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

Title: Changes Related to LCO 3.4.5, Pressurizer

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 Specification 3.4.5.

RCOL COL Item Number and Title:

There are no Vogtle COL items applicable to Specification 3.4.6.

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 A043: TS 3.4.5 Required Action A.1 is deleted

VEGP LAR DOC L07: Certain TS Required Actions requiring the RTBs to be opened are revised into two Required Actions.

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(1) applicable to operating reactor designs, but not to the AP1000 design; (2) already incorporated in the GTS; or (3) superseded by another change.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)

V. Applicability

Affected Generic Technical Specifications and Bases:

Section 3.4.5, Pressurizer

Changes to the Generic Technical Specifications and Bases:

Required Action A.1 is deleted and the corresponding Bases are updated. The Required Action is a restatement of the LCO and is not required by the TS Writer's Guide (Reference 4). (DOC A043)

Required Action A.2.1 (new A.1) is revised to break the RTB statement into two parts. This eliminates the potential for undesirable secondary effects of opening the reactor trip breakers. (DOC L07)

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 A043 deletes Required Action A.1, "Restore pressurizer water level within limit," within 6 hours.

DOC L07 replaces Required Actions to open the reactor trip breakers with two Required Actions.

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:

Deletion of Required Action A.1 per DOC A043 is consistent with the TS Writer's Guide (Reference 4). Unless an action to restore a parameter to within limit is the only required action for the associated Condition, such an action is implicitly specified and does not need to be explicitly stated.

DOC L07 notes that when the RTBs are opened, certain other interlocks can be initiated. The initiation of the associated interlocks may have an undesirable secondary effect on the ease of operation of the plant such as the initiation of the P-4 interlock, which, in the event of low RCS temperature, can result in isolation of main feedwater to the steam generators.

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)

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.

VII. GTST Safety Evaluation**Technical Analysis:**

DOC L07 replaces Required Actions to open the reactor trip breakers with two Required Actions. Each of the Required Actions to open the RTBs is intended to assure that rods cannot be withdrawn thereby eliminating the possibility for control rod related positive reactivity additions and associated heat input into the reactor coolant. Additionally, opening the RTBs would result in all rods being inserted. Therefore, replacing the Required Actions to open RTBs with two actions to “initiate action to fully insert all rods” and “place the Plant Control System in a condition incapable of rod withdrawal,” maintains the intent of the existing requirement. This change replaces the specific method of precluding rod withdrawal and ensuring all rods are inserted while maintaining the requirement for establishing the plant conditions equivalent to opening RTBs.

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 3.4.5 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.

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).
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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)

3.4.5 Pressurizer

LCO 3.4.5 The pressurizer water level shall be \leq 92% of span.

APPLICABILITY: MODES 1, 2, and 3.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Pressurizer water level not within limit.	A.1 — Restore pressurizer water level within limit.	6 hours
	OR	
	A.2.1 Be in MODE 3 with reactor trip breakers open.	6 hours
	<u>AND</u>	
	A.2 Initiate action to fully insert all rods.	6 hours
	<u>AND</u>	
	A.3 Place the Plant Control System in a condition incapable of rod withdrawal.	6 hours
	<u>AND</u>	
	A.2.24 Be in MODE 4.	12 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.4.5.1	Verify pressurizer water level \leq 92% of span.	12 hours

B 3.4 REACTOR COOLANT SYSTEM (RCS)

B 3.4.5 Pressurizer

BASES

BACKGROUND

The pressurizer provides a point in the RCS where liquid and vapor are maintained in equilibrium under saturated conditions for pressure control purposes to prevent bulk boiling in the remainder of the RCS. Key functions include maintaining required primary system pressure during steady state operation, and limiting the pressure changes caused by reactor coolant thermal expansion and contraction during normal load transients.

The normal level and pressure control components addressed by this LCO include the pressurizer water level, the heaters, their controls, and power supplies. Pressurizer safety valves and automatic depressurization valves are addressed by LCO 3.4.6, "Pressurizer Safety Valves," and LCO 3.4.11, "Automatic Depressurization System (ADS) – Operating," respectively.

