Industry/TSTF Standard Technical Specification Change Traveler

Relocate TS Parameters to COLR

Classification: 3) Improve Specifications

NUREGs Affected: ☐ 1430 ☑ 1431 ☐ 1432 ☐ 1433 ☐ 1434

Description:

Relocate TS parameters to the COLR consistent with WCAP-14483.

The TSTF believes that this change, or portions thereof, may be applicable to the other PWR NUREGs. The TSTF is evaluating the applicability and will provide a revision, if necessary.

Justification:

By letter dated January 19, 1999, the NRC approved WCAP-14483, "Generic Methodology for Expanded Core Operating Limits Report." The Safety Evaluation Report contained in the NRC letter concludes that additional information contained in the TS may be relocated to the COLR.

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Revision History

OG Revision 0 Revision Status: Closed

Revision Proposed by: Westinghouse

Revision Description:
Original Issue

Owners Group Review Information

Date Originated by OG: 17-Mar-99

Owners Group Comments
(No Comments)

Owners Group Resolution: Approved Date: 17-Mar-99

TSTF Review Information

TSTF Received Date: 15-Jun-99 Date Distributed for Review 15-Jun-99

OG Review Completed: ☑ BWOG ☑ WOG ☑ CEOG ☑ BWROG

TSTF Comments:

The TSTF believes that this change, or portions thereof, may be applicable to the other PWR NUREGs. The TSTF is evaluating the applicability and will provide a revision, if necessary.

TSTF Resolution: Approved Date: 15-Jun-99

NRC Review Information

NRC Received Date: 23-Jun-99

NRC Comments:

7/27/99 - NRC comments: TS Fig 2.1.1-1 should be relocated to the COLR to be consistent with the

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OG Revision 0 Revision Status: Closed

approved version of WCAP-14483-a.

Fig 2.1.1-1 represents core limits on RCS temp conditions as a function of pressurizer pressure and fractional rated power. It was originally included in the WOG TS to satisfy the requirements of 10 CFR 50.36 which states that safety limits upon important process variables (measurable quantities. To ensure that 50.36 is met, the WOG agreed (in WCAP-144843-A) to retain the requirement for a Reactor Core Limits figure in the TS but relocate it to the COLR and replace it with the DNBR and fuel centerline melt design basis limits.

Final Resolution: Superceded by Revision Final Resolution Date: 27-Jul-99

TSTF Revision 1 Revision Status: Closed

Revision Proposed by: NRC

Revision Description:
Revised to incorporate NRC comments. Added limits on DNBR and peak fuel centerline temperature to Section 2.1. Moved Figure 2.1.1-1 to the COLR and revised reference.

TSTF Review Information

TSTF Received Date: 03-Aug-99 Date Distributed for Review 03-Aug-99

OG Review Completed: ☑ BWOG ☑ WOG ☑ CEOG ☑ BWROG

TSTF Comments:
(No Comments)

TSTF Resolution: Approved Date: 03-Aug-99

NRC Review Information

NRC Received Date: 04-Aug-99

NRC Comments:
8/31/99 - Approved by NRC.

Final Resolution: Superceded by Revision Final Resolution Date: 26-May-00

TSTF Revision 2 Revision Status: Active Next Action: NRC

Revision Proposed by: WOG

Revision Description:
The NRC approved TSTF-339, Rev. 1, on August 31, 1999. Subsequently, during the review of a plant specific submittal utilizing TST-339, Rev. 1, additional changes were made to the plant specific request based on comments from the Technical Specifications Branch of the NRC that require TSTF-339, Rev. 1 to be revised. Additionally, it was identified that some additional changes were warranted based on WCAP-14483.

Specifically, Insert 1 is revised to clarify that the reactor core limits are specified in the COLR and the Safety Limits (as opposed to fuel design criteria) shall not be exceeded. In the Safety Limits Bases (page B 2.0-3), the first paragraph is reinstated with reference to the figures in the COLR.

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TSTF Revision 2 **Revision Status: Active** **Next Action: NRC**

In the Bases for 3.4.1, changes are made to the Applicable Safety Analysis consistent with WCAP-14483 in that the DNBR criterion is in the COLR. Additionally, the LCO Bases are modified to refer to undetected fouling instead of indicated fouling.

TSTF Review Information

TSTF Received Date: 26-May-00 Date Distributed for Review 26-May-00

OG Review Completed: ☑ BWOG ☑ WOG ☑ CEOG ☑ BWROG

TSTF Comments:

TSTF reviewed by e-mail.

