

3.0 LIMITING CONDITIONS FOR OPERATION

3.1 REACTOR COOLANT SYSTEM

Applicability

Applies to the operating status of the Reactor Coolant System.

Objective

To specify those Reactor Coolant System conditions which must be met to assure safe reactor operation.

Specification

3.1.1 Operational Components

3.1.1.1 Coolant Pumps

- a. At least one reactor coolant pump or the Residual Heat Removal System shall be in operation when a reduction is made in the boron concentration of the reactor coolant.
- b. When the reactor is critical, at least one reactor coolant pump shall be in operation.
- c. Power operation with less than three loops in service is prohibited.
- d. Deleted.
- e. A reactor coolant pump may be started (or jogged) only if there is a steam bubble in the pressurizer or the steam generator temperature is no higher than 50°F higher than the temperature of the reactor coolant system.

3.1.1.2 Steam Generator

At least two steam generators shall be operable whenever the average primary coolant temperature is above 350°F.

3.1.1.3 Pressurizer

- a. The pressurizer including necessary spray and heater control systems shall be operable before the reactor is made critical.
- b. At least one pressurizer code safety valve shall be operable whenever the reactor head is on the vessel.
- c. All three pressurizer code safety valves shall be operable whenever the primary coolant average temperature is greater than 350°F or the reactor is critical. Their lift settings shall be maintained between 2485 psig and 2560 psig.

Basis

When the boron concentration of the Reactor Coolant System is to be reduced, the process must be uniform to prevent sudden reactivity changes in the reactor. Mixing of the reactor coolant will be sufficient to maintain a uniform boron concentration if at least one reactor coolant pump or one residual heat removal pump is running while the change is taking place. The residual heat removal pump will circulate the primary system volume in approximately one-half hour. The pressurizer is of no concern because of the low pressurizer volume and because the pressurizer boron concentration will be higher than that of the rest of the reactor coolant.

Specification 3.1.1.1.c requires that all three reactor coolant pumps be operating during power operation to provide core cooling in the event that a loss of

flow occurs. The flow provided will keep DNB well above 1.30. Therefore, cladding damage and release of fission products to the reactor coolant will not occur. Specification 3.1.1.1.b will allow special low power physics testing to be conducted following refueling under adequately controlled conditions.

- b. The boron injection tank contains not less than 900 gallons of 20,000 to 22,500 ppm boron solution at a temperature of at least 145°F. Two channels of heat tracing shall be available for the flow path.
- c. Each accumulator is pressurized to at least 600 psig and contains at least 825 ft³ and no more than 841 ft³ of water with a boron concentration of at least 1950 ppm. No accumulator may be isolated.
- d. Three safety injection pumps are operable.
- e. Two residual heat removal pumps are operable.
- f. Two residual heat exchangers are operable.
- g. All essential features including valves, interlocks, and piping associated with the above components are operable.
- h. During conditions of operation with reactor coolant pressure in excess of 1000 psig the A.C. control power shall be removed from the following motor operated valves with the valve in the specified position:

<u>Valves</u>	<u>Position</u>
MOV 862 A&B	Open
MOV 864 A&B	Open
MOV 865 A, B, & C	Open
MOV 878 A&B	Open
MOV 863 A&B	Closed
MOV 866 A&B	Closed

3.3.1.3 When the reactor is in the hot shutdown condition, the requirements of 3.3.1.1 and 3.3.1.2 shall be met. Except that the accumulators may be isolated, and in addition, any one component as defined in 3.3.1.2 may be inoperable for a period equal to the time period specified in the subparagraphs of 3.3.1.2 plus 48 hours, after which the plant shall be placed in the cold shutdown condition utilizing normal operating procedures. The safety injection pump power supply breakers must be racked out when the reactor coolant system temperature is below 350°F and the system is not vented to containment atmosphere.

