Advanced Passive 1000 (AP1000)
Generic Technical Specification Traveler (GTST)

Title: Changes Related to LCO 3.4.1, RCS Pressure, Temperature, and Flow DNB Limits

I. Technical Specifications Task Force (TSTF) Travelers, Approved Since Revision 2 of STS NUREG-1431, and Used to Develop this GTST

TSTF Number and Title:

TSTF-425-A, Rev 3, Relocate Surveillance Frequencies to Licensee Control – RITSTF Initiative 5b

STS NUREGs Affected:

TSTF-425-A, Rev 3: NUREGs 1430, 1431, 1432, 1433, and 1434

NRC Approval Date:

TSTF-425-A, Rev. 3: 06-Jul-09

TSTF Classification:

TSTF-425-A, Rev 3: Technical Change

II. Reference Combined License (RCOL) Standard Departures (Std. Dep.), RCOL COL Items, and RCOL Plant-Specific Technical Specifications (PTS) Changes Used to Develop this GTST

RCOL Std. Dep. Number and Title:

There are no Vogtle departures applicable to GTS 3.4.1.

RCOL COL Item Number and Title:

There are no Vogtle COL items applicable to GTS 3.4.1.

RCOL PTS Change Number and Title:

VEGP LAR DOC A003:	References to various Chapters and Sections of the Final Safety Analysis Report (FSAR) are revised to include FSAR.
VEGP LAR DOC A038:	Numerous TS surveillances are revised by deletion of word “that” from the surveillance.
VEGP LAR DOC A041:	SR 3.4.1.4 and SR 3.4.1.5 are revised to eliminate parenthetical reference to “(differential pressure)” and including it as the descriptor: “differential pressure RCS total flow rate indication.”

III. Comments on Relations Among TSTFs, RCOL Std. Dep., RCOL COL Items, and RCOL PTS Changes

This section discusses the considered changes that are: (1) applicable to operating reactor designs, but not to the AP1000 design; (2) already incorporated in the GTS; or (3) superseded by another change.

TSTF-425-A deferred for future consideration.

IV. Additional Changes Proposed as Part of this GTST (modifications proposed by NRC staff and/or clear editorial changes or deviations identified by preparer of GTST)

Grammatical errors are corrected in the Bases.

APOG Recommended Changes to Improve the Bases

Throughout the Bases, references to Sections and Chapters of the FSAR do not include the "FSAR" clarifier. Since these Section and Chapter references are to an external document, it is appropriate to include the "FSAR" modifier. (DOC A003)

Replace "DNBR" with "DNB" in the "Background" section of the Bases, second paragraph, last sentence for improved clarity.

Replace "100-percent" with "100%" in the "Background" section of the Bases, fourth paragraph, next to last sentence for improved clarity.

The "Applicable Safety Analyses" section of the Bases matches NUREG-1431 in referencing LCOs 3.1.6, 3.2.3, and 3.2.4. However, for AP1000, LCO 3.2.5, "On-Line Power Distribution Monitoring System (OPDMS) - Monitored Parameters" provides an alternative to LCO 3.2.3 and LCO 3.2.4 when the OPDMS is operable. Therefore, APOG recommends also referencing LCO 3.2.5 in the first paragraph, last sentence of the "ASA" section of the Bases for added clarity.

Delete "TS" in the "LCO" section of the Bases, first paragraph, third sentence to correct the grammar.

Revise the Bases discussion for SRs 3.4.1.1, 3.4.1.2, and 3.4.1.3 to clarify the applicable Surveillance requirement. Currently, the SR Bases only discuss the Frequency and do not address the purpose of the Surveillance itself. A sentence is added to each SR in the form, "This surveillance demonstrates that the [pressurizer pressure; RCS temperature; RCS total flow rate] remains [greater than or equal to; less than or equal to; ≥ 301,670 gpm and greater than or equal to] the limit specified in the COLR."

V. Applicability

Affected Generic Technical Specifications and Bases:

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

Changes to the Generic Technical Specifications and Bases:

The last sentence of the second paragraph in the “Background” section of the Bases is revised to improve clarity, consistency, and operator usability. (APOG Comment)

The next to last sentence of the fourth paragraph in the “Background” section of the Bases is revised to improve clarity, consistency, and operator usability. (APOG Comment)

The last sentence of the first paragraph in the “Applicable Safety Analysis” section of the Bases under the heading “On-Line Power Distribution Monitoring System (OPDMS) - Monitored Parameters” is revised for added clarity. (APOG Comment)

The third sentence of the first paragraph in the “LCO” section of the Bases is revised to correct grammar. (APOG Comment)

The text for SR 3.4.1.4 is revised to provide clarity be eliminating the parenthetical reference to “(differential pressure)” and including it as the descriptor. The phrase “differential pressure” is also added to the SR Bases discussion. (DOC A041)

The text for SR 3.4.1.5 is revised to provide clarity by deleting the word “that” from the surveillance and eliminating the parenthetical reference to “(differential pressure)” and including it as the descriptor. (DOC A038 and A041)