TSTF Resolution: Approved Date: 26-May-00

NRC Review Information

NRC Received Date: 26-May-00

NRC Comments:

(No Comments)

Final Resolution: NRC Action Pending Final Resolution Date:

Incorporation Into the NUREGs

File to BBS/LAN Date: TSTF Informed Date: TSTF Approved Date:

NUREG Rev Incorporated:

Affected Technical Specifications

SL 2.1.1	SLs	NUREG(s)- 1431 Only
SL 2.1.1 Bases	Reactor Core SLs Change Description: Deletion of Figure B 2.1.1-1	NUREG(s)- 1431 Only
LCO 3.3.1	RTS Instrumentation Change Description: Revision of Table 3.3.1-1, Notes 1 and 2	NUREG(s)- 1431 Only
3.4.1	RCS Pressure, Temperature, and Flow DNB Limits	NUREG(s)- 1431 Only
S/A 3.4.1 Bases	RCS Pressure, Temperature, and Flow DNB Limits	NUREG(s)- 1431 Only
LCO 3.4.1 Bases	RCS Pressure, Temperature, and Flow DNB Limits	NUREG(s)- 1431 Only
Appl. 3.4.1 Bases	RCS Pressure, Temperature, and Flow DNB Limits	NUREG(s)- 1431 Only

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INSERT 1

the COLR; and the following SLs shall not be exceeded:

2.1.1.1 The departure from nucleate boiling ratio (DNBR) shall be maintained ≥ [1.17 for the WRB-l/WRB-2 DNB correlations].

2.1.1.2 The peak fuel centerline temperature shall be maintained < [5080°F, decreasing by 58°F per 10,000 MWD/MTU of burnup].

INSERT 2

The reactor core SLs are established to preclude violation of the following fuel design criteria:

a. There must be at least a 95% probability at a 95% confidence level (the 95/95 DNB criterion) that the hot fuel rod in the core does not experience DNB; and

b. There must be at least a 95% probability at a 95% confidence level that the hot fuel pellet in the core does not experience centerline fuel melting.

The reactor core SLs are used to define the various RPS functions such that the above criteria are satisfied during steady state operation, normal operational transients, and anticipated operational occurrences (AOOs). To ensure that the RPS precludes the violation of the above criteria, additional criteria are applied to the Overtemperature and Overpower ΔT reactor trip functions. That is, it must be demonstrated that the average enthalpy in the hot leg is less than or equal to the saturation enthalpy and that the core exit quality is within the limits defined by the DNBR correlation. Appropriate functioning of the RPS ensures that for variations in the THERMAL POWER, RCS Pressure, RCS average temperature, RCS flow rate, and ΔI that the reactor core SLs will be satisfied during steady state operation, normal operational transients, and AOOs.

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2.0 SAFETY LIMITS (SLs)

2.1 SLs

2.1.1 Reactor Core SLs

In MODES 1 and 2, the combination of THERMAL POWER, Reactor Coolant System (RCS) highest loop average temperature, and pressurizer pressure shall not exceed the ~~SLs~~ limits specified in ~~Figure 2.1.1-1.~~ Insert 1

2.1.2 RCS Pressure SL

In MODES 1, 2, 3, 4, and 5, the RCS pressure shall be maintained ≤ [2735] psig.

2.2 SL Violations

2.2.1 If SL 2.1.1 is violated, restore compliance and be in MODE 3 within 1 hour.

2.2.2 If SL 2.1.2 is violated:

2.2.2.1 In MODE 1 or 2, restore compliance and be in MODE 3 within 1 hour.

2.2.2.2 In MODE 3, 4, or 5, restore compliance within 5 minutes.

2.2.3 Within 1 hour, notify the NRC Operations Center, in accordance with 10 CFR 50.72.

2.2.4 Within 24 hours, notify the [Plant Superintendent and Vice President—Nuclear Operations].

2.2.5 Within 30 days a Licensee Event Report (LER) shall be prepared pursuant to 10 CFR 50.73. The LER shall be submitted to the NRC, the [offsite review function], and the [Plant Superintendent, and Vice President—Nuclear Operations].

