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3/4.4 REACTOR COOLANT SYSTEM

3/4.4.1 REACTOR COOLANT LOOPS

NORMAL OPERATION

LIMITING CONDITION FOR OPERATION

3.4.1.1 All reactor coolant loops shall be in operation.

APPLICABILITY: As noted below, for MODES 1 and 2.*

ACTION:

Above P-7, comply with either of the following ACTIONS:

- a. With one reactor coolant loop and associated pump not in operation, STARTUP and/or continued POWER OPERATION may proceed provided THERMAL POWER is restricted to <31% of RATED THERMAL POWER and the following ESFAS instrumentation channels associated with the loop not in operation, are placed in their tripped condition within 1 hour:
 - 1) T_{avg} -- Low-Low channel used in the coincidence circuit with Steam Flow - High for Safety Injection.
 - 2) Steam Line Pressure - Low channel used in the coincidence circuit with Steam Flow - High for Safety Injection.
 - 3) Steam Flow-High channel used for Safety Injection.
 - 4) Differential Pressure Between Steam Lines - High Channel used for Safety Injection (trip all bistables which indicate low active loop steam pressure with respect to the idle loop steam pressure).
- b. With one reactor coolant loop and associated pump not in operation, subsequent STARTUP and POWER OPERATION above 31% of RATED THERMAL POWER may proceed provided:
 1. The following actions have been completed with the reactor subcritical:
 - a) Reduce the overtemperature ΔT trip setpoint to the value specified in Specification 2.2.1 for 3 loop operation.

* See Special Test Exception 3.10.5.

3/4.4 REACTOR COOLANT SYSTEM

BASES

3/4.4.2 and 3/4.4.3 SAFETY VALVES (Continued)

the valve's 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 RHR 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 2735 psig. The combined relief capacity of all of these valves is greater than the maximum surge rate resulting from a complete loss of load assuming no reactor trip until the first Reactor Protective System trip set point is reached (i.e., no credit is taken for a direct reactor trip on the loss of load) and also assuming no operation of the power-operated relief valves or steam dump valves.

Demonstration of the safety valves' lift settings will occur only during shutdown and will be performed in accordance with the provisions of Section XI of the ASME Boiler and Pressure Code, 1974 Edition.

REACTOR COOLANT SYSTEM

ACTION (Continued)

- b) Place the following reactor trip system and ESFAS instrumentation channels, associated with the loop not in operation, in their tripped conditions:
- 1) Overpower ΔT channel.
 - 2) Overtemperature ΔT channel.
 - 3) T_{avg} -- Low-Low channel used in the coincidence circuit with steam Flow - High for Safety Injection.
 - 4) Steam Line Pressure - Low channel used in the coincidence circuit with Steam Flow - High for Safety Injection.
 - 5) Steam Flow-High channel used for Safety Injection.
 - 6) Differential Pressure Between Steam Lines - High Channel used for Safety Injection (trip all bistables which indicate low active loop steam pressure with respect to the idle loop steam pressure).
- c) Change the P-8 interlock setpoint from the value specified in Table 3.3-1 to <75% of RATED THERMAL POWER.

2. THERMAL POWER is restricted to <70% of RATED THERMAL POWER.

Below P-7:

- a. With $K_{eff} > 1.0$, operation below P-7 may proceed provided at least two reactor coolant loops and associated pumps are in operation.
- b. The provisions of Specifications 3.0.3 and 3.0.4 are not applicable.

REACTOR COOLANT SYSTEM

SURVEILLANCE REQUIREMENTS

4.4.1.1 With one reactor coolant loop and associated pump not in operation, at least once per 7 days determine that:

- a. The applicable reactor trip system and/or ESFAS instrumentation channel specified in the ACTION statements above have been placed in their tripped conditions, and
- b. The P-8 interlock setpoint has been changed to $\leq 75\%$ of RATED THERMAL POWER.

REACTOR COOLANT SYSTEM

HOT STANDBY

LIMITING CONDITION FOR OPERATION

- 3.4.1.2 a. At least two reactor coolant loops shall be OPERABLE.
- b. At least one reactor coolant loop shall be in operation.*

APPLICABILITY: MODE 3

ACTION:

- a. 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.
- b. With no reactor coolant loop 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 coolant loop to operation.

