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

Title: Changes Related to LCO 3.7.11, Spent Fuel Pool Boron Concentration

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:

None

STS NUREGs Affected:

Not Applicable

NRC Approval Date:

Not Applicable

TSTF Classification:

Not Applicable

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 3.7.11.

RCOL COL Item Number and Title:

There are no Vogtle COL items applicable to Specification 3.7.12.

RCOL PTS Change Number and Title:

VEGP LAR DOC A105: TS 3.7.11 Applicability and Required Action A.2.2 are revised
VEGP LAR DOC A109: TS 3.7.11 Applicability is revised
VEGP LAR DOC L05: TS LCO 3.0.8 is eliminated

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

This section discusses changes: (1) that were applicable to previous designs, but are not to the current design; (2) that are already incorporated in the GTS; and (3) that are superseded by another change.

None

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)

Minor corrections were made to correct grammatical errors in the bases.

V. Applicability

Affected Generic Technical Specifications and Bases:

Section 3.7.11 Spent Fuel Storage Pool Boron Concentration

Changes to the Generic Technical Specifications and Bases:

The GTS 3.7.11 LCO header, title and Specification statement are revised to provide consistent terminology for the Spent Fuel Pool system. (DOC A105)

The GTS 3.7.11 Applicability statement is revised and formatted. (DOC A105 and DOC A109)

The GTS 3.7.11 Action Note is revised to eliminate reference to AP1000 GTS LCO 3.0.8. (DOC L05)

GTS 3.7.11 Condition A and associated Required Actions are revised to provide consistent terminology for the Spent Fuel Pool system. (DOC A105)

GTS SR 3.7.11.1 is revised to provide consistent terminology for the Spent Fuel Pool system. (DOC A105)

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:

VEGP LAR DOC A105 revises phrase “Fuel Storage Pool Boron Concentration,” to “Spent Fuel Pool Boron Concentration” throughout the GTS 3.7.11 LCO Specification and bases.

VEGP LAR DOC A109 corrects the format of the Applicability statement.

VEGP LAR DOC L05 removes reference to AP1000 GTS LCO 3.0.8, which is eliminated.

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:

VEGP LAR DOC A105 provides consistent terminology with respect to the Spent Fuel Pool.

VEGP LAR DOC A109 is consistent with the TS Writer's Guide (Reference 4).

VEGP LAR DOC L05 notes that current considerations of AP1000 GTS LCO 3.0.8 are adequately addressed within individual LCO referencing LCO 3.0.8 or by TS 5.4.1.b to Monitor Safety System Shutdown Monitoring Trees parameters. AP1000 GTS LCO 3.0.8 is eliminated.

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

Dashes were added to time descriptors such as “the 72-hour completion time is acceptable…” in the Actions section of the bases.

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

These changes are to correct grammatical errors in the bases.

VII. GTST Safety Evaluation

Technical Analysis:

VEGP LAR DOC L05 eliminates GTS LCO 3.0.8. In conjunction with the change to eliminate LCO 3.0.8, all Notes and references are no longer necessary and are administratively eliminated. The elimination of GTS LCO 3.0.8 is discussed in detail in GTS O01-LCO 3.0.

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.

References to Previous NRC Safety Evaluation Reports (SERs):

VEGP LAR SER (Reference 3)

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 Monday, May 19, 2014.

NRC Final Approval Date:

NRC Contact:

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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)

XI. MARKUP of the Applicable GTS Section 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.

3.7 PLANT SYSTEMS

3.7.11 **Spent** Fuel ~~Storage~~ Pool Boron Concentration

LCO 3.7.11 The **spent** fuel ~~storage~~ pool boron concentration shall be ≥ 2300 ppm.

APPLICABILITY: When fuel assemblies are stored in the **spent** fuel ~~storage~~ pool and a **spent** fuel ~~storage~~ pool **storage** verification has not been performed since the last movement of fuel assemblies in the **spent** fuel ~~storage~~ pool.

