3/4.4 REACTOR COOLANT SYSTEM

REACTOR COOLANT LOOPS

LIMITING CONDITION FOR OPERATION

3.4.1.1 Both reactor coolant loops and both reactor coolant pumps in each loop shall be in operation.

APPLICABILITY: Modes 1 and 2*

ACTION:

a. With one reactor coolant pump not in operation, STARTUP and/or continued POWER OPERATION may proceed provided THERMAL POWER is restricted to $\leq$ 90% of RATED THERMAL POWER and the setpoints in Specification 2.2.1 for operation with three reactor coolant pumps operating:

   1. Power Level-High
   2. Reactor Coolant Flow-Low
   3. Thermal Margin/Low Pressure
   4. Axial Flux Offset

b. With two reactor coolant pumps in opposite loops not in operation, STARTUP and/or continued POWER OPERATION may proceed provided THERMAL POWER is restricted to $\leq$ 51.1% of RATED THERMAL POWER, and the setpoints for the following trips have been reduced to the values specified in Specification 2.2.1 for operation with two (2) reactor coolant pumps operating in opposite loops:

   1. Power Level-High
   2. Reactor Coolant Flow-Low
   3. Thermal Margin/Low Pressure
   4. Axial Flux Offset

*See Special Test Exception 3.10.3.

LIMITING CONDITION FOR OPERATION (Continued)

c. With two reactor coolant pumps in the same loop not in operation, STARTUP and/or continued POWER OPERATION may proceed provided the water level in both steam generators is maintained above the Steam Generator Water Level-Low trip setpoint, the THERMAL POWER is restricted to $\leq$ 45.8% of RATER THERMAL POWER, and the setpoints for the following trips have been reduced to the values specified in Specification 2.2.1 for operation with two reactor coolant pumps operating in the same loop:

1. Power Level-High
2. Reactor Coolant Flow-Low
3. Thermal Margin/Low Pressure
4. Axial Flux Offset

SURVEILLANCE REQUIREMENTS

4.4.1.1 The Reactor Protective Instrumentation channels specified in the applicable ACTION statement above, shall be verified to have had their trip setpoints changed to the values specified in Specification 2.2.1 for the applicable number of reactor coolant pumps operating either:

a. Within 4 hours after switching to a different pump combination, if switch is made while operating, or

b. Prior to reactor criticality, if switch is made while shutdown.

REACTOR COOLANT SYSTEM

HOT STANDBY

LIMITING CONDITION FOR OPERATION

3.4.1.2 Both eactor coolant loops, shall be operable, and at least one reactor coolant pump shall be in operation in each loop *

APPLICABILITY: Mode 3

ACTION:

With less than the above required reactor coolant loops operable, restore the required loops to OPERABLE status within 72 hours or be in HOT SHUTDOWN within the next 12 hours.

SURVEILLANCE REQUIREMENTS

4.4.1.2 The required coolant loop shall be verified to be in operation and circulating reactor coolant at least once per 12 hours

* All reactor coolant pumps and ~~decay heat removal~~ shutdown cooling pumps may be de-engergized for up to 1 hour, provided (1) no operations are permitted that would cause dilution of the reactor coolant system boron concentration, and (2) core outlet temperature is maintained at least 10°F below saturation temperature.

LIMITING CONDITION FOR OPERATION

3.4.1.3 At least two (2) of the four (4) below listed coolant loops shall be operable, and at least one (1) coolant loop shall be in operation:*

a. Two (2) reactor coolant loops and one (1) associated reactor coolant pump in each loop.

b. Two (2) shutdown coolant loops.***

APPLICABILITY: Modes 4**# and 5**#

ACTION:

a. Mode 4
With less than the above required coolant loops operable, restore the required loops to OPERABLE status within 72 hours or be in COLD SHUTDOWN within the next 12 hours.

b. Mode 5
1. With less than the required shutdown cooling loops operable, initiate corrective action to return the required number of loops to OPERABLE status as soon as possible.

