3.3 REACTOR COOLING SYSTEM OPERATIONAL COMPONENTS

Applicability

Applies to the operating status of the Reactor Coolant System equipment.

Objective

To specify conditions of Reactor Coolant System components for reactor operation.

Specification

A. Reactor Coolant Pumps

1. At least one reactor coolant pump or one low pressure safety injection pump operating in the residual heat removal mode shall be in operation providing flow through the reactor when the Reactor Coolant System boron concentration is being reduced.

2. At least three reactor coolant pumps shall be in operation providing flow through the core with their steam generators capable of performing their heat transfer function whenever the reactor is in a critical condition.]]

   Exception

   The requirements of 3.3.A.2 may be modified during initial testing to permit power levels not to exceed 10% of rated power with three loops operating on natural circulation.]]

B. Pressurizer Safety and Relief Valves

1. At least one pressurizer code safety valve shall be operable whenever fuel is in the reactor, and the Reactor Coolant System is isolated from the Residual Heat Removal System and the head is on the vessel.

2. At least two pressurizer code safety valves shall be operable whenever the reactor is critical.

3. One Power-Operated Relief Valve (PORV) and its associated block valve shall be operable whenever the Reactor Coolant System temperature is greater than 210°F.

   Exception;

   The power operated relief valve may be closed and rendered inoperable for purposes of hydrostatic testing.]

4. In the event either PORV or its associated block valve becomes inoperable, within six hours: either restore the PORV or block valve to operable status, or close and remove power from the associated block valve.

C. Pressurizer

1. The pressurizer shall be operable with at least one bank of proportional heaters and a water level during normal system operation between 28% and 60% whenever the Reactor Coolant System Tave is greater than 500°F.

2. The pressurizer spray system must be lined up to provide continuous pressurizer spray flow whenever the reactor is critical.

Basis

Reactor coolant pump flow and steam generator heat transfer capabilities are specified to assure adequate core heat transfer capability under all operating conditions from criticality to full power. Three loop operation is specified to assure plant operation is restricted to conditions considered in the safety analyses.]]

The exception permits testing to determine decay heat removal capabilities of the Primary System while on natural circulation, prior to operation at higher power.]]

Following a loss of off-site power, stored and decay heat from the reactor would normally be removed by natural circulation using the steam generators as the heat sink. Water supply to the steam generators is maintained by the Auxiliary Feedwater System. Natural circulation cooling of the Primary System requires the use of the pressurizer heaters or high pressure safety injection pumps to maintain a suitable overpressure on the Reactor Coolant System. Alternatively, in the event that natural circulation in the Reactor Coolant System is interrupted, the feed and bleed mode of Reactor Coolant System operation can be used to remove decay heat from the reactor. This method of decay heat removal requires the use of the Emergency Core Cooling System (ECCS) and the Power-Operated Relief Valves (PORVs) in the pressurizer.

The PORVs can be operated either manually or automatically in the Maine Yankee design. Block valves are provided upstream of the relief valves to isolate the valve in the event that a PORV fails.

The exception permits hydrostatic testing of the Reactor Coolant System in accordance with the ASME code when the test pressure approaches the PORV setpoint.]

When reactor coolant boron concentration is being reduced, the process must be uniform throughout the Reactor Coolant System volume to prevent stratification of reactor coolant at a lower boron concentration which could result in a reactivity insertion.

Sufficient mixing of the reactor coolant is assured by one Low Pressure Safety Injection (LPSI) pump operating in the RHR mode. When operated in this mode it will circulate the Reactor Coolant System volume in less than 12 minutes. The pressurizer volume is relatively inactive; therefore, it will tend to have a boron concentration higher than the rest of the Reactor Coolant System during a dilution operation. A continuous pressurizer spray flow will maintain a nominal spread between the boron concentration in the pressurizer and the Reactor Coolant System during the addition of boron. Without residual heat removal, the amount of steam which could be generated at safety valve lift pressure with the reactor subcritical would be less than half of the valve's capacity. One valve, therefore, provides adequate defense against overpressurization when the reactor is subcritical.

Overpressure protection is provided for all critical conditions. The safety valves are sized to relieve steam at a rate equivalent to the peak volumetric pressure surge rate. For this purpose one safety valve is sufficient; however, a minimum of two safety valves is required by Section III of the ASME Code.