B 3.7 PLANT SYSTEMS

B 3.7.2 Reactor Building Cooling Water (RCW) System, Reactor Service Water (RSW) System and Ultimate Heat Sink (UHS) - Shutdown

BASES

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BACKGROUND

A description of the RCW and RSW Systems and the UHS are provided in the Bases for LCO 3.7.1, "Reactor Building Cooling Water (RCW) System, Reactor Service Water (RSW) System and Ultimate Heat Sink (UHS) - Operating."

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APPLICABLE SAFETY ANALYSES

The volume of water incorporated in the UHS is sized so that sufficient water inventory is available for all RCW/RSW System post LOCA cooling requirements for a 30 day period with no additional makeup water source available (Ref. 1). The ability of the RCW/RSW System to support long term cooling of the reactor or containment is assumed in evaluations of the equipment required for safe reactor shutdown presented in the SSAR, Sections 9.2.11, 6.2.1.1.3.3.1.4, and Chapter 15, (Refs. 2, 3 and 4, respectively). The long term cooling analyses following a design basis LOCA demonstrates that only one division of the RCW/RSW system is required, post LOCA, to support long term cooling of the reactor or containment. To provide redundancy, a minimum of two RCW/RSW divisions are required to be OPERABLE in MODES 4 and 5 except with the reactor cavity to dryer/separator storage pool gate removed and water le[illegible] ≥ 7.0 m (23 ft) over the top of the react[illegible] pressure vessel flange.

The combined RCW/RSW System, together with the UHS, satisfy Criterion 3 of the NRC Policy Statement.

(continued)

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BASES

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LCO

Two divisions of the RCW/RSW System and the UHS are required to be OPERABLE to ensure the effective operation of the RHR System in removing heat from the reactor, and the effective operation of other safety related equipment during a DBA or transient. Requiring two divisions to be OPERABLE ensures that one division will be available to provide adequate capability to meet cooling requirements of the equipment required for safe shutdown in the event of a single failure. Operability of the UHS and the RCW/RSW System is defined in the Basis for LCO 3.7.1.

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APPLICABILITY

In MODES 4 and 5 except with the reactor cavity to dryer/separator storage pool gate removed and water level $\geq$ 7.0 m (23 ft) over the top of the reactor pressure vessel flange, two divisions of the RCW/RSW System and the UHS are required to be OPERABLE to support OPERABILITY of the equipment serviced by the RCW/RSW System and UHS, and are required to be OPERABLE in these MODES.

In MODES 1, 2, and 3, the OPERABILITY requirements of the RCW/RSW System and UHS are specified in LCO 3.7.1.

In MODE 5 with the reactor cavity to dryer/separator storage pool gate removed and water level $\geq$ 7.0 m (23 ft) over the top of the reactor pressure vessel flange, the OPERABILITY requirements of the RCW/RSW System and UHS are specified in LCO 3.7.3, "RCW/RSW System and UHS - Refueling".

(continued)

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BASES

ACTIONS

A.1 and A.2

If one or more required RCW/RSW division(s) or the UHS is inoperable, then, immediately, those required feature(s) supported by the inoperable RCW/RSW division(s) or UHS must be declared inoperable (i.e., Emergency Diesel Generator, RHR heat exchanger) and the applicable Conditions and Required Actions of the appropriate LCOs for the inoperable required feature(s) must be entered. For the applicable shutdown MODES, an inoperable RCW/RSW division or UHS requires entering the Conditions of LCO 3.8.2, "AC Sources-Shutdown," for a diesel generator made inoperable and either LCO 3.4.8, "Residual Heat Removal (RHR) Shutdown Cooling System-Cold Shutdown," or LCO 3.9.8, "Residual Heat Removal (RHR) Low Water Level" for RHR shutdown cooling made inoperable. This is in accordance with LCO 3.0.6 and ensures the proper actions are taken for these components.

SURVEILLANCE REQUIREMENTS

SR 3.7.2.1

This SR ensures adequate long term (30 days) cooling can be maintained. With the UHS water source below the minimum level, the affected RCW/RSW division must be declared inoperable. The 24 hour Frequency is based on operating experience related to trending of the parameter variations during the applicable MODES.

SR 3.7.2.2

This SR verifies the water level in each RSW pump well of the intake structure to be sufficient for the proper operation of the RSW pumps (net positive suction head and pump vortexing are considered in determining this limit). The 24 hour Frequency is based on operating experience related to trending of the parameter variations during the applicable MODES.

(continued)

BASES

SR 3.7.2.3

Verification of the UHS temperature ensures that the heat removal capability of the RCW/RSW System is within the assumptions of the DBA analysis. The 24 hour Frequency is based on operating experience related to trending of the parameter variations during the applicable MODES.