A sentence is added to the Bases discussion of SRs 3.4.1.1, 3.4.1.2, and 3.4.1.3 in the form: “This surveillance demonstrates that the [pressurizer pressure; RCS temperature; RCS total flow rate] remains [greater than or equal to; less than or equal to; ≥ 301,670 gpm and greater than or equal to] the limit specified in the COLR.” (APOG Comment)

The acronym “FSAR” is added to modify “Section” and “Chapter” in references to the FSAR throughout the Bases. (DOC A003) (APOG Comment)

VI. Traveler Information

Description of TSTF changes:

Not Applicable

Rationale for TSTF changes:

Not Applicable

Description of changes in RCOL Std. Dep., RCOL COL Item(s), and RCOL PTS Changes:

DOC A038 revises SR 3.4.1.4 by deleting "that" from the surveillance.

DOC A041 revises TS 3.4.1, "RCS Pressure, Temperature, and Flow Departure from Nucleate Boiling (DNB) Limits," SR 3.4.1.4 and SR 3.4.1.5 to eliminate parenthetical reference to "(differential pressure)" and including it as the descriptor: "differential pressure RCS total flow rate indication."

A more detailed description of each DOC can be found in Reference 2, VEGP TSU LAR Enclosure 1, and the NRC staff safety evaluation can be found in Reference 3, VEGP LAR SER. The VEGP TSU LAR was modified in response to NRC staff RAIs in Reference 5 and the Southern Nuclear Operating Company RAI Response in Reference 6.

Rationale for changes in RCOL Std. Dep., RCOL COL Item(s), and RCOL PTS Changes:

The deletion of "that" from Surveillances per DOC A038 is consistent with the guidance provided in TSTF-GG-05-01, subsection 3.1.1.g, that states: "Avoid the use of 'that' in the Specifications if the statement is clear without it." Deleting "that" from the current SRs does not reduce the clarity of the SRs.

Additionally, TSTF-GG-05-01, subsection 3.3.1.g, recommends avoiding the overuse of parenthetical type statements within sentences, as they generally make the sentence longer, more complicated, and more difficult to understand. The proposed change to the SRs per DOC A041 clarifies the SR, is consistent with the intent of the current wording, and remains consistent with the wording of the Bases.

Description of additional changes proposed by NRC staff/preparer of GTST:

The acronym "FSAR" is added to modify "Section" and "Chapter" in references to the FSAR throughout the Bases. (DOC A003) (APOG Comment)

Replace "DNBR" with "DNB" in the "Background" section of the Bases, second paragraph, last sentence. (APOG Comment)

Replace "100-percent" with "100%" in the "Background" section of the Bases, fourth paragraph, next to last sentence. (APOG Comment)

Clarify the STS Bases to more specifically acknowledge the actual GTS requirements by revising the first paragraph, last sentence of the "ASA" section of the Bases as indicated (APOG Comment):

> An assumption for the analysis of these events is that the core power distribution is within the limits of LCO 3.1.6, "Control Bank Insertion Limits**,**"~~;~~ **as well as within the limits of either** LCO 3.2.3, "AXIAL FLUX DIFFERENCE (AFD)**,**"~~;~~ and LCO 3.2.4, "QUADRANT POWER TILT RATIO (QPTR)**,**~~.~~" **or within the limits of LCO 3.2.5, "On-Line Power Distribution Monitoring System (OPDMS) - Monitored Parameters.**

Delete "TS" in the "LCO" section of the Bases, first paragraph, third sentence. (APOG Comment)

Revise the Bases discussion for SRs 3.4.1.1, 3.4.1.2, and 3.4.1.3 by adding a sentence to each SR in the form, "This surveillance demonstrates that the [pressurizer pressure; RCS temperature; RCS total flow rate] remains [greater than or equal to; less than or equal to; ≥ 301,670 gpm and greater than or equal to] the limit specified in the COLR." (APOG Comment)

Rationale for additional changes proposed by NRC staff/preparer of GTST:

Since Bases references to FSAR Sections and Chapters are to an external document, it is appropriate to include the "FSAR" modifier.

The changes in the "Background" section of the Bases from "DNBR" with "DNB" and from "100-percent" to "100%" are non-technical changes that provide improved clarity, consistency, and operator usability. In addition, the latter change is consistent with Writer's Guide 3.3.4.d (Reference 4).

Discussion of the initial analyses assumptions matches NUREG-1431 in referencing LCOs 3.1.6, 3.2.3, and 3.2.4. However, for AP1000, OPDMS (LCO 3.2.5) provides an alternative to LCO 3.2.3 and LCO 3.2.4 when OPDMS is operable. Therefore, the STS Bases are clarified to more specifically acknowledge the actual GTS requirements. Revising the "Applicable Safety Analyses" section of the Bases of GTS 3.4.1 to include LCO 3.2.5, "On-Line Power Distribution Monitoring System (OPDMS) - Monitored Parameters," is appropriate because it more specifically acknowledges the actual GTS requirements.

