ATTACHMENT "A"

EXISTING SPECIFICATIONS
UNIT 2

3/4.9.8 SHUTDOWN COOLING AND COOLANT CIRCULATION

HIGH WATER LEVEL

LIMITING CONDITION FOR OPERATION

3.9.8.1 At least one shutdown cooling train shall be OPERABLE and in operation.#*

APPLICABILITY: MODE 6 when the water level above the top of the reactor pressure vessel flange is greater than or equal to 23 feet.

ACTION:

With no shutdown cooling train OPERABLE and in operation, suspend all operations involving an increase in the reactor decay heat load or a reduction in boron concentration of the Reactor Coolant System and immediately initiate corrective action to return the required shutdown cooling train to OPERABLE and operating status as soon as possible. Close all containment penetrations providing direct access from the containment atmosphere to the outside atmosphere within 4 hours.

SURVEILLANCE REQUIREMENTS

4.9.8.1 a. At least one shutdown cooling train shall be verified to be in operation and circulating reactor coolant at a flow rate of greater than or equal to 2200 gpm at least once per 12 hours.

#The shutdown cooling train may be removed from operation for up to 1 hour per 8-hour period during the performance of CORE ALTERATIONS in the vicinity of the reactor pressure vessel hot legs.

*A containment spray pump may be used in place of a low pressure safety injection pump in either or both shutdown cooling trains to provide shutdown cooling flow. (Subsequent to implementation of DCP 2-6863)

LOW WATER LEVEL

LIMITING CONDITION FOR OPERATION

3.9.8.2 Two independent shutdown cooling trains shall be OPERABLE and at least one shutdown cooling train shall be in operation.*

APPLICABILITY: MODE 6 when the water level above the top of the reactor pressure vessel flange is less than 23 feet.

ACTION:

a. With less than the required shutdown cooling trains OPERABLE, immediately initiate corrective action to return the required shutdown cooling trains to OPERABLE status, or to establish greater than or equal to 23 feet of water above the reactor pressure vessel flange as soon as possible.

b. With no shutdown cooling train in operation, suspend all operations involving a reduction in boron concentration of the Reactor Coolant System and immediately initiate corrective action to return the required shutdown cooling train to operation. Close all containment penetrations providing direct access from the containment atmosphere to the outside atmosphere within 4 hours.

SURVEILLANCE REQUIREMENTS

4.9.8.2 At least one shutdown cooling train shall be verified to be in operation and circulating reactor coolant at a flow rate of greater than or equal to 2200 gpm at least once per 12 hours.

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*A containment spray pump may be used in place of a low pressure safety injection pump in either or both shutdown cooling trains to provide shutdown cooling flow. (Subsequent to implementation of DCP 2-6863)

BASES

3/4.9.8 SHUTDOWN COOLING AND COOLANT CIRCULATION

The requirement that at least one shutdown cooling train be in operation ensures that (1) sufficient cooling capacity is available to remove decay heat and maintain the water in the reactor pressure vessel below 140°F as required during the REFUELING MODE, and (2) sufficient coolant circulation is maintained through the reactor core to minimize the effects of a boron dilution incident and prevent boron stratification.

In MODE 6 a containment spray (CS) pump may be used in place of the low pressure safety injection (LPSI) pump in either or both shutdown cooling trains to provide shutdown cooling (SDC) flow.

The requirement to have two shutdown cooling trains OPERABLE when there is less than 23 feet of water above the reactor pressure vessel flange, ensures that a single failure of the operating shutdown cooling loop will not result in a complete loss of decay heat removal capacity. With the reactor vessel head removed and 23 feet of water above the reactor pressure vessel flange, a large heat sink is available for core cooling, thus in the event of a failure of the operating shutdown cooling train, adequate time is provided to initiate emergency procedures to cool the core.

ATTACHMENT "B"

EXISTING SPECIFICATIONS
UNIT 3

3/4.9.8 SHUTDOWN COOLING AND COOLANT CIRCULATION

HIGH WATER LEVEL

LIMITING CONDITION FOR OPERATION

3.9.8.1 At least one shutdown cooling train shall be OPERABLE and in operation.#*

APPLICABILITY: MODE 6 when the water level above the top of the reactor pressure vessel flange is greater than or equal to 23 feet.

ACTION:

With no shutdown cooling train OPERABLE and in operation, suspend all operations involving an increase in the reactor decay heat load or a reduction in boron concentration of the Reactor Coolant System and immediately initiate corrective action to return the required shutdown cooling train to OPERABLE and operating status as soon as possible. Close all containment penetrations providing direct access from the containment atmosphere to the outside atmosphere within 4 hours.

SURVEILLANCE REQUIREMENTS

4.9.8.1 a. At least one shutdown cooling train shall be verified to be in operation and circulating reactor coolant at a flow rate of greater than or equal to 2200 gpm at least once per 12 hours.

#The shutdown cooling train may be removed from operation for up to 1 hour per 8-hour period during the performance of CORE ALTERATIONS in the vicinity of the reactor pressure vessel hot legs.

*A containment spray pump may be used in place of a low pressure safety injection pump in either or both shutdown cooling trains to provide shutdown cooling flow. (Subsequent to implementation of MMP 3-6863)

LOW WATER LEVEL

LIMITING CONDITION FOR OPERATION

3.9.8.2 Two independent shutdown cooling trains shall be OPERABLE and at least one shutdown cooling train shall be in operation.#*

APPLICABILITY: MODE 6 when the water level above the top of the reactor pressure vessel flange is less than 23 feet.

ACTION:

a. With less than the required shutdown cooling trains OPERABLE, immediately initiate corrective action to return the required shutdown cooling trains to OPERABLE status, or to establish greater than or equal to 23 feet of water above the reactor pressure vessel flange as soon as possible.

b. With no shutdown cooling train in operation, suspend all operations involving a reduction in boron concentration of the Reactor Coolant System and immediately initiate corrective action to return the required shutdown cooling train to operation. Close all containment penetrations providing direct access from the containment atmosphere to the outside atmosphere within 4 hours.

SURVEILLANCE REQUIREMENTS

4.9.8.2 At least one shutdown cooling train shall be verified to be in operation and circulating reactor coolant at a flow rate of greater than or equal to 2200 gpm at least once per 12 hours.

#Both shutdown cooling trains may be removed from operation for up to 1 hour per 8-hour period during the performance of CORE ALTERATIONS in the vicinity of the reactor pressure vessel hot legs provided all operations involving a reduction in boron concentration of the RCS are suspended.

*A containment spray pump may be used in place of a low pressure safety injection pump in either or both shutdown cooling trains to provide shutdown cooling flow. (Subsequent to implementation of MMP 3-6863)

BASES

3/4.9.8 SHUTDOWN COOLING AND COOLANT CIRCULATION

The requirement that at least one shutdown cooling train be in operation ensures that (1) sufficient cooling capacity is available to remove decay heat and maintain the water in the reactor pressure vessel below 140°F as required during the REFUELING MODE, and (2) sufficient coolant circulation is maintained through the reactor core to minimize the effects of a boron dilution incident and prevent boron stratification.

In MODE 6 a containment spray (CS) pump may be used in place of the low pressure safety injection (LPSI) pump in either or both shutdown cooling trains to provide shutdown cooling (SDC) flow.

The requirement to have two shutdown cooling trains OPERABLE when there is less than 23 feet of water above the reactor pressure vessel flange, ensures that a single failure of the operating shutdown cooling loop will not result in a complete loss of decay heat removal capacity. With the reactor vessel head removed and 23 feet of water above the reactor pressure vessel flange, a large heat sink is available for core cooling, thus in the event of a failure of the operating shutdown cooling train, adequate time is provided to initiate emergency procedures to cool the core.