SURVEILLANCE REQUIREMENTS

- 4.4.1.2.1 At least the above required reactor coolant pumps, if not in operation, shall be determined to be OPERABLE once per 7 days by verifying correct breaker alignments and indicated power availability.
- 4.4.1.2.2 At least one cooling loop shall be verified to be in operation and circulating reactor coolant at least once per 12 hours.

* All reactor coolant 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.

REACTOR COOLANT SYSTEM

SHUTDOWN

LIMITING CONDITION FOR OPERATION

- 3.4.1.3 a. At least two of the cooling loops listed below shall be OPERABLE:
1. Reactor Coolant Loop (A) and its associated steam generator and reactor coolant pump,*
 2. Reactor Coolant Loop (B) and its associated steam generator and reactor coolant pump,*
 3. Reactor Coolant Loop (C) and its associated steam generator and reactor coolant pump,*
 4. Reactor Coolant Loop (D) and its associated steam generator and reactor coolant pump,*
 5. Residual Heat Removal Loop (A),**
 6. Residual Heat Removal Loop (B).**
- b. At least one of the above coolant loops shall be in operation.***

APPLICABILITY: MODES 4 and 5

ACTION:

- a. With less than the above required loops OPERABLE, immediately initiate corrective action to return the required loops to OPERABLE status as soon as possible; be in COLD SHUTDOWN within 20 hours.
- b. With no coolant loop 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 coolant loop to operation.

* A reactor coolant pump shall not be started with one or more of the RCS cold leg temperatures less than or equal to 290°F unless 1) the pressurizer steam volume is greater than 200 cubic feet, or 2) the secondary water temperature of each steam generator is less than 50°F above each of the RCS cold leg temperatures.

** The normal or emergency power source may be inoperable in MODE 5.

*** All reactor coolant pumps and residual heat removal 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.

REACTOR COOLANT SYSTEM

SURVEILLANCE REQUIREMENTS

4.4.1.3.1 The required residual heat removal loops(s) shall be determined OPERABLE per Specification 4.0.5.

4.4.1.3.2 The required reactor coolant pump(s), if not in operation, shall be determined to be OPERABLE once per 7 days by verifying correct breaker alignments and indicated power availability.

4.4.1.3.3 The required steam generator(s) shall be determined OPERABLE by verifying secondary side level to be greater than or equal to 0% narrow range indication at least once per 12 hours.

4.4.1.3.4 At least one 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

5.9.8.1 At least one residual heat removal loop shall be in operation.

APPLICABILITY: MODE 6.

ACTION:

- a. With less than one residual heat removal 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.
- b. The residual heat removal 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 residual heat removal 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.

REFUELING OPERATIONS

LOW WATER LEVEL

LIMITING CONDITION FOR OPERATION

3.9.8.2 Two independent Residual Heat Removal (RHR) loops shall be OPERABLE.*

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 RHR loops OPERABLE, immediately initiate corrective action to return the required RHR 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 The required Residual Heat Removal loops shall be determined OPERABLE per Specification 4.0.5.

* The normal or emergency power source may be inoperable for each RHR loop.

REFUELING OPERATIONS

WATER LEVEL - REACTOR VESSEL

LIMITING CONDITION FOR OPERATION

3.9.10 At least 23 feet of water shall be maintained over the top of the reactor pressure vessel flange.

APPLICABILITY: During movement of fuel assemblies or control rods within the reactor pressure vessel while in MODE 6.

ACTION:

- a. With the requirements of the above specification not satisfied, suspend all operations involving movement of fuel assemblies or control rods within the pressure vessel.
- b. The provisions of Specification 3.0.3 are not applicable.

SURVEILLANCE REQUIREMENTS

4.9.10 The water level shall be determined to be at least its minimum required depth within 2 hours prior to the start of and at least once per 24 hours thereafter during movement of fuel assemblies or control rods within the reactor pressure vessel.

REFUELING OPERATIONS

CONTAINMENT PURGE EXHAUST SYSTEM OPERATION

LIMITING CONDITION FOR OPERATION

3.9.13 The Containment purge exhaust fans shall not be operated when irradiated fuel is being moved inside Containment during the first 285 hours following reactor shutdown.