The intent of the LCO is to ensure that a steam bubble exists in the pressurizer prior to power operation to minimize the consequences of potential overpressure transients. The presence of a steam bubble is consistent with analytical assumptions. Relatively small amounts of ~~noncondensable~~ **noncondensible** gases can inhibit the condensation heat transfer between the pressurizer spray and the steam, and diminish the spray effectiveness for pressure control.

Electrical immersion heaters, located in the lower section of the pressurizer vessel, keep the water in the pressurizer at saturation temperature and maintain a constant operating pressure.

APPLICABLE
SAFETY
ANALYSES

In MODES 1, 2, and 3, the LCO requirement for a steam bubble is reflected implicitly in the accident analyses. Safety analyses performed for lower MODES are not limiting. All analyses performed from a critical reactor condition assume the existence of a steam bubble and saturated conditions in the pressurizer. In making this assumption, the analyses neglect the small fraction of ~~noncondensable~~ **noncondensible** gases normally present.

BASES

APPLICABLE SAFETY ANALYSES (continued)

Safety analyses presented in **FSAR** Chapter 15 (Ref. 1) do not take credit for pressurizer heater operation, however, an implicit initial condition assumption of the safety analyses is that the RCS is operating at normal pressure.

The maximum pressurizer water level limit satisfies Criterion 2 of 10 CFR 50.36(c)(2)(ii).

LCO

The LCO requirement for the pressurizer water volume $\leq 92\%$ of span, ensures that an adequate steam bubble exists. Limiting the LCO maximum operating water level preserves the steam space for pressure control. The LCO has been established to ensure the capability to establish and maintain pressure control for steady state operation and to minimize the consequences of potential overpressure transients. Requiring the presence of a steam bubble is also consistent with analytical assumptions.

APPLICABILITY

The need for pressure control is most pertinent when core heat can cause the greatest effect on RCS temperature, resulting in the greatest effect on pressurizer level and RCS pressure control. Thus, applicability has been designated for MODES 1 and 2. The applicability is also provided for MODE 3. The purpose is to prevent solid water RCS operation during heatup and cooldown to avoid rapid pressure rises caused by normal operational perturbation, such as reactor coolant pump startup.

ACTIONS

A.1, A.2, A.3, and A.24

Pressurizer water level control malfunctions or other plant evolutions may result in a pressurizer water level above the nominal upper limit, even with the plant at steady state conditions.

If the pressurizer water level is above the limit, action must be taken to restore the plant to operation within the bounds of the safety analyses. This is done by ~~restoring the level to within limit, within 6 hours, or by placing the unit in MODE 3 with the reactor trip breakers open~~ **placing the unit in MODE 3 with the Plant Control System in a condition incapable of rod withdrawal and action initiated to fully insert all control rods** within 6 hours, and placing the unit in MODE 4 within

BASES

ACTIONS (continued)

12 hours. This takes the unit out of the applicable MODES and restores the unit to operation within the bounds of the safety analyses.

The allowed Completion Times are reasonable, based on operating experience, to reach the required plant conditions from full power conditions in an orderly manner without challenging plant systems.

SURVEILLANCE
REQUIREMENTSSR 3.4.5.1

This SR requires that during steady state operation, pressurizer level is maintained below the nominal upper limit to provide a minimum space for a steam bubble. The Surveillance is performed by observing the indicated level. The Frequency of 12 hours corresponds to verifying the parameter each shift. The 12 hour interval has been shown by operating practice to be sufficient to regularly assess the level for any deviation and verify that operation is within safety analyses assumptions. Alarms are also available for early detection of abnormal level indications.

REFERENCES

1. **FSAR** Chapter 15, "Accident **Analyses** ~~Analysis~~."
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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)

3.4.5 Pressurizer

LCO 3.4.5 The pressurizer water level shall be $\leq 92\%$ of span.

APPLICABILITY: MODES 1, 2, and 3.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Pressurizer water level not within limit.	A.1 Be in MODE 3.	6 hours
	<u>AND</u>	
	A.2 Initiate action to fully insert all rods.	6 hours
	<u>AND</u>	
	A.3 Place the Plant Control System in a condition incapable of rod withdrawal.	6 hours
	<u>AND</u>	
	A.4 Be in MODE 4.	12 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
SR 3.4.5.1 Verify pressurizer water level $\leq 92\%$ of span.	12 hours

B 3.4 REACTOR COOLANT SYSTEM (RCS)

B 3.4.5 Pressurizer

BASES

BACKGROUND

The pressurizer provides a point in the RCS where liquid and vapor are maintained in equilibrium under saturated conditions for pressure control purposes to prevent bulk boiling in the remainder of the RCS. Key functions include maintaining required primary system pressure during steady state operation, and limiting the pressure changes caused by reactor coolant thermal expansion and contraction during normal load transients.