2.2.6 Operation of the unit shall not be resumed until authorized by the NRC.

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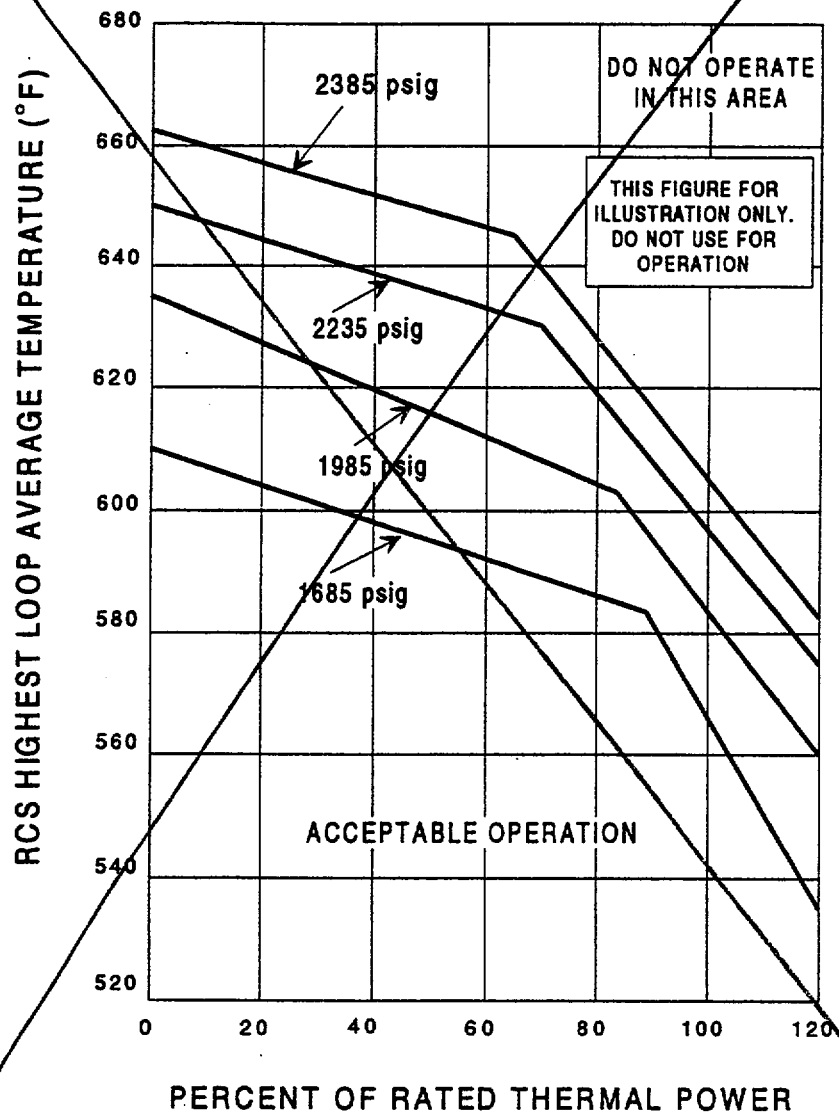

Figure 2.1.1-1 (page 1 of 1)
Reactor Core Safety Limits

BASES

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BACKGROUND (continued)

The proper functioning of the Reactor Protection System (RPS) and steam generator safety valves prevents violation of the reactor core SLs.

APPLICABLE SAFETY ANALYSES

The fuel cladding must not sustain damage as a result of normal operation and AOOs. The reactor core SLs are established to preclude violation of the following fuel design criteria:

a. There must be at least 95% probability at a 95% confidence level (the 95/95 DNB criterion) that the hot fuel rod in the core does not experience DNB; and

b. The hot fuel pellet in the core must not experience centerline fuel melting.

The Reactor Trip System setpoints (Ref. 2), in combination with all the LCOs, are designed to prevent any anticipated combination of transient conditions for Reactor Coolant System (RCS) temperature, pressure, RCS Flow, ΔI, and THERMAL POWER level that would result in a departure from nucleate boiling ratio (DNBR) of less than the DNBR limit and preclude the existence of flow instabilities.