The change in the "LCO" section of the Bases, first paragraph, third sentence is a non-technical change to correct grammar.

Currently, the SR Bases discussion for SRs 3.4.1.1, 3.4.1.2, and 3.4.1.3 only discuss the Frequency and do not address the purpose of the Surveillance itself. A lead-in sentence is added to the Bases discussion for each SR to clarify the applicable Surveillance requirement. This is a non-technical change to the Bases.

VII. GTST Safety Evaluation

Technical Analysis:

The “Applicable Safety Analysis” section of the Bases matches NUREG-1431 in referencing LCOs 3.1.6, 3.2.3, and 3.2.4. However, for AP1000, LCO 3.2.5, “On-Line Power Distribution Monitoring System (OPDMS)-Monitored Parameters” provides an alternative to LCO 3.2.3 and LCO 3.2.4 when the OPDMS is operable. Therefore, LCO 3.2.5 is added as an option for ensuring the initial conditions for a DNB limited transient are within limits to the first paragraph, last sentence of the “ASA” section of the Bases for added clarity and to more specifically acknowledge the actual TS requirements. Based on the preceding evaluation, the proposed change to the “ASA” section of the GTS 3.4.1 Bases is acceptable.

The SR Bases discussion for SRs 3.4.1.1, 3.4.1.2, and 3.4.1.3 only discuss the Frequency. The purpose of each individual Surveillance is not identified. Therefore, a lead-in sentence is added to the Bases discussion for each SR to clarify the applicable Surveillance requirement. The proposed change to the SR section of the GTS 3.4.1 Bases is administrative because it does not result in a technical change and is, therefore, acceptable.

The remaining changes are editorial, clarifying, grammatical, or otherwise considered administrative. These changes do not affect the technical content, but improve the readability, implementation, and understanding of the requirements, and are therefore acceptable.

Having found that this GTST’s proposed changes to the GTS and Bases are acceptable, the NRC staff concludes that AP1000 STS Subsection 3.4.1 is an acceptable model Specification for the AP1000 standard reactor design.

References to Previous NRC Safety Evaluation Reports (SERs):

None

VIII. Review Information

Evaluator Comments:

None

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Review Information:

Availability for public review and comment on Revision 0 of this traveler approved by NRC staff on 5/16/2014.

APOG Comments (Ref. 7) and Resolutions:

1. (Internal # 3) Throughout the Bases, references to Sections and Chapters of the FSAR do not include the “FSAR” clarifier. Since these Section and Chapter references are to an external document, it is appropriate (DOC A003) to include the “FSAR” modifier. This is resolved by adding the FSAR modifier as appropriate.

2. (Internal # 7) Section VII, GTST Safety Evaluation, inconsistently completes the subsection “References to Previous NRC Safety Evaluation Reports (SERs)” by citing the associated SE for VEGP 3&4 COL Amendment 13. It is not clear whether there is a substantive intended difference when omitting the SE citation. This is resolved by removing the SE citation in Section VII of the GTST and ensuring that appropriate references to the consistent citation of this reference in Section X of the GTST are made.

3. (Internal #13) Many GTSTs evaluated TSTF-425 with the following note: Risk-informed TS changes will be considered at a later time for application to the AP1000 STS.

   The NRC approval of TSTF-425, and model safety evaluation provided in the CLIIP for TSTF-425, are generically applicable to any design’s Technical Specifications. As such, the replacement of certain Frequencies with a Surveillance Frequency Control Program should be included in the GTST for AP1000 STS NUREG.

   However, implementation in the AP1000 STS should not reflect optional (i.e., bracketed) material showing retention of fixed Surveillance Frequencies where relocation to a Surveillance Frequency Control Program is acceptable. Since each represented AP1000 Utility is committed to maintaining standardization, there is no rationale for an AP1000 STS that includes bracketed options.

   Consistent with TSTF-425 criteria, replace applicable Surveillance Frequencies with “In accordance with the Surveillance Frequency control Program” and add that Program as new AP1000 STS Specification 5.5.15.

   NRC Staff disagreed with implementing TSTF-425 in the initial version of the STS. Although the APOG thinks the analysis supporting this traveler is general enough to be applicable to AP1000, staff thinks an AP1000-specific proposal from APOG is needed to

identify any GTS SRs that should be excluded. Also, with the adoption of a Surveillance Frequency Control Program (SFCP) in the AP1000 STS, bracketed Frequencies, which provide a choice between the GTS Frequency and the SFCP Frequency, are needed because the NRC will use the AP1000 STS as a reference, and to be consistent with NUREG-1431, Rev. 4. APOG was requested to consider proposing an AP1000 version of TSTF-425 for a subsequent revision of the STS.

4. (Internal # 218) In GTST Section V, DOC A038 states that it revises SR 3.4.1.4. DOC A038 actually revises SR 3.4.1.5. This is resolved in the GTST for Subsection 3.4.1, Section V, by replacing “SR 3.4.1.4” with “SR 3.4.1.5.”