2. The provisions of Specification 3.0.3 are not applicable.

*All reactor coolant pumps and ~~decay heat removal~~ shutdown cooling pumps may be de-energized for up to 1 hour, provided (1) no operations are permitted that would cause dilution of the reactor coolant system boron concentration, and (2) core outlet temperature is maintained at least 10°F below saturation temperature.

**A reactor coolant pump shall not be started with one or more of the RCS cold leg temperature $\leq$ 275°F, unless (1) the pressurizer water volume is less than 600 cubic feet, or (2) the secondary water temperature of each steam generator is less than 46°F (34°F when measured by a surface contact instrument) above the coolant temperature in the reactor vessel.

***Normal or emergency power may be inoperable for each shutdown cooling loop in Mode 5.

#See Special Test Exception 3.10.5.

SURVEILLANCE REQUIREMENTS

4.4.1.3 The required coolant loop shall be verified to be in operation and circulating reactor coolant at least once per 12 hours.

REFUELING OPERATIONS

COOLANT CIRCULATION

LIMITING CONDITION FOR OPERATION

3.9.8.1 At least one shutdown cooling loop shall be in operation.

APPLICABILITY: Mode 6 when the water level above the top of the irradiated fuel assemblies seated within the reactor vessel is ≥ 23 feet or the spent fuel pool cooling system** is aligned to circulate water through and remove decay heat from the core.

ACTION:

a. With less than one shutdown cooling loop in operation, except as provided in b. below, suspend all operations involving an increase in the reactor decay heat load or a reduction in boron concentration of the Reactor Coolant System. Close all containment penetrations providing direct access from the containment atmosphere to the outside atmosphere within 4 hours. The shutdown cooling pumps may be de-energized during the time intervals required for local leak rate testing of containment penetration number 41 pursuant to the requirements of Specification 4.6.1.2.d, provided (1) no operations are permitted which could cause dilution of the reactor coolant system boron concentration, (2) all CORE ALTERATIONS are suspended, and (3) all containment penetrations providing direct access from the containment atmosphere to the outside atmosphere are maintained closed.

b. The shutdown cooling loop 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.

c. The provisions of Specification 3.0.3 are not applicable.

SURVEILLANCE REQUIREMENTS

4.9.8.1 A shutdown cooling loop shall be determined to be in operation and circulating reactor coolant at a flow rate of ≥ 3000 gpm* at least once per 12 hours.

* ≥ 1500 gpm when the Reactor Coolant System is drained to a level below the midplane of the hot leg.

** may be used when heat removal capability of spent fuel pool cooling systems exceeds residual decay heat generation of irradiated fuel within the reactor vessel as calculated by Branch Technical Position ASCB 9-2.

REFUELING OPERATIONS

COOLANT CIRCULATION

LIMITING CONDITION FOR OPERATION

3.9.8.2 Two (2) independent shutdown cooling loops shall be OPERABLE.*

APPLICABILITY: Mode 6 when the water level above the top of the irradiated fuel assemblies seated within the reactor pressure vessel is less than 23 feet.

ACTION:

a. With less than the required shutdown cooling loops OPERABLE, initiate corrective action to return loops to OPERABLE status as soon as possible.

b. The provisions of Specification 3.0.3 are not applicable.

SURVEILLANCE REQUIREMENTS

4.9.8.2 No additional Surveillance Requirements other than these required by Specification 4.0.5.

*Normal or emergency power source may be inoperable for each shutdown cooling loop.

3/4.4.1 REACTOR COOLANT LOOPS

The plant is designed to operate with both reactor coolant loops and associated reactor coolant pumps in operations, and maintain DNBR above 1.30 during all normal operations and anticipated transients. STARTUP and POWER OPERATION may be initiated and may proceed with one or two reactor coolant pumps not in operation after the setpoints for the Power Level-High, Reactor Coolant Flow-Low, Thermal Margin/Low Pressure and Axial Flux Offset trips have been reduced to their specified values. Reducing these trip setpoints ensures that the DNBR will be maintained above 1.30 during three pump operation and that during two pump operation the core void fraction will be limited to ensure parallel channel flow stability within the core and thereby prevent premature DNB.