ATTACHMENT "C"

REVISED SPECIFICATIONS
UNIT 2

3/4.9.8 SHUTDOWN COOLING AND COOLANT CIRCULATION

HIGH WATER LEVEL

LIMITING CONDITION FOR OPERATION

3.9.8.1 At least one shutdown cooling train shall be OPERABLE and in operation.#*

APPLICABILITY: MODE 6 when the water level above the top of the reactor pressure vessel flange is greater than or equal to ~~23~~ 20 feet.

ACTION:

With no shutdown cooling train OPERABLE and in operation, suspend all operations involving an increase in the reactor decay heat load or a reduction in boron concentration of the Reactor Coolant System and immediately initiate corrective action to return the required shutdown cooling train to OPERABLE and operating status as soon as possible. Close all containment penetrations providing direct access from the containment atmosphere to the outside atmosphere within 4 hours.

SURVEILLANCE REQUIREMENTS

4.9.8.1 a. At least one shutdown cooling train shall be verified to be in operation and circulating reactor coolant at a flow rate of greater than or equal to 2200 gpm at least once per 12 hours.

#The shutdown cooling train may be removed from operation for up to ~~1~~ 2 hours per 8-hour period during the performance of 1) CORE ALTERATIONS in the vicinity of the reactor pressure vessel hot legs or 2) testing of LPSI system components required by the inservice inspection program provided:

a. The maximum RCS temperature is maintained ≤ 140°F.
b. No operations are permitted that would cause a reduction of the RCS boron concentration.
c. The capability to close the containment penetrations with direct access to the outside atmosphere within the calculated time to boil is maintained.
d. The reactor cavity water level is maintained ≥ 20 feet above the top of the reactor pressure vessel flange, or, for Core Alterations, ≥ 23 feet above the top of the reactor pressure vessel flange.

*A containment spray pump may be used in place of a low pressure safety injection pump in either or both shutdown cooling trains to provide shutdown cooling flow. ~~(Subsequent to implementation of DCP 2-6863)~~

LOW WATER LEVEL

LIMITING CONDITION FOR OPERATION

3.9.8.2 Two independent shutdown cooling trains shall be OPERABLE and at least one shutdown cooling train shall be in operation.*

or

One train of shutdown cooling shall be OPERABLE and operating under the following conditions:

1) The reactor has been shutdown for at least 6 days.

2) The water level above the reactor vessel flange is greater than 12 feet.

3) One train of Salt Water Cooling (SWC) is OPERABLE and operating.

4) One train of Component Cooling Water (CCW) and the CCW swing pump are OPERABLE, and the CCW train is operating with either of the OPERABLE CCW pumps.

5) One train of Shutdown Cooling is OPERABLE with a containment spray pump operating on shutdown cooling, the high pressure safety injection pump and the low pressure safety injection pump of the same train are OPERABLE and available for injection from the RWST.

6) The RWST contains the volume of water required to raise the level to 20 feet above the reactor vessel flange.

7) The associated Emergency Diesel Generator is OPERABLE.

8) The water temperature of the SDC system is maintained less than 120°F.

APPLICABILITY: MODE 6 when the water level above the top of the reactor pressure vessel flange is less than ~~23~~ 20 feet.

ACTION:

a. With less than the required shutdown cooling trains OPERABLE, immediately initiate corrective action to return the required shutdown cooling trains to OPERABLE status, or to establish greater than or equal to ~~23~~ 20 feet of water above the reactor pressure vessel flange as soon as possible.

b. If operating one train of the shutdown cooling system with less than 20 feet of water above the reactor pressure vessel flange and any of the required conditions (1 through 8) are not met, immediately take action to establish greater than or equal to 20 feet of water above the reactor pressure vessel flange.

~~b~~ c. With no shutdown cooling train in operation, suspend all operations involving a reduction in boron concentration of the Reactor Coolant System and immediately initiate corrective action to return the required shutdown cooling train to operation. Close all containment penetrations providing direct access from the containment atmosphere to the outside atmosphere within 4 hours.

SURVEILLANCE REQUIREMENTS

4.9.8.2 At least one shutdown cooling train shall be verified to be in operation and circulating reactor coolant at a flow rate of greater than or equal to 2200 gpm at least once per 12 hours.

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*A containment spray pump may be used in place of a low pressure safety injection pump in either or both shutdown cooling trains to provide shutdown cooling flow. ~~(Subsequent to implementation of DCP 2 6863)~~

3/4.9.8 SHUTDOWN COOLING AND COOLANT CIRCULATION

The requirement that at least one shutdown cooling train be in operation ensures that (1) sufficient cooling capacity is available to remove decay heat and maintain the water in the reactor pressure vessel below 140°F as required during the REFUELING MODE, and (2) sufficient coolant circulation is maintained through the reactor core to minimize the effects of a boron dilution incident and prevent boron stratification.

In MODE 6 a containment spray (CS) pump may be used in place of the low pressure safety injection (LPSI) pump in either or both shutdown cooling trains to provide shutdown cooling (SDC) flow.

The requirement to have two shutdown cooling trains OPERABLE when there is less than ~~23~~ 20 feet of water above the reactor pressure vessel flange, ensures that a single failure of the operating shutdown cooling loop will not result in a complete loss of decay heat removal capacity. With the reactor vessel head removed and ~~23~~ 20 feet of water above the reactor pressure vessel flange, a large heat sink is available for core cooling, thus in the event of a failure of the operating shutdown cooling train, adequate time is provided to initiate emergency procedures to cool the core.

With the reactor vessel head removed and 12 feet of water above the reactor pressure vessel flange and all the specified requirements met, a heat sink is available for core cooling and a method is available to restore the reactor cavity level to 20 feet above the reactor vessel flange. Therefore, in the event of a failure of the operating shutdown cooling train, adequate time is provided to initiate emergency procedures to cool the core.

ATTACHMENT "D"

REVISED SPECIFICATIONS
UNIT 3

3/4.9.8 SHUTDOWN COOLING AND COOLANT CIRCULATION

HIGH WATER LEVEL

LIMITING CONDITION FOR OPERATION

3.9.8.1 At least one shutdown cooling train shall be OPERABLE and in operation.#*

APPLICABILITY: MODE 6 when the water level above the top of the reactor pressure vessel flange is greater than or equal to ~~23~~ 20 feet.

ACTION:

With no shutdown cooling train OPERABLE and in operation, suspend all operations involving an increase in the reactor decay heat load or a reduction in boron concentration of the Reactor Coolant System and immediately initiate corrective action to return the required shutdown cooling train to OPERABLE and operating status as soon as possible. Close all containment penetrations providing direct access from the containment atmosphere to the outside atmosphere within 4 hours.

SURVEILLANCE REQUIREMENTS

4.9.8.1 a. At least one shutdown cooling train shall be verified to be in operation and circulating reactor coolant at a flow rate of greater than or equal to 2200 gpm at least once per 12 hours.

#The shutdown cooling train may be removed from operation for up to ~~1~~ 2 hours per 8-hour period during the performance of 1) CORE ALTERATIONS in the vicinity of the reactor pressure vessel hot legs or 2) testing of LPSI system components required by the inservice inspection program provided:

a. The maximum RCS temperature is maintained ≤ 140°F.
b. No operations are permitted that would cause a reduction of the RCS boron concentration.
c. The capability to close the containment penetrations with direct access to the outside atmosphere within the calculated time to boil is maintained.
d. The reactor cavity water level is maintained ≥ 20 feet above the top of the reactor pressure vessel flange, or, for Core Alterations, ≥ 23 feet above the top of the reactor pressure vessel flange.