5. (Internal # 219) In GTST Section XI and XII, the heading in upper right corner has a large space after “Temperature,” and before “and Flow.” This is resolved by removing the extra spaces.

6. (Internal # 220) In GTST Section XI and XII, GTS LCO 3.4.1 Applicability has a 2-part Note regarding Pressurizer pressure limits. The GTST contains no evaluation discussing deletion of these Notes. This appears to be a typographical oversight omitting these Notes. This is resolved by adding the correct Applicability Note.

7. (Internal # 221) APOG recommends changing DNBR in the second paragraph, last sentence of the “Background” section of the Bases to DNB to provide improved clarity, consistency, and operator usability. This is resolved by making the recommended change.

8. (Internal # 222) APOG recommends changing “100-percent” in the fourth paragraph, next to last sentence of the “Background” section of the Bases to “100%” to provide improved clarity, consistency, and operator usability. This is resolved by making the recommended change.

9. (Internal # 223) APOG recommends revising the STS 3.4.1 “Applicable Safety Analyses” of the Bases to include LCO 3.2.5, “On-Line Power Distribution Monitoring System (OPDMS) - Monitored Parameters.” Discussion of the initial analyses assumptions matches NUREG-1431 in referencing LCOs 3.1.6, 3.2.3, and 3.2.4. However, for AP1000, OPDMS (LCO 3.2.5) provides an alternative to LCO 3.2.3 and LCO 3.2.4 when OPDMS is operable. The STS Bases are clarified to more specifically acknowledge the actual GTS requirements. This is resolved by revising the first paragraph, last sentence of the “ASA” section of the Bases as indicated:

   > An assumption for the analysis of these events is that the core power distribution is within the limits of LCO 3.1.6, “Control Bank Insertion Limits**,**”~~;~~ **as well as within the limits of either** LCO 3.2.3, “AXIAL FLUX DIFFERENCE (AFD)**,**”~~;~~ and LCO 3.2.4, “QUADRANT POWER TILT RATIO (QPTR)~~,~~” **or within the limits of LCO 3.2.5, “On - Line Power Distribution Monitoring System (OPDMS) - Monitored Parameters.**

10. (Internal # 224) APOG recommends deleting the abbreviation “TS” in the first paragraph, third sentence of the “LCO” section of the Bases to improve the sentence grammar. This is resolved by making the recommended change.

11. (Internal # 225, 226, and 227) APOG recommends revising the Bases discussion for SRs 3.4.1.1, 3.4.1.2, and 3.4.1.3 to clarify the applicable Surveillance requirement. Currently, the SR Bases only discuss the Frequency and do not address the purpose of the Surveillance itself. These comments are resolved by adding an introductory sentence in the Bases for each SR.

NRC Final Approval Date: 12/7/2015

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IX. Evaluator Comments for Consideration in Finalizing Technical Specifications and Bases

None

X. References Used in GTST

1. AP1000 DCD, Revision 19, Section 16, “Technical Specifications,” June 2011 (ML11171A500).

2. Southern Nuclear Operating Company, Vogtle Electric Generating Plant, Units 3 and 4, Technical Specifications Upgrade License Amendment Request, February 24, 2011 (ML12065A057).

3. NRC Safety Evaluation (SE) for Amendment No. 13 to Combined License (COL) No. NPF-91 for Vogtle Electric Generating Plant (VEGP) Unit 3, and Amendment No. 13 to COL No. NPF-92 for VEGP Unit 4, September 9, 2013, ADAMS Package Accession No. ML13238A337, which contains:

ML13238A355	Cover Letter - Issuance of License Amendment No. 13 for Vogtle Units 3 and 4 (LAR 12-002).
ML13238A359	Enclosure 1 - Amendment No. 13 to COL No. NPF-91
ML13239A256	Enclosure 2 - Amendment No. 13 to COL No. NPF-92
ML13239A284	Enclosure 3 - Revised plant-specific TS pages (Attachment to Amendment No. 13)
ML13239A287	Enclosure 4 - Safety Evaluation (SE), and Attachment 1 - Acronyms
ML13239A288	SE Attachment 2 - Table A - Administrative Changes
ML13239A319	SE Attachment 3 - Table M - More Restrictive Changes
ML13239A333	SE Attachment 4 - Table R - Relocated Specifications
ML13239A331	SE Attachment 5 - Table D - Detail Removed Changes
ML13239A316	SE Attachment 6 - Table L - Less Restrictive Changes

   The following documents were subsequently issued to correct an administrative error in Enclosure 3:

ML13277A616	Letter - Correction To The Attachment (Replacement Pages) - Vogtle Electric Generating Plant Units 3 and 4-Issuance of Amendment Re: Technical Specifications Upgrade (LAR 12-002) (TAC No. RP9402)
ML13277A637	Enclosure 3 - Revised plant-specific TS pages (Attachment to Amendment No. 13) (corrected)

4. TSTF-GG-05-01, “Writer's Guide for Plant-Specific Improved Technical Specifications,” June 2005.

5. RAI Letter No. 01 Related to License Amendment Request (LAR) 12-002 for the Vogtle Electric Generating Plant Units 3 and 4 Combined Licenses, September 7, 2012 (ML12251A355).