Automatic enforcement of these reactor core SLs is provided by the appropriate operation of the RPS and the steam generator safety valves. ~~following functions:~~

~~a. High pressurizer pressure trip;~~

~~b. Low pressurizer pressure trip;~~

~~c. Overtemperature ΔT trip;~~

~~d. Overpower ΔT trip;~~

~~e. Power Range Neutron Flux trip; and~~

~~f. Steam generator safety valves.~~

~~The limitation that the average enthalpy in the hot leg be less than or equal to the enthalpy of saturated liquid also ensures that the ΔT measured by instrumentation, used in the RPS design as a measure of core power, is proportional to core power.~~

(continued)

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BASES

APPLICABLE SAFETY ANALYSES (continued)

The SLs represent a design requirement for establishing the RPS trip setpoints identified previously. LCO 3.4.1, "RCS Pressure, Temperature, and Flow Departure from Nucleate Boiling (DNB) Limits," or the assumed initial conditions of the safety analyses (as indicated in the FSAR, Ref. 2) provide more restrictive limits to ensure that the SLs are not exceeded.

the COLR shows

SAFETY LIMITS

figure

The curves provided in Figure B 2.1.1-1 show the loci of points of THERMAL POWER, RCS pressure, and average temperature for which the minimum DNBR is not less than the safety analyses limit, that fuel centerline temperature remains below melting, that the average enthalpy in the hot leg is less than or equal to the enthalpy of saturated liquid, or that the exit quality is within the limits defined by the DNBR correlation.

Insert 2

~~The curves are based on enthalpy hot channel factor limits provided in the COLR. The dashed line of Figure B 2.1.1-1 shows an example of a limit curve at 2235 psig. In addition, it illustrates the various RPS functions that are designed to prevent the unit from reaching the limit.~~

~~The SL is higher than the limit calculated when the AFD is within the limits of the $F_1(\Delta I)$ function of the overtemperature ΔT reactor trip. When the AFD is not within the tolerance, the AFD effect on the overtemperature ΔT reactor trips will reduce the setpoints to provide protection consistent with the reactor core SLs (Refs. 3 and 4).~~

APPLICABILITY

SL 2.1.1 only applies in MODES 1 and 2 because these are the only MODES in which the reactor is critical. Automatic protection functions are required to be OPERABLE during MODES 1 and 2 to ensure operation within the reactor core SLs. The steam generator safety valves or automatic protection actions serve to prevent RCS heatup to the reactor core SL conditions or to initiate a reactor trip function, which forces the unit into MODE 3. Setpoints for the reactor trip functions are specified in LCO 3.3.1, "Reactor Trip System (RTS) Instrumentation." In MODES 3, 4,

(continued)

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BASES

APPLICABILITY (continued)

5, and 6, Applicability is not required since the reactor is not generating significant THERMAL POWER.

SAFETY LIMIT VIOLATIONS

The following SL violation responses are applicable to the reactor core SLs.

2.2.1

If SL 2.1.1 is violated, the requirement to go to MODE 3 places the unit in a MODE in which this SL is not applicable.

The allowed Completion Time of 1 hour recognizes the importance of bringing the unit to a MODE of operation where this SL is not applicable, and reduces the probability of fuel damage.

2.2.3

If SL 2.1.1 is violated, the NRC Operations Center must be notified within 1 hour, in accordance with 10 CFR 50.72 (Ref. ~~8~~ 3).

2.2.4

If SL 2.1.1 is violated, the Plant Superintendent and the Vice President—Nuclear Operations shall be notified within 24 hours. This 24 hour period provides time for the plant operators and staff to take the appropriate immediate action and assess the condition of the unit before reporting to senior management.

2.2.5

If SL 2.1.1 is violated, a Licensee Event Report shall be prepared and submitted within 30 days to the NRC in accordance with 10 CFR 50.73 (Ref. ~~8~~ 4). A copy of the report shall also be provided to the Plant Superintendent and the Vice President—Nuclear Operations.

(continued)

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SAFETY LIMIT VIOLATIONS (continued)

2.2.6

If SL 2.1.1 is violated, restart of the unit shall not commence until authorized by the NRC. This requirement ensures the NRC that all necessary reviews, analyses, and actions are completed before the unit begins its restart to normal operation.

REFERENCES

1. 10 CFR 50, Appendix A, GDC 10.

2. FSAR, Section [7.2].

~~3. WCAP-8746-A, March 1977.~~

~~4. WCAP-9273-NP-A, July 1985.~~

3 ~~8~~. 10 CFR 50.72.

4 ~~8~~. 10 CFR 50.73.