SR 3.7.2.4

Verifying the correct alignment for each manual, power operated, and automatic valve in each RCW/RSW division flow path provides assurance that the proper flow paths will exist for RCW/RSW 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. 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.

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

The 31 day Frequency is based on engineering judgement, is consistent with the procedural controls governing valve operation, and ensures correct valve positions.

(continued)

BASES

SR 3.7.2.5

This SR verifies that the automatic isolation valves of the RCW/RSW System will automatically switch to the safety or emergency position to provide cooling water exclusively to the safety related equipment, and limited non-safety related equipment, during an accident event. This is demonstrated by use of an actual or simulated initiation signal. This SR also verifies the automatic start capability of the RCW/RSW pumps that are in standby and automatic valving in each of the standby RCW/RSW heat exchangers in each division. The LOGIC SYSTEM FUNCTIONAL TEST in SR 3.3.5.1.4 overlaps this SR to provide complete testing of the safety function.

Operating experience has shown that these components usually pass the SR when performed on the 18 month Frequency. Therefore, this Frequency is concluded to be acceptable from a reliability standpoint.

REFERENCES

1. Regulatory Guide 1.27, Revision 2, January 1976.

2. ABWR SSAR, Sections 9.2.11 and 9.2.15.

3. ABWR SSAR, Section 6.2.1.1.3.3.1.4.

4. ABWR SSAR, Chapter 15.

B 3.7 PLANT SYSTEMS

B 3.7.3 Reactor Building Cooling Water (RCW) System, Reactor Service Water (RSW) System and Ultimate Heat Sink (UHS) - Refueling

BASES

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BACKGROUND

A description of the RCW and RSW Systems and the UHS are provided in the Bases for LCO 3.7.1, "Reactor Building Cooling Water (RCW) System, Reactor Service Water (RSW) System and Ultimate Heat Sink (UHS) - Operating". In MODE 5 with the reactor vessel water level $\geq$ 7.0 m (23 ft) over the vessel flange the unit components to which the RCW/RSW System is required to supply cooling water is greatly reduced from normal operation. For example, LCO 3.8.2, "AC Sources-Shutdown" and LCO 3.9.7, "RHR-High Water Level" require one DG and one RHR subsystem to be OPERABLE, respectively, and LCO 3.5.2, "ECCS-Shutdown" does not require any ECCS components to be OPERABLE for this condition.

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APPLICABLE SAFETY ANALYSES

The volume of water incorporated in the UHS is sized so that sufficient water inventory is available for all RCW/RSW System post LOCA cooling requirements for a 30 day period with no additional makeup water source available (Ref. 1). The ability of the RCW/RSW System to support long term cooling of the reactor or containment is assumed in evaluations of the equipment required for safe reactor shutdown presented in the SSAR, Sections 9.2.11, 6.2.1.1.3.3.1.4, and Chapter 15, (Refs. 2, 3 and 4, respectively). With the unit in MODE 5 and with the reactor cavity to dryer/separator storage gate removed and water level $\geq$ 7.0 m (23 ft) over the top of the reactor pressure vessel flange, the volume of water in the reactor vessel provides a heat sink for decay heat removal. However, to provide redundancy, a minimum of one RCW/RSW division is required to be OPERABLE.

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BASES

APPLICABLE SAFETY ANALYSIS (continued)

The combined RCW/RSW System, together with the UHS, satisfy Criterion 3 of the NRC Policy Statement.

LCO

One division of the RCW/RSW System and the UHS are required to be OPERABLE to ensure the effective operation of the RHR System in removing heat from the reactor. LCO 3.9.7, "RHR-High Water Level" requires that one RHR subsystem be OPERABLE and in operation in MODE 5 with the water level $\geq$ 7.0 m (23 ft) above the RPV flange. Only one subsystem is required because the volume of water above the RPV flange provides backup decay heat removal capability. Operability of the UHS and the RCW/RSW System is defined in the Basis for LCO 3.7.1.

APPLICABILITY

In MODE 5 with the reactor cavity to dryer/separator storage pool gate removed and water level $\geq$ 7.0 m (23 ft) over the top of the reactor pressure vessel flange, one division of the RCW/RSW System and the UHS are required to be OPERABLE to support OPERABILITY of the equipment serviced by the RCW/RSW System and UHS, and are required to be OPERABLE in this MODE.

In MODES 1, 2, and 3, the OPERABILITY requirements of the RCW/RSW System and UHS are specified in LCO 3.7.1.