6. Southern Nuclear Operating Company, Vogtle Electric Generating Plant, Units 3 and 4, Response to Request for Additional Information Letter No. 01 Related to License Amendment Request LAR-12-002, ND-12-2015, October 04, 2012 (ML12286A363 and ML12286A360)

7. APOG-2014-008, APOG (AP1000 Utilities) Comments on AP1000 Standardized Technical Specifications (STS) Generic Technical Specification Travelers (GTSTs), Docket ID NRC-2014-0147, September 22, 2014 (ML14265A493).

XI. MARKUP of the Applicable GTS Subsection for Preparation of the STS NUREG

The entire section of the Specifications and the Bases associated with this GTST is presented next.

Changes to the Specifications and Bases are denoted as follows: Deleted portions are marked in strikethrough red font, and inserted portions in bold blue font.

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 is greater than or equal to the limit specified in the COLR

b. RCS Average Temperature is less than or equal to the limit specified in the COLR, and

c. RCS total flow rate ≥ 301,670 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

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.4.1.1	Verify pressurizer pressure is greater than or equal to the limit specified in the COLR.	12 hours
SR 3.4.1.2	Verify RCS average temperature is less than or equal to the limit specified in the COLR.	12 hours
SR 3.4.1.3	Verify RCS total flow rate is ≥ 301,670 gpm and greater than or equal to the limit specified in the COLR.	12 hours
SR 3.4.1.4	Perform a CHANNEL CALIBRATION of **differential pressure** RCS total flow rate indication ~~(differential pressure)~~ channels.	24 months
SR 3.4.1.5	----------NOTE---------- Not required to be performed until 24 hours after ≥ 90% RTP. ---------- Verify ~~that~~ RCS total flow rate is ≥ 301,670 gpm and greater than or equal to the limit specified in the COLR as determined by precision heat balance or **differential pressure** RCS total flow rate indication ~~(differential pressure)~~ measurements.	24 months

B 3.4 REACTOR COOLANT SYSTEM (RCS)

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

BASES

BACKGROUND

These Bases address requirements for maintaining RCS pressure, temperature, and flow rate within the limits assumed in the safety analyses. The safety analyses (Ref. 1) of normal operating conditions and anticipated operational occurrences assume initial conditions within the normal steady state envelope of operating conditions. The limits placed on RCS pressure, temperature, and flow rate ensure that the minimum departure from nucleate boiling ratio (DNBR) will be met for each of the transients analyzed.

The RCS pressure limit is consistent with operation within the nominal operational envelope. Pressurizer pressure indications are averaged to come up with a value for comparison to the limit. A lower pressure will cause the reactor core to approach DNB~~R~~ limits.

The RCS coolant average temperature limit is consistent with full power operation within the nominal operational envelope. Indications of temperature are averaged to determine a value for comparison to the limit. A higher average temperature will cause the core to approach DNB limits.

The RCS flow rate normally remains constant during an operational fuel cycle with all pumps running. The minimum RCS flow limit corresponds to that assumed for DNB analyses. At the beginning of the first fuel cycle, precision (calorimetric) flow measurements, augmented by hydraulic measurements in the reactor coolant loop and pump performance, provide a value for comparison to the limit, and to determine the calibration coefficients for future use with differential pressure measurements. The reactor coolant flow rate channels are normalized to these test measurements for 100**%** ~~percent~~ indication using these calibration coefficients and are frequently monitored to determine flow degradation. A lower RCS flow will cause the core to approach DNB limits.

Operation for significant periods of time outside these DNB limits increases the likelihood of a fuel cladding failure in a DNB limited event.

BASES

APPLICABLE SAFETY ANALYSES

The requirements of this LCO represent the initial conditions for DNB limited transients analyzed in the plant safety analyses (Ref. 1). The safety analyses have shown transients initiated within the requirements of this LCO will result in meeting the DNBR criterion. This is the acceptance limit for the RCS DNB parameters. Changes to the unit which could impact these parameters must be assessed for their impact on the DNBR criterion. The transients analyzed include loss of coolant flow events and dropped or stuck rod events. An assumption for the analysis of these events is that the core power distribution is within the limits of LCO 3.1.6, "Control Bank Insertion Limits**," as well as within the limits of either**~~;~~ LCO 3.2.3, "AXIAL FLUX DIFFERENCE (AFD)**,**"~~;~~ and LCO 3.2.4, "QUADRANT POWER TILT RATIO (QPTR)**,**~~.~~" **or within the limits of LCO 3.2.5, "On-Line Power Distribution Monitoring System (OPDMS) – Monitored Parameters."**

The pressurizer pressure limit and the RCS average temperature limit specified in the COLR correspond to analytical limits, with an allowance for steady state fluctuations and measurement errors. The RCS average temperature limit corresponds to the analytical limit with allowance for controller deadband and measurement uncertainty.

