESW System to provide adequate cooling to the identified safety equipment is an implicit assumption for the safety analyses evaluated in References 1 and 2. The ability to provide onsite emergency AC power is dependent on the ability of the ESW System to cool the DGs. The long term cooling capability of the RHR and core spray pumps is also dependent on the cooling provided by the ESW System.

The ESW System satisfies Criterion 3 of the NRC Policy Statement. (Ref. 3)

## BASES

---

### LCO

The ESW subsystems are independent of each other to the degree that each has separate controls, power supplies, and the operation of one does not depend on the other. In the event of a DBA, one subsystem of ESW is required to provide the minimum heat removal capability assumed in the safety analysis for the system to which it supplies cooling water. To ensure this requirement is met, two subsystems of ESW must be OPERABLE. At least one subsystem will operate, if the worst single active failure occurs coincident with the loss of offsite power.

A subsystem is considered OPERABLE when it has two OPERABLE pumps, and an OPERABLE flow path capable of taking suction from the UHS and transferring the water to the appropriate equipment and returning flow to the UHS. If individual loads are isolated, the affected components may be rendered inoperable, but it does not necessarily affect the OPERABILITY of the ESW System. Because each ESW subsystem supplies all four required DGs, an ESW subsystem is considered OPERABLE if it supplies at least three of the four DGs provided no single DG does not have an ESW subsystem capable of supplying flow.

An adequate suction source is not addressed in this LCO since the minimum net positive suction head of the ESW pumps is bounded by the Residual Heat Removal Service Water System requirements (LCO 3.7.1, "Residual Heat Removal System and Ultimate Heat Sink (UHS)").

The ESW return loop requirement, in terms of operable UHS return paths or UHS spray capacity, is also not addressed in this LCO. UHS operability, in terms of the return loop and spray capacity is addressed in the RHRSW/UHS Technical Specification (LCO 3.7.1, "Residual Heat Removal Service Water System and Ultimate Heat Sink (UHS)").

---

### APPLICABILITY

In MODES 1, 2, and 3, the ESW System is required to be OPERABLE to support OPERABILITY of the equipment serviced by the ESW System. Therefore, the ESW System is required to be OPERABLE in these MODES.

Although the LCO for the ESW System is not applicable in MODES 4 and 5, the capability of the ESW System to perform its necessary related support functions may be required for OPERABILITY of supported systems.

BASES

---

ACTIONS

The ACTIONS are modified by a Note indicating that the applicable Conditions of LCO 3.8.1, be entered and Required Actions taken if the inoperable ESW subsystem results in inoperable DGs (i.e., the supply from both subsystems of ESW is secured to the same DG). This is an exception to LCO 3.0.6 because the Required Actions of LCO 3.7.2 do not adequately compensate for the loss of a DG (LCO 3.8.1) due to loss of ESW flow.

A.1

With one ESW pump inoperable in each subsystem, both inoperable pumps must be restored to OPERABLE status within 7 days. With the unit in this condition, the remaining OPERABLE ESW pumps are adequate to perform the ESW heat removal function; however, the overall reliability is reduced because a single failure could result in loss of ESW function. The 7 day Completion Time is based on the remaining ESW heat removal capability and the low probability of an event occurring during this time period.

B.1

With one or both ESW subsystems not capable of supplying ESW flow to two or more DGs, the capability to supply ESW to at least three DGs from each ESW subsystem must be restored within 7 days. With the units in this condition, the remaining ESW flow to DGs is adequate to maintain the full capability of all DGs; however, the overall reliability is reduced because a single failure could result in loss of the multiple DGs. The 7 day Completion Time is based on the fact that all DGs remain capable of responding to an event occurring during this time period.

Additionally, the Completion Time to restore the ESW subsystem has been extended to 14 days in order to complete the replacement of a portion of the Unit 1 ESW piping. This is a temporary extension of the Completion Time and is applicable during the Unit 1 ESW piping replacement. In order to cope with the consequences of a LOCA/LOOP in Unit 2 during the extended Completion Time, the following compensatory action is required: Provisions will be implemented to restore piping integrity to allow the use of the inoperable Unit 2 ESW subsystem within the current LCO Completion Time. Upon completion of the Unit 1 ESW piping replacement, this temporary extension is no longer applicable and will expire on June 25, 2026.

BASES

---

ACTIONS  
(continued)

C.1

With one ESW subsystem inoperable for reasons other than Condition B, the ESW subsystem must be restored to OPERABLE status within 7 days. With the unit in this condition, the remaining OPERABLE ESW subsystem is adequate to perform the heat removal function. However, the overall reliability is reduced because a single failure in the OPERABLE ESW subsystem could result in loss of ESW function.

The 7 day Completion Time is based on the redundant ESW System capabilities afforded by the OPERABLE subsystem, the low probability of an accident occurring during this time period, and is consistent with the allowed Completion Time for restoring an inoperable Core Spray Loop, LPCI Pumps and Control Structure Chiller.

Additionally, the Completion Time to restore the ESW subsystem has been extended to 14 days in order to complete the replacement of a portion of the Unit 1 ESW piping. This is a temporary extension of the Completion Time and is applicable during the Unit 1 ESW piping replacement. In order to cope with the consequences of a LOCA/LOOP in Unit 2 during the extended Completion Time, the following compensatory action is required: Provisions will be implemented to restore piping integrity to allow the use of the inoperable Unit 2 ESW subsystem within the current LCO Completion Time. Upon completion of the Unit 1 ESW piping replacement, this temporary extension is no longer applicable and will expire on June 25, 2026.

D.1 and D.2

If the ESW subsystem cannot be restored to OPERABLE status within the associated Completion Time, or both ESW subsystems are inoperable for reasons other than Condition A and B (i.e., three ESW pumps inoperable), the unit must be placed in a MODE in which the LCO does not apply. To achieve this status, the unit must be placed in at least MODE 3 within 12 hours and in MODE 4 within 36 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required unit conditions from full power conditions in an orderly manner and without challenging unit systems.

BASES

---

SURVEILLANCE  
REQUIREMENTS

SR 3.7.2.1

Verifying the correct alignment for each manual, power operated, and automatic valve in each ESW subsystem flow path provides assurance that the proper flow paths will exist for ESW 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 locking, sealing, or securing. A valve is also allowed to be in the nonaccident position, and yet considered in the correct position, provided it can be automatically realigned to its accident position within the required time.

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.

This SR is modified by a Note indicating that isolation of the ESW System to components or systems may render those components or systems inoperable, but does not necessarily affect the OPERABILITY of the ESW System. As such, when all ESW pumps, valves, and piping are OPERABLE, but a branch connection off the main header is isolated, the ESW System is still OPERABLE.

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

SR 3.7.2.2

This SR verifies that the automatic valves of the ESW System will automatically switch to the safety or emergency position to provide cooling water exclusively to the safety related equipment during an accident event. This is demonstrated by the use of an actual or simulated initiation signal. This SR also verifies the automatic start capability of the ESW pumps in each subsystem.

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

---

REFERENCES

1. FSAR, Chapter 4.
  2. FSAR, Chapter 6.
  3. Final Policy Statement on Technical Specifications Improvements, July 22, 1993 (58 FR 39132)
-