The normal level and pressure control components addressed by this LCO include the pressurizer water level, the heaters, their controls, and power supplies. Pressurizer safety valves and automatic depressurization valves are addressed by LCO 3.4.6, "Pressurizer Safety Valves," and LCO 3.4.11, "Automatic Depressurization System (ADS) – Operating," respectively.

The intent of the LCO is to ensure that a steam bubble exists in the pressurizer prior to power operation to minimize the consequences of potential overpressure transients. The presence of a steam bubble is consistent with analytical assumptions. Relatively small amounts of noncondensable gases can inhibit the condensation heat transfer between the pressurizer spray and the steam, and diminish the spray effectiveness for pressure control.

Electrical immersion heaters, located in the lower section of the pressurizer vessel, keep the water in the pressurizer at saturation temperature and maintain a constant operating pressure.

APPLICABLE
SAFETY
ANALYSES

In MODES 1, 2, and 3, the LCO requirement for a steam bubble is reflected implicitly in the accident analyses. Safety analyses performed for lower MODES are not limiting. All analyses performed from a critical reactor condition assume the existence of a steam bubble and saturated conditions in the pressurizer. In making this assumption, the analyses neglect the small fraction of noncondensable gases normally present.

Safety analyses presented in FSAR Chapter 15 (Ref. 1) do not take credit for pressurizer heater operation, however, an implicit initial condition assumption of the safety analyses is that the RCS is operating at normal pressure.

BASES

APPLICABLE SAFETY ANALYSES (continued)

The maximum pressurizer water level limit satisfies Criterion 2 of 10 CFR 50.36(c)(2)(ii).

LCO The LCO requirement for the pressurizer water volume $\leq 92\%$ of span ensures that an adequate steam bubble exists. Limiting the LCO maximum operating water level preserves the steam space for pressure control. The LCO has been established to ensure the capability to establish and maintain pressure control for steady state operation and to minimize the consequences of potential overpressure transients. Requiring the presence of a steam bubble is also consistent with analytical assumptions.

APPLICABILITY The need for pressure control is most pertinent when core heat can cause the greatest effect on RCS temperature, resulting in the greatest effect on pressurizer level and RCS pressure control. Thus, applicability has been designated for MODES 1 and 2. The applicability is also provided for MODE 3. The purpose is to prevent solid water RCS operation during heatup and cooldown to avoid rapid pressure rises caused by normal operational perturbation, such as reactor coolant pump startup.

ACTIONS A.1, A.2, A.3, and A.4

Pressurizer water level control malfunctions or other plant evolutions may result in a pressurizer water level above the nominal upper limit, even with the plant at steady state conditions.

If the pressurizer water level is above the limit, action must be taken to restore the plant to operation within the bounds of the safety analyses. This is done by placing the unit in MODE 3 with the Plant Control System in a condition incapable of rod withdrawal and action initiated to fully insert all control rods within 6 hours, and placing the unit in MODE 4 within 12 hours. This takes the unit out of the applicable MODES and restores the unit to operation within the bounds of the safety analyses.

The allowed Completion Times are reasonable, based on operating experience, to reach the required plant conditions from full power conditions in an orderly manner without challenging plant systems.

BASES

SURVEILLANCE
REQUIREMENTSSR 3.4.5.1

This SR requires that during steady state operation, pressurizer level is maintained below the nominal upper limit to provide a minimum space for a steam bubble. The Surveillance is performed by observing the indicated level. The Frequency of 12 hours corresponds to verifying the parameter each shift. The 12 hour interval has been shown by operating practice to be sufficient to regularly assess the level for any deviation and verify that operation is within safety analyses assumptions. Alarms are also available for early detection of abnormal level indications.

REFERENCES

1. FSAR Chapter 15, "Accident Analyses."
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