ACTIONS

----------NOTE----------
LCO~~s~~ 3.0.3 **is** ~~and 3.0.8 are~~ not applicable.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. **Spent fuel** ~~Fuel storage~~ pool boron concentration not within limit.	A.1 Suspend movement of fuel assemblies in the **spent** fuel ~~storage~~ pool. AND A.2.1 Initiate action to restore **spent** fuel ~~storage~~ pool boron concentration to within limit. OR A.2.1 Initiate action to perform a **spent** fuel ~~storage~~ pool **storage** verification.	Immediately Immediately Immediately

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.7.11.1	Verify the **spent** fuel ~~storage~~ pool boron concentration is within limit.	7 days

B 3.7 PLANT SYSTEMS

B 3.7.11 **Spent** Fuel ~~Storage~~ Pool Boron Concentration

BASES

BACKGROUND

The water in the spent fuel ~~storage~~ pool normally contains soluble boron, which would result in large subcriticality margins under actual operating conditions. For storage of fuel in the spent fuel racks, the design basis for preventing criticality outside the reactor is that there is a 95 percent probability at a 95 percent confidence level, without soluble boron, that the effective multiplication factor (k_{eff}) of the fuel assembly array will be less than 0.997, including uncertainties and tolerances. The NRC guidelines specify a limiting k_{eff} of 1.0 for normal storage in the absence of soluble boron. Therefore, the design is based on the use of unborated water, which maintains a subcritical condition (Ref. 1). The double contingency principle discussed in ANSI N-16.1-1975 and the April 1978 NRC letter (Ref. 2) allows credit for soluble boron under other abnormal or accident conditions, since only a single independent accident need be considered at one time. For example, the only accident scenario that has a potential for more than negligible positive reactivity effect is an inadvertent misplacement of a new fuel assembly. This accident has the potential for exceeding the limiting reactivity, should there be a concurrent and independent accident condition resulting in the loss of all soluble poison. To mitigate these postulated criticality related accidents, boron is dissolved in the pool water. Safe operation with unborated water and no movement of assemblies may, therefore, be achieved by controlling the location of each assembly in accordance with LCO 3.7.12, “Spent Fuel Pool Storage.” Prior to movement of an assembly, it is necessary to perform SR 3.7.12.1.

APPLICABLE SAFETY ANALYSES

Although credit for the soluble boron normally present in the spent fuel pool water is permitted under abnormal or accident conditions, most abnormal or accident conditions will not result in exceeding the limiting reactivity even in the absence of soluble boron. The effects on reactivity of credible abnormal and accident conditions due to temperature increase, assembly dropped on top of a rack, and misplacement/misloading of a fuel assembly have been analyzed. The reactivity effects of bulk spent fuel pool temperature increase (>140°F) and steaming from the pool water surface or intramodule water gap reductions between the firmly interconnected cell and module arrays due to a seismic event are bounded by the fuel mishandling/misloading

BASES

APPLICABLE SAFETY ANALYSES (continued)

reactivity increases and therefore assessed as negligible. The spent fuel pool k_{eff} storage limit of 0.95 is maintained during these events by a minimum boron concentration of greater than or equal to 800 ppm established by criticality analysis (Ref. 3). Compliance with the LCO minimum boron concentration limit of 2300 ppm ensures that the credited concentration is always available.

The concentration of dissolved boron in the **spent** fuel ~~storage~~ pool satisfies Criterion 2 of 10 CFR 50.36(c)(2)(ii).

LCO

The **spent** fuel ~~storage~~ pool boron concentration is required to be ≥ 2300 ppm. The specified concentration of dissolved boron in the **spent** fuel ~~storage~~ pool preserves the assumptions used in the analyses of the potential critical accident scenarios as described in References 1 and 3. This concentration of dissolved boron is the minimum required concentration for fuel assembly storage and movement within the **spent** fuel ~~storage~~ pool.

APPLICABILITY

This LCO applies whenever fuel assemblies are stored in the spent fuel ~~storage~~ pool and a **spent** fuel ~~storage~~ pool **storage** verification has not been performed since the last movement of fuel assemblies in the **spent** fuel ~~storage~~ pool.

ACTIONS

LCO 3.0.3 is applicable while in MODE 1, 2, 3, or 4. Since spent fuel pool cooling requirements apply in all MODES when fuel is stored in the spent fuel ~~storage~~ pool, the ACTIONS have been modified by the Note stating that LCO 3.0.3 is not applicable. Spent fuel pool boron concentration requirements are independent of reactor operations. Entering LCO 3.0.3 while in MODE 1, 2, 3, or 4 would require the unit to be shutdown unnecessarily.

