

REACTOR COOLANT SYSTEM

OVERPRESSURE PROTECTION

LIMITING CONDITION FOR OPERATION

3.4.12 Low temperature overpressure protection (LTOP) shall be OPERABLE with each SIT isolated*, and:

- a. Two LTOP relief valves with a lift setting of ≤ 430 psig, or
- b. The Reactor Coolant System depressurized with an RCS vent path ≥ 6.38 square inches,

* SIT isolation is only required when SIT pressure is greater than or equal to RCS pressure.

APPLICABILITY: MODE 4 with $T_C \leq 220^\circ\text{F}$, MODE 5, MODE 6 with reactor vessel head in place.

ACTION:

- a. With one LTOP relief valve inoperable, restore the inoperable valve to OPERABLE status within 7 days or depressurize and vent the RCS through a ≥ 6.38 square inch vent path within the next 8 hours.
- b. With both LTOP relief valves inoperable, depressurize and vent the RCS through a ≥ 6.38 square inch vent path within 8 hours.
- c. With a SIT not isolated, isolate the affected SIT within 1 hour. If required action is not met, either:
 - (1) Depressurize the SIT to less than the RCS pressure within 12 hours, or
 - (2) Increase cold leg temperature to greater than or equal to 220°F within 12 hours.
- d. The provisions of Specification 3.0.4 are not applicable.

SURVEILLANCE REQUIREMENTS

- 4.4.12.1 Verify both sets of LTOP relief valve isolation valves are open at least once per 72 hours when the LTOP relief valves are being used for overpressure protection.
- 4.4.12.2 The RCS vent path shall be verified to be open at least once per 12 hours** when the vent path is being used for overpressure protection.
- 4.4.12.3 Verify that each SIT is isolated, when required, once every 12 hours.

4.4.12.4 No additional LTOP relief valve Surveillance Requirements other than those required by Specification 4.0.5.

** Except when the vent path is provided with a valve which is locked, sealed, or otherwise secured in the open position, then verify this valve is open at least once per 31 days.

REACTOR COOLANT SYSTEM

BASES

3/4.4.12 LOW TEMPERATURE OVERPRESSURE PROTECTION SYSTEMS

Low temperature overpressure protection (LTOP) of the RCS, including the reactor vessel, is provided by redundant relief valves on the pressurizer which discharge from a single discharge header. Each LTOP relief valve is a direct action, spring-loaded relief valve, with orifice area of 6.38 in² and a lift setting of ≤ 430 psig, and is capable of mitigating the worst-case design basis pressurization event. The LTOP design basis event is a simultaneous injection of two HPSI pumps and all three charging pumps to the water-solid RCS. The analyses assume that the safety injection tanks are either isolated or are depressurized.

The LTOP system, in combination with the RCS heatup and cooldown limitations of LCO 3.4.9.1 and administrative restrictions on RCP operation, provides assurance that the reactor vessel non-ductile fracture limits are not exceeded during the design basis event at low RCS temperatures. These non-ductile fracture limits are identified as LTOP pressure-temperature (P-T) limits, which were specifically developed to provide a basis for the LTOP system. These LTOP P-T limits, along with the LTOP enable temperature, were developed using guidance provided in ASME Code Section XI, Division 1, Code Case N-514 that mandates that "LTOP systems shall limit the maximum pressure in the vessel to 110% of the pressure determined to satisfy Appendix G, paragraph G-2215 of Section XI, Division 1".

The enable temperature of the LTOP isolation valves is based on any RCS cold leg temperature reaching 220°F (including a 20°F uncertainty). Although each relief valve is capable of mitigating the design basis LTOP event, both valves are required to be opened below the enable temperature to meet the single failure criterion of NRC Branch Technical Position RSB 5-2, unless an RCS vent path of 6.38 in² (equivalent relief valve orifice area) or larger is maintained.

Attachment 2

Arkansas Nuclear One, Unit 2

**"Low-Temperature Overpressure Protection Pressure-Temperature
Limits for 21 Effective Full Power Years"**

(ABB-CE Engineering Report A-PENG-ER-004, Revision 00)