3.3.1.4 When the reactor is in the cold shutdown condition (except refueling operation when Specification 3.8.1.e applies), both residual heat removal loops must be operable. Except that either the normal or emergency power source to both residual heat removal loops may be inoperable.

a. If one residual heat removal loop becomes inoperable during cold shutdown operation, within 24 hours verify the existence of a method to add make-up water to the reactor coolant system such as charging pumps, safety injection pumps (under adequate operator control to prevent system overpressurization), or primary water (if the reactor coolant system is open for maintenance) as back-up decay heat removal method, or prepare and submit a thirty-day written report pursuant to 6.9.2.b.

b. Restore the inoperable RHR loop to operable status within 14 days or prepare and submit a special report to the Commission pursuant to Specification 6.9.3.1 within the next 30 days outlining the action taken, the cause of the inoperability and the plans and schedule for restoring the

loop to operable status.

- c. If both residual heat removal loops become inoperable during cold shutdown operation, close all containment penetrations providing direct access from the containment atmosphere to the outside atmosphere prior to the reactor coolant average temperature exceeding 200°F, restore at least one residual heat removal loop to operable status within one hour or prepare and submit a thirty-day written report pursuant to 6.9.2.b. If the reactor coolant average temperature exceeds 200°F with both RHR loops inoperable and the reactor coolant system open for maintenance, provide prompt notification to the Commission pursuant to 6.9.2.a.

3.3.2 Containment Cooling and Iodine Removal Systems

- 3.3.2.1 The reactor shall not be made critical, except for low temperature physics tests, unless the following conditions are met:
 - a. The spray additive tank contains not less than 2505 gallons of solution with a sodium hydroxide concentration of not less than 30% by weight.
 - b. Two containment spray pumps are operable.
 - c. Four fan cooler units are operable.
 - d. All essential features, including valves, controls, dampers, and piping associated with the above components are operable.
 - e. The system which automatically initiates the sodium hydroxide addition to the containment spray simultaneously to the actuation of the containment spray is operable.

Specification 3.3.1.4 requires that two residual heat removal loops be operable when the reactor is in cold shutdown. One RHR loop will normally be in operation in cold shutdown to remove decay heat, maintain the reactor coolant system temperature required for maintenance, ensure even mixing, and produce gradual reactivity changes well within the capability of the operator to control. However, single failure considerations require that two loops be operable.

The limiting conditions for operation associated with specification 3.3.1.4 will allow routine cold shutdown maintenance to be performed, ensure core cooling capability is maintained, and ensure the NRC is kept informed of significant problems with plant cold shutdown temperature control.

Specification 3.3.1.1.h requires control power be removed from the listed valves to prevent inadvertent operation caused by control power wiring failures (inadvertent mispositioning of these valves could violate the single failure criteria of the accident analysis). Removal of the control power only will allow these valves to be restored to an operable status quickly when required for recovery from a loss of coolant accident.

indication available in the containment. When core geometry is not being changed at least one source range neutron flux monitor shall be in service.

- e. At least one residual heat removal loop shall be operable, refueling cavity water level \geq Plant elevation 272 ft. - 2 in. whenever fuel assemblies are being moved within the reactor pressure vessel, and $T_{ave} \leq 140^{\circ}\text{F}$.
- f. During reactor vessel head removal and while loading and unloading fuel from the reactor, the minimum boron concentration of 1950 ppm shall be maintained in the primary coolant system and verified by sampling once each shift.
- g. Direct communication between the control room and the refueling cavity manipulator crane shall be available whenever changes in core geometry are taking place.
- h. Movement of fuel within the core shall not be initiated prior to 100 hours after shutdown.
- i. The Spent Fuel Building ventilation system shall be operating when handling irradiated fuel in this area. Prior to moving irradiated fuel assemblies in the spent fuel pool, the ventilation system exhaust shall be aligned to discharge through HEPA and impregnated charcoal filters. When in operation, the exhaust flow of the Containment Purge System shall discharge through HEPA and impregnated charcoal filters. When the Containment Purge System is not in operation at least one automatic containment isolation valve shall be secured in each line penetrating the containment which provides a direct path from the containment atmosphere to the outside atmosphere.