The RCS DNB parameters satisfy Criterion 2 of 10 CFR 50.36(c)(2)(ii).

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. 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. Operating within these limits will result in meeting DNBR criterion in the event of a DNB limited transient.

The COLR RCS total flow rate limit is equal to or more restrictive than the ≥ 301,670 gpm limit specified in the LCO. The COLR limit reflects the cycle-specific core design and plant conditions as well as added margin.

Separate minimum RCS total flow rate limits are specified in the COLR for measurement by precision heat balance or by differential pressure instrumentation. Different flow limits may apply for each measurement method since the two methods have unique measurement errors and instrument allowances that are included in the COLR RCS flow rate limits.

BASES

LCO (continued)

The calibration coefficients for the differential pressure (hot-leg elbow and cold-leg bend) RCS total flow rate indication channels are established based on the comprehensive RCS flow measurements taken at the beginning of the first fuel cycle. These measurements include precision (calorimetric) flow, differential temperature, reactor coolant loop hydraulic tests, and pump performance. The differential pressure calibration coefficients are not expected to change during plant life. Measurement errors associated with the method used to determine the calibration coefficients are included in the differential pressure COLR RCS flow rate limit.

The numerical values for pressure, temperature, and flow rate specified in the COLR are given for the measurement location but have been adjusted for instrument error.

APPLICABILITY

In MODE 1, the limits on pressurizer pressure, RCS coolant average temperature, and RCS flow rate must be maintained during steady state plant operation in order to ensure **the** DNBR criterion will be met in the event of an unplanned loss of forced coolant flow or other DNB-limiting 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 counter productive. 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 is provided in SL 2.1.1, “Reactor Core SLs.” The conditions which define the DNBR limit 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 an SL may have been exceeded.

BASES

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.

The 2 hour Completion Time for restoration of the parameters provides sufficient time to adjust plant parameters, to determine the cause for the off normal condition, and to restore the readings within limits, and is based on plant operating experience.

B.1

If Required Action A.1 is not met within the associated Completion Time, the plant must be brought to a MODE in which the LCO does not apply. To achieve this status, the plant must be brought to at least MODE 2 within 6 hours. In MODE 2, the reduced power condition eliminates the potential for violation of the accident analysis bounds. The Completion Time of 6 hours is reasonable to reach the required plant conditions in an orderly manner.

SURVEILLANCE REQUIREMENTS

SR 3.4.1.1

This surveillance demonstrates that the pressurizer pressure remains greater than or equal to the limit specified in the COLR. Since Required Action A.1 allows a Completion Time of 2 hours to restore parameters that are not within limits, the 12 hour Surveillance Frequency **for** ~~of~~ pressurizer pressure is sufficient to ensure the pressure can be restored to a normal operation, steady state condition following load changes and other expected transient operations. The 12 hour interval has been shown by operating practice to be sufficient to regularly assess for potential degradation and to verify operation is within safety analysis assumptions.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.4.1.2

This surveillance demonstrates that the average RCS temperature remains less than or equal to the limit specified in the COLR. Since Required Action A.1 allows a Completion Time of 2 hours to restore parameters that are not within limits, the 12 hour Surveillance Frequency for RCS average temperature is sufficient to ensure the temperature can be restored to a normal operation, steady state condition following load changes and other expected transient operations. The 12 hour Frequency has been shown by operating practice to be sufficient to regularly assess for potential degradation and to verify operation is within safety analysis assumptions.

SR 3.4.1.3

This surveillance demonstrates that the RCS total flow rate remains ≥ 301,670 gpm and greater than or equal to the limit specified in the COLR. The 12 hour Surveillance Frequency for RCS total flow rate is performed using the installed differential pressure flow instrumentation. The 12 hour interval has been shown by operating practice to be sufficient to regularly assess potential degradation and to verify operation within safety analysis assumptions.

SR 3.4.1.4

A CHANNEL CALIBRATION of the **differential pressure** RCS total flow rate indication channels is performed every 24 months, at the beginning of each fuel cycle.

CHANNEL CALIBRATION is a complete check of the instrument loop, including the sensor. The test verifies that the channel responds to a measured parameter with the necessary range and accuracy.

The Frequency is based on consistency with the refueling cycle.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.4.1.5

Measurement of RCS total flow rate by performance of precision test measurements once every 24 months, at the beginning of each fuel cycle, allows the installed RCS flow instrumentation to be normalized and verifies the actual RCS flow is greater than or equal to the minimum required RCS flow rate. These test measurements may be based on a precision heat balance, or by differential pressure measurements of static elements in the RCS piping (such as elbows) that have been calibrated by previous precision tests, or by a combination of those two methods. In all cases, the measured flow, less allowance for error, must exceed the corresponding value used in the safety analysis and specified in the COLR.

