## 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.

----------NOTES----------

1. The required SDC loop may be removed from operation for ≤ 1 hour per 8 hour period, provided no operations are permitted that would cause dilution of the Reactor Coolant System boron concentration.

2. 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 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.<br><br>AND | Immediately<br><br>(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.

---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 ft above the top of reactor vessel flange.

ACTIONS

| CONDITION | REQUIRED ACTION | | COMPLETION TIME |
|---|---|---|---|
| A. One SDC loop inoperable. | A.1 | Initiate action to restore SDC loop to OPERABLE status. | Immediately |
| | OR | | |
| | A.2 | Initiate actions to establish ≥ 23 ft of water above the top of reactor vessel flange. | Immediately |
| B. No SDC loop OPERABLE or in operation. | B.1 | Suspend operations involving a reduction in reactor coolant boron concentration. | Immediately |
| | AND | | |
| | | | (continued) |

ACTIONS

| CONDITION | REQUIRED ACTION | COMPLETION TIME |
|---|---|---|
| B. (continued) | B.2 Initiate action to restore one SDC loop to OPERABLE status and to operation. | Immediately |
| | AND | |
| | B.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 |

ATTACHMENT "B"

EXISTING 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.

---NOTES---

1. The required SDC loop may be removed from operation for ≤ 1 hour per 8 hour period, provided no operations are permitted that would cause dilution of the Reactor Coolant System boron concentration.

2. 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 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.<br><br>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.

---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 ft above the top of reactor vessel flange.

ACTIONS

| CONDITION | REQUIRED ACTION | | COMPLETION TIME |
|---|---|---|---|
| A. One SDC loop inoperable. | A.1 | Initiate action to restore SDC loop to OPERABLE status. | Immediately |
| | OR | | |
| | A.2 | Initiate actions to establish ≥ 23 ft of water above the top of reactor vessel flange. | Immediately |
| B. No SDC loop OPERABLE or in operation. | B.1 | Suspend operations involving a reduction in reactor coolant boron concentration. | Immediately |
| | AND | | |
| | | | (continued) |

ACTIONS

| CONDITION | REQUIRED ACTION | | COMPLETION TIME |
|---|---|---|---|
| B. (continued) | B.2 | Initiate action to restore one SDC loop to OPERABLE status and to operation. | Immediately |
| | AND | | |
| | B.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 |

ATTACHMENT "C"

REVISED 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---
With the upper guide structure removed from the reactor vessel the required SDC loop may be removed from operation for ≤ ~~1~~ 2 hours per 8-hour period, provided: ~~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 top of 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 in either or both shutdown cooling loops to provide shutdown cooling flow.
---

APPLICABILITY: MODE 6 with the water level ≥ ~~23~~ 20 ft above the top of the 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.<br><br>AND | Immediately<br><br>(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.

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

or

One loop 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 12 feet or greater.

3) The associated loop of Salt Water Cooling (SWC) is OPERABLE and operating.

4) The associated Component Cooling Water (CCW) pump and the CCW swing pump are OPERABLE, and the associated CCW loop is OPERABLE and operating.

5) The Shutdown Cooling system is operating using the containment spray pump, and the associated high pressure safety injection pump and the low pressure safety injection pump are OPERABLE and at ambient temperature, 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 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.<br><br>(Applicable to initial conditions of two shutdown cooling loops OPERABLE) | A.1 Initiate action to restore SDC loop to OPERABLE status.<br><br>OR<br><br>A.2 Initiate actions to establish ≥ ~~23~~ 20 ft of water above the top of reactor vessel flange. | Immediately<br><br>Immediately |
| B. One SDC loop operable, less than 20 feet of water above the reactor vessel flange and any of the 8 requirements not met<br><br>(Applicable to initial conditions of one shutdown cooling loop 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.<br><br>AND | Immediately<br><br>(continued) |

ACTIONS

| CONDITION | REQUIRED ACTION | COMPLETION TIME |
|---|---|---|
| ~~BC~~. (continued) | ~~BC~~.2 Initiate action to restore one SDC loop to OPERABLE status and to operation.<br><br>AND | Immediately |
| | ~~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 |

ATTACHMENT "D"

REVISED 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---
With the upper guide structure removed from the reactor vessel the required SDC loop may be removed from operation for ≤ ~~1~~ 2 hours per 8-hour period, provided: ~~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 top of 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 in either or both shutdown cooling loops to provide shutdown cooling flow.
---

APPLICABILITY: MODE 6 with the water level ≥ ~~23~~ 20 ft above the top of the 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.<br><br>AND | Immediately<br><br>(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.

