

Response to SDAA Audit Question

Question Number: A-16.3.4.3-1

Receipt Date: 02/26/2024

Question:

Specification 5.6.4, "Reactor Coolant System (RCS) PRESSURE AND TEMPERATURE LIMITS REPORT (PTLR)," paragraph "b" lists the pressure-temperature limits methodology as:

'TR-130877-P, "Pressure and Temperature Limits Methodology," [Revision 2, December 2022.]'

Should Reference 4 in References section of GTS Bases Subsection B 3.4.3 state this methodology instead of

'[TR 127993 "Pressure and Temperature Limits Methodology," Rev. 0].'?

Response:

NuScale revises Reference 4 in GTS Bases B 3.4.3 to read:

"TR-130877-P, "Pressure and Temperature Limits Methodology," [Revision 2, December 2022].

As the result of a corrective action unrelated to Audit Item A-.3.4.3-1, NuScale also revises the units for the reactor safety valve setpoints specified in GTS SR 3.4.4.1 from "psia" to "psid." The external pressure for piping inside the containment vessel is conservatively assumed to be 0 psia when evaluating internal design pressure." This defines the design pressure for the RCS in units of differential pressure; i.e., the design pressure is 2,200 psia – 0 psia = 2,200 psid. This distinction was not reflected by the reactor safety valve setpoints specified in GTS SR 3.4.4.1.

Markups of the affected changes, as described in the response, are provided below:

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.4.4.1	<p>Verify each RSV is OPERABLE in accordance with the INSERVICE TESTING PROGRAM. Following testing, lift settings shall be within 1% of the nominal setpoints of 2200 psida and 2290 psida as shown below:</p> <p>Valve 1 Setpoint: ≥ 2178 psida and ≤ 2222 psida.</p> <p>Valve 2 Setpoint: ≥ 2268 psida and ≤ 2312 psida.</p>	In accordance with the INSERVICE TESTING PROGRAM

BASES

APPLICABLE SAFETY ANALYSES (continued)

The demineralized water isolation valves isolate on actuation signals initiated by the low RCS flow, High Subcritical Multiplication or reactor trip system (RTS). The low RCS Flow actuation signal is designed to ensure boron dilution cannot be performed at low RCS flowrates where the loop time is too long to be able to detect the reactivity change in the core within sufficient time to mitigate the event. The High Subcritical Multiplication actuation signal is designed to detect and mitigate inadvertent subcritical boron dilution events in MODES 2 and 3.

The RTS actuation initiates a signal to isolate the demineralized water isolation valves to support a reactor trip. The demineralized water isolation valves prevent the designed source of dilution water from contributing to events when these conditions exist. The analysis for an inadvertent boron dilution event assumes that the diluting flow is from the demineralized water source, however the boric acid storage tank and boric acid batch tank also supply flow to the CVCS. Controlling the boron concentration in these supplies ensures that they are not a source of dilution water. Thus the boric acid supply boron concentration is an assumption of the boron dilution accident.

Another initial assumption of the inadvertent boron dilution event (Ref. 1) is that the maximum CVCS dilution flow is limited at reduced power levels. The lowest maximum acceptable demineralized water flow rate is that provided by one CVCS makeup pump. And the maximum acceptable demineralized water flow rate varies with core design and boron concentration in the RCS. The initial safety analysis assumption limits maximum flow to that provided by a single makeup pump, however analyses may be performed consistent with approved methodologies listed in TS 5.6.3, "Core Operating Limits Report," to permit adjustments to the maximum demineralized water flow limit as a function of core design and boron concentration in the RCS. CVCS flow between units via the module heating system (MHS) MHS headers could result in unplanned changes to the boration of a unit aligned to the MHS.

CVCS demineralized water isolation valves satisfy Criterion 3 of 10 CFR 50.36(c)(2)(ii). The boron concentration in the boric acid supply, the CVCS makeup pump demineralized water flow path flowrate, and isolation of MHS flow paths between units satisfy Criterion 2 of 10 CFR 50.36(c)(2)(ii).

BASES

LCO

The requirement that two demineralized water isolation valves be OPERABLE ~~assures~~ensures that there will be redundant means available to terminate an inadvertent boron dilution event. The requirement that the boron concentration of the boric acid supply be maintained within the limits specified in the COLR ensures that the supply is not a source to the CVCS that could result in an inadvertent boron dilution event.

The limits on maximum CVCS makeup pump demineralized water flow path flowrate are established by restricting the flow that can be provided during system operation to within the limits in the COLR. The restrictions may be implemented by use of at least one closed manual or one closed and de-activated automatic valve, or by removing the power supply from one CVCS makeup pump.

APPLICABILITY

The requirement that two demineralized water isolation valves be OPERABLE, and that the boric acid storage tank boron concentration and maximum CVCS makeup pump demineralized water flow path flowrate is within the limits specified in the COLR is applicable in MODES 1, 2, and 3 with any dilution source flow path in the CVCS makeup line not isolated. In these MODES, a boron dilution event is considered possible, and the automatic closure of these valves is assumed in the safety analysis. The boron concentration of the boric acid sources are not assumed to be capable of causing a dilution event by the boron dilution event analysis. The maximum CVCS makeup pump demineralized water flow path flowrate is an assumption of the boron dilution event.

In MODE 1 < 15% RTP, the detection and mitigation of a boron dilution event would be signaled by a High Source or Intermediate Range Log Power Rate or a High Source Range Count Rate.

In MODE 1 \geq 15% RTP, the detection and mitigation of a boron dilution event would be signaled by a High Power Range Rate or High Power Range Linear Power. In MODES 2 and 3, the detection and mitigation of a boron dilution event would be signaled by a Source Range High Count Rate trip, a trip on Source Range High Log Power Rate, or a trip on High Subcritical Multiplication, or low RCS flow.

In MODES 4 and 5, a dilution event is precluded because the CVCS RCS injection and discharge flow paths are not connected to the RCS, thus eliminating the possibility of a boron dilution event in the RCS. Pool volume is sufficient to minimize the potential for boron dilution during MODE 5 within the surveillance intervals provided by LCO 3.5.3, "Ultimate Heat Sink."

BASES

SURVEILLANCE REQUIREMENTS

SR 3.4.3.1

Verification that operation is within PTLR limits is required when RCS P/T conditions are undergoing planned changes. The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program. Pressurizer pressure instrumentation is utilized to monitor vessel pressure during planned changes. Use of temperature monitoring instrumentation is based on evolution being performed and delineated in PTLR.

Surveillance for heatup and cooldown, may be discontinued when the definition given in the relevant plant procedure for ending the activity is satisfied.

This SR is modified by a Note that only requires this surveillance to be performed during system heatup and cooldown and inservice leak and hydrostatic testing.

REFERENCES

1. 10 CFR 50, Appendix G.
2. ASME, Boiler and Pressure Vessel Code, Section XI, Appendix G, [2017 edition].
3. ASME, Boiler and Pressure Vessel Code, Section XI, Appendix E, [2017 edition].
4. [TR-130877-P, "Pressure and Temperature Limits Methodology," \[Revision 2, December 2022\].](#) ~~[TR 127993 "Pressure and Temperature Limits Methodology," Rev. 0].~~