*A containment spray pump may be used in place of a low pressure safety injection pump in either or both shutdown cooling trains to provide shutdown cooling flow. ~~(Subsequent to implementation of MMP 3-6863)~~

LOW WATER LEVEL

LIMITING CONDITION FOR OPERATION

3.9.8.2 Two Independent shutdown cooling trains shall be OPERABLE and at least one shutdown cooling train shall be in operation.**

or

One train of shutdown cooling shall be OPERABLE and operating under the following conditions:

1) The reactor has been shutdown for at least 6 days.

2) The water level above the reactor vessel flange is greater than 12 feet.

3) One train of Salt Water Cooling (SWC) is OPERABLE and operating.

4) One train of Component Cooling Water (CCW) and the CCW swing pump are OPERABLE, and the CCW train is operating with either of the OPERABLE CCW pumps.

5) One train of Shutdown Cooling is OPERABLE with a containment spray pump operating on shutdown cooling, the high pressure safety injection pump and the low pressure safety injection pump of the same train are OPERABLE and available for injection from the RWST.

6) The RWST contains the volume of water required to raise the level to 20 feet above the reactor vessel flange.

7) The associated Emergency Diesel Generator is OPERABLE.

8) The water temperature of the SDC system is maintained less than 120°F.

APPLICABILITY: MODE 6 when the water level above the top of the reactor pressure vessel flange is less than ~~23~~ 20 feet.

ACTION:

a. With less than the required shutdown cooling trains OPERABLE, immediately initiate corrective action to return the required shutdown cooling trains to OPERABLE status, or to establish greater than or equal to ~~23~~ 20 feet of water above the reactor pressure vessel flange as soon as possible.

b. If operating one train of the shutdown cooling system with less than 20 feet of water above the reactor pressure vessel flange and any of the required conditions (1 through 8) are not met, immediately take action to establish greater than or equal to 20 feet of water above the reactor pressure vessel flange.

~~b~~ c. With no shutdown cooling train in operation, suspend all operations involving a reduction in boron concentration of the Reactor Coolant System and immediately initiate corrective action to return the required shutdown cooling train to operation. Close all containment penetrations providing direct access from the containment atmosphere to the outside atmosphere within 4 HOURS.

SURVEILLANCE REQUIREMENTS

4.9.8.2 At least one shutdown cooling train shall be verified to be in operation and circulating reactor coolant at a flow rate of greater than or equal to 2200 gpm at least once per 12 hours.

~~# Both shutdown cooling trains may be removed from operation for up to 1 hour per 8 hour period during the performance of CORE ALTERATIONS in the vicinity of the reactor pressure vessel hot legs provided all operations involving a reduction in boron concentration of the RCS are suspended.~~

*A containment spray pump may be used in place of a low pressure safety injection pump in either or both shutdown cooling trains to provide shutdown cooling flow. ~~(Subsequent to implementation of MMP 3-6863)~~

3/4.9.8 SHUTDOWN COOLING AND COOLANT CIRCULATION

The requirement that at least one shutdown cooling train be in operation ensures that (1) sufficient cooling capacity is available to remove decay heat and maintain the water in the reactor pressure vessel below 140°F as required during the REFUELING MODE, and (2) sufficient coolant circulation is maintained through the reactor core to minimize the effects of a boron dilution incident and prevent boron stratification.

In MODE 6 a containment spray (CS) pump may be used in place of the low pressure safety injection (LPSI) pump in either or both shutdown cooling trains to provide shutdown cooling (SDC) flow.

The requirement to have two shutdown cooling trains OPERABLE when there is less than ~~23~~ 20 feet of water above the reactor pressure vessel flange, ensures that a single failure of the operating shutdown cooling loop will not result in a complete loss of decay heat removal capacity. With the reactor vessel head removed and ~~23~~ 20 feet of water above the reactor pressure vessel flange, a large heat sink is available for core cooling, thus in the event of a failure of the operating shutdown cooling train, adequate time is provided to initiate emergency procedures to cool the core.

With the reactor vessel head removed and 12 feet of water above the reactor pressure vessel flange and all the specified requirements met, a heat sink is available for core cooling and a method is available to restore the reactor cavity level to 20 feet above the reactor vessel flange. Therefore, in the event of a failure of the operating shutdown cooling train, adequate time is provided to initiate emergency procedures to cool the core.

Enclosure 2

REVISED TECHNICAL SPECIFICATION IMPROVEMENT PROGRAM
(PCN 299) TECHNICAL SPECIFICATIONS
UNIT 2

3.9 REFUELING OPERATIONS

3.9.4 Shutdown Cooling (SDC) and Coolant Circulation—High Water Level

LCO 3.9.4 One SDC loop shall be OPERABLE and in operation.

----------NOTE----------
The shutdown cooling train may be removed from operation for ≤ ~~1~~ 2 hours per 8-hour period during the performance of 1) CORE ALTERATIONS in the vicinity of the reactor pressure vessel hot legs or 2) testing of LPSI system components required by the inservice inspection program provided:

a. The maximum RCS temperature is maintained ≤ 140°F.
b. No operations are permitted that would cause a reduction of the RCS boron concentration.
c. The capability to close the containment penetrations with direct access to the outside atmosphere within the calculated time to boil is maintained.
d. The reactor cavity water level is maintained ≥ 20 feet above the reactor pressure vessel flange, or, for Core Alterations, ≥ 23 feet above the top of the reactor pressure vessel flange.

----------NOTE----------
A containment spray pump may be used in place of a low pressure safety injection pump to provide shutdown cooling flow.

APPLICABILITY: MODE 6 with the water level ≥ ~~23~~ 20 ft above the top of reactor vessel flange.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. SDC loop requirements not met.	A.1 Suspend operations involving a reduction in reactor coolant boron concentration. AND	Immediately (continued)

ACTIONS

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. (continued)	A.2	Suspend loading irradiated fuel assemblies in the core.	Immediately
	AND		
	A.3	Initiate action to satisfy SDC loop requirements.	Immediately
	AND		
	A.4	Close all containment penetrations providing direct access from containment atmosphere to outside atmosphere.	4 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.9.4.1	Verify one SDC loop is in operation and circulating reactor coolant at a flow rate of ≥ 2200 gpm.	12 hours

3.9 REFUELING OPERATIONS

3.9.5 Shutdown Cooling (SDC) and Coolant Circulation—Low Water Level

LCO 3.9.5 Two SDC loops shall be OPERABLE, and one SDC loop shall be in operation.

or

One train of shutdown cooling shall be OPERABLE and operating under the following conditions:

1) The reactor has been shutdown for at least 6 days.

2) The water level above the reactor vessel flange is greater than 12 feet.

3) One train of Salt Water Cooling (SWC) is OPERABLE and operating.

4) One train of Component Cooling Water (CCW) and the CCW swing pump are OPERABLE, and the CCW train is operating with either of the OPERABLE CCW pumps.

5) One train of Shutdown Cooling is OPERABLE with a containment spray pump operating on shutdown cooling, the high pressure safety injection pump and the low pressure safety injection pump of the same train are OPERABLE and available for injection from the RWST.

6) The RWST contains the volume of water required to raise the level to 20 feet above the reactor vessel flange.

7) The associated Emergency Diesel Generator is OPERABLE.

8) The water temperature of the SDC system is maintained less than 120°F.