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

or

One loop 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 12 feet or greater.

3) The associated loop of Salt Water Cooling (SWC) is OPERABLE and operating.

4) The associated Component Cooling Water (CCW) pump and the CCW swing pump are OPERABLE, and the associated CCW loop is OPERABLE and operating.

5) The Shutdown Cooling system is operating using the containment spray pump, and the associated high pressure safety injection pump and the low pressure safety injection pump are OPERABLE and at ambient temperature, 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 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.<br><br>(Applicable to initial conditions of two shutdown cooling loops 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 vessel flange and any of the 8 requirements not met<br><br>(Applicable to initial conditions of one shutdown cooling loop 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.<br><br>AND | Immediately |
| | ~~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 |

ATTACHMENT "E"

FIGURE 1 FROM CALCULATION NO. SUPPLEMENT A N-0220-029
RCS HEATUP RATE AS A FUNCTION OF TIME
AFTER SHUTDOWN AND CAVITY LEVEL

# CALCULATION SHEET

| ICCN NO./ PRELIM. CCN NO. N-4 | PAGE 29 OF 32 |
|---|---|
| CCN CONVERSION: CCN NO. CCN – | |

Project or DCP/MMP SONGS 2/3 Calc. No. Supp A N-0220-029

Subject RCS Heatup Following Loss of Shutdown Cooling Sheet No. A-28

| REV | ORIGINATOR | DATE | IRE | DATE | REV | ORIGINATOR | DATE | IRE | DATE | REV |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | W. G. Flournoy | 3/25/94 | J. Boyajian | 3/25/94 | | | | | | |
| | | | | | | | | | | |