~~LCO 3.0.8 is applicable while in MODE 5 or 6. Since spent fuel pool cooling requirements apply in all MODES when fuel is stored in the spent fuel storage pool, the ACTIONS have been modified by a Note stating that LCO 3.0.8 is not applicable. Spent fuel pool boron concentration requirements are independent of shutdown reactor operations. Entering LCO 3.0.8 while in MODE 5 or 6 would require the optimization of plant safety, unnecessarily.~~

BASES

ACTIONS (continued)

A.1, A.2.1, and A.2.2

When the concentration of boron in the **spent** fuel ~~storage~~ pool is less than required, immediate action must be taken to preclude the occurrence of an accident or to mitigate the consequences of an accident in progress. This is most efficiently achieved by immediately suspending the movement of fuel assemblies. The concentration of boron is restored simultaneously with suspending movement of fuel assemblies. An acceptable alternative is to verify by administrative means that the **spent** fuel ~~storage~~ pool **storage** verification has been performed since the last movement of fuel assemblies in the **spent** fuel ~~storage~~ pool. However, prior to resuming movement of fuel assemblies, the concentration of boron must be restored. This does not preclude movement of a fuel assembly to a safe position.

SURVEILLANCE REQUIREMENTS

SR 3.7.11.1

This SR verifies that the concentration of boron in the **spent** fuel ~~storage~~ pool is within the required limit. As long as this SR is met, the analyzed accidents are fully addressed. The 7-day Frequency is appropriate because no major replenishment of pool water is expected to take place over such a short period of time.

REFERENCES

1. Sections 9.1.2, “Spent Fuel Storage” and 15.7.4, “Fuel Handling Accident.”

2. Double contingency principle of ANSI N16.1 1975, as specified in the April 14, 1978 NRC letter (Section 1.2) and implied in the proposed revision to Regulatory Guide 1.13 (Section 1.4, Appendix A).

3. APP GW GLR 029P, “AP1000 Spent Fuel Storage Racks Criticality Analysis,” Westinghouse Electric Company LLC (Westinghouse Proprietary).

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.

3.7 PLANT SYSTEMS

3.7.11 Spent Fuel Pool Boron Concentration

LCO 3.7.11 The spent fuel pool boron concentration shall be ≥ 2300 ppm.

APPLICABILITY: When fuel assemblies are stored in the spent fuel pool and a spent fuel pool storage verification has not been performed since the last movement of fuel assemblies in the spent fuel pool.

ACTIONS

----------NOTE----------
LCO 3.0.3 is not applicable.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Spent fuel pool boron concentration not within limit.	A.1 Suspend movement of fuel assemblies in the spent fuel pool. AND A.2.1 Initiate action to restore spent fuel pool boron concentration to within limit. OR A.2.1 Initiate action to perform a spent fuel pool storage verification.	Immediately Immediately Immediately

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.7.11.1	Verify the spent fuel pool boron concentration is within limit.	7 days

B 3.7 PLANT SYSTEMS

B 3.7.11 Spent Fuel Pool Boron Concentration

BASES

BACKGROUND

The water in the spent fuel pool normally contains soluble boron, which would result in large subcriticality margins under actual operating conditions. For storage of fuel in the spent fuel racks, the design basis for preventing criticality outside the reactor is that there is a 95 percent probability at a 95 percent confidence level, without soluble boron, that the effective multiplication factor (k_{eff}) of the fuel assembly array will be less than 0.997, including uncertainties and tolerances. The NRC guidelines specify a limiting k_{eff} of 1.0 for normal storage in the absence of soluble boron. Therefore, the design is based on the use of unborated water, which maintains a subcritical condition (Ref. 1). The double contingency principle discussed in ANSI N-16.1-1975 and the April 1978 NRC letter (Ref. 2) allows credit for soluble boron under other abnormal or accident conditions, since only a single independent accident need be considered at one time. For example, the only accident scenario that has a potential for more than negligible positive reactivity effect is an inadvertent misplacement of a new fuel assembly. This accident has the potential for exceeding the limiting reactivity, should there be a concurrent and independent accident condition resulting in the loss of all soluble poison. To mitigate these postulated criticality related accidents, boron is dissolved in the pool water. Safe operation with unborated water and no movement of assemblies may, therefore, be achieved by controlling the location of each assembly in accordance with LCO 3.7.12, “Spent Fuel Pool Storage.” Prior to movement of an assembly, it is necessary to perform SR 3.7.12.1.