In MODES 4 and 5 except with the reactor cavity to dryer/separator storage pool gate removed and water level $\geq$ 7.0 m (23 ft) over the top of the reactor pressure vessel flange, the OPERABILITY requirements of the RCW/RSW System and UHS are specified in LCO 3.7.2, "RCW/RSW System and UHS - Shutdown".

(continued)

BASES

ACTIONS

A.1 and A.2

If no RCW/RSW division is operable or the UHS is inoperable, then, immediately, those required feature(s) supported by the inoperable required RCW/RSW division or UHS must be declared inoperable (i.e., Emergency Diesel Generator, RHR heat exchanger) and the applicable Conditions and Required Actions of the appropriate LCOs for the inoperable required feature(s) must be entered. An inoperable RCW/RSW division or UHS requires entering the Conditions of LCO 3.8.2, "AC Sources-Shutdown," for a diesel generator made inoperable and LCO 3.9.7, "Residual Heat Removal (RHR)-High Water Level" for RHR shutdown cooling made inoperable. This is in accordance with LCO 3.0.6 and ensures the proper actions are taken for these components.

SURVEILLANCE REQUIREMENTS

SR 3.7.3.1

This SR ensures adequate long term (30 days) cooling can be maintained. With the UHS water source below the minimum level, the affected RCW/RSW division must be declared inoperable. The 24 hour Frequency is based on operating experience related to trending of the parameter variations during the applicable MODES.

SR 3.7.3.2

This SR verifies the water level in each RSW pump well of the intake structure to be sufficient for the proper operation of the RSW pumps (net positive suction head and pump vortexing are considered in determining this limit). The 24 hour Frequency is based on operating experience related to trending of the parameter variations during the applicable MODES.

(continued)

BASES

SR 3.7.3.3

Verification of the UHS temperature ensures that the heat removal capability of the RCW/RSW System is within the assumptions of the DBA analysis. The 24 hour Frequency is based on operating experience related to trending of the parameter variations during the applicable MODES.

SR 3.7.3.4

Verifying the correct alignment for each manual, power operated, and automatic valve in each RCW/RSW division flow path provides assurance that the proper flow paths will exist for RCW/RSW 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. 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.

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

The 31 day Frequency is based on engineering judgement, is consistent with the procedural controls governing valve operation, and ensures correct valve positions.

(continued)

BASES

SR 3.7.3.5

This SR verifies that the automatic isolation valves of the RCW/RSW System will automatically switch to the safety or emergency position to provide cooling water exclusively to the safety related equipment, and limited non-safety related equipment, during an accident event. This is demonstrated by use of an actual or simulated initiation signal. This SR also verifies the automatic start capability of the RCW/RSW pumps that are in standby and automatic valving in each of the standby RCW/RSW heat exchangers in each division. The LOGIC SYSTEM FUNCTIONAL TEST in SR 3.3.5.1.4 overlaps this SR to provide complete testing of the safety function.

Operating experience has shown that these components usually pass the SR when performed on the 18 month Frequency. Therefore, this Frequency is concluded to be acceptable from a reliability standpoint.

REFERENCES

1. Regulatory Guide 1.27, Revision 2, January 1976.

2. ABWR SSAR, Sections 9.2.11 and 9.2.15.

3. ABWR SSAR, Section 6.2.1.1.3.3.1.4.

4. ABWR SSAR, Chapter 15.

RCW/RSW

~~[SSW]~~ System and [UHS] – 3.7.1 Operating

Reactor Building Cooling

RCW

Reactor Service Water (RSW) System

3.7 PLANT SYSTEMS

3.7.1 [~~Standby Service~~ Water (~~SSW~~)] System, and [Ultimate Heat Sink (UHS)] – Operating

LCO 3.7.1 Division ~~1 and 2 [SSW] subsystems~~ A, B and C of the RCW/RSW System and [UHS] the shall be OPERABLE.

APPLICABILITY: MODES 1, 2, and 3.

ACTIONS

| CONDITION | REQUIRED ACTION | COMPLETION TIME |
|---|---|---|
| ~~A. One or more cooling towers with one cooling tower fan inoperable.~~ | ~~A.1 Restore cooling tower fan(s) to OPERABLE status.~~ | ~~7 days~~ |
| A. One RCW pump and/or one RSW pump and/or one RCW/RSW heat exchanger inoperable in a single division. | A.1 Restore pump(s) and/or heat exchanger to OPERABLE status. | (continued) 30 days |