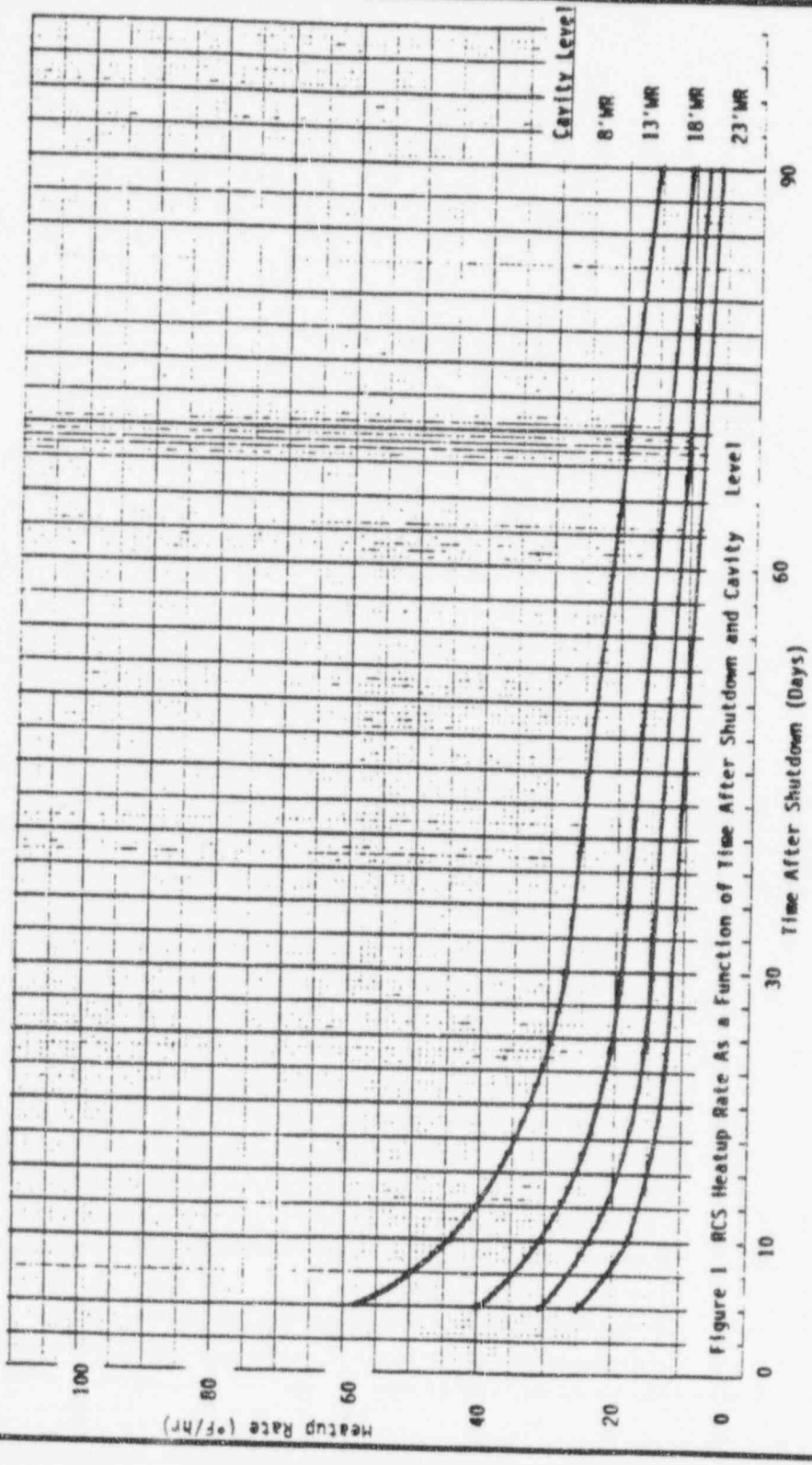


Figure 1 RCS Heatup Rate As a Function of Time After Shutdown and Cavity Level

ATTACHMENT "F"

Technical Specification Bases
for Units 2 and 3

BASES (Continued)

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~~ loop 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 3 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 two Notes. With the upper guide structure removed from the reactor vessel Note 1 allows the required operating SDC loop to be removed from service for up to ~~12~~ 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 temperature 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.

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 ~~1~~ 2 hour period, decay heat is removed by natural convection to the large mass of water in the refueling canal.

Note 2 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 ~~23~~20 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

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~~ loops of the SDC System are required to be OPERABLE, and one ~~train~~ loop 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 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 loop, adequate time is provided to initiate emergency procedures to cool the core.

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 (continued)

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 12 feet or greater.

3) The associated loop of Salt Water Cooling (SWC) is OPERABLE and operating.

4) The associated Component Cooling Water (CCW) pump and the CCW swing pump are OPERABLE, and the associated CCW loop is OPERABLE and operating.

5) The Shutdown Cooling system is operating using the containment spray pump, and the associated high pressure safety injection pump and the low pressure safety injection pump are OPERABLE and at ambient temperature, 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

(continued)

BASES (continued)

APPLICABILITY (continued)

Coolant System. MODE 6 requirements, with a water level ≥ ~~2320~~ ft above the reactor vessel flange, are covered in LCO 3.9.4, "Shutdown Cooling and Coolant Circulation—High Water Level."

ACTIONS

A.1 and A.2

When two SDC loops 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 loop of the SDC is operable with requirements 1-8 satisfied and the SDC loop becomes inoperable or any of the 8 requirements are not met, actions shall be immediately initiated to establish a water level > 20 feet above the reactor flange. When the water level is established at > 20 feet 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~~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 (continued)

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~~ loop 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 3 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 two Notes. With the upper guide structure removed from the reactor vessel Note 1 allows the required operating SDC loop to be removed from service for up to ~~12~~ 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 temperature 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.

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 ~~1~~ 2 hour period, decay heat is removed by natural convection to the large mass of water in the refueling canal.

Note 2 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 ~~23~~20 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

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~~ loops of the SDC System are required to be OPERABLE, and one ~~train~~ loop 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 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 loop, adequate time is provided to initiate emergency procedures to cool the core.

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 (continued)

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 12 feet or greater.

3) The associated loop of Salt Water Cooling (SWC) is OPERABLE and operating.

4) The associated Component Cooling Water (CCW) pump and the CCW swing pump are OPERABLE, and the associated CCW loop is OPERABLE and operating.

5) The Shutdown Cooling system is operating using the containment spray pump, and the associated high pressure safety injection pump and the low pressure safety injection pump are OPERABLE and at ambient temperature, 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

(continued)

BASES (continued)

APPLICABILITY (continued)

Coolant System. MODE 6 requirements, with a water level ≥ ~~23~~20 ft above the reactor vessel flange, are covered in LCO 3.9.4, "Shutdown Cooling and Coolant Circulation - High Water Level."

ACTIONS

A.1 and A.2

When two SDC loops 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 loop of the SDC is operable with requirements 1-8 satisfied and the SDC loop becomes inoperable or any of the 8 requirements are not met, actions shall be immediately initiated to establish a water level > 20 feet above the reactor flange. when the water level is established at > 20 feet 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~~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.

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