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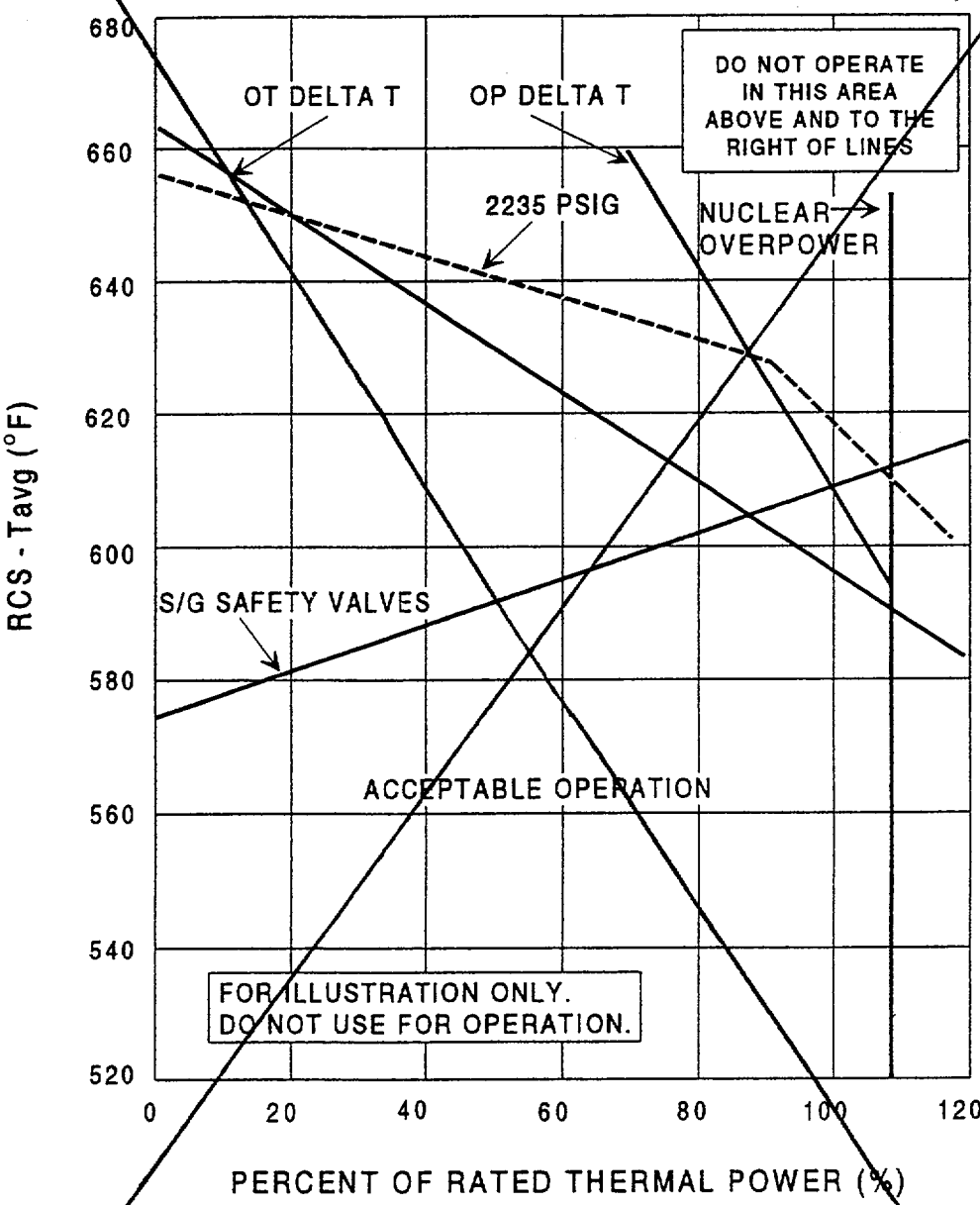

Figure B 2.1.1-1 (page 1 of 1)
Reactor Core Safety Limits vs. Boundary of Protection

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Table 3.3.1-1 (page 7 of 8)
Reactor Trip System Instrumentation

Note 1: Overtemperature ΔT

The Overtemperature ΔT Function Allowable Value shall not exceed the following Trip Setpoint by more than [3.8]% of ΔT span.

$$\Delta T \frac{(1+\tau_1 s)}{(1+\tau_2 s)}\left(\frac{1}{1+\tau_3 s}\right) \le \Delta T_o \left\{K_1 - K_2 \frac{(1+\tau_4 s)}{(1+\tau_5 s)}\left[T \frac{1}{(1+\tau_6 s)} - T'\right] + K_3(P-P') - f_1(\Delta I)\right\}$$