ACTIONS (continued)

| CONDITION | REQUIRED ACTION | COMPLETION TIME |
|---|---|---|
| RCW/RSW division<br>B. One [SSW] ~~subsystem~~ inoperable [for reasons other than Condition A]. | B.1 --------NOTES--------<br>1. Enter applicable Conditions and Required Actions of LCO 3.8.1, "AC Sources—Operating," for diesel generator made inoperable by [SSW].<br>2. Enter applicable Conditions and Required Actions of LCO 3.4.9, "Residual Heat Removal (RHR) Shutdown Cooling System—Hot Shutdown," for [RHR shutdown cooling] made inoperable by [SSW].<br>----------<br>Restore [SSW] subsystem to OPERABLE status. | Immediately<br><br>~~72 hours~~ |
| B.1 Declare associated supported required feature(s) inoperable and enter applicable Conditions and Required Actions of the LCOs for the inoperable required feature(s).<br>AND<br>B.2 Initiate action to restore RCW/RSW division to OPERABLE status. | | Immediately |
| C. Condition A exists in two or more RCW/RSW divisions. | C.1 Restore one inoperable RCW/RSW division to OPERABLE status.<br>AND<br>C.2 Restore two inoperable RCW/RSW divisions to OPERABLE status. | (continued)<br>7 days<br><br>14 days |

ACTIONS (continued)

| CONDITION | REQUIRED ACTION | COMPLETION TIME |
|---|---|---|
| D<br>~~C~~. Required Action and associated Completion Time of Condition A, B or ~~B~~ C not met.<br><br>OR<br><br>Two or more RCW/RSW divisions<br>~~Both [SSW] subsystems~~ inoperable [for reasons other than Condition ~~A~~ C]. | D<br>~~C~~.1 Be in MODE 3.<br><br>AND<br><br>P<br>~~C~~.2 Be in MODE 4. | 12 hours<br><br><br><br>36 hours |
| OR<br><br>[UHS] inoperable. ~~for reasons other than Condition A.~~ | | |

SURVEILLANCE REQUIREMENTS

| SURVEILLANCE | | FREQUENCY |
|---|---|---|
| SR 3.7.1.1 | Verify the water level of each [UHS] ~~cooling tower basin~~ [spray pond] is ≥ [~~7.25~~] ft. | 24 hours |
| SR 3.7.1.2 | Verify the water level [in each R ~~S~~SW pump well of the intake structure] is ≥ [ ] ft. | 24 hours |
| SR 3.7.1.3 | Verify the average water temperature of [UHS] is ≤ [~~]~~] °F. 35°C (95°F) | 24 hours |

(continued)

SURVEILLANCE REQUIREMENTS (continued)

| SURVEILLANCE | | FREQUENCY |
|---|---|---|
| ~~SR 3.7.1.4~~ | ~~Operate each [SSW] cooling tower fan for ≥ [15] minutes.~~ | ~~31 days~~ |
| SR 3.7.1.4 | ----------NOTE---------- RCW/RSW<br>Isolation of flow to individual components does not render ~~[SSW]~~ System inoperable.<br>----------<br>Verify each ~~[SSW] subsystem~~ RCW/RSW division manual, power operated, and automatic valve in the flow path servicing safety related systems or components, that is not locked, sealed, or otherwise secured in position, is in the correct position. | 31 days |
| SR 3.7.1.5 | Verify each ~~[SSW] subsystem~~ RCW/RSW division actuates on an actual or simulated initiation signal. | [18] months |

B 3.7 PLANT SYSTEMS

B 3.7.1 [~~Standby Service~~ Water (~~SSW~~)] System and [Ultimate Heat Sink (UHS)] - Operating

BASES

BACKGROUND

The [~~SSW~~] System is designed to provide cooling water for the removal of heat from unit auxiliaries, such as Residual Heat Removal (RHR) System heat exchangers, standby diesel generators (DGs), and room coolers for Emergency Core Cooling System equipment required for a safe reactor shutdown following a Design Basis Accident (DBA) or transient. The [~~SSW~~] System also provides cooling to unit components, as required, during normal shutdown and reactor isolation modes. During a DBA, the equipment required for normal operation only is isolated from the [~~SSW~~] System, and cooling is directed only to safety related equipment.

The [SSW] System consists of the [UHS], two independent cooling water headers (subsystems A and B), and their associated pumps, piping, valves, and instrumentation. The two [SSW] pumps, or one [SSW] pump and the high pressure core spray service water pump, are sized to provide sufficient cooling capacity to support the required safety related systems during safe shutdown of the unit following a loss of coolant accident (LOCA). Subsystems A and B are redundant and service equipment in [SSW] Divisions 1 and 2, respectively.