----------NOTE----------
A containment spray pump may be used in place of a low pressure safety injection pump to provide shutdown cooling flow.

APPLICABILITY: MODE 6 with the water level < ~~23~~ 20 ft above the top of reactor vessel flange.

ACTIONS

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. One SDC loop inoperable. (Applicable to initial conditions of two shutdown cooling trains OPERABLE)	A.1	Initiate action to restore SDC loop to OPERABLE status.	Immediately
	OR		
	A.2	Initiate actions to establish ≥ ~~23~~ 20 ft of water above the top of reactor vessel flange.	Immediately
B. One SDC loop operable, less than 20 feet of water above the reactor pressure vessel flange and all 8 requirements not met (Applicable to initial conditions of one shutdown cooling train OPERABLE and operating with requirements 1-8)	B.1	Initiate actions to establish ≥ 20 feet of water.	Immediately
~~B~~C. No SDC loop OPERABLE or in operation.	~~B~~C.1	Suspend operations involving a reduction in reactor coolant boron concentration.	Immediately
	AND		
			(continued)

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
~~BC~~. (continued)	~~BC~~.2 Initiate action to restore one SDC loop to OPERABLE status and to operation.	Immediately
	AND	
	~~BC~~.3 Close all containment penetrations providing direct access from containment atmosphere to outside atmosphere.	4 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.9.5.1	Verify required SDC loops are OPERABLE and one SDC loop is in operation and circulating reactor coolant at a flow rate of ≥ 2200 gpm.	12 hours

B 3.9 REFUELING OPERATIONS

B 3.9.4 Shutdown Cooling (SDC) and Coolant Circulation—High Water Level

BASES

BACKGROUND

The purposes of the SDC System in MODE 6 are to remove decay heat and sensible heat from the Reactor Coolant System (RCS), as required by GDC 34, to provide mixing of borated coolant, to provide sufficient coolant circulation to minimize the effects of a boron dilution accident, and to prevent boron stratification (Ref. 1). Heat is removed from the RCS by circulating reactor coolant through the SDC heat exchangers, where the heat is transferred to the Component Cooling Water System via the SDC heat exchangers. The coolant is then returned to the RCS via the RCS cold leg(s). Operation of the SDC System for normal cooldown or decay heat removal is manually accomplished from the control room. The heat removal rate is adjusted by controlling the flow of reactor coolant through the SDC heat exchangers and bypassing the heat exchangers. Mixing of the reactor coolant is maintained by this continuous circulation of reactor coolant through the SDC System.

The shutdown cooling system is a safety related, seismically qualified system which is powered by a class 1E electrical system. The cooling capacity of 1 train of the shutdown cooling system is sufficient to maintain the spent fuel pool temperature lower than can be maintained by the spent fuel pool cooling system. When components of the shutdown cooling system are not required to be OPERABLE by technical specifications, then one train of the shutdown cooling system (consisting of at least 1 LPSI pump or 1 containment spray pump, 1 heat exchanger, flow path to and from the SFP, and the associated Diesel Generator) may be aligned to cool the spent fuel pool. Additionally, during MODE 6 with the reactor refueling canal water level greater than or equal to ~~23~~ 20 feet above the reactor flange, the SDC system (consisting of at least 2 pumps (either 1 LPSI pump and 1 CS pump or 2 CS pumps), 1 SDC heat exchanger, flow paths to and from the RCS and SFP, and the associated Diesel Generator) may be aligned to cool both the SFP and the reactor core.

(continued)

BASES

APPLICABLE SAFETY ANALYSES

If the reactor coolant temperature is not maintained below 200°F, boiling of the reactor coolant could result. This could lead to inadequate cooling of the reactor fuel due to a resulting loss of coolant in the reactor vessel. Additionally, boiling of the reactor coolant could lead to a reduction in boron concentration in the coolant due to the boron plating out on components near the areas of the boiling activity, and because of the possible addition of water to the reactor vessel with a lower boron concentration than is required to keep the reactor subcritical. The loss of reactor coolant and the reduction of boron concentration in the reactor coolant would eventually challenge the integrity of the fuel cladding, which is a fission product barrier. One train of the SDC System is required to be operational in MODE 6, with the water level ≥ ~~23~~ 20 ft above the top of the reactor vessel flange, to prevent this challenge. The LCO does permit de-energizing of the SDC pump for short durations under the condition that the boron concentration is not diluted. This conditional de-energizing of the SDC pump does not result in a challenge to the fission product barrier.

SDC and Coolant Circulation—High Water Level satisfies Criterion 2 of the NRC Policy Statement.

LCO

Only one SDC loop is required for decay heat removal in MODE 6, with water level ≥ ~~23~~ 20 ft above the top of the reactor vessel flange. Only one SDC loop is required because the volume of water above the reactor vessel flange provides backup decay heat removal capability. At least one SDC loop must be in operation to provide:

a. Removal of decay heat;

b. Mixing of borated coolant to minimize the possibility of a criticality; and

c. Indication of reactor coolant temperature.

An OPERABLE SDC loop includes an SDC pump, a heat exchanger, valves, piping, instruments, and controls to ensure an OPERABLE flow path and to determine the low end temperature.

(continued)

BASES

LCO (continued)

The flow path starts in one of the RCS hot legs and is returned to the RCS cold legs.

The LCO is modified by a Note that allows the required operating SDC loop to be removed from service for up to ~~1~~2 hours in each 8 hour period, provided that: ~~no operations are permitted that would cause dilution of the Reactor Coolant System boron concentration.~~

a. The Maximum RCS temperature is maintained ≤ 140°F.
b. No operations are permitted that would cause a reduction of the RCS boron concentration.
c. The capability to close the containment penetrations with direct access to the outside atmosphere within the calculated time to boil is maintained.
d. The reactor cavity water level is maintained ≥ 20 feet above the reactor pressure vessel flange, or, for Core Alterations, ≥ 23 feet above the top of the reactor pressure vessel flange.

This permits operations such as core mapping or alterations in the vicinity of the reactor vessel hot leg nozzles, ~~and~~ RCS to SDC isolation valve testing, and inservice testing of LPSI system components. During this 2 hour period, decay heat is removed by natural convection to the large mass of water in the refueling canal.

Also, this LCO is modified by the Note that allows Operations to use a containment spray pump in place of a low pressure safety injection pump to provide shutdown cooling flow.

APPLICABILITY

One SDC loop must be in operation in MODE 6, with the water level ≥ ~~23~~20 ft above the top of the reactor vessel flange, to provide decay heat removal. ~~The 23 ft level was selected because it corresponds to the 23 ft requirement established for fuel movement in LCO 3.9.6, "Refueling Water Level."~~ Requirements for the SDC System in other MODES are covered by LCOs in Section 3.4, Reactor Coolant System (RCS), and Section 3.5, Emergency Core Cooling Systems (ECCS). SDC loop requirements in MODE 6, with the water level < ~~23~~ 20 ft above the top of the reactor vessel flange, are located in LCO 3.9.5, "Shutdown Cooling (SDC) and Coolant Circulation—Low Water Level."

(continued)

BASES

ACTIONS

SDC loop requirements are met by having one SDC loop OPERABLE and in operation, except as permitted in the Note to the LCO.

A.1

If SDC loop requirements are not met, there will be no forced circulation to provide mixing to establish uniform boron concentrations. Reduced boron concentrations can occur through the addition of water with a lower boron concentration than that contained in the RCS. Therefore, actions that reduce boron concentration shall be suspended immediately.