APPLICABLE SAFETY ANALYSES

Although credit for the soluble boron normally present in the spent fuel pool water is permitted under abnormal or accident conditions, most abnormal or accident conditions will not result in exceeding the limiting reactivity even in the absence of soluble boron. The effects on reactivity of credible abnormal and accident conditions due to temperature increase, assembly dropped on top of a rack, and misplacement/misloading of a fuel assembly have been analyzed. The reactivity effects of bulk spent fuel pool temperature increase (>140°F) and steaming from the pool water surface or intramodule water gap reductions between the firmly interconnected cell and module arrays due to a seismic event are bounded by the fuel mishandling/misloading

BASES

APPLICABLE SAFETY ANALYSES (continued)

reactivity increases and therefore assessed as negligible. The spent fuel pool k_{eff} storage limit of 0.95 is maintained during these events by a minimum boron concentration of greater than or equal to 800 ppm established by criticality analysis (Ref. 3). Compliance with the LCO minimum boron concentration limit of 2300 ppm ensures that the credited concentration is always available.

The concentration of dissolved boron in the spent fuel pool satisfies Criterion 2 of 10 CFR 50.36(c)(2)(ii).

LCO

The spent fuel pool boron concentration is required to be ≥ 2300 ppm. The specified concentration of dissolved boron in the spent fuel pool preserves the assumptions used in the analyses of the potential critical accident scenarios as described in References 1 and 3. This concentration of dissolved boron is the minimum required concentration for fuel assembly storage and movement within the spent fuel pool.

APPLICABILITY

This LCO applies whenever fuel assemblies are stored in the spent fuel pool and a spent fuel pool storage verification has not been performed since the last movement of fuel assemblies in the spent fuel pool.

ACTIONS

LCO 3.0.3 is applicable while in MODE 1, 2, 3, or 4. Since spent fuel pool cooling requirements apply in all MODES when fuel is stored in the spent fuel pool, the ACTIONS have been modified by the Note stating that LCO 3.0.3 is not applicable. Spent fuel pool boron concentration requirements are independent of reactor operations. Entering LCO 3.0.3 while in MODE 1, 2, 3, or 4 would require the unit to be shutdown unnecessarily.

A.1, A.2.1, and A.2.2

When the concentration of boron in the spent fuel pool is less than required, immediate action must be taken to preclude the occurrence of an accident or to mitigate the consequences of an accident in progress. This is most efficiently achieved by immediately suspending the movement of fuel assemblies. The concentration of boron is restored simultaneously with suspending movement of fuel assemblies. An

BASES

ACTIONS (continued)

acceptable alternative is to verify by administrative means that the spent fuel pool storage verification has been performed since the last movement of fuel assemblies in the spent fuel pool. However, prior to resuming movement of fuel assemblies, the concentration of boron must be restored. This does not preclude movement of a fuel assembly to a safe position.

SURVEILLANCE REQUIREMENTS

SR 3.7.11.1

This SR verifies that the concentration of boron in the spent fuel pool is within the required limit. As long as this SR is met, the analyzed accidents are fully addressed. The 7-day Frequency is appropriate because no major replenishment of pool water is expected to take place over such a short period of time.

REFERENCES

1. Sections 9.1.2, “Spent Fuel Storage” and 15.7.4, “Fuel Handling Accident.”

2. Double contingency principle of ANSI N16.1 1975, as specified in the April 14, 1978 NRC letter (Section 1.2) and implied in the proposed revision to Regulatory Guide 1.13 (Section 1.4, Appendix A).

3. APP GW GLR 029P, “AP1000 Spent Fuel Storage Racks Criticality Analysis,” Westinghouse Electric Company LLC (Westinghouse Proprietary).