The [UHS] ~~consists of two concrete makeup water basins, each containing one cooling tower with two fan cells per basin.~~ The ~~combined basin volume~~ is sized such that sufficient water inventory is available for all [~~SSW~~] System post LOCA cooling requirements for a 30 day period with no external makeup water source available (Regulatory Guide 1.27, Ref. 1). Normal makeup for ~~each basin~~ is provided automatically by the ~~Plant Service Water System~~.

Cooling water is pumped from the ~~cooling tower basins~~ by the ~~two~~ [~~SSW~~] pumps to the ~~essential components~~. Through the ~~two~~ main redundant supply headers (~~subsystems A and B~~). ~~After removing heat from the components, the water is discharged to the cooling towers where the heat is rejected through direct contact with ambient air.~~

~~Subsystems~~ Divisions A, and ~~B~~ C supply cooling water to redundant equipment required for a safe reactor shutdown. Additional

(continued)



Reactor Building Cooling

RCW

Reactor service Water (RSW) system,

drywell coolers

RCW and RSW are

RCW/RSW

to selected non-essential equipment such as control rod drive (CRD) pump oil coolers, instrument and service air compressor coolers, reactor water cleanup (RWCU) pump coolers, and reactor internal pump (RIP) MG set coolers and

most, but not all,

RCW/RSW

ALL non-essential equipment can be manually isolated if required. During all plant operating modes, ALL RCW/RSW divisions have at least one pump operating and, therefore, if a LOCA occurs the RCW/RSW systems will already be in operation.

Replace with Insert M

[is a spray pond with four spray networks, and their supply piping, suspended above the pond surface on reinforced concrete columns.]

[spray pond]

RCW/RSW

[the spray pond]

[power cycle heat sink makeup line]

RSW

[spray pond]

RCW/RSW heat exchangers

three

(divisions A, B and C)

In a separate closed loop cooling water is circulated by the pump(s) in each RCW division through the essential components to be cooled and back through the RCW/RSW heat exchangers. Thus, the heat removed from the components by the RCW is transferred to the RSW, and then ultimately rejected to the UHS.

(M)

division

division

The combined RCW/RSW system includes three seperate ~~subsystems~~ (A, B and C). Each ~~subsystem~~ consists of the ultimate heat sink (UHS), an independent cooling water header, an independent service water loop, and the associated pumps, heat exchangers, piping, valves and instrumentation. Each ~~subsystem~~ includes two RCW pumps, two RSW pumps and three RCW to RSW heat exchangers. Each ~~subsystem~~ is sized to provide sufficient cooling capacity to support the required safety-related systems in its respective division during safe shutdown of the unit following a loss-of-coolant accident (LOCA).

division

division

BASES

BACKGROUND (continued)

information on the design and operation of the ~~[SSW]~~ System and [UHS] along with the specific equipment for which the ~~[SSW]~~ System supplies cooling water is provided in the FSAR, Section [9.2.1] and the FSAR, Table [9.2-3] (Refs. 2 and 3, respectively). The ~~[SSW]~~ System is designed to withstand a single active or passive failure, coincident with a loss of offsite power, without losing the capability to supply adequate cooling water to equipment required for safe reactor shutdown.

Following a DBA or transient, the ~~[SSW]~~ System will operate automatically without operator action. Manual initiation of supported systems ~~(e.g., suppression pool cooling)~~ is, however, performed for ~~long term~~ cooling operations.

APPLICABLE SAFETY ANALYSES

The volume of ~~each~~ water ~~source~~ incorporated in ~~a [UHS] complex~~ is sized so that sufficient water inventory is available for all ~~[SSW]~~ System post LOCA cooling requirements for a 30 day period with no additional makeup water source available (Ref. 1). The ability of the ~~[SSW]~~ System to support long term cooling of the reactor or containment is assumed in evaluations of the equipment required for safe reactor shutdown presented in the FSAR, Sections [9.2.1], ~~[6.2.1.1.3.3.1.6]~~ and Chapter [15], (Refs. 2, 4, and 5, respectively). These analyses include the evaluation of the long term primary containment response after a design basis LOCA. The ~~[SSW]~~ System provides cooling water for the RHR suppression pool cooling mode to limit suppression pool temperature and primary containment pressure following a LOCA. This ensures that the primary containment can perform its intended function of limiting the release of radioactive materials to the environment following a LOCA. The ~~[SSW]~~ System also provides cooling to other components assumed to function during a LOCA (e.g., RHR) ~~and Low Pressure Core Spray systems)~~. Also, the ability to provide onsite emergency AC power is dependent on the ability of the ~~[SSW]~~ System to cool the DGs.