A.2

If SDC loop requirements are not met, actions shall be taken immediately to suspend loading irradiated fuel assemblies in the core. With no forced circulation cooling, decay heat removal from the core occurs by natural convection to the heat sink provided by the water above the core. A minimum refueling water level of 2320 ft above the reactor vessel flange provides an adequate available heat sink. Suspending any operation that would increase the decay heat load, such as loading a fuel assembly, is a prudent action under this condition.

A.3

If SDC loop requirements are not met, actions shall be initiated and continued in order to satisfy SDC loop requirements.

A.4

If SDC loop requirements are not met, all containment penetrations to the outside atmosphere must be closed to prevent fission products, if released by a loss of decay heat event, from escaping the containment building. The 4 hour Completion Time allows fixing most SDC problems without incurring the additional action of violating the containment atmosphere.

(continued)

BASES

SURVEILLANCE REQUIREMENTS

SR 3.9.4.1

This Surveillance demonstrates that the SDC loop is in operation and circulating reactor coolant. The flow rate is determined by the flow rate necessary to provide sufficient decay heat removal capability and to prevent thermal and boron stratification in the core. The Frequency of 12 hours is sufficient, considering the flow, temperature, pump control, and alarm indications available to the operator in the control room for monitoring the SDC System.

REFERENCE

1. UFSAR, Section 7.4.

B 3.9 REFUELING OPERATIONS

B 3.9.5 Shutdown Cooling (SDC) and Coolant Circulation - Low Water Level

BASES

BACKGROUND

The purposes of the SDC System in MODE 6 are to remove decay heat and sensible heat from the Reactor Coolant System (RCS), as required by GDC 34, to provide mixing of borated coolant, to provide sufficient coolant circulation to minimize the effects of a boron dilution accident, and to prevent boron stratification (Ref. 1). Heat is removed from the RCS by circulating reactor coolant through the SDC heat exchangers, where the heat is transferred to the Component Cooling Water System via the SDC heat exchangers. The coolant is then returned to the RCS via the RCS cold legs. Operation of the SDC System for normal cooldown or decay heat removal is manually accomplished from the control room. The heat removal rate is adjusted by controlling the flow of reactor coolant through the SDC heat exchangers and bypassing the heat exchangers. Mixing of the reactor coolant is maintained by this continuous circulation of reactor coolant through the SDC System.

The shutdown cooling system is a safety related, seismically qualified system which is powered by a class 1E electrical system. The cooling capacity of 1 train of the shutdown cooling system is sufficient to maintain the spent fuel pool temperature lower than can be maintained by the spent fuel pool cooling system. When components of the shutdown cooling system are not required to be OPERABLE by technical specifications, then one train of the shutdown cooling system (consisting of at least 1 LPSI pump or 1 containment spray pump, 1 heat exchanger, flow path to and from the SFP, and the associated Diesel Generator) may be aligned to cool the spent fuel pool. Additionally, during MODE 6 with the reactor refueling cavity water level less than ~~23~~ 20 feet above the reactor flange, the SDC system (consisting of at least 2 pumps (either 1 LPSI pump and 1 CS pump or 2 CS pumps), 1 SDC heat exchanger, flow paths to and from the RCS and SFP, and the associated Diesel Generator) may be aligned to cool both the SFP and the reactor core.

(continued)

BASES

APPLICABLE SAFETY ANALYSES

If the reactor coolant temperature is not maintained below 200°F, boiling of the reactor coolant could result. This could lead to inadequate cooling of the reactor fuel due to the resulting loss of coolant in the reactor vessel. Additionally, boiling of the reactor coolant could lead to a reduction in boron concentration in the coolant due to the boron plating out on components near the areas of the boiling activity, and because of the possible addition of water to the reactor vessel with a lower boron concentration than is required to keep the reactor subcritical. The loss of reactor coolant and the reduction of boron concentration in the reactor coolant would eventually challenge the integrity of the fuel cladding, which is a fission product barrier. Two trains of the SDC System are required to be OPERABLE, and one train is required to be in operation in MODE 6, with the water level < ~~23~~20 ft above the top of the reactor vessel flange, to prevent this challenge.

With the reactor vessel head removed and 12 feet of water above the reactor pressure vessel flange and all the specified requirements met a heat sink is available for core cooling and a method is available to restore the reactor cavity level to 20 feet above the reactor vessel flange. Therefore in the event of a failure of the operating shutdown cooling train, adequate time is provided to initiate emergency procedures to cool the core.

One train of shutdown cooling shall be OPERABLE and operating under the following conditions:

SDC and Coolant Circulation—Low Water Level satisfies Criterion 3 of the NRC Policy Statement.

LCO

In MODE 6, with the water level < ~~23~~20 ft above the top of the reactor vessel flange, both SDC loops must be OPERABLE. Additionally, one loop of the SDC System must be in operation in order to provide:

a. Removal of decay heat;

b. Mixing of borated coolant to minimize the possibility of a criticality; and

c. Indication of reactor coolant temperature.

(continued)

BASES

LCO (continued)

An OPERABLE SDC loop consists of an SDC pump, a heat exchanger, valves, piping, instruments, and controls to ensure an OPERABLE flow path and to determine the low end temperature. The flow path starts in one of the RCS hot legs and is returned to the RCS cold legs.

This LCO is modified by the Note that allows Operations to use a containment spray pump in place of a low pressure safety injection pump to provide shutdown cooling flow.

or

1) The reactor has been shutdown for at least 6 days.

2) The water level above the reactor vessel flange is greater than 12 feet.

3) One train of Salt Water Cooling (SWC) is OPERABLE and operating.

4) One train of Component Cooling Water (CCW) and the CCW swing pump are OPERABLE, and the CCW train is operating with either of the OPERABLE CCW pumps.

5) One train of Shutdown Cooling is OPERABLE with a containment spray pump operating on shutdown cooling, the high pressure safety injection pump and the low pressure safety injection pump of the same train are OPERABLE and available for injection from the RWST.

6) The RWST contains the volume of water required to raise the level to 20 feet above the reactor vessel flange.

7) The associated Emergency Diesel Generator is Operable.

8) The water temperature of the SDC system is maintained less than 120°F.

APPLICABILITY

Two SDC loops are required to be OPERABLE, and one SDC loop must be in operation in MODE 6, with the water level < ~~23~~20 ft above the top of the reactor vessel flange, to provide decay heat removal. Requirements for the SDC System in other MODES are covered by LCOs in Section 3.4, Reactor Coolant System. MODE 6 requirements, with a water level ≥ ~~23~~20 ft above the reactor vessel flange, are covered in

(continued)

BASES

APPLICABILITY (continued)

LCO 3.9.4, "Shutdown Cooling and Coolant Circulation—High Water Level."

ACTIONS

A.1 and A.2

When two SDC trains are operable and ~~I~~if one SDC loop ~~is inoperable~~becomes inoperable, actions shall be immediately initiated and continued until the SDC loop is restored to OPERABLE status and to operation, or until ≥ ~~2320~~ ft of water level is established above the reactor vessel flange. When the water level is established at ≥ ~~2320~~ ft above the reactor vessel flange, the Applicability will change to that of LCO 3.9.4, "Shutdown Cooling and Coolant Circulation—High Water Level," and only one SDC loop is required to be OPERABLE and in operation. An immediate Completion Time is necessary for an operator to initiate corrective actions.