Where: ΔT is measured RCS ΔT, °F.
ΔT_0 is the indicated ΔT at RTP, °F.
s is the Laplace transform operator, sec^{-1}.
T is the measured RCS average temperature, °F.
T′ is the nominal T_{avg} at RTP, ≤ [588]°F (*)

P is the measured pressurizer pressure, psig
P′ is the nominal RCS operating pressure, ≤ [2235] psig

(*) $K_1 \le$ [1.09] $K_2 \ge$ [0.0138]/°F $K_3 =$ [0.00067]/psig
$\tau_1 \ge$ [28] sec $\tau_2 \le$ [4] sec (*) $\tau_3 \le$ [2] sec (*)
$\tau_4 \ge$ [28] sec $\tau_5 \le$ [4] sec $\tau_6 \le$ [2] sec

[*] $f_1(\Delta I) =$ 1.26{28 + $(q_t - q_b)$} when $q_t - q_b \le -$ [38]% RTP (*)
0% of RTP when −[38]% RTP < $q_t - q_b \le$ [7]% RTP
−1.09{$(q_t - q_b)$ − 7} when $q_t - q_b >$ [7]% RTP

Where q_t and q_b are percent RTP in the upper and lower halves of the core, respectively, and $q_t + q_b$ is the total THERMAL POWER in percent RTP.

The values denoted with [*] are specified in the COLR.

Table 3.3.1-1 (page 8 of 8)
Reactor Trip System Instrumentation

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Note 2: Overpower ΔT

The Overpower ΔT Function Allowable Value shall not exceed the following Trip Setpoint by more than [3]% of ΔT span.

$$\Delta T \frac{(1+\tau_1 s)}{(1+\tau_2 s)}\left(\frac{1}{1+\tau_3 s}\right) \le \Delta T_0 \left\{ K_4 - K_5 \frac{\tau_7 s}{1+\tau_7 s}\left(\frac{1}{1+\tau_6 s}\right) T - K_6 \left[T \frac{1}{1+\tau_6 s} - T'' \right] - f_2(\Delta I) \right\}$$

Where: ΔT is measured RCS ΔT, °F.
ΔT_0 is the indicated ΔT at RTP, °F.
s is the Laplace transform operator, sec^{-1}.
T is the measured RCS average temperature, °F.
T" is the nominal T_{avg} at RTP, ≤ [588]°F.

K_4 ≤ [1.09]
K_5 ≥ [0.02]/°F for increasing T_{avg}
[0]/°F for decreasing T_{avg}
K_6 ≥ [0.0028]/°F when T > T"
[0]/°F when T ≤ T"
τ_1 ≥ [8] sec
τ_6 ≤ [0] sec
τ_2 ≤ [0] sec
τ_7 ≥ [10] sec
τ_3 ≤ [2] sec
$f_2(\Delta I)$ = ~~[0% RTP for all ΔI]~~
[*]

The values denoted with [*] are specified in the COLR.

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3.4 REACTOR COOLANT SYSTEM (RCS)

3.4.1 RCS Pressure, Temperature, and Flow Departure from Nucleate Boiling (DNB) Limits

LCO 3.4.1 RCS DNB parameters for pressurizer pressure, RCS average temperature, and RCS total flow rate shall be within the limits specified below:

a. Pressurizer pressure ~~≥ [2200] psig~~; is greater than or equal to the limit specified in the COLR.

b. RCS average temperature ~~≤ [581] °F~~; and is less than or equal to the limit specified in the COLR

c. RCS total flow rate ≥ [284,000] gpm. and greater than or equal to the limit specified in the COLR

APPLICABILITY: MODE 1.

----------NOTE----------
Pressurizer pressure limit does not apply during:

a. THERMAL POWER ramp > 5% RTP per minute; or

b. THERMAL POWER step > 10% RTP.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more RCS DNB parameters not within limits.	A.1 Restore RCS DNB parameter(s) to within limit.	2 hours
B. Required Action and associated Completion Time not met.	B.1 Be in MODE 2.	6 hours