The safety analyses for long term containment cooling were performed, as discussed in the FSAR, Sections [6.2.1.1.3.3.1.6] and [6.2.2.3] (Refs. 4 and 6, respectively), for a LOCA, concurrent with a loss of offsite power, and minimum available DG power. The worst case single failure affecting the performance of the ~~[SSW]~~ System

(continued)

APPLICABLE SAFETY ANALYSES (continued)

is the failure of one of the ~~two~~ three standby DGs, which would in turn affect one of the three RCW/RSW divisions ~~[SSW] subsystem. The [SSW] flow assumed in the analyses is [7900] gpm per pump to the heat exchanger (FSAR, Table [6.2-2], Ref. 7).~~ and cause failure of a RHR heat exchanger as assumed in the SSAR analysis. Operating Reference 2 discusses ~~[SSW]~~ RCW/RSW System performance during these conditions.

The ~~[SSW]~~ combined RCW/RSW System, together with the [UHS], satisfy Criterion 3 of the NRC Policy Statement.

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LCO

The OPERABILITY of ~~subsystem A (Division 1) and subsystem B (Division 2)~~ Divisions A, B and C of the RCW/RSW ~~[SSW]~~ System is required to ensure the effective operation of the RHR System in removing heat from the reactor, and the effective operation of other safety related equipment during a DBA or transient. Requiring ~~both subsystems~~ all three divisions to be OPERABLE ensures that ~~either subsystem A or B~~ two divisions will be available to provide adequate capability to meet cooling requirements of the equipment required for safe shutdown in the event of a single failure.

A ~~subsystem~~ division is considered OPERABLE when:

a. ~~The~~ ALL four associated RCW/RSW pump ~~is~~ are OPERABLE;
b. ~~ALL three~~ RCW/RSW ~~heat exchangers~~ are OPERABLE;
c. ~~b.~~ The associated [UHS] is OPERABLE; and
d. ~~c.~~ The associated piping, valves, instrumentation, and controls required to perform the safety related function are OPERABLE.

OPERABILITY of the [UHS] is based on a maximum water temperature of ~~([95] °F)~~ 35°C with OPERABILITY of each ~~subsystem~~ division requiring a minimum ~~basin~~ water level at or above elevation [~~130 ft 3 inches~~] mean sea level (equivalent to an indicated level of ≥ [~~7 ft 3 inches~~]) and four OPERABLE ~~cooling tower fans~~ [spray networks].

The isolation of the RCW/RSW ~~[SSW]~~ System to components or systems may render those components or systems inoperable, but does not affect the OPERABILITY of the RCW/RSW ~~[SSW]~~ System.

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APPLICABILITY

In MODES 1, 2, and 3, the RCW/RSW ~~[SSW]~~ System and [UHS] are required to be OPERABLE to support OPERABILITY of the

(continued)

BASES

APPLICABILITY (continued)

equipment serviced by the ~~[SSW]~~ RCW/RSW System and [UHS], and are required to be OPERABLE in these MODES.

In MODES 4 and 5, the OPERABILITY requirements of the ~~[SSW]~~ RCW/RSW System and [UHS] are ~~determined by the systems they support~~ specified in LCO's 3.7.2, "RCW/RSW and UHS-Shutdown" and 3.7.3, "RCW/RSW and UHS-Refueling."

ACTIONS

A.1

~~If one~~ or more cooling towers have one fan inoperable (i.e., up to one fan per cooling tower inoperable), action ~~must~~ be taken to restore the inoperable cooling tower fan(s) to OPERABLE status ~~within 7 days~~.

The 7 day Completion Time is reasonable, based on the low probability of an accident occurring during the 7 days that one cooling tower fan is inoperable in one or more cooling towers, the number of available systems, and the time required to complete the Required Action.

Replace with INSERT N

B.1

~~RCW/RSW division~~

If one [SSW] ~~subsystem~~ is inoperable [for reasons other than Condition A], it must be restored to OPERABLE status within 72 hours. With the unit in this condition, the remaining OPERABLE [SSW] subsystem is adequate to perform the heat removal function. However, the overall reliability is reduced because a single failure in the OPERABLE [SSW] subsystem could result in loss of [SSW] function. The 72 hour Completion Time was developed taking into account the redundant capabilities afforded by the OPERABLE subsystem and the low probability of a DBA occurring during this period.

The Required Action is modified by two Notes indicating that the applicable Conditions of LCO 3.8.1, "AC Sources—Operating," and LCO 3.4.9, "Residual Heat Removal (RHR) Shutdown Cooling System—Hot Shutdown," be entered and the Required Actions taken if the inoperable [SSW] subsystem results in an inoperable DG or RHR shutdown cooling, respectively. This is in accordance with LCO 3.0.6 and ensures the proper actions are taken for these components.