- j. If any of the specified limiting conditions for refueling are not met, refueling of the reactor shall cease; work shall be initiated to correct the conditions so that the specified limits are met; and no operations which may increase the reactivity of the core shall be made.
- k. The reactor shall be subcritical as required by 3.10.8.3.

3.8.2

The Spent Fuel Building filter system and the Containment Purge filter system shall satisfy the following conditions:

- a. The results of the in-place cold DOP and halogenated hydrocarbon tests at greater than 20 percent design flows on HEPA filters and charcoal adsorber banks shall show ≥ 99 percent DOP removal and ≥ 99 percent halogenated hydrocarbon removal.
- b. Verification by way of a laboratory carbon sample analysis from the Spent Fuel Building filter system carbon and the Containment Purge filter system carbon to show ≥ 90 percent radioactive methyl iodine removal in accordance with test 5.b of Table 5-1 of ANSI/ASME N509 except that ≥ 70 percent relative humidity air is required.
- c. All filter system fans shall be shown to operate within $\pm 10\%$ of design flow.
- d. During fuel handling operations, the relative humidity (R.H.) of the air processed by the refueling filter systems shall be ≤ 70 percent.
- e. From and after the date that the Spent Fuel Building filter system is made or found to be inoperable for any reason, fuel handling operations in the Spent Fuel Building shall be terminated immediately.

Basis

The equipment and general procedures to be utilized during refueling are discussed in the Final Facility Description and Safety Analysis Report. Detailed instructions, the above specified precautions, and the design of the fuel handling equipment incorporating built-in interlocks and safety features, provide assurance that no incident could occur during the refueling operations that would result in a hazard to public health and safety.⁽¹⁾

Whenever changes are not being made in core geometry one flux monitor is sufficient. This permits maintenance of the instrumentation. Continuous monitoring of radiation levels and neutron flux provides immediate indication of an unsafe condition.

One residual heat removal loop will normally be in operation during refueling operations to remove decay heat, maintain $T_{ave} \leq 140^{\circ}\text{F}$, minimize the effect of a boron dilution event, and maintain a uniform boron concentration. The requirement to have one loop operable will allow the loop to be secured for brief periods of time to facilitate fuel movement. The refueling cavity water level specified ensures that there will be at least 23 feet of water above the reactor pressure vessel flange whenever fuel assemblies are being moved within the reactor pressure vessel. This prevents a fuel assembly from becoming partially uncovered while being transported over the vessel flange. This cavity level requirement also provides a large heat sink to ensure adequate time is available to initiate emergency methods to cool the core should the operable RHR loop fail.

The boron concentration of 1950 ppm will keep the core subcritical even if all control rods were withdrawn from the core. During refueling, the reactor refueling cavity is filled with approximately 285,000 gallons of borated water.

The boron concentration of this water at 1950 ppm boron is sufficient to maintain the reactor subcritical by at least 10% $\Delta k/k$ in the refueling condition with all rods inserted, and will also maintain the core subcritical even if no control rods were inserted into the reactor.⁽²⁾ Weekly checks of refueling water storage tank boron concentration ensure the proper shutdown margin.⁽³⁾ Direct communications allow the control room operator to inform the manipulator operator of any impending unsafe condition detected from the control board indicators during fuel movement.

In addition to the above safety features, interlocks are utilized during refueling to ensure safe handling. An excess weight interlock is provided on the lifting hoist to prevent movement of more than one fuel assembly at a time. The spent fuel transfer mechanism can accommodate only one fuel assembly at a time.

- c. Deleted
- d. Inservice Inspection 4.2 After five years of operation
- e. Containment Sample Tendon Surveillance 4.4 Upon completion of the inspection at 5 and 25 years of operation
- f. Post-operational Containment Structural Test 4.4 Upon completion of the test at 3 and 20 years of operation
- g. Fire Protection System 3.14 As specified by limiting condition for operation
- h. Overpressure Protection System Operation 3.1.2.1.e Within 30 days of operation
- i. Cold Shutdown RHR Loop Operability Requirements 3.3.1.4 As specified by limiting condition for operation