B.1

When one train of SDC is operable with requirements 1-8 satisfied and the SDC loop becomes inoperable or all 8 requirements are not met, actions shall be immediately initiated to establish a water level > 20 feet above the reactor pressure flange. When the water level is established at > 20 feet above the reactor pressure vessel flange, the applicability will change to that of LCO 3.9.4, "Shutdown Cooling and Coolant Circulation—High Water Level," and only one SDC loop is required to be OPERABLE and in operation. An immediate Completion Time is necessary for an operator to initiate corrective actions.

~~B~~C.1

If no SDC loop is in operation or no SDC loops are OPERABLE, there will be no forced circulation to provide mixing to establish uniform boron concentrations. Reduced boron concentrations can occur by the addition of water with lower boron concentration than that contained in the RCS. Therefore, actions that reduce boron concentration shall be suspended immediately.

(continued)

BASES

ACTIONS (continued)

BC.2

If no SDC loop is in operation or no SDC loops are OPERABLE, actions shall be initiated immediately and continued without interruption to restore one SDC loop to OPERABLE status and operation. Since the unit is in Conditions A and B concurrently, the restoration of two OPERABLE SDC loops and one operating SDC loop should be accomplished expeditiously.

BC.3

If SDC loops requirements are not met, all containment penetrations to the outside atmosphere must be closed to prevent fission products, if released by a loss of decay heat event, from escaping the containment building. The 4 hour Completion Time allows fixing most SDC problems without incurring the additional action of violating the containment atmosphere.

SURVEILLANCE REQUIREMENTS

SR 3.9.5.1

This Surveillance demonstrates that one SDC loop is operating and circulating reactor coolant. The flow rate is determined by the flow rate necessary to provide sufficient decay heat removal capability and to prevent thermal and boron stratification in the core. In addition, this Surveillance demonstrates that the other SDC loop is OPERABLE.

In addition, during operation of the SDC loop with the water level in the vicinity of the reactor vessel nozzles, the SDC loop flow rate determination must also consider the SDC pump suction requirements. The Frequency of 12 hours is sufficient, considering the flow, temperature, pump control, and alarm indications available to the operator to monitor the SDC System in the control room.

Verification that the required loops are OPERABLE and in operation ensures that loops can be placed in operation as needed, to maintain decay heat and retain forced circulation. The Frequency of 12 hours is considered reasonable, since other administrative controls are available and have proven to be acceptable by operating experience.

(continued)

BASES

REFERENCE 1. UFSAR, Section 7.4.

REVISED TECHNICAL SPECIFICATION IMPROVEMENT PROGRAM
(PCN 299) TECHNICAL SPECIFICATIONS
UNIT 3

3.9 REFUELING OPERATIONS

3.9.4 Shutdown Cooling (SDC) and Coolant Circulation—High Water Level

LCO 3.9.4 One SDC loop shall be OPERABLE and in operation.

----------NOTE----------
The shutdown cooling train may be removed from operation for ≤ ~~1~~ 2 hours per 8-hour period to support 1) CORE ALTERATIONS in the vicinity of the reactor pressure vessel hot legs or 2) testing of LPSI system components required by the inservice inspection program provided:

a. The maximum RCS temperature is maintained ≤ 140°F.
b. No operations are permitted that would cause a reduction of the RCS boron concentration.
c. The capability to close the containment penetrations with direct access to the outside atmosphere within the calculated time to boil is maintained.
d. The reactor cavity water level is maintained ≥ 20 feet above the reactor pressure vessel flange, or, for Core Alterations, ≥ 23 feet above the top of the reactor pressure vessel flange.

----------NOTE----------
A containment spray pump may be used in place of a low pressure safety injection pump to provide shutdown cooling flow.

APPLICABILITY: MODE 6 with the water level ≥ ~~23~~ 20 ft above the top of reactor vessel flange.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. SDC loop requirements not met.	A.1 Suspend operations involving a reduction in reactor coolant boron concentration. AND	Immediately (continued)

ACTIONS

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. (continued)	A.2	Suspend loading irradiated fuel assemblies in the core.	Immediately
	AND		
	A.3	Initiate action to satisfy SDC loop requirements.	Immediately
	AND		
	A.4	Close all containment penetrations providing direct access from containment atmosphere to outside atmosphere.	4 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.9.4.1	Verify one SDC loop is in operation and circulating reactor coolant at a flow rate of ≥ 2200 gpm.	12 hours

3.9 REFUELING OPERATIONS

3.9.5 Shutdown Cooling (SDC) and Coolant Circulation - Low Water Level

LCO 3.9.5 Two SDC loops shall be OPERABLE, and one SDC loop shall be in operation.

or

One train of shutdown cooling shall be OPERABLE and operating under the following conditions:

1) The reactor has been shutdown for at least 6 days.

2) The water level above the reactor vessel flange is greater than 12 feet.

3) One train of Salt Water Cooling (SWC) is OPERABLE and operating.

4) One train of Component Cooling Water (CCW) and the CCW swing pump are OPERABLE, and the CCW train is operating with either of the OPERABLE CCW pumps.

5) One train of Shutdown Cooling is OPERABLE with a containment spray pump operating on shutdown cooling, the high pressure safety injection pump and the low pressure safety injection pump of the same train are OPERABLE and available for injection from the RWST.

6) The RWST contains the volume of water required to raise the level to 20 feet above the reactor vessel flange.

7) The associated Emergency Diesel Generator is OPERABLE.

8) The water temperature of the SDC system is maintained less than 120°F.

----------NOTE----------
A containment spray pump may be used in place of a low pressure safety injection pump to provide shutdown cooling flow.

APPLICABILITY: MODE 6 with the water level < ~~23~~ 20 ft above the top of reactor vessel flange.

ACTIONS

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. One SDC loop inoperable. (Applicable to initial conditions of two shutdown cooling trains OPERABLE)	A.1	Initiate action to restore SDC loop to OPERABLE status.	Immediately
	OR		
	A.2	Initiate actions to establish ≥ ~~23~~ 20 ft of water above the top of reactor vessel flange.	Immediately
B. One SDC Loop Operable, less than 20 feet of water above the reactor pressure vessel flange and all 8 requirements not met (Applicable to initial conditions of one shutdown cooling train OPERABLE and operating with requirements 1-8)	B.1	Initiate actions to establish ≥ 20 ft of water	Immediately
~~B~~C. No SDC loop OPERABLE or in operation.	~~B~~C.1	Suspend operations involving a reduction in reactor coolant boron concentration.	Immediately
	AND		
			(continued)

ACTIONS

CONDITION	REQUIRED ACTION		COMPLETION TIME
	BC.2	Initiate action to restore one SDC loop to OPERABLE status and to operation.	Immediately
	AND		
	BC.3	Close all containment penetrations providing direct access from containment atmosphere to outside atmosphere.	4 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.9.5.1	Verify required SDC loops are OPERABLE and one SDC loop is in operation and circulating reactor coolant at a flow rate of ≥ 2200 gpm.	12 hours

B 3.9 REFUELING OPERATIONS

B 3.9.4 Shutdown Cooling (SDC) and Coolant Circulation—High Water Level

BASES

BACKGROUND

The purposes of the SDC System in MODE 6 are to remove decay heat and sensible heat from the Reactor Coolant System (RCS), as required by GDC 34, to provide mixing of borated coolant, to provide sufficient coolant circulation to minimize the effects of a boron dilution accident, and to prevent boron stratification (Ref. 1). Heat is removed from the RCS by circulating reactor coolant through the SDC heat exchangers, where the heat is transferred to the Component Cooling Water System via the SDC heat exchangers. The coolant is then returned to the RCS via the RCS cold leg(s). Operation of the SDC System for normal cooldown or decay heat removal is manually accomplished from the control room. The heat removal rate is adjusted by controlling the flow of reactor coolant through the SDC heat exchangers and bypassing the heat exchangers. Mixing of the reactor coolant is maintained by this continuous circulation of reactor coolant through the SDC System.