Replace with INSERT FF

(continued)

(N)

A.1

If one RCW pump and/or one RSW pump and/or one RCW/RSW heat exchanger in the same ~~subsystem~~ is inoperable (i.e., if ~~less than a~~ minimum complement of one RCW pump, one RSW pump and two RCW/RSW heat exchangers are OPERABLE) in one ~~subsystem~~, action must be taken to restore the inoperable component(s), and thus the ~~subsystem~~ affected, to OPERABLE status within 30 days. In this condition sufficient redundant equipment is still available to provide cooling water to the required safety related components and sufficient heat removal capacity is still available to adequately cool safety related loads, even assuming the worst case single failure. However, in the degraded mode of this Condition, overall reliability is reduced and a ~~subsystem~~ may not be capable of removing heat from the respective RHR heat exchanger at a rate consistent with design basis assumptions and modeling in the analysis for long term containment cooling (depending on other factors such as actual UHS temperature).

With a minimum complement of one RCW pump, one RSW pump and two RCW/RSW heat exchangers, a ~~subsystem~~ is capable of performing its safety related cooling function, consistent with design basis assumptions, for all required modes with the exception of containment cooling. However, beyond design basis calculations performed to support PRA success criteria (Ref. ~~xx~~) demonstrate that successful operation of only one of three RHR ~~subsystems~~ (in the suppression pool cooling mode) is needed to prevent conditions inside the containment from exceeding its ultimate capacity (see B 3.6.2.3). Thus, should a DBA occur while in this slightly degraded Condition, even considering a coincident worst case single failure, the combined RCW/RSW and RHR system would retain the capability to ultimately protect containment integrity.

The 30-day Completion Time is reasonable, based on the low probability of an accident occurring during the 30 days that a component is inoperable in one or more ~~subsystems~~, the number of available redundant ~~subsystems~~, the substantial cooling capability still remaining in a ~~subsystem(s)~~ division ~~subsystem(s)~~ in this Condition, and the expected high ~~subsystem~~ division availability afforded by a system where most of the equipment, including the minimum required for most functions, is normally operating.

~~The Required Action is modified by a Note indicating that the provisions of LCO 3.0.4 are not applicable. This is acceptable given the substantial degree of redundancy provided by the RCW/RSW and supported systems and the significant operational capability that still exists, in this marginally degraded condition.~~

B 3.7-4a

FF

B.1 and B.2

If one RCW/RSW division is inoperable for reasons other than Condition A, then, immediately, those required feature(s) supported by the inoperable RCW/RSW division must be declared inoperable (e.g., Emergency Diesel Generator, RHR heat exchanger, drywell coolers, RIP coolers, etc.) and the applicable Conditions and Required Actions of the appropriate LCOs for the inoperable required feature(s) must be entered. For example, applicable Conditions of LCO 3.8.1, "AC Sources-Operating," LCO 3.4.7, "Residual Heat Removal (RHR) Shutdown Cooling System-Hot Shutdown," LCO 3.4.1, "Reactor Internal Pumps (RIP) Operating," and LCO 3.6.1.5, "Drywell Air Temperature" be entered and the Required Actions taken if the inoperable RCW/RSW division results in an inoperable DG, RHR shutdown cooling, RIPs or drywell coolers, respectively. This is in accordance with LCO 3.0.6 and ensures the proper actions are taken for these components.

Additionally, immediate action must be taken to restore the inoperable RCW/RSW division to OPERABLE status. This is consistent with the Required Actions of the applicable LCOs for those support feature(s) declared inoperable as a result of the inoperable RCW/RSW division.

INSERT O

BASES

ACTIONS (continued)

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

If the ~~[SSW] subsystem~~ cannot be restored to OPERABLE status within the associated Completion Time, or ~~both [SSW] subsystems~~ are inoperable [for reasons other than Condition A], or the [UHS] is determined inoperable, ~~for reasons other than Condition A~~, 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.

SURVEILLANCE REQUIREMENTS

SR 3.7.1.1

This SR ensures adequate long term (30 days) cooling can be maintained. With the [UHS] water source below the minimum level, the affected ~~[SSW] subsystem~~ must be declared inoperable. The 24 hour Frequency is based on operating experience related to trending of the parameter variations during the applicable MODES.

SR 3.7.1.2

This SR verifies the water level [in each ~~[SSW]~~ pump well of the intake structure] to be sufficient for the proper operation of the ~~[SSW]~~ pumps (net positive suction head and pump vortexing are considered in determining this limit). The 24 hour Frequency is based on operating experience related to trending of the parameter variations during the applicable MODES.

