

ATTACHMENT 3

**Markup of Technical Specification Bases Pages
(for information only)**

B 3.4 REACTOR COOLANT SYSTEM (RCS)

B 3.4.11 RCS Pressure and Temperature (P/T) Limits

BASES

BACKGROUND

All components of the RCS are designed to withstand effects of cyclic loads due to system pressure and temperature changes. These loads are introduced by startup (heatup) and shutdown (cooldown) operations, power transients, and reactor trips. This LCO limits the pressure and temperature changes during RCS heatup and cooldown, within the design assumptions and the stress limits for cyclic operation.

The Specification contains P/T limit curves for heatup, cooldown, inservice leak and hydrostatic testing, and criticality and also limits the maximum rate of change of reactor coolant temperature. The P/T limit curves are applicable for ~~32~~ effective full power years.

54

Each P/T limit curve defines an acceptable region for normal operation. The usual use of the curves is operational guidance during heatup or cooldown maneuvering, when pressure and temperature indications are monitored and compared to the applicable curve to determine that operation is within the allowable region.

The LCO establishes operating limits that provide a margin to brittle failure of the reactor vessel and piping of the reactor coolant pressure boundary (RCPB). The vessel is the component most subject to brittle failure. Therefore, the LCO limits apply mainly to the vessel.

10 CFR 50, Appendix G (Ref. 1), requires the establishment of P/T limits for material fracture toughness requirements of the RCPB materials. Reference 1 requires an adequate margin to brittle failure during normal operation, anticipated operational occurrences, and system hydrostatic tests. It mandates the use of the American Society of Mechanical Engineers (ASME) Code, Section III, Appendix G (Ref. 2).

The actual shift in the RT_{NDT} of the vessel material will be established periodically by removing and evaluating the irradiated reactor vessel material specimens, in accordance with ASTM E 185 (Ref. 3) and 10 CFR 50, Appendix H

(continued)

BASES

APPLICABLE
SAFETY ANALYSES
(continued)

P/T limits are not derived from any DBA, there are no acceptance limits related to the P/T limits. Rather, the P/T limits are acceptance limits themselves since they preclude operation in an unanalyzed condition.

RCS P/T limits satisfy Criterion 2 of 10 CFR 50.36(c)(2)(ii).

LCO

The elements of this LCO are:

the PTLR

within the limits specified in the PTLR

within the limits specified in the PTLR

within the limits specified in the PTLR

the PTLR

within the limits specified in the PTLR

- a. RCS pressure and temperature are within the limits specified in ~~Figures 3.4.11-1, 3.4.11-2, 3.4.11-3, 3.4.11-4, 3.4.11-5, and 3.4.11-6,~~ heatup and cooldown rates are $\leq 100^{\circ}\text{F}$ in any 1 hour period during RCS heatup, cooldown, and inservice leak and hydrostatic testing, and the RCS temperature change during system leakage and hydrostatic testing is $\leq 20^{\circ}\text{F}$ in any 1 hour period ~~when the RCS temperature and pressure are not within the limits of Figure 3.4.11 2 and 3.4.11 5 as applicable;~~
- b. The temperature difference between the reactor vessel bottom head coolant and the reactor pressure vessel (RPV) coolant is $\leq 145^{\circ}\text{F}$ during recirculation pump startup in MODES 1, 2, 3, and 4;
- c. The temperature difference between the reactor coolant in the respective ~~recirculation loop and in the reactor vessel~~ is $\leq 50^{\circ}\text{F}$ during recirculation pump startup in MODES 1, 2, 3, and 4;
- d. RCS pressure and temperature are within the applicable ~~criticality limits specified in Figures 3.4.11-3 and 3.4.11-6,~~ prior to achieving criticality; and
- e. The reactor vessel flange and the head flange temperatures are $\geq 72^{\circ}\text{F}$ for Unit 1 and $\geq 86^{\circ}\text{F}$ for Unit ~~2~~ when tensioning the reactor vessel head bolting studs and when the reactor head is tensioned.

These limits define allowable operating regions and permit a large number of operating cycles while also providing a wide margin to nonductile failure.

(continued)

BASES

SURVEILLANCE
REQUIREMENTS

SR 3.4.11.1 (continued)

specified in the
PTLR

The limits of ~~Figures 3.4.11-1, 3.4.11-2, 3.4.11-3, 3.4.11-4, 3.4.11-5, and 3.4.11-6~~ are met when operation is to the right of the applicable curve.

Surveillance for heatup, cooldown, or inservice leak and hydrostatic testing may be discontinued when the criteria given in the relevant plant procedure for ending the activity are satisfied.

This SR has been modified by a Note that requires this Surveillance to be performed only during system heatup and cooldown operations and inservice leak and hydrostatic testing.

SR 3.4.11.2

specified in the
PTLR

A separate limit is used when the reactor is approaching criticality. Consequently, the RCS pressure and temperature must be verified within the appropriate limits before withdrawing control rods that will make the reactor critical. The limits of ~~Figures 3.4.11-3 and 3.4.11-6~~ are met when operation is to the right of the applicable curve.

Performing the Surveillance within 15 minutes before control rod withdrawal for the purpose of achieving criticality provides adequate assurance that the limits will not be exceeded between the time of the Surveillance and the time of the control rod withdrawal.

SR 3.4.11.3 and SR 3.4.11.4

Differential temperatures within the applicable limits ensure that thermal stresses resulting from the startup of an idle recirculation pump will not exceed design allowances. In addition, compliance with these limits ensures that the assumptions of the analysis for the startup of an idle recirculation loop (Ref. 8) are satisfied.

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