The shutdown cooling system is a safety related, seismically qualified system which is powered by a class 1E electrical system. The cooling capacity of 1 train of the shutdown cooling system is sufficient to maintain the spent fuel pool temperature lower than can be maintained by the spent fuel pool cooling system. When components of the shutdown cooling system are not required to be OPERABLE by technical specifications, then one train of the shutdown cooling system (consisting of at least 1 LPSI pump or 1 containment spray pump, 1 heat exchanger, flow path to and from the SFP, and the associated Diesel Generator) may be aligned to cool the spent fuel pool. Additionally, during MODE 6 with the reactor refueling canal water level greater than or equal to ~~23~~ 20 feet above the reactor flange, the SDC system (consisting of at least 2 pumps (either 1 LPSI pump and 1 CS pump or 2 CS pumps), 1 SDC heat exchanger, flow paths to and from the RCS and SFP, and the associated Diesel Generator) may be aligned to cool both the SFP and the reactor core.

(continued)

BASES

APPLICABLE SAFETY ANALYSES

If the reactor coolant temperature is not maintained below 200°F, boiling of the reactor coolant could result. This could lead to inadequate cooling of the reactor fuel due to a resulting loss of coolant in the reactor vessel. Additionally, boiling of the reactor coolant could lead to a reduction in boron concentration in the coolant due to the boron plating out on components near the areas of the boiling activity, and because of the possible addition of water to the reactor vessel with a lower boron concentration than is required to keep the reactor subcritical. The loss of reactor coolant and the reduction of boron concentration in the reactor coolant would eventually challenge the integrity of the fuel cladding, which is a fission product barrier. One train of the SDC System is required to be operational in MODE 6, with the water level ≥ ~~23~~ 20 ft above the top of the reactor vessel flange, to prevent this challenge. The LCO does permit de-energizing of the SDC pump for short durations under the condition that the boron concentration is not diluted. This conditional de-energizing of the SDC pump does not result in a challenge to the fission product barrier.

SDC and Coolant Circulation—High Water Level satisfies Criterion 2 of the NRC Policy Statement.

LCO

Only one SDC loop is required for decay heat removal in MODE 6, with water level ≥ ~~23~~ 20 ft above the top of the reactor vessel flange. Only one SDC loop is required because the volume of water above the reactor vessel flange provides backup decay heat removal capability. At least one SDC loop must be in operation to provide:

a. Removal of decay heat;

b. Mixing of borated coolant to minimize the possibility of a criticality; and

c. Indication of reactor coolant temperature.

An OPERABLE SDC loop includes an SDC pump, a heat exchanger, valves, piping, instruments, and controls to ensure an OPERABLE flow path and to determine the low end temperature.

(continued)

BASES

LCO (continued)

The flow path starts in one of the RCS hot legs and is returned to the RCS cold legs.

The LCO is modified by a Note that allows the required operating SDC loop to be removed from service for up to ~~1~~2 hours in each 8 hour period, provided that: ~~no operations are permitted that would cause dilution of the Reactor Coolant System boron concentration.~~

a. The Maximum RCS temperature is maintained ≤ 140°F.
b. No operations are permitted that would cause a reduction of the RCS boron concentration.
c. The capability to close the containment penetrations with direct access to the outside atmosphere within the calculated time to boil is maintained.
d. The reactor cavity water level is maintained ≥ 20 feet above the reactor pressure vessel flange, or, for Core Alterations, ≥ 23 feet above the top of the reactor pressure vessel flange.

This permits operations such as core mapping or alterations in the vicinity of the reactor vessel hot leg nozzles, ~~and~~ RCS to SDC isolation valve testing, and inservice testing of LPSI system components. During this 2 hour period, decay heat is removed by natural convection to the large mass of water in the refueling canal.

Also, this LCO is modified by the Note that allows Operations to use a containment spray pump in place of a low pressure safety injection pump to provide shutdown cooling flow.

APPLICABILITY

One SDC loop must be in operation in MODE 6, with the water level ≥ ~~23~~20 ft above the top of the reactor vessel flange, to provide decay heat removal. ~~The 23 ft level was selected because it corresponds to the 23 ft requirement established for fuel movement in LCO 3.9.6, "Refueling Water Level."~~ Requirements for the SDC System in other MODES are covered by LCOs in Section 3.4, Reactor Coolant System (RCS), and Section 3.5, Emergency Core Cooling Systems (ECCS). SDC loop requirements in MODE 6, with the water level < ~~23~~ 20 ft above the top of the reactor vessel flange, are located in LCO 3.9.5, "Shutdown Cooling (SDC) and Coolant Circulation – Low Water Level."

(continued)

BASES

ACTIONS

SDC loop requirements are met by having one SDC loop OPERABLE and in operation, except as permitted in the Note to the LCO.

A.1

If SDC loop requirements are not met, there will be no forced circulation to provide mixing to establish uniform boron concentrations. Reduced boron concentrations can occur through the addition of water with a lower boron concentration than that contained in the RCS. Therefore, actions that reduce boron concentration shall be suspended immediately.

A.2

If SDC loop requirements are not met, actions shall be taken immediately to suspend loading irradiated fuel assemblies in the core. With no forced circulation cooling, decay heat removal from the core occurs by natural convection to the heat sink provided by the water above the core. A minimum refueling water level of ~~2320~~ 2321 ft above the reactor vessel flange provides an adequate available heat sink. Suspending any operation that would increase the decay heat load, such as loading a fuel assembly, is a prudent action under this condition.

A.3

If SDC loop requirements are not met, actions shall be initiated and continued in order to satisfy SDC loop requirements.

A.4

If SDC loop requirements are not met, all containment penetrations to the outside atmosphere must be closed to prevent fission products, if released by a loss of decay heat event, from escaping the containment building. The 4 hour Completion Time allows fixing most SDC problems without incurring the additional action of violating the containment atmosphere.

(continued)

BASES

SURVEILLANCE REQUIREMENTS

SR 3.9.4.1

This Surveillance demonstrates that the SDC loop is in operation and circulating reactor coolant. The flow rate is determined by the flow rate necessary to provide sufficient decay heat removal capability and to prevent thermal and boron stratification in the core. The Frequency of 12 hours is sufficient, considering the flow, temperature, pump control, and alarm indications available to the operator in the control room for monitoring the SDC System.

REFERENCE

1. UFSAR, Section 7.4.

B 3.9 REFUELING OPERATIONS

B 3.9.5 Shutdown Cooling (SDC) and Coolant Circulation—Low Water Level

BASES

BACKGROUND

The purposes of the SDC System in MODE 6 are to remove decay heat and sensible heat from the Reactor Coolant System (RCS), as required by GDC 34, to provide mixing of borated coolant, to provide sufficient coolant circulation to minimize the effects of a boron dilution accident, and to prevent boron stratification (Ref. 1). Heat is removed from the RCS by circulating reactor coolant through the SDC heat exchangers, where the heat is transferred to the Component Cooling Water System via the SDC heat exchangers. The coolant is then returned to the RCS via the RCS cold legs. Operation of the SDC System for normal cooldown or decay heat removal is manually accomplished from the control room. The heat removal rate is adjusted by controlling the flow of reactor coolant through the SDC heat exchangers and bypassing the heat exchangers. Mixing of the reactor coolant is maintained by this continuous circulation of reactor coolant through the SDC System.