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SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.4.1.1	Verify pressurizer pressure is ~~≥ [2200] psia.~~ greater than or equal to the limit specified in the COLR.	12 hours
SR 3.4.1.2	Verify RCS average temperature is ~~≤ [581] °F.~~ less than or equal to the limit specified in the COLR.	12 hours
SR 3.4.1.3	Verify RCS total flow rate is ≥ [284,000] gpm. and greater than or equal to the limit specified in the COLR	12 hours
SR 3.4.1.4	----------NOTE---------- Not required to be performed until 24 hours after ≥ [90]% RTP. ---------- Verify by precision heat balance that RCS total flow rate is ≥ [284,000] gpm. and greater than or equal to the limit specified in the COLR	[18] months

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BASES

APPLICABLE SAFETY ANALYSES (continued)

result in meeting the DNBR criterion ~~of ≥ [1.3]~~. This is the acceptance limit for the RCS DNB parameters. Changes to the unit that could impact these parameters must be assessed for their impact on the DNBR criteria. The transients analyzed for include loss of coolant flow events and dropped or stuck rod events. A key assumption for the analysis of these events is that the core power distribution is within the limits of LCO 3.1.7, "Control Bank Insertion Limits"; LCO 3.2.3, "AXIAL FLUX DIFFERENCE (AFD)"; and LCO 3.2.4, "QUADRANT POWER TILT RATIO (QPTR)."

specified in the COLR

The pressurizer pressure limit ~~of [2200] psig~~ and ~~the~~ RCS average temperature limit ~~of [581] °F~~ correspond to the analytical limits ~~of [2205] psig and [593] °F~~ used in the safety analyses, with allowance for measurement uncertainty.

The RCS DNB parameters satisfy Criterion 2 of the NRC Policy Statement.

LCO

These variables are contained in the COLR to provide operating and analysis flexibility from cycle to cycle. However, the minimum RCS flow, usually based on [maximum analyzed steam generator tube plugging], is retained in the TS LCO.

This LCO specifies limits on the monitored process variables—pressurizer pressure, RCS average temperature, and RCS total flow rate—to ensure the core operates within the limits assumed in the safety analyses. Operating within these limits will result in meeting the DNBR criterion in the event of a DNB limited transient.

RCS total flow rate contains a measurement error ~~of [2.0]%~~ based on performing a precision heat balance and using the result to calibrate the RCS flow rate indicators. Potential fouling of the feedwater venturi, which might not be detected, could bias the result from the precision heat balance in a nonconservative manner. Therefore, a penalty ~~of [2.1]%~~ for undetected fouling of the feedwater venturi raises the nominal flow measurement allowance ~~to [2.1]%~~ for no fouling.

the penalty for undetected fouling of the feedwater venturi

Any fouling that might bias the flow rate measurement greater than ~~[0.1]%~~ can be detected by monitoring and trending various plant performance parameters. If detected, either the effect of the fouling shall be quantified and compensated for in the RCS flow rate measurement or the venturi shall be cleaned to eliminate the fouling.

(continued)

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LCO (continued)

The LCO numerical values for pressure, temperature, and flow rate specified in the COLR are given for the measurement location but have not been adjusted for instrument error. and

APPLICABILITY

In MODE 1, the limits on pressurizer pressure, RCS coolant average temperature, and RCS flow rate must be maintained during steady state operation in order to ensure DNBR criteria will be met in the event of an unplanned loss of forced coolant flow or other DNB limited transient. In all other MODES, the power level is low enough that DNB is not a concern.

A Note has been added to indicate the limit on pressurizer pressure is not applicable during short term operational transients such as a THERMAL POWER ramp increase > 5% RTP per minute or a THERMAL POWER step increase > 10% RTP. These conditions represent short term perturbations where actions to control pressure variations might be counterproductive. Also, since they represent transients initiated from power levels < 100% RTP, an increased DNBR margin exists to offset the temporary pressure variations.

The DNBR limit ~~Another set of limits on DNB related parameters~~ is provided in SL 2.1.1, "Reactor Core SLs." ~~Those limits~~ are less restrictive than the limits of this LCO, but violation of a Safety Limit (SL) merits a stricter, more severe Required Action. Should a violation of this LCO occur, the operator must check whether or not an SL may have been exceeded.

The conditions which define the DNBR limit

ACTIONS

A.1

RCS pressure and RCS average temperature are controllable and measurable parameters. With one or both of these parameters not within LCO limits, action must be taken to restore parameter(s).

RCS total flow rate is not a controllable parameter and is not expected to vary during steady state operation. If the indicated RCS total flow rate is below the LCO limit, power must be reduced, as required by Required Action B.1, to restore DNB margin and eliminate the potential for violation of the accident analysis bounds.

(continued)