A single reactor coolant loop with its steam generator filled above the low level trip setpoint provides sufficient heat removal capability for core cooling while in MODES 2 and 3; however, single failure considerations require that two loops be OPERABLE.

In MODES 4 and 5, a single reactor coolant loop or shutdown cooling loop provides sufficient heat removal capability for removing decay heat; but single failure considerations require that atleast two loops be OPERABLE.

The restrictions on starting a Reactor Coolant Pump during MODES 4 and 5 with one or more RCS cold legs $\leq 275^{\circ}F$ are provided to prevent RCS pressure transients, caused by energy additions from the secondary system, which could exceed the limits of Appendix G to 10 CFR Part 50. The RCS will be protected against overpressure transients and will not exceed the limits of Appendix G by either (1) restricting the water volume in the pressurizer and thereby providing a volume for the primary coolant to expand into or (2) by restricting starting of the RCPs to when the secondary water temperature of each steam generator is less than $46^{\circ}F$ ($34^{\circ}F$ when measured by a surface contact instrument) above the coolant temperature in the reactor vessel.

3/4.4.2 and 3/4.4.3 SAFETY VALVES

The pressurizer code safety valves operate to prevent the RCS from being pressurized above its Safety Limit of 2750 psia. Each safety valve is designed to relieve 7.6×10^5 lbs per hour of saturated steam at the valve setpoint. The relief capacity of a single safety valve is adequate to relieve any overpressure condition which could occur during shutdown. In the event that no safety valves are OPERABLE, an operating shutdown cooling loop, connected to the RCS, provides overpressure relief capability and will prevent RCS overpressurization.

During operation, all pressurizer code safety valves must be OPERABLE to prevent the RCS from being pressurized above its safety limit of 2750 psia. The combined relief capacity of these valves is sufficient to

BASES

3/4.9.6 REFUELING MACHINE OPERABILITY

The OPERABILITY requirements for the refueling machine ensure that: 1) the refueling machine will be used for movement of CEAs and fuel assemblies, 2) the refueling machine has sufficient load capacity to lift a CEA or fuel assembly, and 3) the core internals and pressure vessel are protected from excessive lifting force in the event they are inadvertently engaged during lifting operations.

3/4.9.7 CRANE TRAVEL - SPENT FUEL STORAGE BUILDING

The restriction on movement of loads in excess of the nominal weight of a fuel assembly and CEA over other fuel assemblies in the storage pool ensures that in the event this load is dropped (1) the activity release will be limited to that contained in a single fuel assembly, and (2) any possible distortion of fuel in the storage racks will not result in a critical array. This assumption is consistent with the activity release assumed in the accident analyses.

3/4.9.8 COOLANT CIRCULATION

The requirement that at least one shutdown cooling loop 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.

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

3/4.9.9 CONTAINMENT PURGE VALVE ISOLATION SYSTEM

The OPERABILITY of this system ensures that the containment purge valves will be automatically isolated upon detection of high radiation levels within the containment. The OPERABILITY of this system is required to restrict the release of radioactive material from the containment atmosphere to the environment.

3/4.9.10 and 3/4.9.11 WATER LEVEL-REACTOR VESSEL AND SPENT FUEL POOL WATER LEVEL

The restrictions on minimum water level ensure that sufficient water depth is available to remove 99% of the assumed 10% iodine gap activity released from the rupture of an irradiated fuel assembly. The minimum water depth is consistent with the assumptions of the accident analysis.

3/4.9.12 SPENT FUEL POOL VENTILATION SYSTEM

The limitations on the spent fuel pool ventilation system ensure that all radioactive material released from an irradiated fuel assembly will be filtered through the HEPA filters and charcoal adsorber prior to discharge to the atmosphere. The OPERABILITY of this system and the resulting iodine removal capacity are consistent with the assumptions of the accident analyses.

3/4.9.13 SPENT FUEL CASK HANDLING CRANE

The restriction on movement of the spent fuel shipping cask within one cask length of any fuel assembly ensures that in the event this load is dropped (1) the stored spent fuel assemblies will not be damaged, and (2) any possible distortion of fuel in the storage racks will not result is a critical array.