The Frequency of 24 months reflects the importance of verifying flow after a refueling outage when the core has been altered, which may have caused an alteration of flow resistance.

This SR is modified by a Note that allows entry into MODE 1, without having performed the SR, and placement of the unit in the best condition for performing the SR. The Note states that the SR is not required to be performed until after 24 hours after ≥ 90% RTP. This exception is appropriate since the heat balance requires the plant to be at a minimum of 90% RTP to obtain the stated RCS flow accuracies. The Surveillance shall be performed within 24 hours after reaching 90% RTP.

REFERENCES 1. **FSAR** Chapter 15, “Accident Analyses.”

XII. Applicable STS Subsection After Incorporation of this GTST's Modifications

The entire subsection of the Specifications and the Bases associated with this GTST, following incorporation of the modifications, is presented next.

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 is greater than or equal to the limit specified in the COLR

b. RCS Average Temperature is less than or equal to the limit specified in the COLR, and

c. RCS total flow rate ≥ 301,670 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

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.4.1.1	Verify pressurizer pressure is greater than or equal to the limit specified in the COLR.	12 hours
SR 3.4.1.2	Verify RCS average temperature is less than or equal to the limit specified in the COLR.	12 hours
SR 3.4.1.3	Verify RCS total flow rate is ≥ 301,670 gpm and greater than or equal to the limit specified in the COLR.	12 hours
SR 3.4.1.4	Perform a CHANNEL CALIBRATION of differential pressure RCS total flow rate indication channels.	24 months
SR 3.4.1.5	----------NOTE---------- Not required to be performed until 24 hours after ≥ 90% RTP. ---------- Verify RCS total flow rate is ≥ 301,670 gpm and greater than or equal to the limit specified in the COLR as determined by precision heat balance or differential pressure RCS total flow rate indication measurements.	24 months

B 3.4 REACTOR COOLANT SYSTEM (RCS)

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

BASES

BACKGROUND

These Bases address requirements for maintaining RCS pressure, temperature, and flow rate within the limits assumed in the safety analyses. The safety analyses (Ref. 1) of normal operating conditions and anticipated operational occurrences assume initial conditions within the normal steady state envelope of operating conditions. The limits placed on RCS pressure, temperature, and flow rate ensure that the minimum departure from nucleate boiling ratio (DNBR) will be met for each of the transients analyzed.

The RCS pressure limit is consistent with operation within the nominal operational envelope. Pressurizer pressure indications are averaged to come up with a value for comparison to the limit. A lower pressure will cause the reactor core to approach DNB limits.

The RCS coolant average temperature limit is consistent with full power operation within the nominal operational envelope. Indications of temperature are averaged to determine a value for comparison to the limit. A higher average temperature will cause the core to approach DNB limits.

The RCS flow rate normally remains constant during an operational fuel cycle with all pumps running. The minimum RCS flow limit corresponds to that assumed for DNB analyses. At the beginning of the first fuel cycle, precision (calorimetric) flow measurements, augmented by hydraulic measurements in the reactor coolant loop and pump performance, provide a value for comparison to the limit, and to determine the calibration coefficients for future use with differential pressure measurements. The reactor coolant flow rate channels are normalized to these test measurements for 100% indication using these calibration coefficients and are frequently monitored to determine flow degradation. A lower RCS flow will cause the core to approach DNB limits.

Operation for significant periods of time outside these DNB limits increases the likelihood of a fuel cladding failure in a DNB limited event.

BASES

APPLICABLE SAFETY ANALYSES

The requirements of this LCO represent the initial conditions for DNB limited transients analyzed in the plant safety analyses (Ref. 1). The safety analyses have shown transients initiated within the requirements of this LCO will result in meeting the DNBR criterion. This is the acceptance limit for the RCS DNB parameters. Changes to the unit which could impact these parameters must be assessed for their impact on the DNBR criterion. The transients analyzed include loss of coolant flow events and dropped or stuck rod events. An assumption for the analysis of these events is that the core power distribution is within the limits of LCO 3.1.6, “Control Bank Insertion Limits,” as well as within the limits of either LCO 3.2.3, “AXIAL FLUX DIFFERENCE (AFD),” and LCO 3.2.4, “QUADRANT POWER TILT RATIO (QPTR),” or within the limits of LCO 3.2.5, “On-Line Power Distribution Monitoring System (OPDMS) – Monitored Parameters.”

The pressurizer pressure limit and the RCS average temperature limit specified in the COLR correspond to analytical limits, with an allowance for steady state fluctuations and measurement errors. The RCS average temperature limit corresponds to the analytical limit with allowance for controller deadband and measurement uncertainty.

The RCS DNB parameters satisfy Criterion 2 of 10 CFR 50.36(c)(2)(ii).

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. 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 LCO. Operating within these limits will result in meeting DNBR criterion in the event of a DNB limited transient.

The COLR RCS total flow rate limit is equal to or more restrictive than the ≥ 301,670 gpm limit specified in the LCO. The COLR limit reflects the cycle-specific core design and plant conditions as well as added margin.