The shutdown cooling system is a safety related, seismically qualified system which is powered by a class 1E electrical system. The cooling capacity of 1 train of the shutdown cooling system is sufficient to maintain the spent fuel pool temperature lower than can be maintained by the spent fuel pool cooling system. When components of the shutdown cooling system are not required to be OPERABLE by technical specifications, then one train of the shutdown cooling system (consisting of at least 1 LPSI pump or 1 containment spray pump, 1 heat exchanger, flow path to and from the SFP, and the associated Diesel Generator) may be aligned to cool the spent fuel pool. Additionally, during MODE 6 with the reactor refueling cavity water level less than ~~23~~ 20 feet above the reactor flange, the SDC system (consisting of at least 2 pumps (either 1 LPSI pump and 1 CS pump or 2 CS pumps), 1 SDC heat exchanger, flow paths to and from the RCS and SFP, and the associated Diesel Generator) may be aligned to cool both the SFP and the reactor core.

(continued)

BASES

APPLICABLE SAFETY ANALYSES

If the reactor coolant temperature is not maintained below 200°F, boiling of the reactor coolant could result. This could lead to inadequate cooling of the reactor fuel due to the resulting loss of coolant in the reactor vessel. Additionally, boiling of the reactor coolant could lead to a reduction in boron concentration in the coolant due to the boron plating out on components near the areas of the boiling activity, and because of the possible addition of water to the reactor vessel with a lower boron concentration than is required to keep the reactor subcritical. The loss of reactor coolant and the reduction of boron concentration in the reactor coolant would eventually challenge the integrity of the fuel cladding, which is a fission product barrier. Two trains of the SDC System are required to be OPERABLE, and one train is required to be in operation in MODE 6, with the water level < ~~2320~~ ft above the top of the reactor vessel flange, to prevent this challenge.

With the reactor vessel head removed and 12 feet of water above the reactor pressure vessel flange and all the specified requirements met a heat sink is available for core cooling and a method is available to restore the reactor cavity level to 20 feet above the reactor vessel flange. Therefore in the event of a failure of the operating shutdown cooling train, adequate time is provided to initiate emergency procedures to cool the core.

One train of shutdown cooling shall be OPERABLE and operating under the following conditions:

SDC and Coolant Circulation – Low Water Level satisfies Criterion 3 of the NRC Policy Statement.

LCO

In MODE 6, with the water level < ~~2320~~ ft above the top of the reactor vessel flange, both SDC loops must be OPERABLE. Additionally, one loop of the SDC System must be in operation in order to provide:

a. Removal of decay heat;

b. Mixing of borated coolant to minimize the possibility of a criticality; and

c. Indication of reactor coolant temperature.

(continued)

BASES

LCO (continued)

An OPERABLE SDC loop consists of an SDC pump, a heat exchanger, valves, piping, instruments, and controls to ensure an OPERABLE flow path and to determine the low end temperature. The flow path starts in one of the RCS hot legs and is returned to the RCS cold legs.

This LCO is modified by the Note that allows Operations to use a containment spray pump in place of a low pressure safety injection pump to provide shutdown cooling flow.

or

1) The reactor has been shutdown for at least 6 days.

2) The water level above the reactor vessel flange is greater than 12 feet.

3) One train of Salt Water Cooling (SWC) is OPERABLE and operating.

4) One train of Component Cooling Water (CCW) and the CCW swing pump are OPERABLE, and the CCW train is operating with either of the OPERABLE CCW pumps.

5) One train of Shutdown Cooling is OPERABLE with a containment spray pump operating on shutdown cooling, the high pressure safety injection pump and the low pressure safety injection pump of the same train are OPERABLE and available for injection from the RWST.

6) The RWST contains the volume of water required to raise the level to 20 feet above the reactor vessel flange.

7) The associated Emergency Diesel Generator is Operable.

8) The water temperature of the SDC system is maintained less than 120°F.

APPLICABILITY

Two SDC loops are required to be OPERABLE, and one SDC loop must be in operation in MODE 6, with the water level < ~~2320~~ ft above the top of the reactor vessel flange, to provide decay heat removal. Requirements for the SDC System in other MODES are covered by LCOs in Section 3.4, Reactor Coolant System. MODE 6 requirements, with a water level ≥ ~~2320~~ ft above the reactor vessel flange, are covered in

(continued)

BASES

APPLICABILITY (continued)

LCO 3.9.4, "Shutdown Cooling and Coolant Circulation – High Water Level."

ACTIONS

A.1 and A.2

When two SDC trains are operable and ~~I~~if one SDC loop ~~is inoperable~~becomes inoperable, actions shall be immediately initiated and continued until the SDC loop is restored to OPERABLE status and to operation, or until ≥ ~~23~~20 ft of water level is established above the reactor vessel flange. When the water level is established at ≥ ~~23~~20 ft above the reactor vessel flange, the Applicability will change to that of LCO 3.9.4, "Shutdown Cooling and Coolant Circulation – High Water Level," and only one SDC loop is required to be OPERABLE and in operation. An immediate Completion Time is necessary for an operator to initiate corrective actions.

B.1

When one train of SDC is operable with requirements 1-8 satisfied and the SDC loop becomes inoperable or all 8 requirements are not met, actions shall be immediately initiated to establish a water level > 20 feet above the reactor pressure flange. When the water level is established at > 20 feet above the reactor pressure vessel flange, the applicability will change to that of LCO 3.9.4, "Shutdown Cooling and Coolant Circulation – High Water Level," and only one SDC loop is required to be OPERABLE and in operation. An immediate Completion Time is necessary for an operator to initiate corrective actions.

~~B~~C.1

If no SDC loop is in operation or no SDC loops are OPERABLE, there will be no forced circulation to provide mixing to establish uniform boron concentrations. Reduced boron concentrations can occur by the addition of water with lower boron concentration than that contained in the RCS. Therefore, actions that reduce boron concentration shall be suspended immediately.

(continued)

BASES

ACTIONS (continued)

~~B~~C.2

If no SDC loop is in operation or no SDC loops are OPERABLE, actions shall be initiated immediately and continued without interruption to restore one SDC loop to OPERABLE status and operation. Since the unit is in Conditions A and B concurrently, the restoration of two OPERABLE SDC loops and one operating SDC loop should be accomplished expeditiously.

~~B~~C.3

If SDC loops requirements are not met, all containment penetrations to the outside atmosphere must be closed to prevent fission products, if released by a loss of decay heat event, from escaping the containment building. The 4 hour Completion Time allows fixing most SDC problems without incurring the additional action of violating the containment atmosphere.

SURVEILLANCE REQUIREMENTS

SR 3.9.5.1

This Surveillance demonstrates that one SDC loop is operating and circulating reactor coolant. The flow rate is determined by the flow rate necessary to provide sufficient decay heat removal capability and to prevent thermal and boron stratification in the core. In addition, this Surveillance demonstrates that the other SDC loop is OPERABLE.

In addition, during operation of the SDC loop with the water level in the vicinity of the reactor vessel nozzles, the SDC loop flow rate determination must also consider the SDC pump suction requirements. The Frequency of 12 hours is sufficient, considering the flow, temperature, pump control, and alarm indications available to the operator to monitor the SDC System in the control room.

Verification that the required loops are OPERABLE and in operation ensures that loops can be placed in operation as needed, to maintain decay heat and retain forced circulation. The Frequency of 12 hours is considered reasonable, since other administrative controls are available and have proven to be acceptable by operating experience.

(continued)

BASES

REFERENCE 1. UFSAR, Section 7.4.