APPLICABILITY: MODE 6.

ACTION:

- a. With the requirements of the above specification not satisfied, suspend movement of fuel in the Containment Building.
- b. The provisions of Specification 3.0.3 are not applicable.

SURVEILLANCE REQUIREMENTS

4.9.13 It shall be determined prior to fuel movement inside Containment that either the Containment purge exhaust fans are not in operation or that more than 285 hours have elapsed since reactor shutdown.

3/4.4 REACTOR COOLANT SYSTEM

BASES

3/4.4.1 REACTOR COOLANT LOOPS AND COOLANT CIRCULATION

The plant is designed to operate with all reactor coolant loops in operation, and to maintain DNBR above 1.73 during all normal operations and anticipated transients. With one reactor coolant loop not in operation, THERMAL POWER is restricted to < 38 percent of RATED THERMAL POWER until the Overtemperature ΔT trip is reset. Either action ensures that the DNBR will be maintained above 1.73. A loss of flow in two loops will cause a reactor trip if operating above P-7 (10 percent of RATED THERMAL POWER) while a loss of flow in one loop will cause a reactor trip if operating above P-8 (38 percent of RATED THERMAL POWER).

In MODE 3, a single reactor coolant loop provides sufficient heat removal capability for removing decay heat; however, single failure considerations require that two loops be OPERABLE.

In MODES 4 and 5, a single reactor coolant loop or RHR loop provides sufficient heat removal capability for removing decay heat; but single failure considerations require that at least two loops be OPERABLE. Thus, if the reactor coolant loops are not OPERABLE, this specification requires two RHR loops to be OPERABLE.

The operation of one Reactor Coolant Pump or one RHR pump provides adequate flow to ensure mixing, prevent stratification and produce gradual reactivity changes during boron concentration reductions in the Reactor Coolant System. The reactivity change rate associated with boron reduction will, therefore, be within the capability of operator recognition and control.

The restrictions on starting a Reactor Coolant Pump with one or more RCS cold legs less than or equal to 290°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 50°F above each of the RCS cold leg temperatures.

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 2735 psig. Each safety valve is designed to relieve 420,000 lbs per hour of saturated steam at 110% of

REFUELING OPERATIONS

BASES

3/4.9.6 MANIPULATOR CRANE OPERABILITY

The OPERABILITY requirements for the manipulator cranes ensure that: 1) manipulator cranes will be used for movement of control rods and fuel assemblies 2) each crane has sufficient load capacity to lift a control rod 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 - FUEL BUILDING

The restriction on movement of loads in excess of the nominal weight of a fuel assembly over other fuel assemblies ensures that no more than the contents of one fuel assembly will be ruptured in the event of a fuel handling accident. This assumption is consistent with the activity release assumed in the accident analyses.

3/4.9.8 RESIDUAL HEAT REMOVAL AND COOLANT CIRCULATION

The requirement that at least one residual heat removal (RHR) 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 effect of a boron dilution incident and prevent boron stratification.

The requirement to have two RHR loops OPERABLE when there is less than 23 feet of water above the reactor pressure vessel flange ensures that a single failure of the operating RHR loop will not result in a complete loss of residual heat removal capability. 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 RHR loop, adequate time is provided to initiate emergency procedures to cool the core.

3/9.9 CONTAINMENT VENTILATION ISOLATION SYSTEM

The OPERABILITY of this system ensures that the containment ventilation penetrations 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 STORAGE POOL

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.

REFUELING OPERATIONS

BASES

3/4.9.12 SPENT FUEL POOL EXHAUST SYSTEM

The limitations on the spent fuel pool exhaust 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 CONTAINMENT PURGE/EXHAUST SYSTEM

The restriction on the use of Containment purge exhaust system for the first 285 hours following reactor shutdown during actual fuel movement ensures that the resultant offsite doses from a fuel handling accident inside Containment are within the guidelines of 10 CFR 100. The evaluation used to determine that doses would be within 10 CFR 100 assumes assembly activities consistent with Regulatory Guide 1.25 and that all the activity from a single fuel assembly is released directly to the atmosphere.