Separate minimum RCS total flow rate limits are specified in the COLR for measurement by precision heat balance or by differential pressure instrumentation. Different flow limits may apply for each measurement method since the two methods have unique measurement errors and instrument allowances that are included in the COLR RCS flow rate limits.

BASES

LCO (continued)

The calibration coefficients for the differential pressure (hot-leg elbow and cold-leg bend) RCS total flow rate indication channels are established based on the comprehensive RCS flow measurements taken at the beginning of the first fuel cycle. These measurements include precision (calorimetric) flow, differential temperature, reactor coolant loop hydraulic tests, and pump performance. The differential pressure calibration coefficients are not expected to change during plant life. Measurement errors associated with the method used to determine the calibration coefficients are included in the differential pressure COLR RCS flow rate limit.

The numerical values for pressure, temperature, and flow rate specified in the COLR are given for the measurement location but have been adjusted for instrument error.

APPLICABILITY

In MODE 1, the limits on pressurizer pressure, RCS coolant average temperature, and RCS flow rate must be maintained during steady state plant operation in order to ensure the DNBR criterion will be met in the event of an unplanned loss of forced coolant flow or other DNB-limiting 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 counter productive. 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 is provided in SL 2.1.1, “Reactor Core SLs.” The conditions which define the DNBR limit 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 an SL may have been exceeded.

BASES

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.

The 2 hour Completion Time for restoration of the parameters provides sufficient time to adjust plant parameters, to determine the cause for the off normal condition, and to restore the readings within limits, and is based on plant operating experience.

B.1

If Required Action A.1 is not met within the associated Completion Time, the plant must be brought to a MODE in which the LCO does not apply. To achieve this status, the plant must be brought to at least MODE 2 within 6 hours. In MODE 2, the reduced power condition eliminates the potential for violation of the accident analysis bounds. The Completion Time of 6 hours is reasonable to reach the required plant conditions in an orderly manner.

SURVEILLANCE REQUIREMENTS

SR 3.4.1.1

This surveillance demonstrates that the pressurizer pressure remains greater than or equal to the limit specified in the COLR. Since Required Action A.1 allows a Completion Time of 2 hours to restore parameters that are not within limits, the 12 hour Surveillance Frequency for pressurizer pressure is sufficient to ensure the pressure can be restored to a normal operation, steady state condition following load changes and other expected transient operations. The 12 hour interval has been shown by operating practice to be sufficient to regularly assess for potential degradation and to verify operation is within safety analysis assumptions.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.4.1.2

This surveillance demonstrates that the average RCS temperature remains less than or equal to the limit specified in the COLR. Since Required Action A.1 allows a Completion Time of 2 hours to restore parameters that are not within limits, the 12 hour Surveillance Frequency for RCS average temperature is sufficient to ensure the temperature can be restored to a normal operation, steady state condition following load changes and other expected transient operations. The 12 hour Frequency has been shown by operating practice to be sufficient to regularly assess for potential degradation and to verify operation is within safety analysis assumptions.

SR 3.4.1.3

This surveillance demonstrates that the RCS total flow rate remains ≥ 301,670 gpm and greater than or equal to the limit specified in the COLR. The 12 hour Surveillance Frequency for RCS total flow rate is performed using the installed differential pressure flow instrumentation. The 12 hour interval has been shown by operating practice to be sufficient to regularly assess potential degradation and to verify operation within safety analysis assumptions.

SR 3.4.1.4

A CHANNEL CALIBRATION of the differential pressure RCS total flow rate indication channels is performed every 24 months, at the beginning of each fuel cycle.

CHANNEL CALIBRATION is a complete check of the instrument loop, including the sensor. The test verifies that the channel responds to a measured parameter with the necessary range and accuracy.

The Frequency is based on consistency with the refueling cycle.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.4.1.5

Measurement of RCS total flow rate by performance of precision test measurements once every 24 months, at the beginning of each fuel cycle, allows the installed RCS flow instrumentation to be normalized and verifies the actual RCS flow is greater than or equal to the minimum required RCS flow rate. These test measurements may be based on a precision heat balance, or by differential pressure measurements of static elements in the RCS piping (such as elbows) that have been calibrated by previous precision tests, or by a combination of those two methods. In all cases, the measured flow, less allowance for error, must exceed the corresponding value used in the safety analysis and specified in the COLR.

The Frequency of 24 months reflects the importance of verifying flow after a refueling outage when the core has been altered, which may have caused an alteration of flow resistance.

This SR is modified by a Note that allows entry into MODE 1, without having performed the SR, and placement of the unit in the best condition for performing the SR. The Note states that the SR is not required to be performed until after 24 hours after ≥ 90% RTP. This exception is appropriate since the heat balance requires the plant to be at a minimum of 90% RTP to obtain the stated RCS flow accuracies. The Surveillance shall be performed within 24 hours after reaching 90% RTP.

REFERENCES 1. FSAR Chapter 15, “Accident Analyses.”