SR 3.7.1.3

Verification of the [UHS] temperature ensures that the heat removal capability of the ~~[SSW]~~ System is within the assumptions of the DBA analysis. The 24 hour Frequency is based on operating experience related to trending of the parameter variations during the applicable MODES.

(continued)

and two RCW/RSW divisions must be restored to OPERABLE status in 14 days

C.1 and C.2 or more divisions division

If one RCW pump and/or one RSW pump and/or one RCW/RSW heat exchanger in the same ~~subsystem~~ is inoperable in ~~each of~~ two separate ~~subsystems~~, one RCW/RSW ~~subsystem~~ division must be restored to OPERABLE status within 7 days. In this condition sufficient redundant equipment is still available to provide cooling water to the required safety related components and sufficient heat removal capacity is still available to adequately cool safety related loads. However, a ~~subsystem~~ division may not be capable of removing heat from the respective RHR heat exchanger at a rate consistent with design basis assumptions and modeling in the analyis for long term containment cooling. Nonetheless, with a minimum complement of one RCW pump, one RSW pump and two RCW/RSW heat exchangers, a division ~~subsystem~~ is still capable of performing its safety related cooling function, consistent with design basis assumptions, for all other modes. Furthermore, beyond design basis calculations performed to support PRA 3 7 divisions success criteria (Ref. ~~XX~~) demonstrate that only one of three RHR ~~subsystems~~ (in the suppression pool cooling mode) is needed to ultimately protect containment integrity (see B 3.6.2.3). Therefore, continued operation for a limited time is justified. However, in the degraded mode of this Condition, overall reliability and heat removal capability is reduced from that of Condition A, and thus a more restrictive Completion Time is imposed.

The 7 day and 14 Completion Time is reasonable, based on the low probability of an accident occurring during the ~~7 days~~ period that one or more redundant components are inoperable in divisions are one or more ~~each of two subsystems~~, the number of available redundant divisions ~~subsystems~~, the substantial cooling capability still divisions remaining in ~~subsystems~~ in this Condition, and the division expected high ~~subsystem~~ availability afforded by a system where most of the equipment, including the minimum required for most functions, is normally operating.

~~The Required Action is modified by a Note indicating that the applicable Conditions of LCO 3.4.5, "Residual Heat Removal (RHR) Shutdown Cooling—Hot Shutdown" be entered and Required Actions taken if the inoperable RCW/RSW division subsystem results in an inoperable required RHR Shutdown Cooling subsystem. This is an exception to LCO 3.0.6 and ensures the proper actions are taken for these components.~~

5



in accordance with

SURVEILLANCE REQUIREMENTS (continued)

SR 3.7.1.4

Operating each cooling tower fan for ≥ 15 minutes ensures that all fans are OPERABLE and that all associated controls are functioning properly. It also ensures that fan or motor failure, or excessive vibration can be detected for corrective action. The 31 day Frequency is based on operating experience, the known reliability of the fan units, the redundancy available, and the low probability of significant degradation of the cooling tower fans occurring between Surveillances.

SR 3.7.1.5

Verifying the correct alignment for each manual, power operated, and automatic valve in each [SSW] subsystem flow path provides assurance that the proper flow paths will exist for [SSW] 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. 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.

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

The 31 day Frequency is based on engineering judgment, is consistent with the procedural controls governing valve operation, and ensures correct valve positions.

(continued)

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.7.1.~~6~~ 5

This SR verifies that the automatic isolation valves of the ~~[SSW]~~ 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 use of an actual or simulated initiation signal. This SR also verifies the automatic start capability of the ~~[SSW]~~ pump ~~and cooling tower fans~~ in each ~~subsystem~~. The LOGIC SYSTEM FUNCTIONAL TEST in SR 3.3.5.1.~~6~~ 4 overlaps this SR to provide complete testing of the safety function.

Operating experience has shown that these components usually pass the SR when performed on the [18] month Frequency. Therefore, this Frequency is concluded to be acceptable from a reliability standpoint.

REFERENCES

1. Regulatory Guide 1.27, Revision 2, January 1976.
2. ~~FSAR, Section~~ [9.2.~~1~~ 11 and 9.2.15].
3. ~~FSAR, Table~~ [9.2-~~3~~ 4C].
4. ~~FSAR, Section~~ [6.2.1.1.3.3.1.~~6~~ 4].
5. ~~FSAR, Chapter~~ [15].
6. ~~FSAR, Section~~ [6.2.2.3].
7. ~~FSAR, Table [6.2-2].~~ [LATER]